

# Waitakere City Comprehensive Urban Stormwater Management Strategy and Action Plan



Ministry for the  
**Environment**  
*Manatu Mo Te Taiao*



**Waitakere City Council**  
*Te Taiao o Waitakere*

**EcoWater Solutions**  
Waitakere's Three Waters



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## EXECUTIVE SUMMARY

This Comprehensive Urban Stormwater Management Strategy and Action Plan (Stormwater Strategy) sets out the Waitakere City Council's approach to managing the City's stormwater over the next twenty years. It is intended mainly for Council and staff, as well as key external stakeholders and members of the community with an interest in sustainable stormwater management.

Waitakere City has a wealth of ocean beaches, harbours, estuaries, wetlands, lakes and streams. To the people of Waitakere and beyond, these natural features provide many benefits, including sporting and recreation facilities and a pleasant environment that enriches the quality of life in the City. Water is of special value to the tangata whenua of the City and the waterways and their margins provide habitat for much native wildlife.

The expansion of Waitakere City, particularly since the Second World War, has severely impacted on these aquatic environments. Stormwater runoff is a major source of pollutants entering many waterways, and degrades the quality of water in streams and coastal environments. Motor vehicles are the single largest source of pollution of the City's urban water bodies, with their pollutants carried by stormwater running off roads and parking areas. Siltation of streams and coastal waters from erosion and the impact of pollutants on waterways have become pressing issues, with a significant level of community concern about the ability to use certain areas for recreation and food gathering.

For many years the management of water quality has been centred on controlling industrial discharges, with inadequate consideration of smaller diffuse sources of pollution from roadways, homes and agriculture, or the importance of good urban design. The focus on reducing flooding and instability has led to stormwater works aimed at efficiently removing stormwater into a reticulation system, mainly consisting of investment in kerbs, channels and piped infrastructure. This has often meant that the adverse environmental impacts upon the receiving waters and aquatic ecosystems have been overlooked.

More recent realisation is that stormwater management also needs to address the impacts of flow volumes, pollution and works on the City's streams, beaches and harbours and their native wildlife. Because Waitakere is a rapidly growing city, a major focus of the Stormwater Strategy is on preventing future problems through careful design of new development and its stormwater management systems. An additional challenge within the limited resources available is remedying problems arising from past solutions that have proved inadequate.

Successful management of stormwater needs a long-term approach to integrate best practice catchment management principles with excellence in rural and urban design in both new and established areas, as well as community and business involvement and education programmes.

Stormwater systems and management need to be consistent with and actively contribute to a number of other environmental and community outcomes. Together these will improve the City's stormwater systems, the safety of people and property and the quality of the environment.

This Strategy sets out Waitakere City Council's vision for holistic management of stormwater in conjunction with iwi and the community. The Strategy:

- sets out a vision for sustainable stormwater management;
- summarises the issues ;
- identifies key internal and external stakeholders;
- describes the national, regional and local policy and management framework;
- sets out goals and objectives;
- outlines policies;
- establishes priorities;
- outlines options and implementation methods;
- establishes monitoring measures; and
- assesses costs and benefits.



The legislative and strategic context at both national and regional levels, the iwi perspective and the Council's own strategic direction all point to the need for a shift to a more holistic focus for managing stormwater, recognising the need for total water cycle management, and for ensuring that any adverse effects on the environment are avoided, remedied or mitigated.

***Sustainable development in relation to stormwater involves the whole of the Waitakere City community, iwi groups and the Council.***

This complex issue covers ecosystems, people, urban design, communities and businesses, as well as cultural, amenity and social values. It requires input from a wide range of professionals such as stormwater, geotechnical and roading engineers, educationalists and communicators, ecologists, planners, cleaner production experts and land developers. The diverse areas of expertise from throughout the whole Council must therefore continue their involvement in sustainable stormwater management. The support of iwi groups, key stakeholders and the community is also essential if a sustainable future is to be achieved in the City.

Through its Green Network strategic direction, Waitakere City has achieved a fully integrated approach to managing stormwater from a multi-disciplinary perspective, a far remove from the traditionally engineering management perspective. However, measures are still required to ensure the diverse areas of expertise from throughout the whole Council continue their involvement in sustainable stormwater management. This strategy aims to achieve that goal.

***The Stormwater Strategy sets a direction and Priorities that will enable the Council to address stormwater issues over the next 20 years.***

This Stormwater Strategy is concerned with identifying the issues, values and opportunities associated with stormwater quality and quantity. It sets a direction and priorities for implementation that will enable Council to address these issues over the next twenty years.

The priorities for the stormwater programme were determined by firstly, identifying stormwater management units (large catchment areas) throughout the City and a set of generic issues associated with urban stormwater. Next, the issues present in each stormwater management unit were noted, and stormwater management units and their coastal receiving environments were classified according to their sensitivity and ecological values, in order to devise stormwater management goals appropriate to each. Community use of stormwater management units was also considered.

This information has then been brought together to prioritise the stormwater management units for the purposes of programming comprehensive stormwater catchment management plans and funding allocation for capital works.

The issues identified in this strategy that are posed by stormwater are:

- loss of habitat quality and quantity
- point source contamination of water
- non-point source contamination of water
- flooding
- accelerated erosion and land instability
- land development potential
- altering the natural water balance
- existing stormwater infrastructure
- community use

The report concludes with a detailed summary of objectives, policies, explanations and implementation methods for each of the identified stormwater-related issues, so that these can be applied to the catchments in their order of priority.

## 1. INTRODUCTION

### 1.1 *Purpose*

This stormwater strategy sets out the Waitakere City Council's approach to managing the City's stormwater over the next twenty years. It is intended mainly for Council and staff, as well as key external stakeholders and members of the community with an interest in sustainable stormwater management.

Waitakere City has a wealth of ocean beaches, harbours, estuaries, wetlands, lakes and streams. To the people of Waitakere and beyond, these natural features provide many benefits, including sporting and recreation facilities and a pleasant environment that enriches the quality of life in the City. Water is of special value to the tangata whenua of the City and the waterways and their margins provide habitat for much native wildlife.

The expansion of Waitakere City, particularly since the Second World War, has severely impacted on these aquatic environments. Stormwater runoff is a major source of pollutants entering many waterways, and degrades the quality of water in streams and coastal environments. Motor vehicles are the single largest source of pollution of the City's urban water bodies, with their pollutants carried by stormwater running off roads and parking areas. Siltation of streams and coastal waters from erosion and the impact of pollutants on waterways have become pressing issues, with a significant level of community concern about the ability to use certain areas for recreation and food gathering.

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More recent realisation is that stormwater management also need to address the impacts of flow volumes, pollution and works on the City's streams, beaches and harbours and their native wildlife.

Because Waitakere is a rapidly growing city, a major focus of the Stormwater Strategy is on preventing future problems through careful design of new development and its stormwater management systems. An additional challenge within the limited resources available is remedying problems arising from past solutions that have proved inadequate.

Successful management of stormwater needs a long-term approach to integrate best practice catchment management principles with Excellence in rural and urban design in both new and established areas, and community involvement and education programmes. Stormwater systems and management need to be consistent with and actively contribute to a number of other environmental and community outcomes. Together these will improve the City's stormwater systems, the safety of people and property and the quality of the environment.

This Strategy sets out Waitakere City Council's vision for holistic management of stormwater in conjunction with iwi and the community. The Strategy:

- sets out a vision
- summarises the issues
- sets out goals and objectives
- outlines policies
- establishes priorities
- outlines options and implementation methods
- establishes monitoring measures
- assesses costs and benefits



## **VISION**

*Waitakere City Council will manage the effects of the City's stormwater runoff with due regard to:*

- *the health and safety of its people, land and property*
- *maintaining the mauri of water*
- *protecting and enhancing the life-supporting properties and quality of its streams, rivers, estuaries and harbours*
- *efficient and effective stormwater infrastructure*



**PLATE 1:** *Sand infiltration basin*

This sand infiltration basin has been retrofitted into an industrial area to filter pollutants from stormwater runoff. Such works are an example of improved stormwater management systems.

### **1.3 Key Stakeholders**

This Stormwater Strategy recognises that integrated stormwater management must involve interaction with iwi, the community (including special interest groups) and other key stakeholders shown in Figure 1.

Knowledge and involvement encourages community interest in managing local environments. This interest is crucial to sustainable stormwater management.

EcoWater, a Council Business Unit, is responsible for technical and strategic aspects of stormwater management in Waitakere City, but sustainable stormwater management involves the whole Council, as outlined next.

### **1.4 Internal Stakeholders**

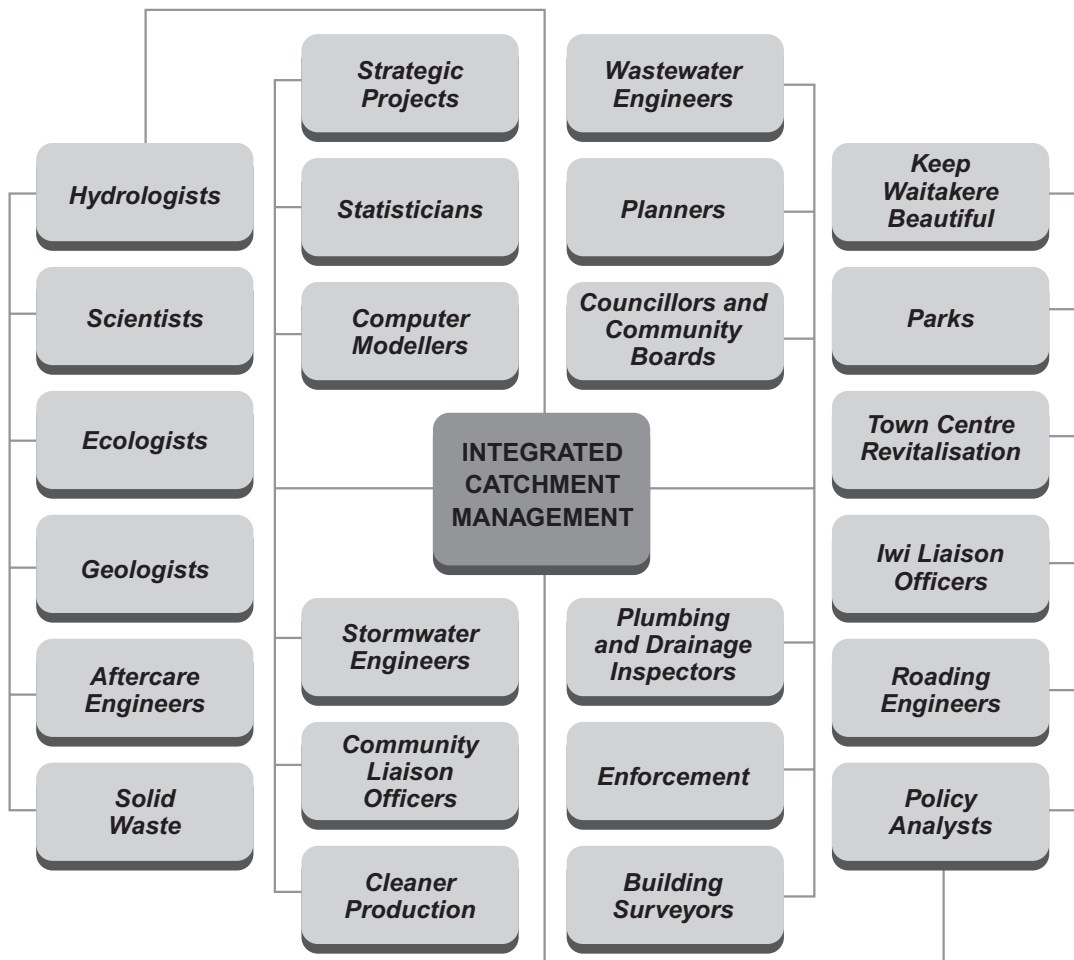
Although EcoWater has substantial responsibility for the stormwater system, including streams, flow paths and the piped system, the work of many other sections within the Council impacts heavily on flooding, water quality and the health of aquatic ecosystems. To achieve the desired outcomes in relation to stormwater management, integrated effort by a wide range of Council staff expertise is required.

Figure 2 illustrates the internal stakeholders involved in various aspects of Waitakere City Council's stormwater management.

Figure 1: General Overview of Key Stakeholders



Figure 2: General Overview of Internal Stakeholders





## 1.5 Policy Framework

Elements of the policy framework that affect sustainable stormwater management in Waitakere City include:

- Tikanga Maori
- legislation
- central and regional government policy
- Waitakere City policy, plans and strategies
- other Council goals, documents and processes

These are briefly discussed next.

### 1.5.1 Stormwater and Tikanga Maori

The Treaty of Waitangi and the Resource Management Act require Local Government to take into account the unique role and distinct cultural beliefs and traditions of Maori. Waitakere City works with Te Kawerau A Maki and Ngati Whatua as the two tangata whenua groups who claim manawhenua status within the area. Council is obliged under the Resource Management Act to consult in an open, timely and meaningful way with both groups, and has a policy of promoting meaningful partnership arrangements and processes with iwi.

Maori view water and other natural resources as taonga (treasures) with spiritual and metaphysical properties. These levels, practical and spiritual, are bound together within the mauri or life force that empowers all living things, makes human beings a part of the natural world and is central to the mana and lifeblood of iwi, hapu and whanau. Specific management practices considered necessary to maintain the mauri of these taonga include:

- a holistic approach to resource management
- protection of habitats of edible plants and native marine life which are traditional sources of food for local Maori
- restoring a buffer of native vegetation alongside waterways
- water conservation
- avoiding mixing waters from different sources
- waste minimisation
- treating stormwater (restoring its mauri) by passing it through land before it is released into natural waterways

Both iwi have nominated representatives who are responsible for working with Council on matters of mutual interest. Both iwi have indicated that water issues and management are a priority and their respective iwi statements explain the role of iwi as kaitiaki (or guardians) of the taonga. Their mana and wealth as well as the state of the environment depends on the extent to which iwi are able to give effect to this role.

#### NGATI WHATUA RESOURCE MANAGEMENT CONCERNS<sup>1</sup>

Water represents the tears of Ranginui, the life blood of Papatuanuku and is the domain of Tangaroa. Water must be managed holistically and nurtured as a living entity. Matters of concern to Ngati Whatua are:

- sewage and stormwater discharges to waterways
- industrial and urban discharges and stormwater runoff
- leachate from landfills
- sedimentation and erosion
- dumping of animal carcasses near waterways
- mixing of waters from different sources, which is spiritually offensive
- noxious weeds in waterways
- the need to reintroduce and retain natural wetlands

All wastes derived from the land should be returned to the land rather than directly into the waterways in order to protect the mauri.

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<sup>1</sup> Waitakere City Proposed District Plan Policy Section - Tangata Whenua (December 1998 Version)

### TE KAWERAU A MAKI RESOURCE MANAGEMENT CONCERNS<sup>1</sup>

The main concerns of Te Kawerau a Maki Trust are that:

- the mauri of all natural waterways is protected
- the food producing capacity of natural waterways is protected and enhanced
- the life supporting capacity of natural waterways is protected and enhanced

Te Kawerau a Maki advocates water conservation and efficient use of water, opposes the direct disposal of any wastes into waterways and requires that waste pass through the soils before discharge. The iwi wants waterways to be managed to a level that ensures their use as a food source and supports active restoration programmes, including stream edge planting. Above all the iwi requires that spiritual and cultural concepts should be recognised as key issues in water management.

The iwi supports active programmes to enhance the coastal area and the ecology of the Manukau and Waitemata Harbours and the West Coast area known as Nga Tai Whakatu a Kupe.

### PAN-TRIBAL MAORI RESOURCE MANAGEMENT CONCERNS

Pan-tribal Maori (Maori with connection to iwi and hapu in other parts of the country) comprise a large proportion of the City's total Maori population. Although iwi have clear status under the Resource Management Act, the cultural perspective of other Maori is also a major consideration. Of particular concern to pan-tribal urban Maori in Waitakere City are the:

- protection of natural and physical resources, in particular, water quality
- avoidance of discharge of wastes (treated or untreated) into waterways

#### ***1.5.2 Legislation***

The many pieces of legislation that influence stormwater management include:

- Local Government Act 1974 and the 1996 Local Government Amendment Act (No. 3)
- Resource Management Act 1991
- Building Act 1991
- Health Act 1956

#### RESERVES ACT 1997

These are briefly discussed next.

#### LOCAL GOVERNMENT ACT

The Local Government Act provides the Council with powers to undertake public drainage works and their repair and maintenance. It directs Council to produce and maintain a drainage map, construct drains and cover and use watercourses for the discharge of stormwater subject to the provisions of the Resource Management Act.

The Local Government Act also sets out the legal framework within which local authorities manage their finances, with mechanisms for ensuring improved accountability and transparent decision-making. It requires councils to prepare:

- an Annual Plan with performance measures established by community consultation
- an Annual Report outlining Council's performance against the Annual Plan's objectives
- a Long Term Financial Strategy spanning a period of not less than 10 years, which sets the context within which councils must make their Annual Plan decisions

The Local Government Amendment Act (No. 3) 1996 requires the Council to make its financial decisions within a framework of principles set out in Section 122C, including assessment of the costs and benefits of different funding options.



## RESOURCE MANAGEMENT ACT 1991

The purpose of the Resource Management Act is promotion of 'the sustainable management of natural and physical resources'. This means 'managing the use, development and protection of natural and physical resources ... while ... safeguarding the life-supporting capacity of air, water, soil and ecosystems; and avoiding, remedying or mitigating any adverse effects of activities on the environment'.

The Act sets out matters of national importance to be recognised and provided for (Section 6), including:

- the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins
- the protection of them from inappropriate subdivision, use and development
- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna
- the protection of the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga

In addition, when managing the use, development and protection of natural and physical resources, particular regard must be had to a number of issues, including:

- Kaitiakitanga
- the efficient use and development of natural and physical resources
- the maintenance and enhancement of amenity values
- intrinsic values of ecosystems
- the maintenance and enhancement of the quality of the environment
- the protection of the habitat of trout and salmon

Section 31 sets out the functions of the Council, which include the control of any actual or potential effects of the use, development or protection of land, including for the purpose of avoidance or mitigation of natural hazards and the control of subdivision of land. Section 32 requires the consideration of alternatives and an evaluation of the benefits and costs.

The rules about discharges in Section 70 are of particular relevance to this Strategy, providing the basis for regional councils to deal with applications to discharge stormwater. In the Auckland Region, the Auckland Regional Council has typically granted city and district councils comprehensive discharge consents on a catchment basis in accordance with the provisions of a Stormwater Catchment Management Plan.

Under the Resource Management Act, stormwater management is thus required to focus on solutions that allow the best possible use of existing physical and natural resources while protecting natural values where at all possible. Especially relevant are the Act's requirements for:

- sustainable management of freshwater resources
- safeguarding the life-supporting capacity of water
- maintenance and enhancement of water quality and aquatic habitats
- setting minimum flow rates in rivers and streams

## BUILDING ACT 1992

The Building Act co-ordinates building controls with controls on natural and physical resource management. Stormwater-related issues are dealt with in the requirements to control hazardous substances used or stored in buildings and to protect the environment from damage arising from the construction, use or demolition of buildings.

Section 36 requires Council to refuse to grant a building consent if the land is likely to be subject to inundation unless provision has been made to protect the land or building. The building code requires that surface water resulting from a storm with a 2% probability of occurring annually shall not enter buildings.

**HEALTH ACT 1956**

The Health Act affects any source of water under the Council's control in order to protect public health, for example where water is polluted by deficient wastewater systems. If the Medical Officer of Health determines that any source of pollution is dangerous to health, the Council will be required to take corrective measures.

**1.5.3 Central and regional government policies and plans**

Waitakere City's Stormwater Strategy cannot be inconsistent with National and Regional Policy Statements and Plans, including the:

- National Coastal Policy Statement
- Auckland Regional Policy Statement
- Auckland Regional Plan: Coastal
- Auckland Region Urban Stormwater Management Project Strategy Statement
- Auckland Regional Growth Strategy
- Low Impact Design Manual
- Draft Auckland Regional Land, Air and Water Plan

These are briefly discussed next.

**THE 1994 NATIONAL COASTAL POLICY STATEMENT**

The National Coastal Policy Statement requires as a national priority in the coastal environment the protection of significant conservation values, the preservation of estuaries and of predominantly unmodified coastal wetlands, lakes and ponds and the restoration of degraded water quality. Local plans must give effect to its policies, including reducing the adverse effects on the coastal environment of stormwater discharge, maintaining the diversity of indigenous species and of natural communities and ecosystems and restoring degraded habitats and/or ecosystems. The relevant policies are in Appendix A.

**THE JULY 1999 AUCKLAND REGIONAL POLICY STATEMENT**

The Auckland Regional Policy Statement has stormwater management policy objectives that require water quality in water bodies and coastal waters to be maintained and enhanced and the adverse effects of natural hazards on human life, property and the environment to be avoided, remedied, or mitigated. The relevant policies are in Appendix B.

**THE 1995 PROPOSED AUCKLAND REGIONAL PLAN: COASTAL**

The Proposed Auckland Regional Plan: Coastal provides a framework to promote the integrated and sustainable management of Auckland's coastal environment. It identifies the values of the coastal environment and sets out objectives, policies and rules to promote sustainable management of these values. It acknowledges that water and sediment quality is probably the major environmental issue for the Auckland coastal marine area, and seeks to ensure that water quality is maintained or improved. The responsibilities of Territorial Authorities to manage the effects of use, development or protection of land and associated natural and physical resources and subdivision affect the values of the coastal environment, and the document acknowledges the need for integrated management.

**THE JULY 1998 AUCKLAND REGION URBAN STORMWATER MANAGEMENT PROJECT STRATEGY STATEMENT**

The Statement provides a comprehensive twenty-year strategy for managing urban stormwater in the Auckland Region. It is not a binding document but is intended as a framework for the region's councils in preparing asset management plans, stormwater catchment management plans, financial strategies and other measures to give practical effect to the Strategy Statement.

This Strategy focuses on the requirement for all the Region's Councils to meet the purpose of the Act, and to consider the matters of national importance and the other matters set out in Sections 6, 7 and 8 of the Act (as summarised above). This Strategy itemises stormwater priority areas, but acknowledges that as new data becomes available, some aspects, particularly the allocation of priorities, may change.



The 1999 Auckland Regional Growth Strategy, over a three-year period, all eight councils in the Region (Waitakere, North Shore, Manukau and Auckland Cities, Rodney, Papakura and Franklin Districts and the Auckland Regional Council) developed a Regional Growth Strategy to address the environmental and other issues posed by Auckland's rate of growth. While not binding on the Councils, the Growth Strategy has a lot of information about avoiding, minimising and mitigating the environmental effects of development in the Region, including the impacts of stormwater runoff.

#### **THE 2000 LOW IMPACT DESIGN MANUAL**

The Auckland Regional Council's Technical Publication No. 124, Low Impact Design Manual for the Auckland Region, April 2000 sets out the Regional Council's vision of an alternative approach to site design and development. Aimed mainly at reducing the long term adverse environmental effects of development generally, it takes a minimum disturbance approach to earthworks and erosion and sediment control, which also avoids, minimises and remedies that adverse environmental effects of stormwater runoff.

#### **THE DRAFT AUCKLAND REGIONAL LAND, AIR AND WATER PLAN**

At the time of writing, the Auckland Regional Council is preparing a Land, Air and Water (LAW) Plan for the Auckland Region, which will deal with integrated management of these resources. This Plan will also have implications for stormwater management in the Region.

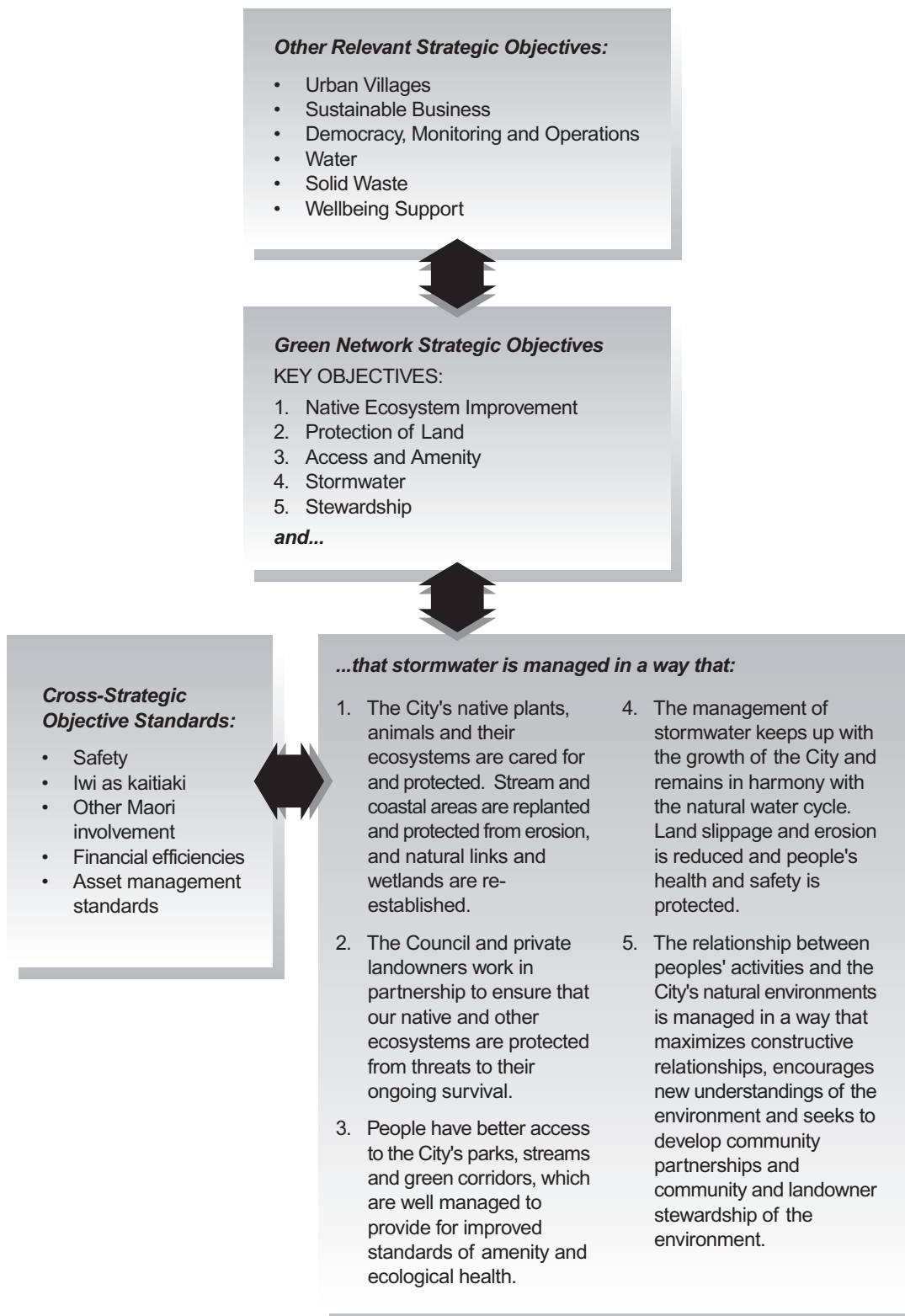
#### ***1.5.4 Waitakere City Policy***

This Stormwater Strategy fits within Council's wider strategic and policy processes and pulls together a number of areas of work that cumulatively contribute to the overall stormwater management picture. The strategic framework is constructed around a number of key documents that have all played a part in Council's baseline strategic direction, including the:

- Waitakere City Strategic Plan
- 'Urban Villages' Strategic Theme
- 'Green Network' Strategic Theme
- Waitakere City Long Term Financial Strategy
- Waitakere City Annual Plan
- Waitakere City Proposed District Plan
- Water Cycle Strategy
- Our Water Our Future - Action Plan
- Waitakere City Council Parks Strategy
- Non-Regulatory Incentives Strategy
- Stormwater catchment Management Plans

Figure 3 shows the key strategic themes and objectives influencing stormwater management, and they are briefly discussed next.

*Figure 3: Key Strategic Themes and Objectives influencing Stormwater Management*





## THE 2000 - 2010 WAITAKERE CITY STRATEGIC PLAN

The Strategic Plan sets out the high level framework for the Stormwater Strategy. It drives and shapes the Council's detailed initiatives within this wider vision.

The Strategic Plan envisages weaving together social, economic and environmental goals in a holistic way. Council's wider urban growth and urban villages strategies aim to create an enhanced green network and better access to recreation and, through education and community involvement, to encourage a community that is closely involved in managing the local environment.

The Strategic Plan clusters the Council's strategic objectives around nine broad themes. The most important of these themes for integrated stormwater management are the 'Green Network' and 'Urban Villages' themes outlined below.

This Stormwater Strategy has been developed in consultation with Council's water, wastewater and solid waste programme managers. Stormwater programme managers have also contributed to Council's sustainable business programme, which aims to promote business development that is integrated with the environment and community, for example by supporting systems that reduce business costs through the recycling of resources, including stormwater.

The Council's overall strategic approach helps reduce long-term costs of infrastructure investment and supports a community that is integrated with its environment.

Two of the most relevant strategic themes are outlined below.

### *The 'Urban Villages' Strategic Theme*

The 'Urban Villages' bundle of objectives are about making sure people have choices about housing, transport, employment and recreation in their neighbourhoods and town centres. It aims to make the city a more vibrant, enjoyable place to live and work by creating attractive urban places where growth and economic development proceed with reduced impacts on the environment. Urban villages initiatives take place in a framework that safeguards resources for future generations and takes account of the principles of the Treaty of Waitangi, with Council objectives relating to growth, amenity provision, access, local parks and community buildings.

Sustainable stormwater systems are an important component of urban villages projects. The Urban Villages programme sets out location, timing and implementation priorities for urban growth and improvements, and sets out standards and change programmes for roading and other access - a key issue for stormwater management.

### *The 'Green Network' Strategic Theme*

The Green Network vision is of trees, parks, bush and restored streams forming 'green fingers' from the Waitakere Ranges through town centres and neighbourhoods to the sea. Stormwater objectives and expenditure are a key part of the Green Network strategy, focusing on protecting and restoring trees, bush and native wildlife corridors, waterways and their aquatic ecosystems, including revegetating the banks of the City's streams. Streams are key parts of both the natural world and the City's stormwater system: they transport stormwater, support native plants and wildlife and are important landscape features. Plants, ponds and wetlands provide wildlife refuge while helping to reduce flooding from increased stormwater runoff from new development. Just as importantly, these features together act as a natural filter for polluted stormwater and help to protect the quality of the water in our streams, harbours and oceans, helping to maintain their delicate ecosystems.

Stormwater management is thus an important focus of the Green Network, together with Council management of parks, esplanade reserves and other public land and private landowner management of their bush, wetland and stream areas. The Green Network is affected by a number of parameters set out in other Strategic Objectives, particularly Urban Villages, as well as other objectives for Sustainable Business, Water, Solid Waste, Democracy Monitoring and Operations and Wellbeing Support.

These major objectives and links are set out in Appendix C, and demonstrate the importance of integrated management for sustainable stormwater management.

### **THE 2000 - 2010 WAITAKERE CITY LONG TERM FINANCIAL STRATEGY**

The Long Term Financial Strategy sets out the level of service that the Council will provide and how it will be funded over the next twenty years. The Strategic Plan and Long Term Financial Strategy are reviewed on a three yearly basis as part of the electoral cycle.

### **THE WAITAKERE CITY ANNUAL PLAN**

The Council prepares a new Annual Plan and budget each year, which forms Year One of the work programme set out in the Long Term Financial Strategy. The Strategic Plan and Long Term Financial Strategy are thus tested and adjusted on a yearly basis through the Annual Plan process.

The Waitakere City Proposed District Plan (notified 1995, Decisions on submissions completed 1998, appeals still outstanding)

The Council's Stormwater Strategy must also meet the objectives and policies of the Waitakere City Proposed District Plan. Key policies and objectives specifically relating to stormwater management require that:

- the life supporting capacity of water be maintained
- impermeable surfaces and stormwater infrastructure be designed and managed in a way that avoids adverse impacts on water quality
- the natural character of the City's coastal environment and rivers and wetlands and their margins, be preserved and enhanced
- those aspects of the environment of significance to tangata whenua, including the mauri (life force), waahi tapu (special sites) and kaitiakitanga (guardianship) are preserved

The District Plan also states that any activity involving the intensification of settlement or subdivision within the Green Network, the Waitakere Ranges, Bush Living, Foothills and Countryside Environments, should be managed in a way that avoids, remedies or mitigates adverse effects on the quality of water, soils and native vegetation and fauna habitat, and the mauri of those resources. Relevant policies and objectives are in Appendix D.

### **THE 1996 WATER CYCLE STRATEGY**

This strategy endorses the idea of water management within the natural water cycle and integrated catchment based water, wastewater and stormwater planning. Goal 7 of the Water Cycle Strategy is to provide efficient stormwater systems. Policies and the overall environmental target are in Appendix E.

### **THE 1998 OUR WATER OUR FUTURE - ACTION PLAN**

This Action Plan further details stormwater management. It sets out a broad level programme that is consistent with the Regional Growth Strategy for managing peripheral growth and urban densities. Feedback from the 1997 'Our Water, Our Future' discussion paper indicated community support for the Council's strategic direction and a more ecologically sustainable approach to the management of the three-waters (water supply, stormwater and wastewater). The Action Plan states the actions needed to achieve this, and these are included in the relevant Asset Management Plans. Council through the Long Term Financial Strategy, Funding Plan and Annual Plan processes then reviews these.

### **THE 1999 WAITAKERE CITY COUNCIL PARKS STRATEGY**

The Parks Strategy sets out a long-term programme for Council's parks, including parks in the Green Network, and incorporates consideration of stormwater issues. The strategy addresses stream management in parks and a restoration programme that must be taken into account in managing stormwater in parks.

### **THE 1999 NON-REGULATORY INCENTIVES STRATEGY**

This strategy sets out a programme of economic incentives for private bush and riparian margin protection and restoration in the City, both of which will benefit stormwater management.



## STORMWATER CATCHMENT MANAGEMENT PLANS

Waitakere City has developed a number of stormwater catchment management plans over the last decade aimed at managing the impacts of stormwater. These plans look at issues and options for managing stormwater from both developed areas and from anticipated new development, and set out detailed guidelines. Each plan forms the necessary basis for a consent application to the Auckland Regional Council for a comprehensive consent to discharge stormwater from new development. Consent is generally granted to the Council in accordance with the provisions of the Stormwater Catchment Management Plan.

As the level of knowledge of integrated catchment management has improved, so has the quality of the Stormwater catchment Management Plans.

### ***1.5.5 Other Council Goals, Documents and Processes***

#### *EcoWater Solutions*

EcoWater is a Council's business unit with responsibility for stormwater, water and wastewater networks. EcoWater has established three main goals for the management of stormwater and its impacts:

- to reduce the impacts of flooding, particularly on the human built environment and property
- to help protect the environment from the impact of stormwater runoff, with particular emphasis on maintaining or where possible improving water quality
- to provide for sustainable development using an integrated approach across the relevant organisations and disciplines

#### ECOWATER SOLUTIONS BUSINESS PLAN

EcoWater Solutions sets out its stormwater objectives in its Business Plan. Three of the eight key Objectives in the 2000/2001 Plan are relevant to the overall management of stormwater:

- Objective 1: to ensure Public Health and Safety
- Objective 2: to ensure reliability of service delivery
- Objective 5: to ensure continual improvement of environmental outcomes

The key strategy for each of the above objectives and the relevant goals (targets) and programme actions are in Appendix F.

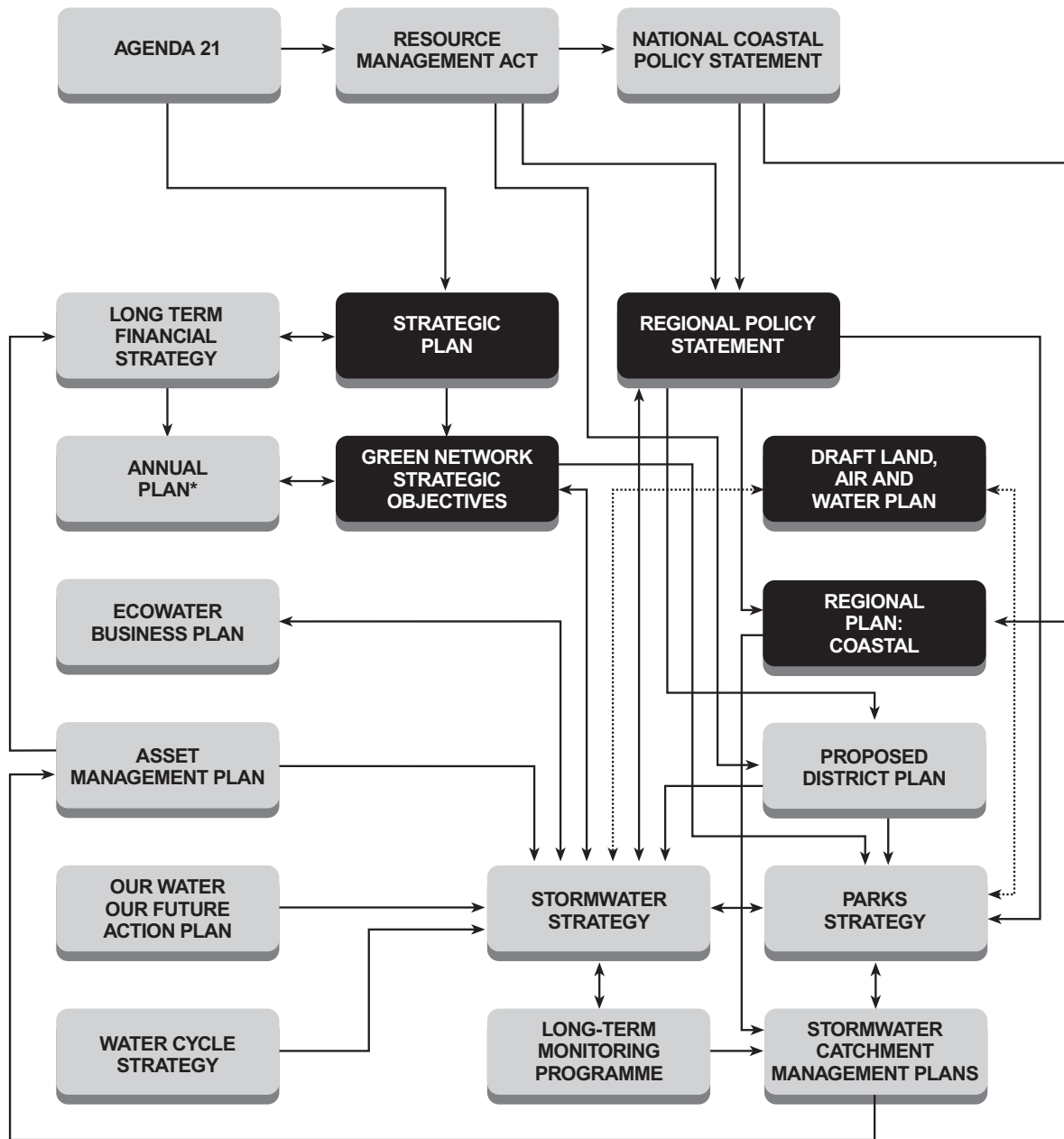
#### STORMWATER ASSET MANAGEMENT PLAN

The Stormwater Asset Management Plan identifies the nature and cost of the works programmes for the management, maintenance and operations and the improvement of the City's stormwater drainage system. It presents a basis for consultation and provides a framework for the consideration of projects and costs and the relative priorities of the planned works and provides a means for reviewing and improving the quality of the information on which the plan relies.

Appendix G is a more detailed list of relevant reference documents.

Figure 4 shows how the various policy documents of the governing bodies (international/national, regional and local) relate to each other.

Figure 4: Overview of Policy and Background Documents



\* The 2000/2001 Annual Plan is incorporated in the Draft Annual & Strategic Plan 2000/01-2009/10



## **1.6 *What the Policy Framework Means for the Council's Approach to Stormwater Management***

The legislative and strategic context at both national and regional levels, the iwi perspective and the Council's own strategic direction all point to the need for a shift to a more holistic focus for managing stormwater, recognising the need for total water cycle management, whilst avoiding, remedying and mitigating any adverse effects on the environment.

Waitakere City faces urban growth pressures from rapidly increasing population and growth must be carefully managed so as not to lose the environmental qualities that make Waitakere City special. Stormwater runoff from roads, from other impermeable surfaces associated with industrial, commercial and residential development, and from rural and horticultural uses, is causing widespread and ongoing degradation of harbours and streams. Flooding, erosion and land stability problems will increase if more and more impervious surfaces are built without proper assessment of the effects or regard to their avoidance (preferably), or at least substantial mitigation. Action to remedy the impacts of past development will be an increasing cost to Council, particularly with greater public awareness and demand for clean water and higher regulatory standards for water quality.

The degradation by stormwater of the City's streams, wetlands and harbours is steady and cumulative, but it is not, at the present time, particularly high profile. Without public support and the necessary resources, the future may well see water quality of City waterways deteriorating to the point where their ecological, aesthetic, recreational and commercial values are seriously compromised.

Stormwater-related stability problems have the potential to occur in the City's stability sensitive areas, however. These high profile problems may happen rapidly and be extremely costly to remedy.

Stormwater contamination, particularly from roads, together with erosion, land instability and flooding are strongly influenced, for better or worse, by land use decisions on issues such as appropriate development densities in established areas and the style of new development. Land use decision-making is a primary responsibility of the Council. Incorporating into the design of new developments features such as adequate riparian margin management areas to remedy or mitigate the adverse effects of stormwater, is crucial if the City is to achieve environmental and financial sustainability into the future.

This Strategy aims to provide a structure for stormwater management in Waitakere City over the next twenty years - one in which the natural world is a central consideration and that enables stormwater infrastructure solutions to achieve multiple outcomes. This includes taking a modified approach to system design and technology but also to the 'management' of stream systems and such traditional methods as stream clearance.

This complex issue covers ecosystems, people and communities and businesses, as well as cultural, amenity and social values. It requires input from a wide range of professionals such as stormwater, geotechnical and roading engineers, educationalists and communicators, ecologists, planners, cleaner production experts and land developers.

This integrated approach to stormwater management, involving all parts of the Council, is central to a sustainable future for Waitakere City.

## **2. PRIORITISING STORMWATER MANAGEMENT UNITS: ISSUES, ECOLOGICAL VALUES AND COMMUNITY USE**

This Stormwater Strategy is concerned with identifying the issues, values and opportunities associated with stormwater quality and quantity. It sets a direction and priorities for implementation that will enable Council to address these issues over the next twenty years.

The priorities were determined by identifying:

- stormwater management units throughout the City (these are shown in Map 1)
- a set of generic issues associated with urban stormwater
- which issues are present in each stormwater management unit
- the sensitivity and ecological values of stormwater management units and their coastal receiving environments
- community use of stormwater management units

These are summarised next in order to explain how the priorities listed in section 2.5 were set for the City's stormwater management units.





## 2.1 Generic stormwater issues

The generic stormwater management issues for the City are set out in Table 2. For management purposes the City has been divided into the stormwater management units shown in Map 1. Each Stormwater Management Unit (SMU) has specific issues, values and opportunities that contribute to its priority ranking.

The issues summarised in Table 2 are:

- loss of habitat quality and quantity
- point source contamination of water
- non-point source contamination of water
- flooding
- accelerated erosion and land instability
- land development potential
- altering the natural water balance
- existing stormwater infrastructure
- community use

**Table 1: Stormwater Issues**

ISSUE	COMPONENTS	EXPLANATION
<b>Loss of Habitat Quality and Quantity</b>	<b>Riparian Vegetation</b>	<p>A reduction in riparian vegetation reduces area of habitat through:</p> <ul style="list-style-type: none"> <li>• loss of shading of water results in less oxygen and growth of exotic weeds, which also consume oxygen needed for other aquatic species</li> <li>• loss of water/vegetation interface habitats means many species can no longer live or breed in the stream</li> <li>• increased erosion of banks and stream bed destroys pools, riffles and other in stream habitats</li> <li>• increased sediment loads and turbidity of water as a result of destabilised banks means sensitive species can no longer live in the water</li> </ul>
	<b>Catchment Vegetation</b>	<p>A reduction in catchment vegetation affects hydrology of the catchment through reduction of:</p> <ul style="list-style-type: none"> <li>• overland flow</li> <li>• the under canopy impact velocities of precipitation</li> <li>• total volumes of water entering the stream channel by evapotranspiration</li> <li>• the catchment response to storm events (i.e. vegetated catchments have lower flood peaks and longer times to peak after a storm)</li> </ul>
	<b>Dumping of Waste</b>	Destroys habitat through pollution and smothering
	<b>Stream Connectivity</b>	<p>Stream connectivity is critical for the migration of native aquatic species, many of which are migratory and need both streams and the sea to complete their breeding cycle. Specific concerns in relation to stream connectivity are:</p> <ul style="list-style-type: none"> <li>• fish passage is prevented by culverts and damming of streams</li> <li>• fish passage is prevented and habitat is removed by piping streams and replacing them with a reticulated pipe network</li> </ul> <p>Increased impermeable surfaces reduce infiltration of rain into soils, reducing stream base flows so that some streams or stream sections become ephemeral and only flow in winter</p>
	<b>Open Streams and Watercourses</b>	<p>Loss of habitat results from the piping of small and ephemeral streams which are very important habitat for native fish</p> <p>Reduction in base flows by increased impermeable surfaces can make permanent streams ephemeral, a loss of aquatic habitat</p> <p>Disruption of in-stream life occurs at outflow points of pipes as a result of peak discharges</p>

ISSUE	COMPONENTS	EXPLANATION
<b>Point Source of Contamination of Water</b>	<b>Sewer Overflows</b>	<ul style="list-style-type: none"> <li>Sewer overflows resulting from blockages (including surcharges) are typically released onto land, instead of into water to make clean-up more possible. Blockages and surcharges are mainly small-scale domestic problems</li> <li>Sewer overflows resulting from inadequate pipe capacity (excluding surcharges) typically enter aquatic environments in large volumes. It is often very difficult to clean up and mitigate impacts once they have occurred</li> </ul>
	<b>Contaminated Sites</b>	Closed landfills and some types of industrial site may be contaminated. Leachate from contaminated sites enters both groundwater and stormwater systems
	<b>Discharges from On Site Disposal Systems</b>	There are large numbers of old septic tanks in some catchments Some catchments have a high incidence of non-performing on-site disposal systems Tank systems that experience flooding can overflow. Tank sizes are typically small and are often poorly designed and/or sited Waitakere City's clay soils and high water table has made design of high quality on site disposal systems difficult
	<b>Discharges from industrial and Domestic Activities</b>	Transport, storage and disposal of hazardous chemicals can result in contamination of stormwater and have serious effects on aquatic life Domestic activities such as changing oil, disposal of paint and so on can result in contamination of stormwater and serious effects on aquatic life
<b>Non-Point Source of Contamination of Water</b>	<b>Zoning of Industry</b>	The potential environmental impact from industrial sites greatly exceeds that of residential sites Where highly toxic substances are present, minute amounts can have a large impact on catchments
	<b>Vehicle Counts</b>	The direct relationship between vehicle counts and contamination of roadways indicates a direct relationship between vehicle numbers and the volume of contaminants in stormwater running off. These contaminants are highly toxic in aquatic environments.
	<b>Air Pollution</b>	Particles from motor vehicle emissions, fires and industrial air discharges collect on impermeable surfaces and are washed off by rain into stormwater
	<b>Agriculture/ Horticulture</b>	Fertiliser and pesticides / insecticides have adverse effects on aquatic environments Application rates of fertiliser and pesticides on properties in the City are not known, although there is only limited agriculture across all the catchments in the City (i.e. few catchments have significant agricultural production)
<b>Flooding</b>	<b>Dwellings, Other Buildings and Land within Flood Plains</b>	Risk to human life Negative impacts on buildings. Public health risk. Costs of clean up and repair to both the private and public sector
	<b>Flooding of Roads</b>	Risk to human life and property Risk of erosion, slips, instability
<b>Accelerated Erosion and Land Instability</b>	<b>Unstable Areas</b>	High sediment release potential during erosive episodes yield large volumes of sediment into the catchment drainage network, degrading stormwater quality Potential threat to human safety and property due to siting of development in unstable areas



ISSUE	COMPONENTS	EXPLANATION
<i>Accelerated Erosion and Land Instability</i>	<i>Erosion - prone Areas</i>	<p>Increased storm flows in soft-bottomed streams (in particular increases in the two-year flood event) cause down cutting and bank erosion resulting in:</p> <ul style="list-style-type: none"> <li>increased sediment loads into stream waters and associated effects on water quality, habitat and aquatic life</li> <li>widening of streams threatening existing development with potential slips into streams</li> </ul>
<i>Land Development Potential</i>	<i>Change in Land Use</i>	<p>Causes significant alteration to existing stormwater flows through loss of vegetation cover, increased impermeable surfaces and loss of streams</p> <p>Causes significant effects on stormwater quality and habitat values through loss of streams, loss of vegetation cover and increased sedimentation from earthworks</p>
	<i>Large - scale Subdivision</i>	<p>May require significant stormwater infrastructure spending, e.g. construction of stormwater ponds, enlarging or laying new stormwater pipelines</p> <p>Large scale earthworks have a very significant effect on stormwater and streams, with up to 25% of silt running off the land ending up in streams, smothering aquatic life and carrying contaminants to the coastal receiving environment</p> <p>Construction of roading and other impermeable surfaces also causes shock loadings of sediment on stormwater and stream systems</p>
	<i>Small - scale Building</i>	<p>Control and monitoring of earthworks associated with building platforms on individual sites is currently not occurring</p> <p>Lack of silt control causes cumulative effects on stormwater quality</p>
<i>Altering the Natural Water Balance</i>	<i>Flow Extremes and Fluctuations</i>	<p>Increased peak flows wash out habitats and wash away aquatic life</p> <p>Increased peak flows affect receiving environment quality (e.g. diluting saline environment) and change habitats</p> <p>Reduced low flows affect habitat quality and quantity by making some small streams ephemeral and by changing the habitat types in others</p>
<i>Existing Stormwater Infrastructure</i>	<i>Asset Age, Condition and Capacity</i>	<p>Some catchments have limited reticulation while some are completely piped</p> <p>Many older urban areas have poor condition and/or under-capacity stormwater networks</p> <p>Older urban areas have legal requirements for Council to apply to the Auckland Regional Council for stormwater discharge consents before April 2001</p>
<i>Community Use</i>	<i>Public Health</i>	<p>Contamination of water with pathogens or toxins has occurred in some areas</p> <p>Many streams and receiving environments are used for contact and non-contact recreation and food harvesting</p>
	<i>Food Sources and Cultural Harvesting</i>	<p>Fishing, eeling and harvesting of watercress, koura and shellfish occurs in streams and receiving environments. It is important for people to be able to undertake these activities safely and to retain the values which allows these activities to occur</p>
	<i>Recreation</i>	<p>Contact recreation through swimming occurs in many streams and most coastal areas within the city</p> <p>Non-contact recreation such as kayaking occurs in larger streams, estuarine and coastal areas</p> <p>Many streams have parks and walkways alongside and contribute significantly to the visual amenity of the City</p>
	<i>Mauri</i>	<p>Streams and water have significant spiritual values to iwi</p>

## 2.2 Specific Issues for each Stormwater Management Unit

This section identifies the generic stormwater issues outlined in Table 1 that are of specific concern in each of the stormwater management units defined in Map 1.

Stormwater Management Units are those areas previously termed Supercatchments. They form the broad geographic basis on which stormwater is managed in Waitakere City. They are defined mainly on the basis of land use as well as catchment boundaries and also comprise the areas on which EcoWater determines Stormwater Financial Contributions.

Stormwater Management Units are identified as having a specific issue if any of the issues summarised in the left hand column of Table 1 are deemed to have a moderate or high priority, as summarised in Table 2.

**Table 2: Issues of moderate or high priority in stormwater management units**

ISSUE	EXPLANATION
<i>Protecting Habitat Quality and Quantity</i>	Areas with high habitat quality and/or extensive habitat quantity
<i>Reducing Effects of Non Point Source Contamination</i>	Areas where contamination is at a level where significant adverse effects on the environment are occurring and mitigation and remediation measures are required to reduce the extent of the problem
<i>Reducing Effects of Point Source Contamination</i>	Areas where contamination is at a level where significant adverse effects on the environment are occurring and mitigation and remediation measures are required to reduce the extent of the problem
<i>Reducing Flooding Risk</i>	Areas where significant flood hazard affects people and property, or areas where significant flooding hazard exists downstream which could be aggravated by increased stormwater flows
<i>Avoiding Accelerated Erosion and Instability</i>	Areas where either: <ul style="list-style-type: none"> <li>Increased stormwater flows are likely to lead to significant erosion through channel down cutting or widening due to the soft nature of the channel substrate and banks; or</li> <li>Where instability due to a lack of roading and private land stormwater infrastructure threatens people or property; or</li> <li>Where coastal erosion is significant and stormwater disposal needs to be undertaken in such a way that it is not aggravated</li> </ul>
<i>Mitigating Effects of Land Development</i>	Rural areas identified for urban development as part of the Regional Growth Strategy, or areas where increased development is proposed through structure planning to create countryside living areas
<i>Minimising Alterations to the Natural Water Balance</i>	Areas where the existing water balance is relatively natural and streams have good base flows or where water balance has been affected by dam construction but could be restored
<i>Improving Existing Stormwater Infrastructure</i>	Areas where old stormwater and/or wastewater infrastructure requires significant renewal or where legal requirements mean that Council must apply by April 2001 to the Auckland Regional Council for discharge consents
<i>Protecting Community Use</i>	Areas where contact or non-contact recreation or shellfish harvesting occurs in the stormwater management unit or in its immediate receiving environment



Table 3 identifies which of the key issues been identified in each of the City's thirty-three Stormwater Management Units.

**Table 3: Key issues for Waitakere City stormwater management units**

STORMWATER MANAGEMENT UNIT	KEY ISSUES
1. <i>Titirangi Laingholm</i>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quality and quantity</li> <li>• protecting community use (shellfish gathering and contact recreation) in the immediate receiving environment</li> </ul>
2. <i>Avondale Stream</i>	<ul style="list-style-type: none"> <li>• protecting habitat quantity and quality</li> <li>• reducing flooding risk</li> <li>• improving existing stormwater infrastructure</li> <li>• protecting community use (non-contact recreation) in the immediate receiving environment</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> </ul>
3. <i>Rewarewa</i>	<ul style="list-style-type: none"> <li>• reducing flooding risk</li> <li>• protecting habitat quantity and quality</li> <li>• protecting community use (non-contact recreation) in the immediate receiving environment</li> <li>• improving existing stormwater infrastructure</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> </ul>
4. <i>New Lynn East</i>	<ul style="list-style-type: none"> <li>• reducing flooding risk</li> <li>• protecting community use (food gathering) in immediate receiving environment</li> <li>• improving existing stormwater infrastructure</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> </ul>
5. <i>Wairau Creek</i>	<ul style="list-style-type: none"> <li>• protecting community use (food gathering)</li> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quantity and quality</li> <li>• reducing flooding risk</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> </ul>
6. <i>Te Atatu South</i>	<ul style="list-style-type: none"> <li>• protecting community use (non-contact recreation) of receiving environment</li> <li>• reducing effects of non point source contamination</li> </ul>
7. <i>Te Atatu Greenfields</i>	<ul style="list-style-type: none"> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quality and quantity</li> </ul>
8. <i>Te Atatu Peninsula</i>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• protecting habitat quality and quantity</li> <li>• protecting community use (contact recreation) of receiving environment</li> </ul>
9. <i>Henderson Creek</i>	<ul style="list-style-type: none"> <li>• protecting community use (food gathering) in receiving environment</li> <li>• reducing flooding risk</li> </ul>

STORMWATER MANAGEMENT UNIT	KEY ISSUES
10. <i>Henderson Creek South</i>	<ul style="list-style-type: none"> <li>• protecting community use (food gathering) in the receiving environment</li> <li>• reducing flooding risk</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> </ul>
11. <i>Glen Eden</i>	<ul style="list-style-type: none"> <li>• reducing flooding risk</li> <li>• improving existing stormwater infrastructure</li> <li>• protecting habitat quantity and quality</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> </ul>
12. <i>Upper Glen Eden</i>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• reducing flooding risk</li> <li>• protecting habitat quality and quantity</li> <li>• minimising alterations to the natural water balance</li> </ul>
13. <i>Upper Oratia</i>	<ul style="list-style-type: none"> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quantity and quality</li> <li>• reducing flooding risk</li> <li>• avoiding accelerated erosion and instability</li> <li>• protecting community use (contact recreation)</li> </ul>
14. <i>Lincoln</i>	<ul style="list-style-type: none"> <li>• reducing flooding risk</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> <li>• protecting community use (contact recreation) of immediate receiving environment</li> </ul>
15. <i>Lower Opanuku</i>	<ul style="list-style-type: none"> <li>• protecting community use (food gathering)</li> <li>• reducing flooding risk</li> </ul>
16. <i>Upper Opanuku</i>	<ul style="list-style-type: none"> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quantity and quality</li> <li>• reducing flooding risk</li> <li>• protecting community use (contact recreation)</li> <li>• avoiding accelerated erosion and instability</li> </ul>
17. <i>Upper Swanson</i>	<ul style="list-style-type: none"> <li>• protecting habitat quality and quantity</li> <li>• avoiding accelerated erosion and instability</li> <li>• reducing flooding risk</li> <li>• minimising alterations to the natural water balance</li> </ul>
18. <i>Waimoko</i>	<ul style="list-style-type: none"> <li>• reducing flooding risk</li> <li>• avoiding accelerated erosion and instability</li> <li>• minimising alterations to the natural water balance</li> </ul>
19. <i>Ranui</i>	<ul style="list-style-type: none"> <li>• reducing flooding risk</li> <li>• protecting habitat quality and quantity</li> <li>• protecting community use (food gathering)</li> <li>• minimising alterations to the natural water balance</li> </ul>
20. <i>Birdwood</i>	<ul style="list-style-type: none"> <li>• protecting habitat quality and quantity</li> <li>• avoiding accelerated erosion and instability</li> <li>• minimising alterations to the natural water balance</li> </ul>



STORMWATER MANAGEMENT UNIT	KEY ISSUES
<b>21. <i>Paremuka</i></b>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• protecting habitat quality and quantity</li> <li>• minimising alterations to the natural water balance</li> </ul>
<b>22. <i>Massey</i></b>	<ul style="list-style-type: none"> <li>• protecting community use (food gathering)</li> <li>• protecting habitat quality and quantity</li> </ul>
<b>23. <i>Massey East</i></b>	<ul style="list-style-type: none"> <li>• protecting community use (food gathering)</li> <li>• protecting habitat quantity and quality</li> <li>• minimising alterations to the natural water balance</li> </ul>
<b>24. <i>West Harbour</i></b>	<ul style="list-style-type: none"> <li>• protecting community use (contact recreation) of receiving environment</li> <li>• avoiding accelerated erosion and instability</li> </ul>
<b>25. <i>Herald Island</i></b>	<ul style="list-style-type: none"> <li>• protecting community use (contact recreation) of the receiving environment</li> <li>• avoiding accelerated erosion and instability</li> </ul>
<b>26. <i>Red Hills</i></b>	<ul style="list-style-type: none"> <li>• protecting community use (non contact recreation) of receiving environment</li> <li>• protecting habitat quality and quantity</li> <li>• minimising alterations to the natural water balance</li> <li>• avoiding accelerated erosion and instability</li> </ul>
<b>27. <i>Whenuapai</i></b>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• protecting habitat quality and quantity</li> <li>• protecting community use (contact recreation) of the receiving environment</li> </ul>
<b>28. <i>Upper Kumeu</i></b>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quantity and quality</li> <li>• reducing flooding risk</li> </ul>
<b>29. <i>West Coast</i></b>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quality and quantity</li> <li>• protecting community use (contact recreation)</li> </ul>
<b>30. <i>Huia</i></b>	<ul style="list-style-type: none"> <li>• avoiding accelerated erosion and instability</li> <li>• protecting community use (contact recreation) in receiving environment</li> <li>• minimising alterations to the natural water balance</li> <li>• protecting habitat quality and quantity</li> </ul>
<b>31. <i>Waitakere River</i></b>	<ul style="list-style-type: none"> <li>• reducing flooding risk</li> <li>• avoiding accelerated erosion and instability</li> <li>• protecting community use (contact recreation)</li> <li>• protecting habitat quality and quantity</li> <li>• minimising alterations to the natural water balance</li> </ul>
<b>32. <i>Central Park Drive</i></b>	<ul style="list-style-type: none"> <li>• protecting community use (food gathering) in receiving environment</li> <li>• reducing effects of non point source contamination</li> <li>• reducing effects of point source contamination</li> </ul>
<b>33. <i>Momutu</i></b>	<ul style="list-style-type: none"> <li>• protecting habitat quality and quantity</li> <li>• avoiding accelerated erosion and instability</li> <li>• reducing flooding risk</li> <li>• minimising alterations to the natural water balance</li> </ul>

### ***2.3 Sensitivity and Ecological Values of Stormwater Management Units and their Coastal Receiving Environments***

The Stormwater Management Units have been grouped together on the basis of:

- a sensitivity ranking of their coastal receiving environments
- their ecological values
- their community use

The methodology for identifying these is outlined next.

#### ***2.3.1 Sensitivity ranking of Waitakere City coastal receiving environments***

The marine and estuarine receiving environments of Waitakere City's stormwater management units were distinguished on the basis of their geographical location and tidal flushing characteristics.

The sensitivity ranking of these receiving environments has been derived in consultation with the Auckland Regional Council by adding together factors representing an ecological value of the water body and its vulnerability to degradation. This receiving environment sensitivity ranking gives valuable guidance for managing the contributing stormwater management units.

For example, the Upper Waitemata Harbour and the enclosed Taikata and Whau River mouths are depositional, low energy environments where fine sediment settles. Because they have slower flushing rates than the middle Waitemata Harbour, they are more vulnerable to water and sediment quality degradation. Ecological values were rated using information from Report 8: Receiving Environment Quality in Waitakere City (Kingett Mitchell & Associates, 2000), Auckland Region Urban Stormwater Management Project Technical Report 2 and the Auckland Regional Plan: Coastal.

These receiving environments are delineated according to the area of immediate impact, and do not include the larger impact zones further away from each stormwater management unit where there are cumulative impacts from many sources. Two exceptions to this are the remote high priority impact areas of the tip of the Te Atatu Peninsula with its mangroves forests and the Hobsonville Peninsula.



Table 4 illustrates the sensitivity ranking of Waitakere City stormwater runoff receiving environments.

**Table 4: Sensitivity ranking of Waitakere City stormwater runoff receiving environments**

ESTUARINE/MARINE RECEIVING ENVIRONMENT	STORMWATER MANAGEMENT UNITS ENTERING ESTUARINE/MARINE RECEIVING ENVIRONMENT	ECOLOGICAL VALUE OF RECEIVING ENVIRONMENT	VULNERABILITY OF RECEIVING ENVIRONMENT TO DEGRADATION	SENSITIVITY RANKING OF RECEIVING ENVIRONMENT
<i>Upper Waitemata Harbour</i>	(27) Whenuapai (25) Herald Island (26) Redhills	4	3	7
<i>Mid Waitemata Harbour</i>	(24) West Harbour (8) Te Atatu Peninsula (7) Te Atatu Greenfields	3	2	5
<i>Whau Estuary</i>	(5) Wairau Creek (4) New Lynn East (3) Rewarewa (2) Avondale Stream (6) Te Atatu South	2	3	5
<i>Taikata (Henderson Creek)</i>	(16) Upper Opanuku (15) Lower Opanuku (13) Upper Oratia (17) Upper Swanson (33) Momutu (20) Birdwood (19) Ranui (18) Waimoko (23) Massey East (22) Massey (14) Lincoln (32) Central Park (21) Paremuka (10) Henderson Creek South (11) Glen Eden (12) Upper Glen Eden (9) Henderson Creek	2	3	5
<i>Manukau/Pataroa</i>	(1) Titirangi/Laingholm	3	3	6
<i>Manakau/Cornwallis</i>	(30) Huia	4	2	6
<i>Tasman Sea</i>	(31) Waitakere River (29) West Coast	5	1	6
<i>Kaipara Harbour</i>	(28) Upper Kumeu	4	3	6

**Notes:**

Ecological value rating is a relativity scale of 1-5, with 1 being lower and 5 being higher

Vulnerability rating is 1-3, with 1 being the lowest vulnerability to water quality degradation and 3 being the highest vulnerability

Sensitivity ranking = ecological value + vulnerability

### 2.3.2 Stormwater management units grouped by ecological category

The stormwater management units were grouped according to their current ecological values, with categories from A-G, as described in Table 5.

Table 6 summarises the ecological values of each stormwater management unit in more detail, showing that the City is fortunate in having many catchments with high ecological values. However, some areas have been adversely affected by both rural and urban development, while more development is planned in several greenfields areas. There is thus a need to set stormwater management priorities for:

- protection of high value areas
- enhancement of moderately impacted areas
- restoration of very impacted areas
- avoidance and mitigation of the adverse effects of development in greenfields areas

Table 5 sets out goals relating to these tools for each stormwater management unit in the City.

**Table 5: Definitions of ecological categories for stormwater management units in Waitakere City**

ECOLOGICAL CATEGORY	DESCRIPTION OF KEY CHARACTERS
<i>A</i>	Those stormwater management units with generally low ecological values and where much of the stream network has been modified and piped. In accordance with the Regional Stormwater Strategy, the goal is to prevent these areas from becoming further degraded, but the greatest ecological priority in their management is to ensure that the ecological values of the receiving environment are protected. This means that it may, in some circumstances be acceptable, for example, for an on-line stormwater pond to be constructed in the stormwater management unit
<i>B</i>	Urban stormwater management units that still retain a reasonable extent of their tributaries. Although impacted, they have the potential to improve. The goal for these areas is for them to provide permanent habitat and breeding areas for a number of hardy native aquatic species such as eels and banded kokopu and for the lower reaches to be useable for whitebait spawning
<i>C</i>	Rural stormwater management units with considerable potential for significant enhancement - most easily through riparian fencing and planting. Because of their rural location they also have almost their entire tributary system intact and have a very interconnected nature. The goal for these areas is to enhance their values through education, advice and assistance to landowners. The Waitakere City Green Network Economic Incentives and ARC Landcare Group programmes provide opportunities for assistance with replanting and fencing
<i>D</i>	Peri urban stormwater management units in areas undergoing or likely to undergo greenfields development in the future. They generally have moderate or moderate high ecological values and through the development of structure and concept plans and the subdivision process have the possibility of significant enhancement. Conversely they are those where the interconnected network of tributary streams are the most threatened. The Goal for these fencing is to ensure that the subdivision process maintains their ecological values and that restoration occurs whenever possible
<i>E</i>	Urban stormwater management units that still retain Moderate to Moderate-High ecological values. Their upper catchment areas are of high ecological value and their receiving environments are also important. These stormwater management units are critical both as habitat for a range of native fish species (including some uncommon ones) and for the passage of native fish and other aquatic life from the sea to stream headwaters -a critical part of their lifecycle. In addition many of these areas are highly visible to the public, so they provide an opportunity for visible restoration - and the associated benefits in terms of public participation and education
<i>F</i>	Bush living stormwater management units in a state of high ecological health, but with potential to be significantly degraded as a result of development. They feed into receiving environments with high use for contact recreation and also food gathering
<i>G</i>	These stormwater management units are in generally excellent ecological health that needs to be protected. A small amount of restoration in the lower part of the stormwater management units is needed. In some cases stream flow regimes in the lower catchment are also affected by flow limitations because of water supply dams



**Table 6: Ecological values of stormwater management units in Waitakere City**

STORMWATER MANAGEMENT UNIT	ECOLOGICAL CATEGORY	EXPLANATION	KEY GOAL
<i>(14) Lincoln</i>	<i>A</i>	Tributaries are piped, only the main channel remaining. Highly polluted catchment with little room for treatment except on the main channel. The depositional receiving environment in Huruhuru Creek means contaminants are likely to build up	Protect Huruhuru Creek receiving environment
<i>(25) Herald Island</i>	<i>A</i>	There are no streams on the island. The Upper Waitemata Harbour is a high-value receiving environment, yet there is little stormwater treatment (swales are the exception) in an area with urban density. The depositional nature of the Upper Waitemata also means that urban contaminants are likely to accumulate	Protect Upper Waitemata receiving environment
<i>(6) Te Atatu South</i>	<i>A</i>	Most tributary streams have been piped in this urbanised area. While one main channel has moderate ecological values, the ability to improve these is limited. The Whau River however is a depositional environment where urban contaminants accumulate. Shellfish in this depositional environment are a significant food source for birdlife. In addition the river flows into the Mid Waitemata by the Pollen Island Marine Reserve with its associated bird habitat and feeding area	Protect Whau River receiving environment
<i>(8) Te Atatu Peninsula</i>	<i>A</i>	Stream values on the Te Atatu Peninsula are generally low, with most streams and their tributaries already in pipes. The exception is the Orukuwai Stream and those within Harbour View where the receiving environments are identified as high value Coastal Protection 1 areas and the Harbour View Wetlands	Protect Mid Waitemata receiving environment and Harbour View wetlands
<i>(9) Henderson Creek</i>	<i>A</i>	This is the residential part of the lower Henderson Creek catchment. Almost all of the stream network is already in pipes except the Takapu Stream and McLeod Stream in Te Atatu South. There are high value wetlands along Henderson Creek	Protect Taikata receiving environment
<i>(32) Central Park Drive</i>	<i>A</i>	The entire tributary network of this system is in pipes discharging directly to Henderson Creek. The inlets and wetlands that the pipes discharge through are high value and should not be modified through stormwater mitigation works	Protect Taikata receiving environment
<i>(24) West Harbour</i>	<i>A</i>	Almost all the stream network is already piped	Protect Mid-Waitemata Harbour recreation environment
<i>(3) Rewarewa</i>	<i>B</i>	While impacted, particularly by wastewater overflows, the Rewarewa stormwater management unit contains an extensive network of tributary streams, many with reasonable riparian cover. Most bush remnants within catchment are associated with the stream network, increasing their overall ecological value. A number of native fish already live in parts of the catchment and these habitats could be extended	Improve habitat values and stream connectivity for hardy native aquatic species so they can live and breed in the catchment
<i>(4) New Lynn East</i>	<i>B</i>	The Taroa and Kelwyn Streams are the main watercourses in this stormwater management unit. Its value is generally low, although some parts of the streams have good native riparian cover and reasonable restoration potential	Improve habitat values and stream connectivity for hardy native aquatic species so they can live and breed in the catchment

STORMWATER MANAGEMENT UNIT	ECOLOGICAL CATEGORY	EXPLANATION	KEY GOAL
<i>(19) Ranui</i>	<i>B</i>	While impacted due to urban development, much of the stream system remains open due to the flooding issues in the catchment. Recent Infrastructure Auckland funding will address some of the key issues in the stormwater management unit, including fish passage and riparian enhancement	Improve habitat values and stream connectivity for hardy native aquatic species so they can live and breed in the catchment
<i>(22) Massey</i>	<i>B</i>	Although impacted, the Rarawaru and Makomako Streams retain a reasonable proportion of their tributary network and provide habitat for some fish species. Most bush remnants in the catchment are also associated with the stream network, increasing their overall ecological value. A number of native fish already live in parts of the catchment and these habitats could be extended	Improve habitat values and stream connectivity for hardy native aquatic species so they can live and breed in the catchment
<i>(11) Glen Eden</i>	<i>B</i>	Impacted by industrial Glen Eden and running through relatively unvegetated backyards in the poorer parts of Glen Eden, the stream is nevertheless home to rare native crabs and a number of hardy native fish species. It is an important thoroughfare link between the upper catchment and the sea. Willow control programmes, while alleviating flooding, have reduced shading of the stream, adversely affecting its habitat values	Improve habitat values and stream connectivity for sensitive native aquatic species in the stormwater management unit, especially and the upper catchment, so they can live, breed and migrate in the catchment
<i>(23) Massey East</i>	<i>B</i>	Includes the Manutewhau and Kopupaka Streams, with the former and most of its open tributaries located within Council parkland. The main channel of the Kopupaka (most of its tributaries are gone) is also in Council parkland. While the instream values are impacted by urban development, the potential for restoration is significant. The surrounding terrestrial ecosystems are highly significant (particularly Moire Park), so this area presents a high profile opportunity for restoration in an area where control already lies with Council. Significant effort is being expended in the upper catchment (Westgate) to restore these areas and there is further potential with the development of the McWhirter Farms block	Improve habitat values and stream connectivity for sensitive native aquatic species in the stormwater management unit, so they can live, breed and migrate in the catchment
<i>(15) Lower Opanuku</i>	<i>B</i>	While the instream values of the main Opanuku stream are only moderate, the area represents a highly visible area of high value native vegetation which is also highly accessible. It has been the focus of substantial Council investment in the terrestrial ecosystems of Henderson Park, Vintage Reserve and Shona Reserve. There are already unrealistic expectations from landowners in the catchment affected by flooding that extensive channelisation, floodbanks and other hard engineering initiatives will be undertaken	Improve habitat values and stream connectivity for hardy native aquatic species so they can live and breed in the stormwater management unit Protect values of Taikata receiving environment
<i>(28) Upper Kumeu</i>	<i>C</i>	In the headwaters of this catchment, some areas are vegetated and small wetlands abound. It is currently mainly impacted from stock grazing and some fencing would solve many of their problems. There are also some wetlands in the lower catchment	Restore habitat values of the stormwater management unit so sensitive native aquatic species can live, breed and migrate in the catchment



STORMWATER MANAGEMENT UNIT	ECOLOGICAL CATEGORY	EXPLANATION	KEY GOAL
<i>(18) Waimoko</i>	<i>D</i>	A rural upper catchment, significantly impacted by grazing, but also by poor land management by lifestyle block owners. Part of the lower catchment is however urbanised, with some greenfields development land also remaining. A Structure Plan is proposed for the area, presenting both opportunities for and threats to restoration	Protect current habitat values during development and restore habitat values so hardy native aquatic species can live, breed and migrate in catchment
<i>(27) Whenuapai</i>	<i>D</i>	These streams all have moderate or better values and a surprising range of habitats. They are mainly impacted by stock grazing and some fencing would solve many of their problems. There are also some wetlands. The stormwater management unit drains into the Upper Waitemata Harbour, so protection of this sensitive receiving environment is also a significant factor. Parts of the management unit are also proposed for future urban development and ecological values will be significantly adversely affected by the new SH16/18 motorway proposals. Most of the rest of the unit is being looked at as part of Structure Plan proposals (both Council and privately initiated)	Protect current habitat values during development and restore habitat values in areas not subject to urbanisation so that sensitive native aquatic species can live, breed and migrate in the catchment Protect the values of the Upper Waitemata Harbour receiving environment
<i>(21) Paremuka</i>	<i>D</i>	The Paremuka Stream once had moderate to moderate-high ecological values. Urbanisation of the eastern part of the catchment has had significant adverse effects, some of which it is hope to mitigate in the long term by the extensive restoration now under way. Urbanisation of the western part of the catchment gives the opportunity either to continue the trend of deterioration or to enhance the overall habitat values of the stormwater management unit	Protect current habitat values during development and restore habitat values so hardy native aquatic species can live, breed and migrate in the catchment
<i>(26) Redhills</i>	<i>D</i>	The streams have moderate ecological values and retain some riparian vegetation but are significantly impacted by grazing. The stormwater management unit drains into the high value Upper Waitemata receiving environment. It is identifies as a proposed future urban development area in the Regional Growth Strategy	Protect current habitat values during development and restore habitat values so sensitive native aquatic species can live, breed and migrate in the catchment. Protect ecological values of the Upper Waitemata Harbour receiving environment
<i>(20) Birdwood</i>	<i>D</i>	The streams have moderate-high ecological values, impacted somewhat by grazing, but land stability is the major issue. The streams could either be restored or destroyed as a result of urban development. Much of downstream catchment is already urbanised, however ecological values are higher than for many other of the major urban stormwater management units	Protect current habitat values during development and restore habitat values so sensitive native aquatic species can live, breed and migrate in the catchment
<i>(10) Henderson Creek South</i>	<i>E</i>	Low-moderate ecological values on the main Lower Oratia Stream, but the tributary streams (which are not piped) still have moderate high values that should be protected. The stream is highly visible, so is a priority site for educative restoration. Significantly impacted by industrial development and encroachment onto the stream banks. Managing the impacts of flooding of property along the main Oratia channel is a significant issue. This stormwater management unit has been the focus of intensive Council investment in the form of willow control, land purchase of areas subject to flooding and restoration initiatives	Improve habitat values and stream connectivity for hardy native aquatic species so they can live and breed in the catchment Protect values of Taikata receiving environment

STORMWATER MANAGEMENT UNIT	ECOLOGICAL CATEGORY	EXPLANATION	KEY GOAL
(5) <i>Wairau Creek</i>	<i>E</i>	A mix of heavily impacted and high value areas make up this catchment. The Gaden Stream and most of its tributary system remain relatively unimpacted in the upper catchment within Waikumete Cemetery. The remainder of the stormwater management unit, however, is largely piped and impacted by urban development. The lower Wairau stormwater management unit is critical for the migratory fish species moving up into the cemetery stream systems - in particular the threatened giant kokopu	Restore habitat values of the stormwater management unit so sensitive native aquatic species can live, breed and migrate in the catchment
(2) <i>Avondale Stream</i>	<i>B</i>	A mix of heavily impacted and high value areas makes up this catchment. The headwaters of the stream are still retained in bush urban areas while the lower reaches have been impacted by industrial and residential development. As part of Project Whau, significant work is under way to restore the lower catchment areas	Restore habitat values of the stormwater management unit so sensitive native aquatic species can live, breed and migrate in the catchment.
(12) <i>Upper Glen Eden</i>	<i>B</i>	The headwaters of the Waikumete catchment, the impacts of urban development on this area have been relatively low, but with infill and development of remaining urban bush sites (Kaurilands and North Titirangi) the potential for degradation is high. Because of the presence of remnant bush, the ecological values of this area are moderately high. One of the key limitations on the habitat values of this area is the extent of urbanisation in the lower catchment - native fish are faced with hot polluted water and migratory barriers in order to get to the higher value habitats upstream	Protect and enhance the habitat values of the stormwater management unit in conjunction with a restoration and connectivity programme in the lower catchment so sensitive native aquatic species can live, breed and migrate in catchment
(1) <i>Titirangi/Laingholm</i>	<i>B</i>	Streams of high ecological value drain into significant receiving environments, but have the potential to be highly impacted by further development. Erosion, land slips and uncontrolled stormwater discharges are key issues which affect ecological in this area	Protect and enhance habitat values in stormwater management unit to ensure a range of sensitive aquatic species continue to live, breed and migrate in catchment
(30) <i>Huia</i>	<i>B</i>	Great ecological health in streams with the exception of those in the settled part of the Cornwallis Peninsula, Parau and in Huia township itself. The low flows of the Huia and Nihotupu Streams are significantly impacted by the presence of two water supply dams on each of their main channels. The ecological impacts of the settlements in this area are little investigated but the streams in Huia (Upland and Ocean View) in particular are quite impacted, being channelised and piped in places. The other streams are impacted more by the rural land use at Huia, Little Huia and Parau. There are no streams mapped on the Cornwallis Peninsula, presumably restoring these small areas of the lower catchment would have major overall benefits to fish passage. The impacts of the Dams are probably the greatest ecological problem	Protect ecological values of most of the stormwater management unit  Focus restoration on settled and rural areas as a priority to ensure a range of sensitive aquatic species continue to live, breed and migrate in the stormwater management unit
	<i>C</i>		Advocate for increased flows as part of the dam consent process



STORMWATER MANAGEMENT UNIT	ECOLOGICAL CATEGORY	EXPLANATION	KEY GOAL
<i>(29) West Coast</i>	<i>G</i>	Streams are very healthy, except those at Piha and Karekare. Here the streams are impacted by sewage as well as loss of riparian cover, channelising and a range of other problems. There is also considerable pressure from development and the values of these streams are constantly being eroded. These are probably some of the City's most actively threatened streams: because their values are so high, the effect of degradation is significant	Protect ecological values of most of the stormwater management unit Focus restoration on settled and rural areas as a priority, to ensure a range of sensitive aquatic species continue to live, breed and migrate in catchment
<i>(17) Upper Swanson</i>	<i>G</i>	Tributary streams are in excellent health, with hardly any development in the catchment, so a key goal is to keep them that way. The main channel of the Swanson is included in this large upper catchment stormwater management unit and is impacted, mainly by grazing	Protect high value habitats. Restore the rest of the stormwater management unit so sensitive native aquatic life can live, breed and migrate in the catchment
<i>(13) Upper Oratia</i>	<i>G</i>	Tributary streams in the upper catchment are in excellent health, with hardly any development in the catchment, so a key goal is to keep them that way. The main channel of the Oratia and the mid part of the catchment are impacted, mainly by loss of riparian vegetation as a result of grazing and orcharding activities	Protect high value habitats. Restore the rest of the stormwater management unit so sensitive native aquatic life can live, breed and migrate in the catchment
<i>(16) Upper Opanuku</i>	<i>G</i>	Tributary streams in the upper catchment are in excellent health, with hardly any development in the catchment, so a key goal is to keep them that way. The main channel of the Opanuku and the Anamata Stream and mid catchment tributaries are impacted by grazing	Protect high value habitats. Restore the rest of the stormwater management unit so sensitive native aquatic life can live, breed and migrate in the catchment
<i>(7) Te Atatu Greenfields</i>	<i>G</i>	Streams are in a natural state but are grazed to the edges with little riparian vegetation. There are important wetland areas in the catchment. There is a high value interface between the stormwater management unit and the receiving environment	Protect and enhance wetland and riparian areas.
<i>(31) Waitakere River</i>	<i>G</i>	The upper parts of the catchment in Regional Parkland are in excellent ecological health, but grazing impacts on the lower parts of the Waitakere River, Waiti and Taimana catchments. The introduction of coarse fish species has aggravated their condition and there are several aquatic weeds throughout the catchment. The Waitakere Dam is likely to contribute significantly to these problems. The Waitakere Wetland, Lake Wainamu, Lake Kawaupaku and Lake Waiataru are all highly significant water bodies and natural areas in this catchment, and have been identified as having values of Regional significance. This, combined with the work to date done in this area by Council, means that restoration is a priority	Restore habitat values of the stormwater management unit so sensitive native aquatic species can live, breed and migrate in the catchment. Control exotic fish species and their adverse effects Advocate for improvements to the stream flow regime through the Waitakere Dam consent application process
<i>(33) Momutu</i>	<i>G</i>	Tributary streams are in good health	Protect high value habitats

## 2.4 Community use of stormwater management units

Table 7 summarises the diverse community uses of the City's stormwater management units, showing the very real community benefits that are derived from sustainable stormwater management.

**Table 7: Community use of stormwater management units**

COMMUNITY USE	STORMWATER MANAGEMENT UNIT
Food gathering from freshwater bodies in the stormwater management unit: <ul style="list-style-type: none"> <li>• fishing</li> <li>• eeling</li> <li>• koura and watercress gathering</li> </ul>	Ranui (19) Lower Opanuku (15) Henderson Creek South (10) Avondale Stream (2) Wairau Creek (5) Massey East (23) Massey (22) New Lynn East (4) Paremuka (21)
Food gathering in the immediate receiving environment: <ul style="list-style-type: none"> <li>• shellfishing</li> </ul>	Waitakere River (30) West Coast (31) Titirangi/Laingholm (1) Huia (29)
Contact recreation in freshwater bodies in the stormwater management unit: <ul style="list-style-type: none"> <li>• swimming</li> <li>• paddling</li> </ul>	Waitakere River (30) Upper Opanuku (16) Upper Oratia (13) Massey East (23) Massey (22)
Contact recreation in the immediate receiving environment: <ul style="list-style-type: none"> <li>• swimming</li> <li>• paddling</li> </ul>	Waitakere River (30) West Coast (31) Titirangi/Laingholm (1) Huia (29) Whenuapai (27) Herald Island (25) West Harbour (24) Te Atatu Peninsula (8) Central Park Drive (32) Lincoln (14)
Non-contact recreation in freshwater bodies in the stormwater management unit: <ul style="list-style-type: none"> <li>• canoeing</li> <li>• wind surfing</li> </ul>	Lower Opanuku (15) Henderson Creek South (10) Ranui (19) New Lynn East (4)
Non-contact recreation in the receiving environment: <ul style="list-style-type: none"> <li>• canoeing</li> <li>• wind surfing</li> <li>• fishing</li> <li>• boating</li> </ul>	Wairau Creek (5) New Lynn East (4) Rewarewa (3) Avondale Stream (2) Henderson Creek (9) Ranui (19) Henderson Creek South (10) Te Atatu South (6) Lower Opanuku (15)
Significant pedestrian recreational access/use/visibility of streams in the stormwater management unit: <ul style="list-style-type: none"> <li>• major walkways</li> <li>• access networks</li> <li>• viewing points</li> <li>• picnic areas</li> </ul>	Massey East (23) Lower Opanuku (15) Henderson Creek South (10) Ranui (19) Upper Swanson (17) Avondale Stream (2) New Lynn East (4) Te Atatu Greenfields (7) Glen Eden (11) Upper Glen Eden (12)
No known community use	Birdwood (20) Redhills (26) Upper Kumeu (28) Waimoko (18) Momutu (33)



## 2.5 Prioritisation of Stormwater Management Units

The Stormwater Management Units were prioritised for the purpose of programming comprehensive stormwater catchment management plans and funding allocation for capital works. Priorities were determined using the methodology in Report 3: Prioritisation Methodology, by weighting the issues / factors influencing the functioning of each of the stormwater management units.

Weightings used for the various issues or factors influencing each stormwater management unit are listed in Table 8.

**Table 8: Weightings used for issues influencing stormwater management units**

KEY ISSUES	WEIGHTING	COMPONENT	SUB WEIGHTING		
Catchment ecology	15%	Vegetation	20%	Riparian	30%
		Ecology	80%	Catchment	70%
		<b>SUBTOTAL</b>	<b>100%</b>		<b>100%</b>
Receiving environment	5%	Freshwater	40%	Ecological values	60%
		Coastal	60%	Vulnerability	40%
Point source contamination	7%	Sewer overflows	40%		
		Septic tanks	10%		
		Contaminated sites	40%		
		Risk industries	10%		
		<b>SUBTOTAL</b>	<b>100%</b>		
Non-point source contamination	5%	Vehicle counts	90%		
		Agriculture/horticulture	10%		
		<b>SUBTOTAL</b>	<b>100%</b>		
Flooding	20%	Risk to land	10%		
		Risk to dwellings	90%		
		<b>SUBTOTAL</b>	<b>100%</b>		
Stability/erosion	3%	Unstable areas	50%		
Land development potential	20%	Erosion-prone areas	50%		
		<b>SUBTOTAL</b>	<b>100%</b>		
Existing stormwater network	10%	Age	80%		
		Condition	20%		
		<b>SUBTOTAL</b>	<b>100%</b>		
Community use	15%				
<b>TOTAL</b>	<b>100%</b>	<b>TOTAL</b>	<b>100%</b>		

Applying the information in Tables 3-9 results in the stormwater management unit priorities in Table 10, where higher numbers indicate a higher priority.

The order of priority of these Stormwater Management Units differs from the management priorities identified in the 1988 Auckland Region Urban Stormwater Strategy Statement because the catchment boundaries now differ, and also because growth pressures have varying impacts on different parts of the City.

**Table 9: Prioritised stormwater management units in Waitakere City**

STORMWATER MANAGEMENT UNITS IN ORDER OF PRIORITY		PRIORITY VALUE *
15	Lower Opanuku	0.722
4	New Lynn East	0.687
19	Ranui	0.679
10	Henderson Creek South	0.650
2	Avondale	0.635
21	Paremuka	0.624
22	Massey	0.619
14	Lincoln	0.606
8	Te Atatu Peninsula	0.597
6	Te Atatu South	0.575
5	Wairau Creek	0.573
3	Rewarewa	0.561
25	Herald Island	0.546
9	Henderson Creek	0.537
11	Glen Eden	0.537
32	Central Park Drive	0.529
23	Massey East	0.514
12	Upper Glen Eden	0.486
29	Huia	0.451
31	West Coast	0.442
1	Titirangi/Laingholm	0.439
30	Waitakere River	0.434
18	Waimoko	0.419
16	Upper Opanuku	0.400
24	West Harbour	0.303
13	Upper Oratia	0.382
27	Whenuapai	0.365
20	Birdwood	0.364
28	Upper Kumeu	0.346
26	Redhills	0.314
17	Upper Swanson	0.290
33	Momutu	0.268
7	Te Atatu Greenfields	0.245

**Notes:**

\* Refer to Report 3 Prioritisation Methodology . Higher numbers indicate a higher priority.



### 3. STORMWATER MANAGEMENT: ISSUES, OBJECTIVES, POLICIES, EXPLANATIONS, IMPLEMENTATION METHODS AND MONITORING

This section outlines:

- management objectives, policies, explanations and implementation methods for each of the major stormwater issues identified in section 2 and Table 2 of this Strategy
- a freshwater aquatic monitoring programme to evaluate the effectiveness of implementing this strategy
- The various issues or factors that influence each of the SMUs, and their relative importance, have enabled a prioritisation ranking for catchment planning and infrastructure management purposes. The following objectives and policies specifically address the issues identified for the stormwater management units in Table 4

#### 3.1 *Issues, objectives, policies, explanations and implementation methods*

The issues drawn from Section 2.1 are:

- the need for an integrated management approach to stormwater, to address all identified issues
- loss of habitat quality and quantity
- point-source contamination
- non-point source contamination
- flooding
- accelerated erosion and land instability
- land development potential
- altering the natural water balance
- existing stormwater infrastructure
- loss of community use of water resources

#### 3.1.1 *The need for an integrated management approach to stormwater*

##### OBJECTIVE 1

To achieve a multidisciplinary, co-ordinated approach to address all aspects of stormwater management in Waitakere City.

##### POLICIES

1. Prepare comprehensive stormwater catchment management plans for each catchment in the city and obtain comprehensive discharge consents.
2. Ensure involvement of external stakeholders, including the Auckland Regional Council, iwi, landowners, developers and the local community.
3. Ensure involvement of all internal stakeholders as part of stormwater management processes, including Parks, Strategic Group, EcoWater, Field Services and other relevant departments.
4. Recognise and draw on the range of skills that contribute to stormwater management, including hydrology, engineering, ecology, water quality science, policy and planning.
5. Highlight stormwater issues and promote better community understanding of the problems and solutions.

##### EXPLANATION

There is more to stormwater management than simply addressing flooding and the movement of water through a catchment. Ecological, recreational, amenity, landscape and cultural issues must be addressed even-handedly. Experts in disciplines other than engineering have much to contribute to stormwater management and can facilitate outcomes that also meet a range of other Council objectives relating to the protection of the ecological values of the Green Network, enhancement of landscape and amenity values and increased public access to natural areas. Through its Green Network strategic direction, Waitakere City has achieved a fully integrated approach to managing stormwater from a multi-disciplinary perspective, a far remove from the traditionally engineering management perspective. However, measures are still required to ensure the diverse areas of expertise from throughout the whole Council continue their involvement in sustainable stormwater management.

## IMPLEMENTATION METHODS

1. Implement a comprehensive monitoring programme as outlined in the Stormwater Monitoring Programme (Report 9) and use the information for further stormwater catchment management planning.
2. Prepare Stormwater Catchment Management Plans that consider both the stormwater and wastewater system.
3. Develop an incentives programme to promote improved stormwater management in new development. Such incentives could include reduced development contributions and transferable development rights.
4. Work with Te Kawerau A Maki and Ngati Whatua, recognising that iwi have a unique role as kaitiaki of natural resources, and provide opportunities to give effect to this role.
5. Obtain comprehensive discharge consents according to the prioritisation of stormwater management units, with consents to be applied for by 1 April 2000.
6. Amend this Stormwater Strategy to reflect any new proposed Regional Plan.
7. Work with Rodney District and Auckland City to manage catchments with shared responsibility or receiving environments.
8. Work with iwi to develop integrated solutions for stormwater management that ensure the protection of the mauri of freshwater and marine resources.
9. Hold regular internal workshops on stormwater management issues.
10. In conjunction with the Auckland Regional Council, apply sustainable stormwater management guidelines to all new subdivisions and developments, and incorporate these into the Waitakere City Council Code of Practice.
11. Amend and update all sections of the Code of Practice to incorporate integrated stormwater management solutions.
12. Ensure stormwater management is internally integrated with wastewater, parks and roading.
13. Ensure Call Centre and customer services procedures are updated on a regular basis so as to maintain stormwater management in line with this Strategy.
14. Look for opportunities where Infrastructure Auckland funding could enhance the benefits of stormwater management projects.
15. Integrate stormwater maintenance and renewal programmes carried out in the town centres intensification and economic development zones.
16. Ensure the appropriate skills are brought together in producing stormwater catchment management plans.
17. Promote the Green Network programme's Economic Incentives as part of stormwater catchment management planning.
18. Work with schools and community groups to form stormwater management partnerships.
19. Undertake sustainable stormwater management demonstration projects and promote these city- and region-wide.
20. Carry out community surveys to understand people's attitudes and obtain their suggestions about stormwater management.
21. Monitor and report progress against targets and report results to the community.
22. Support the WaiCare community stormwater monitoring programme.
23. Hold regular workshops internally and with community stakeholders on stormwater management issues.
24. Promote and assist community involvement and input into planning processes.



### 3.1.2 *Loss of habitat quality and quantity*

#### OBJECTIVE 2

To protect and enhance the quality and quantity of freshwater and marine habitats.

#### POLICIES

1. Protect and enhance riparian vegetation.
2. Minimise vegetation loss, both riparian and catchment-wide.
3. Maintain sufficient water flows in streams to support healthy aquatic life.
4. Minimise earthworks in or around watercourses.
5. Ensure adequate sediment control conditions on all building and resource consents.
6. Minimise work in watercourses, including removal of obstructions where flooding is likely.
7. Promote bridges instead of culverts for stream crossings.
8. Raise the level of understanding of the adverse effects of activities on habitat quality and promote sustainable solutions.
9. When undertaking flood management or erosion protection, use methods that minimize interference with natural channel morphology.
10. Ensure impervious surface coverage doesn't exceed limits set in the District Plan.
11. Avoid the creation of barriers to upstream movement of inanga and other weak-climbing native aquatic species.
12. Remedy existing barriers to migration of inanga and other weak-climbing native aquatic species.
13. Avoid the piping and channelling of streams.
14. Promote the restoration of degraded and piped or channelled streams.
15. Stormwater management devices can and must be designed to increase habitat opportunities.

#### EXPLANATION

The Council has adopted a policy of containment and consolidation of development, and part of this policy is to ensure settlement is located away from vulnerable watercourses and areas prone to flooding. Urban development should not occur in locations where such development will lead to significant adverse effects on water quality and water quantity. Identifying Riparian Margins and acquiring esplanade reserves are additional tools for maintaining and enhancing water and habitat quality.

The Council's has a centralisation policy of encouraging use of public transport and concentration of activities into nodes. One intention is to reduce vehicle trip length and numbers. Another is to minimise the discharge into stormwater systems and watercourses of contaminants deposited on to impermeable surfaces from motor vehicles.

At present, natural stream and wetland habitats are often only considered in isolation on single sites, and seen as dispensable, with the result that fewer and fewer of the region's natural aquatic habitats are being retained. The value of these remaining habitats is unappreciated and, as yet, little understood. Logs, natural debris and other objects can provide habitat and should be left in a stream unless serious flooding would result. Riparian vegetation plays an important role in shading streams, thereby reducing both peak water temperatures and water temperature fluctuations, and so maintaining more even water temperatures. It also provides shelter and refuge for aquatic invertebrates and fish, as well as a food source by dropping debris and providing habitat for terrestrial invertebrates. Riparian vegetation can also provide breeding and resting areas for many native birds and sheltered breeding areas for fish. Riparian areas also act as corridors for the movement and dispersal of native birds and vegetation. Vegetation throughout the catchment also assists in maintaining groundwater levels and filtering overland run-off. Waitakere City Council advocates a precautionary approach to retaining what remains of these habitats in the City and maintaining their ecological health.

Appropriate management of headwaters of streams and watercourses, even if they are too small to be identified as part of the Riparian Margins Natural Area, is important for protecting and enhancing water quality and providing habitat. Subdivision and development of land have significant potential to degrade water quality and aquatic and riparian ecosystems. Revegetation of riparian areas is especially valuable because it reduces erosion and flooding, as well as helping to filter out contaminants before they reach the watercourse.

An understanding of in-stream fauna and their behaviour assists with providing for their habitat needs such as shade, shelter and food sources and their functional needs such as migration and breeding opportunities.

#### IMPLEMENTATION METHODS

1. Provide assistance for the physical protection and replanting of riparian areas through the Green Network Economic Incentives programme.
2. Undertake riparian restoration on Parks, Drainage Reserves and other Council-owned land.
3. Promote the use of the Auckland Regional Council Riparian Guidelines.
4. Ensure replanting of appropriate species when undertaking willow and other riparian weed control.
5. Revegetate banks of major streams - Oratia/Waikumete, Opanuku, Swanson/Waimoko, Paremuka, Waitakere River and Avondale (Wai Tahurangi) Stream as part of stream clearance programmes.
6. Ensure all Stormwater Catchment Management Plans include provision for riparian protection, restoration and habitat enhancement.
7. Provide assistance with covenanting and physical protection of existing native vegetation through the Green Network Economic Incentives programme.
8. Plan the timing of any work in streams in their driest period when fish are not migrating.
9. Comply with the District Plan rules for Riparian Margins.
10. Ensure that Section 13 consents are obtained from the Auckland Regional Council for works in watercourses.
11. Work with the Auckland Regional Council to develop regular workshops with Council regulatory and field staff on sediment and silt control.
12. Promote the use of contractors who have sediment and silt control qualifications.
13. Investigate the possible transference of powers from the Auckland Regional Council with regard to silt control requirements.
14. Produce information and educational material about the effects of aquatic habitats and ways to protect and enhance them.
15. EcoWater will ensure work is really required before undertaking removal of obstructions in watercourse.
16. In conjunction with the Auckland Regional Council, establish criteria and guidelines for stream crossings.
17. In conjunction with the Auckland Regional Council, develop a manual of techniques suitable for erosion protection in streams within the City.
18. When developing Stormwater Catchment Management Plans, weight options which minimise interference with natural stream channels.
19. Ensure all culverts are laid flat and below the streambed to allow passage of fish.
20. Amend the Council's Code of Practice to include requirements and methodologies to allow fish passage when creating vehicle and pedestrian crossings over streams.
21. Undertake a programme of identifying and removing barriers to fish passage in conjunction with other stormwater and park management projects.
22. In areas with good upstream habitat values, investigate possibilities where daylighting (unpiping and unchannelling) streams may be feasible as part of stormwater catchment management planning.
23. When developing Comprehensive Stormwater Management Plans, include keeping streams open and in their natural state as a key aspect.



24. Take enforcement action where illegal piping and filling of streams occurs.
25. Ensure compliance with the Riparian Margins rules in the District Plan.
26. Ensure development does not occur within the 1:100-year flood plain.
27. Amend the Council's Code of Practice to ensure specifications for stormwater treatment devices take into account habitat requirements.

### **3.1.3 Point-source contamination**

#### **OBJECTIVE 3**

To reduce the adverse effects of point-source contamination.

#### **POLICIES**

1. Eliminate where possible, or treat discharges containing contaminants and spills of hazardous substances before they enter natural water bodies.
2. Minimise sewer overflows.
3. Ensure that the design and maintenance of on-site wastewater systems avoids or minimises the discharge of contaminants to natural water bodies.
4. Ensure that sites where hazardous substances are used or stored are designed and operated so as to contain any spills.
5. Promote Cleaner Production programmes and other source control initiatives.

#### **EXPLANATION**

Occasional spills and chronic low-level discharges of substances harmful to aquatic life can destroy in-stream fauna for considerable periods of time, or lead to long-term degradation. Prevention of these discharges is crucial for maintaining and enhancing stormwater quality and the quality of both freshwater and estuarine receiving environments.

#### **IMPLEMENTATION METHODS**

1. Promote and implement clean-up measures after wastewater overflows.
2. Eliminate overflows from local pumping stations that cause adverse effects on the environment or public health.
3. Control infiltration into the City's sewer system to minimise sewer overflows.
4. Implement best management practices from the joint TLA/Watercare Services Limited manual for reducing wastewater overflows.
5. Undertake aftercare to mitigate the effects of contamination from former landfill sites in the City.
6. Enforce the new Hazardous Substances and New Organisms (HSNO) legislation.
7. Ensure regular cleaning of septic tanks.
8. Promote the use of high-tech septic tanks through the use of a rates rebate scheme.
9. In non-reticulated areas, ensure adequate on-site sewage treatment systems are in place.
10. In areas where sewage contamination is indicated as posing a public health risk, undertake programmes, including enforcement if required, to ensure all sites have adequate wastewater treatment.
11. Identify major potential sources and areas vulnerable to contamination from accidents or emergencies.
12. Develop a policy on contaminated sites and hazardous substances as part of the Council's 2000/2001 work programme.
13. Identify the major sources of stormwater pollution in partnership with the Auckland Regional Council.
14. In partnership with the Auckland Regional Council, develop a programme to reduce pollution through education, source control and treatment systems.
15. Undertake Industrial Revitalisation programmes in major industrial areas.

### **3.1.4 Non-point source contamination**

#### **OBJECTIVE 4**

To reduce the adverse effects of non-point source contamination.

#### **POLICIES**

1. Provide for the treatment of 50% of road runoff within the road corridor.
2. Encourage the use of swales within road reserves.
3. Set up a partnership with Transfund for on-going contribution towards the cost of decontamination of road runoff.
4. Promote the use of low impact design for development.
5. Ensure that sediment control is undertaken for all earthworks.
6. Advocate to central government the replacement in and phasing out from building and other materials of all substances with potential to contaminate stormwater.
7. Promote the environmentally safe use of agrochemicals.
8. Encourage the fencing of stock from natural water bodies and their margins.
9. Raise community awareness of the ecological effects of spills and waste dumping.

#### **EXPLANATION**

Non-point source contamination of stormwater can only be controlled through raising community awareness and offering alternative solutions to unsustainable practices. The effects are cumulative and cause and effect are not easily monitored, so prevention of all known sources is the only prudent management approach.

Swales, sediment control for earthworks and low urban impact design with retention of riparian vegetation can physically trap sediment and sediment-bound nutrients. Passage of subsurface flows through riparian margins, particularly swampy margins, can significantly reduce nitrate concentrations in water.

#### **IMPLEMENTATION METHODS**

1. Install cut off drains at the end of driveways in areas with no stormwater reticulation. .
2. Promote the use of the least toxic agrochemicals and application methods that minimise the amounts applied.
3. Encourage the use of swales and vegetative filter strips within road reserves.
4. Investigate and trial new techniques for treating stormwater runoff from roads.
5. In all priority catchments where existing roads are used as primary or secondary flow paths, aim to provide some stormwater treatment.
6. Provide assistance for fencing stock from water bodies through the Green Network Economic Incentives programme.
7. In conjunction with other territorial authorities and the Auckland Regional Council, promote to central government policies and mechanisms to remove from use substances such as metals that contaminate stormwater and have adverse effects on fresh water and ecological systems.
8. Place resource consent conditions and requirements on all building consents involving any degree of earthworks to address sediment runoff.
9. Include monitoring conditions on all resource consents involving earthworks.
10. Provide information on sediment control in the Council's Code of Practice.
11. In co-operation with other agencies, advocate for legislative changes and changes to Regional Policies and Plans where necessary to improve the quality of stormwater runoff.
12. Undertake a programme to put in place stormwater treatment systems that improve stormwater quality in priority catchments.



### **3.1.5 Flooding**

#### **OBJECTIVE 5**

To reduce the adverse effects of flooding on people and property.

#### **POLICIES**

1. In addressing flooding problems, priority will be given to solutions that also address water quality and habitat values.
2. Subdivisions should be designed so that the 1:100-year flood plain is included in a drainage reserve.
3. Subdivision design should, as far as possible, ensure that secondary flow paths are located on public land or in areas where they will not be obstructed by buildings or fences.
4. Building is not permitted where the floor level is less than 0.5m above the 1:100-year flood plain, except where a higher freeboard has been specified in the stormwater catchment management plan.
5. Buildings and other obstructions must be kept clear of secondary flow paths.
6. Plants such as willows, which exacerbate flooding, shall not be planted on stream banks or near wetlands.
7. When planting for environmental quality or to aid stability, plants to be used must not be species that are known to exacerbate flooding.
8. Avoid development that is likely to cause or accelerate inundation of other property.
9. Filling is not permitted within the 1:100-year flood plain, except in exceptional circumstances where it can be demonstrated that adverse effects can be remedied or mitigated.

#### **EXPLANATION**

Catchment development has traditionally taken place from the bottom up, starting at the lower end where the land is flatter, usually near the coast. As steeper, less desirable land is developed further up in the catchment, the resultant increased imperviousness transmits more runoff to the lower areas, and flooding of property begins to occur. In less-developed catchments, the opportunity for flood management is still available, and flooding can be addressed on a more planned and comprehensive basis.

Riparian vegetation can be very effective in slowing the velocity of floodwaters and reducing runoff and floods peaks. For maximum effectiveness, riparian vegetation is needed throughout the entire catchment. However, instream vegetation like willows obstruct and restrict flow by occupying part of the water area. Willows also trap debris and sediment around their roots further blocked water flow and causing localised ponding or flooding. In contrast, sedges and reeds can slow water velocities and hold back flow - a benefit to downstream areas -but are flattened by bigger flows, thus presenting when flows become too strong, allowing water to spill over them, reducing localised ponding or flooding.

#### **IMPLEMENTATION METHODS**

1. Minimise the number of flood hazards affecting people and property.
2. Determine freeboard requirements as part of Stormwater Catchment Management Plans.
3. Consider relocating or raising houses in floodplains before major engineering works.
4. Map 1:100-year flood plains in the City.
5. Allow no more than 250mm of standing water during a 1% AEP (the 1:100-year) flood event on roads built in 1:100-year flood plains.
6. Maintain a current hazard register of all known or potential flooding problems within the City.
7. When approving subdivision plans or building consents, check secondary flow paths to ensure buildings, fences and other development is kept clear of them.
8. In new subdivisions, place easements over secondary flow paths.
9. Promote the use of permeable and semi-permeable surfaces in subdivisions and development where appropriate.

10. Control willows and replace with more appropriate riparian species in areas where they are contributing to flooding problems.
11. Identify other plant species contributing to flooding problems and undertake control programmes where required.
12. Limit stormwater flows to predevelopment levels in structure plan and rural residential areas.
13. Promote the use of the Auckland Regional Council's Large Lot Design Guidelines.

### ***3.1.6 Accelerated erosion and land instability***

#### **OBJECTIVE 6**

To prevent any acceleration of the natural rate of erosion both on land and in stream channels.

#### **POLICIES**

1. Identify streams at risk from stream bank and streambed erosion, and promote appropriate solutions.
2. Promote the use of soft engineering or bioengineering solutions to address erosion.
3. Reduce the adverse effects of land instability on people and property.
4. In stability sensitive areas (as determined in the District Plan/Natural Hazards or Hazard Register), ensure that stormwater from new developments is managed so that it does not flow directly to roads.
5. In stability sensitive areas, ensure that stormwater disposal from roads is managed to avoid risk of land slippage or other environmental damage.

#### **EXPLANATION**

Many streams in Waitakere City are soft-bottomed streams running through weathered clay deposits. The increases in peak flow volume and velocity that results from development causes accelerated erosion of stream banks and the bed of streams. This results in increased sedimentation that smothers instream life and accelerates deposition to receiving environments. The presence of suitable deep-rooting riparian vegetation enhances the stability of stream banks by reducing the erosive effects of the water.

#### **IMPLEMENTATION METHODS**

1. Identify streams at risk of instability or erosion and promote appropriate stormwater management and other solutions.
2. Developments shall not be permitted in areas subject to erosion and land instability unless it can be demonstrated that the adverse effects can be avoided or mitigated.
3. Promote the use of infiltration basins, swales and other measures to reduce stormwater volume velocity.
4. Promote keeping stock away from the edges of streams.
5. Provide assistance with fencing of stock from streams as part of the Green Network Economic Incentives Programme.
6. Undertake stream restoration programmes to control bank slippage and erosion.
7. When undertaking erosion protection, maximise instream habitat opportunities by promoting riparian vegetation and materials such as rip rap and rock walls methods over wooden retaining walls.
8. When addressing erosion problems use soft engineering methods in preference to traditional hard engineering techniques.
9. Develop guidelines for erosion protection that minimise adverse impacts on habitat values.
10. Ensure compliance with District Plan Rules about impermeable surfaces, building and vegetation clearance close to streams.
11. Protect streams in developing areas so that there is no increase in the 2-year return period (the most erosive) storm flow.
12. Promote development design and materials that mimic natural runoff patterns.
13. Minimise direct discharges from stormwater pipes to streams.
14. Where direct discharges of stormwater pipes to streams occur, ensure erosion protection is undertaken.



### ***3.1.7 Land development potential***

#### **OBJECTIVE 7**

Plan and provide stormwater infrastructure ahead of development.

#### **POLICIES**

1. Settlement should be of a type and density that avoids, remedies or mitigates adverse effects of stormwater runoff on water quality, flow volumes and patterns and freshwater and estuarine receiving environments.
2. Subdivision and development of greenfield sites such as Structure Plan Areas should be designed and managed so as to emphasise the protection and enhancement of streams, lakes, watercourses, wetlands and the coast and the enhancement or restoration of riparian vegetation.
3. Promote designs that minimise the need for stormwater infrastructure, especially reticulated systems with direct discharges to streams.
4. Ensure that stormwater management provisions keep pace with urban growth.

#### **EXPLANATION**

The effects of development on stormwater runoff are closely related to the design and materials used, especially the percent impervious area and the extent of stormwater reticulation. The extent of catchment imperviousness is the single most critical determinant of the environmental effects of development. Moreover, in two catchments with the same percent impervious coverage, the one with the most extensive stormwater reticulation will experience the more severe effects on freshwater receiving environments.

#### **IMPLEMENTATION METHODS**

1. Promote the Auckland Regional Council' Low Impact Design Guidelines and Large Lot Development Guidelines.
2. Require stormwater quality treatment on all developments of greater than 20 lots/units.
3. Implement a development contributions policy to ensure that development pays for its fair share of new infrastructure, subject to the completion of the District Plan process.

### ***3.1.8 Altering the natural water balance***

#### **OBJECTIVE 8**

To achieve hydrologically neutral development which maintains the natural water balance as much as possible.

#### **POLICIES**

1. Encourage development styles and stormwater management methods that mimic natural runoff patterns.
2. Maintain perennial flows in streams.
3. Promote the use of stormwater methods that minimise, retain and treat stormwater runoff.

#### **EXPLANATION**

Efficient collection and disposal of stormwater running off extensive impervious areas by reticulated systems short-circuits the natural water cycle, lowering the water table and causing seasonal low flows or cessation of flows in streams. The resulting water shortage compromises catchment vegetation as well as instream communities.

#### **IMPLEMENTATION METHODS**

1. Limit impervious surfaces.
2. Promote the use of infiltration basins, swales and other measures to promote groundwater recharge.
3. Develop and implement an action plan to promote stormwater reuse.
4. Evaluate the economic and environmental costs and benefits of options for reusing rainwater and stormwater in new subdivisions and developments.
5. Explore the potential domestic and commercial applications of greater on-site use of rainwater, including by horticulturalists.
6. Investigate the possibility of stormwater reuse as part of irrigation programmes on sports fields.

### 3.1.9 Existing stormwater infrastructure

#### OBJECTIVE 9

To optimise the effectiveness of the existing stormwater infrastructure network in a way that meets the needs of the community and, where possible, to implement alternative instead of traditional stormwater management solutions while ensuring that Council's management of stormwater pays due regard to the safety of staff and the public.

#### POLICIES

1. Maintain the reticulated stormwater system in an efficient and cost-effective manner.
2. Design stormwater infrastructure to minimise long-term maintenance costs.
3. Provide pipe capacities that accommodate the 1:5-year storm.
4. Provide a secondary flow system with capacity to accommodate the 1:100-year storm clear of all buildings.
5. Ensure stormwater system design does not conflict with the operation of other utilities.
6. Where possible implement innovative solutions for stormwater management.
7. Optimise the timing of replacement of infrastructure to maximise the investment in that infrastructure.
8. Ensure safety of staff and the public with regard to the Council's management of stormwater.
9. Discharges to road drainage systems shall be in compliance with the guidelines for curb discharges.
10. Provide adequate signage for areas known to flood.
11. Apply safety standards for all temporary sediment retention ponds.

#### EXPLANATION

Stormwater infrastructure comprises a large part of Council's managed assets and must be maintained in an efficient and cost effective manner. New services must be able to meet the needs of the community well into the future, providing for expected growth and keeping pace with changes in technology and environmental performance standards.

The key safety hazards of stormwater structures are falling into water retention or carrying devices and not being able to get out. The risk of drowning must be reduced by reducing opportunities for accidental trapping or by posting warning signs.

#### IMPLEMENTATION METHODS

1. Survey stormwater infrastructure to identify condition and priorities for replacement.
2. Continue with prioritised improvements to the condition and capacity of stormwater infrastructure.
3. Benchmark performance of stormwater infrastructure against best practice and agreed performance measures.
4. Ensure compliance with Auckland Regional Council resource consent conditions for all discharge consents.
5. Ensure the Council's Asset Management Plan complies with Audit New Zealand and accounting standards.
6. Keep adequate rainfall records to provide accurate estimates for the 1:5-year storm and 1:100-year storm.
7. Ensure the Council's Code of Practice has adequate rules about the design and capacity of stormwater infrastructure.
8. Review the Council's Asset Management Plan annually in line with the condition rating analysis.
9. Ensure adequate specifications are in place so that appropriate materials and construction techniques are used in constructing and/or replacing existing stormwater network assets.
10. Advocate for legislative changes where necessary, to enable implementation of the Funding Policy.



11. Provide levels of customer services as defined in the EcoWater Statement of Business Intent.
12. Carry out risk assessment of the stormwater asset to identify critical assets and implement prioritised renewal of decision-making.
13. Ensure entry gradients to stormwater ponds comply with safety requirements as set out in the Council's Code of Practice.
14. Ensure dense planting and/or fencing of stormwater ponds as outlined in the Code of Practice.
15. Set standards for temporary sediment retention pond fencing, pursuing a Bylaw to require fencing if necessary.
16. Put in place signage indicating public areas known to flood.
17. Keep an updated hazard register of all properties with known flooding hazard.
18. Put in place warning signage where public health risks arise as a result of sewer overflow or septic tank discharges.

### ***3.1.10 Loss of community use of water resources***

#### **OBJECTIVE 10**

To protect and enhance community access to and enjoyment of freshwater and marine environments.

#### **POLICIES**

1. Ensure that water bodies remain in their natural state to continue providing sustainable stormwater management and landscape and visual amenity.
2. Ensure that water quality is of a standard suitable for contact recreation where this has been or potentially is an appropriate activity.
3. Ensure that water bodies are not degraded to the extent that renders them unsuitable for non-contact recreation.
4. Ensure that water quality is of a standard to ensure the continued use of cultural harvesting of food and other resources where this is appropriate.
5. Ensure water quality standards are met in areas of fishing and shellfish gathering.
6. Protect the mauri of water.

#### **EXPLANATION**

Human activities should not impede natural changes in watercourses, lakes or wetlands and should avoid modifying the interface between wetlands or streams and the surrounding land. This interface between land and water is a transitional zone which is highly vulnerable to development, but which performs important hydrological, ecological and landscape functions.

Water quality must be maintained or improved to enable various activities in and around the City's water bodies to continue. Swimming and shellfish gathering need the highest water quality and visual amenity the lowest. The water quality measures for the community use of water bodies may not directly relate to water quality necessary to maintain healthy aquatic or marine ecosystems, but the precautionary approach promotes management to the most conservative standard where possible.

Activities in the riparian margins must avoid adverse effects on the mauri of that water, taiapure or mahinga maataitai (traditional areas for harvesting cultural materials).

#### **IMPLEMENTATION**

1. All drainage works should be designed, installed and maintained so as to incorporate amenity improvements.

### **3.2 *Monitoring***

Kingett Mitchell's Report 8 identified public health as well as ecological and hydraulic implications of the state of Waitakere City's freshwater and stormwater receiving environments, for example, high nutrient loadings in streams affect human health as well as natural ecosystems. High nutrient loadings and high counts of *Escherichia coli* (an indicator of faecal contamination) can be attributed to a number of sources including sewage overflows, septic tank seepage, grazing and horticulture, as well as excreta from possums and waterfowl.

Aristos Consultants' Report 9 provides the framework for a programme to monitor the effectiveness of the Council's stormwater management initiatives. The report recommends adoption of the 1999 updated ANZECC (Australia New Zealand Environment and Conservation Council) water quality guidelines to determine degradation trigger points.

The proposed monitoring programme identifies habitat, macro invertebrates, macrophytes, fish and water flows and levels as key indicators, and provides methods, a programme and costing to monitor these.

Goals for water quality monitoring are to ensure that:

- public health and safety is protected from the effects of both pollution and flooding
- aquatic ecosystem health is protected and restored.



## 4.0 COSTS AND BENEFITS

### 4.1 Benefits

To assess whether the costs incurred by implementing improved stormwater management are worth the benefits gained it is useful to compare the monetary costs and benefits of carrying out urban stormwater management (after Ward and Scrimgeour 1991) (Table Nine).

**Table 10: Region-wide monetary costs and benefits estimated for urban stormwater management** (after Ward and Scrimgeour 1991).

<i>Monetary costs incurred from stormwater management in Waitakere City</i>	<i>Monetary costs incurred by allowing deterioration of harbour quality through stormwater pollution</i>	<i>Monetary benefits accruing from harbours with an environmental quality in 1991</i>
Average Annual Cost \$12.6 million	Region: \$118-150 million/annum Waitakere City: \$14-18 million/annum	Region: \$442 million/annum Waitakere City: \$53 million/annum

### 4.2 Costs

The costs of the Comprehensive Urban Stormwater Management Strategy and Action Plan have been included in the 2000 Long Term Financial Strategy and are as shown in the table below.

An alternative to the stormwater strategy based on a conventional engineering management of stormwater has been evaluated based on a conventional engineering approach. This demonstrates that this stormwater strategy represents the optimised cost.

**Table 11: 10-Year Stormwater Strategy Costs**

ITEM	STORMWATER STRATEGY 10 YEAR COSTS \$MILLION	ALTERNATIVE APPROACH ENGINEERING MANAGEMENT 10 YEAR COSTS \$MILLION	COMMENT
Operating Costs	\$88.7	\$100.8	includes maintenance, overheads and loan repayments
Asset Renewals	\$37.2	\$37.2	Required for compliance with Local Government Act No.3
Capital Costs	\$96.4	\$152.0	Flooding and consequences of growth mitigated.

## 5 PUBLIC INFORMATION AND FEEDBACK

A discussion document based on the Stormwater Strategy, will be circulated to the public in October 2000.

The traditional approach for managing stormwater has been to pipe and channel it, rather than work in with natural methods for the treatment and disposal of stormwater. More recently, communities have begun to question this approach. This paper suggests alternative ways forward.

This paper:

- Outlines Council's Stormwater Strategy and its goals and progress
- Covers issues surrounding, and some options for managing, stormwater in Waitakere City
- Encourages the public to play a role in continuing to develop our Stormwater Action Plan

The public will be asked for its views and suggestions on stormwater, by returning the feedback form, by 30 November 2000.

Council will hold discussion with Ngati Whatua and Te Kawerau A Maki, as well as consulting with the Taumata Runanaga and Maori Issues Unit to ensure effective communication with local iwi.

Community Groups will be given the opportunity to invite a Council officer to speak at one of their meetings. These officers will record any suggestions and ideas.

Regular updates on stormwater will be included in the Waitakere News, which is regularly distributed to all Waitakere households. This will ensure all members of the community area aware of stormwater issues and processes.

A mobile display will be shown at shopping malls in the City, presenting visual and written information about stormwater issues and options. This will be available for additional exhibitions on request.

Additional news and notices will be posted in local newspapers, to notify progress, meetings and activities.



## 6. GLOSSARY

<i>1:5 and 1:</i>	100-year storm (see also AEP and Return period): A major storm event which has a degree of severity that is unlikely to occur more than once every five years or every 100 years. 100-year flood = 1% A.E.P.
<i>AEP:</i>	Annual Exceedence Probability
<i>Asset management plan:</i>	Refer Waitakere City Stormwater Asset Management Plan in References (above).
<i>Baseflow:</i>	The natural recharge of groundwater to a water body.
<i>Bioengineering:</i>	The design, manufacture, and maintenance of engineering equipment used in biosynthetic processes i.e. the formation of complex compounds from simple substances by living organisms.
<i>Cleaner production:</i>	Means avoiding the use or production of environmentally persistent substances, reducing the amount or toxicity of liquid wastes produced that require disposal and reducing the amount or toxicity of solid wastes.
<i>EcoWater:</i>	Council's business unit with responsibility for water, stormwater and wastewater infrastructures.
<i>Ephemeral:</i>	Transitory or short-lived (e.g. the mayfly is an ephemeral organism).
<i>Escherischia coli (E. coli):</i>	A bacterium common in the human gut, which has been used extensively in biological studies.
<i>Floodplain:</i>	A low-lying area which can be covered in water following a given return period flood event.
<i>Greenfields:</i>	Rural land on the urban periphery that is developed for urban uses.
<i>Habitat:</i>	The natural home or environment of an animal or plant.
<i>Hard engineering:</i>	Refers to the more traditional engineering methods of damming, piping and channelling stormwater run-off, rather than working with more natural methods, which mimic nature's water cycle.
<i>Infrastructure:</i>	The term refers to the often unseen network of services provided for the community. Infrastructure that territorial councils provide includes roads, water, wastewater and stormwater pipes, treatment facilities and parks.
<i>Instream:</i>	Refers to values, such as algal concentration, macro invertebrate communities, etc.
<i>Inundation:</i>	To cover completely with water (may refer to overflow; flood or swamp).
<i>Kaitiaki:</i>	Guardian
<i>Kaitiakitanga:</i>	To conserve, preserve, protect and keep watch over.
<i>Leachate:</i>	Effluent containing contaminants, produced from rain/stormwater percolating through a landfill, which may then discharge to a sewer, water body or harbour.
<i>Macro invertebrates:</i>	An animal that does not possess a backbone (the presence of which is used to help determine water quality).
<i>Macrophytes:</i>	Aquatic macrophytes include rooted plants (submerged, floating or emergent) present within a stream.
<i>Mabinga maataitai:</i>	Traditional areas for harvesting cultural materials.
<i>Manawhenua:</i>	
<i>Mauri:</i>	Life principal, talisman with protecting vitality, mana.
<i>Non-contact recreation:</i>	Recreational pursuits which do not generally entail a person having bodily contact with a stream or other water body (i.e. boating, canoeing).
<i>Non-point source discharge:</i>	Discharges from diffuse or not readily identifiable sites (i.e. stormwater run-off from properties over a wide area).
<i>On-line stormwater pond:</i>	A stormwater treatment device that is constructed within an existing stream or watercourse.
<i>Pathogens:</i>	Any agent that can cause disease.

<i>Perennial:</i>	Everlasting; perpetual (may refer to a woody or herbaceous plant that continues its growth for a least three years).
<i>Peri urban:</i>	City fringe (i.e. low density or semi urban).
<i>Point source discharge:</i>	Specific discharge to the environment (e.g. a wastewater overflow pipe discharging to a stream)
<i>Reticulation:</i>	The existing network or system used to convey stormwater.
<i>Return period (see AEP):</i>	The predicted period (measured in years) that a storm event of similar severity is expected to return.
<i>Riffle:</i>	A rapid or stream running over a rocky shoal
<i>Riparian:</i>	A strip of land (which varies from 5m to 20m in width), which is designated as a protection buffer along the edges of streams, estuaries and coastal margins.
<i>Soft engineering:</i>	Engineering methods which are more closely aligned with the way natural systems work, than traditional “hard-engineering” methods. (see also bioengineering and hard engineering)
<i>Stormwater:</i>	Rain which runs off roads, yards and roofs and down gutters into stormwater grates. Stormwater picks up silt and other contaminants as it runs over these surfaces. It is piped/runs untreated into streams and harbours.
<i>Taiapure:</i>	
<i>Territorial authority:</i>	A local council with responsibility for providing and maintaining a city or district’s infrastructure, as well as, providing a wide range of community services.
<i>Three-waters:</i>	Refers to integrated water resources (water, stormwater, wastewater) development and management.
<i>Water bodies:</i>	Any natural method of conveying water to the sea, i.e. creek, stream, river, wetland, but which also may have been modified (i.e. channelised).
<i>Waahi tapu:</i>	Site with special significance.



## 7. REFERENCES

### *New Zealand National Coastal Policy Statement 1994*

Sets the Policy direction for coastal management including discharges into the Coastal Marine Area.

### *Auckland Regional Policy Statement 1999*

Sets the Policy direction for resource management in the Auckland Region, including streams and stormwater discharges.

### *Auckland Regional Plan: Coastal 1995*

Contains the rules under which stormwater discharge consents are sought and granted.

### *Auckland Region: Draft Land, Air and Water Plan 2000*

In preparation

### *Waitakere City Annual & Strategic Plan 2000/01 - 2009/10*

Incorporates the Long Term Financial Strategy and Funding Policy Summary. It looks forward, to setting out a strategy for taking Waitakere to 2010 and beyond. The Council's Annual Plan for 2000/2001 forms part of this document, but it is presented as year one of a work programme, which has been put together for the long term. The Council prepares a new Annual Plan each year, but only reviews its Strategic Plan every three years as part of the electoral cycle. This means that the Annual Plans for 2001/02 and 2002/03 are prepared using this document as a starting point.

### *Strategic Objectives(3 most relevant):*

#### *Green Network Strategic Objective*

- Includes stormwater objectives and expenditure
- Requires integration with wider Green Network initiatives (including Green Network parks)
- Sets out a programme for promotion of community stewardship.

#### *Urban Villages Strategic Objective*

- Sets out location, timing and implementation priorities for urban improvements
- Sets out standards and change programmes for roading and other access - key issue for stormwater

#### *Water Strategic Objective*

- Identifies programme for management of water and wastewater which includes conservation and recycling
- Programme includes desire to integrate water supply and stormwater management solutions.

### *Waitakere City Detailed Long Term financial Strategy 2000/2001 - 2009/2010*

Sets out the level of service that the Council will provide and how this will be funded over the next 20 years.

### *Waitakere City Proposed District Plan*

Includes a detailed approach, focused primarily on regulatory methods, for the management of stormwater effects and an integrated approach to subdivision design.

### *EcoWater Business Plan*

Sets EcoWater's programme for maintenance and capital works with timeframes.

### *Stormwater Catchment Management Plans*

Set out detailed plans for the management of stormwater on a catchment wide basis.

### *Water Cycle Strategy*

Endorses idea of water management within natural water cycle and integrated catchment based water, wastewater and stormwater planning

### *Our Water Our Future -Action Plan*

Develops further detail of potential detailed stormwater management and obtains broad level community support for such initiatives Urban growth strategy

Sets out a broad level programme, consistent with the Regional Growth Strategy, for the management of peripheral growth and broad level urban densities

### *Urban Villages implementation programmes - e.g. New Lynn*

Sets out detailed design and implementation programmes for particular city areas

Provides a basis for detailed stormwater planning - stormwater issues integrated into planning

*Parks Strategy*

Sets out long term programme for parks, including parks in the Green Network - includes consideration of stormwater issues

Focuses in part around stream management in parks and a restoration programme that must be taken into account in stormwater management.

*Waitakere City Stormwater Asset Management Plan*

Includes a register of Council's fixed assets

Sets out the valuation methodology used to value Council's stormwater infrastructure (includes asset condition, useful life and materials used)

The primary objective of the Asset Management Plan is to minimise the long-term cost of infrastructure, whilst complying with regulatory requirements

*Report 3: Prioritisation Methodology*

Report prepared for Waitakere City Council by Montgomery Watson, 1999

*Report 8: Receiving Environment Quality in Waitakere City*

Report prepared for Waitakere City Council by Kingett Mitchell & Associates Ltd, March 2000

*Commentary on Report 8: Receiving Environment Quality in Waitakere City*

Report prepared for Waitakere City Council by Brian Maunder, Earth Consult, July 2000

*Report 9: Stormwater Monitoring Programme*

Report prepared for Waitakere City Council by Aristos Consultants Ltd, June 2000

*Iwi Resource Management Statements*

Set out broad level priorities and management requirements for stormwater

*Economic Incentives Strategy*

Programme for private bush protection and restoration - a key impact for stormwater management.



## **APPENDIX A:**

### ***Relevant excerpts from the New Zealand Coastal Policy Statement***

National priorities for the preservation of the natural character of the coastal environment, including protection from inappropriate subdivision, use and development include:

- 1.1.2 Protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.
- 1.1.3 (b) Protection of characteristics of special spiritual, historical or cultural significance to Maori identified in accordance with Tikanga Maori
- 1.1.4 Protection of the integrity, functioning and resilience of the coastal environment in terms of:
  - (b) natural movement of biota
  - (d) natural water ... quality
  - (e) natural bio diversity, productivity and biota patterns
  - (f) intrinsic values of ecosystems
- 1.1.5 Restoration and rehabilitation of the natural character of the coastal environment where appropriate.

### ***Chapter 3: Activities involving the subdivision, use or development of areas of the coastal environment***

#### **POLICIES INCLUDE:**

- 3.2 Providing for the appropriate subdivision, use and development of the Coastal Environment.
  - Policy 3.2.7 Policy statements and plans should identify any practicable ways whereby the quality of water in the coastal environment can be improved by altered land management practices, and should encourage the adoption of those practices.
  - Policy 3.2.8 Provision should be made for the protection of habitats (in the coastal marine area) of species that are important for commercial, recreational, traditional or cultural purposes.
  - Policy 3.2.10 Policy statements and plans should indicate that when restoration plantings are carried out, preference should be given to the use of indigenous species, with a further preference for the use of local genetic stock.
- 3.3 Adoption of a precautionary approach to activities with unknown but potentially significant adverse effects.

### ***Chapter 5: Matters to be included in Regional Coastal Plans***

- 5.1 Maintenance and Enhancement of Water Quality
  - 5.1.1 Rules should be made as soon as possible with the object of enhancing water quality in the coastal environment (including aquifers), where that is desirable in achieving the purpose of the Act, and in particular where:
    - a) There is a high public interest in, or use of the water;
    - b) There is particular tangata whenua interest in the water; there is a particular value to be maintained or enhanced
  - 5.1.5 Consideration should be given to reducing any contamination of natural water in the coastal environment caused by the discharge of trade wastes
  - 5.1.6 Consideration should be given to reducing contamination of natural water in the coastal environment from non-point sources
  - 5.1.7 Provision should be made too ensure that the public is adequately warned when the degradation of water in the coastal environment has rendered the water unsafe for swimming, shell-fish gathering or other activities.

**APPENDIX B:*****Relevant excerpts from the Auckland Regional Policy Statement***

Key objectives that relate to stormwater management are:

**6.3 Objective:**

1. To protect and restore ecosystems and other heritage resources, whose heritage value and/or viability is threatened.

**6.4.7 Policies: Evaluation of natural heritage**

3. The heritage value of freshwater ecosystems shall be progressively identified and protected from the adverse effects of use and development.

**8.3 Objective**

1. To maintain water quality in water bodies and coastal water which have good water quality, and to enhance water quality which is degraded particularly for the following purposes:
  - (i) Estuaries and harbours: protection of aquatic ecosystems, recreation, fishing and shellfish gathering, cultural and aesthetic purposes.
  - (ii) Open coastal water, including parts of the Hauraki Gulf: its natural state.
  - (iii) Groundwater: water supply.
  - (iv) Lakes, rivers and streams: protection of aquatic ecosystems, recreation, food gathering, water supply, cultural and aesthetic purposes.
  - (v) Wetlands: protection of aquatic ecosystems.

**8.4.1 Policies: General**

1. Adverse effects on water quality caused by the discharge of contaminants (including non-point source discharges) shall be avoided, particularly the discharge of potentially toxic, persistent or bio-accumulative contaminants. Where it is not practicable to avoid discharges, they shall be adequately remedied or mitigated.
2. Minimum standards for water quality in terms of section 69 of the RM Act shall be set where the use of minimum standards is shown to be the most appropriate means for achieving the purpose of the RM act, having regard to their efficiency and effectiveness relative to other means.

**8.4.7 Policies: Stormwater and sediment discharges**

1. All new developments discharging stormwater, whether allowed as a permitted activity or by a resource consent, shall adopt appropriate methods to avoid or mitigate the adverse effects of urban stormwater runoff on aquatic receiving environments.
2. The ARC will promote stormwater quality control on a catchment wide basis to avoid or mitigate the adverse effects of urban stormwater runoff on aquatic receiving environments.

**8.4.24 Policy: Significant resource management issues for Tangata Whenua**

Maori cultural and traditional values shall be recognised and provided for in the management of water quality.

**11.2.1 Issue:**

Natural hazards pose a risk to people, property and the environment

**11.3 Objective:**

To avoid, remedy, or mitigate the adverse effects of natural hazards on human life, property and the environment, while minimising the adverse effects of measures implemented to reduce the risks of natural hazards.

**11.3.1 Policies:**

2. Natural hazard management shall be integrated and co-ordinated between the ARC and TAs within the Auckland Region, and with adjoining regional councils.



3. Before provision is made enabling significant development or redevelopment of land which will result in intensification of land use, any flood hazards and measures to avoid or mitigate their adverse effects shall be identified.
4. Development shall be discouraged in flood hazard zones unless it can be demonstrated that all habitable floor levels are protected from the 1% AEP flood level, and that structures in the 1% AEP flood level do not divert overland flows onto neighbouring properties.
5. Development shall not be permitted if it is likely to accelerate, worsen or result in inundation of other property, unless it can be demonstrated that the adverse effects can be avoided or mitigated.
7. Construction of mitigation works shall be encouraged only where people, property and the environment are subject to unacceptable risk from flood hazards.
8. When carrying out flood mitigation works, existing vegetation shall be retained, where appropriated, to aid stability and maintain environmental quality. However, the planting of vegetation, which may, because of growth habit etc., restrict water flow and exacerbate the flooding hazard, shall be avoided.

APPENDIX B: EXCERPTS FROM THE AUCKLAND REGIONAL COUNCIL POLICY STATEMENT

**APPENDIX C:*****Relevant excerpts from the Waitakere City Strategic Plan 2000/01 - 2009/10***

<b><i>Strategic Plan - Relevant Objectives and Measures</i></b> GREEN NETWORK	<b><i>Implications for Stormwater Management</i></b>
<p>1. The City's native plants, animals and their ecosystems are cared for and protected. Stream and coastal areas are replanted and protected from erosion, and natural links and wetlands are re-established</p> <p><i>Increase the hectares of bush areas and esplanade reserves with restoration programmes underway</i></p> <p><i>Number and variety of native fish found in targeted streams is maintained, and increased in the long term</i></p> <p>2. The Council and private landowners work in partnership to ensure that our native and other ecosystems are protected from threats to their ongoing survival.</p> <p><i>More weed management plans in place</i></p> <p>3. People have better access to the City's parks, streams and green corridors, which are well managed to provide for improved standards of amenity and ecological health.</p> <p>4. The management of stormwater keeps up with the growth of the City and remains in harmony with the natural water cycle. Land slippage and erosion is reduced and people's health and safety is protected.</p> <p><i>New stormwater treatment systems that improve stormwater quality are in place in priority catchments</i></p> <p><i>Stream restoration projects to control slippage and erosion are completed</i></p> <p><i>Minimise the number of flood hazards</i></p> <p>5. The relationship between people's activities and the City's natural environments is managed in a way that maximises constructive relationships, encourages new understandings of the environment and seeks to develop community partnerships and community and landowner stewardship of the environment.</p> <p><i>Increase in residents who have deliberately taken actions with the intent of improving the natural environment</i></p> <p><i>Increase in people working in partnership with the Council in Green Network projects</i></p>	<p>Maintain and enhance natural systems as a first principle.</p> <p>Plan and design the stormwater implementation programme to fit with the protection, restoration and extension of a Green Network.</p> <p>Encourage design of infrastructure that minimises impacts on natural resources</p> <p>Give priority where possible to planting as a stormwater management solution.</p> <p>Focus on using low impact technical solutions</p> <p>Maintain and enhance natural systems as a first principle.</p> <p>Where possible use technical solutions that enhance and replicate natural systems.</p> <p>Set up a monitoring regime to assess the effectiveness of new technologies and initiatives.</p> <p>Ensure the quantity and rate of stormwater discharged at any time into a waterway is capable of being adequately absorbed by the receiving environment.</p> <p>Involvement of stormwater management in community initiatives around streams.</p> <p>Community involvement in catchment design solutions.</p> <p>Foster recognition and pride in the natural environment special to Waitakere City.</p> <p>Invest directly and encourage investment in the reuse of stormwater.</p>



<i>Strategic Plan - Relevant Objectives and Measures</i> URBAN VILLAGES	<i>Implications for Stormwater Management</i>
<p>Involve communities, especially in conjunction with parks design and management, in the design of an integrated space of high amenity.</p> <p>The City has a network of strong town centres and neighbourhoods which provide for economic and urban growth, enable services to be provided locally, and provide a mix of living, working and leisure opportunities.</p> <p>Town centres and neighbourhoods are attractive and enjoyable places, each with their own identity and natural heritage.</p> <p>People can get easily and safely to where they want to go by walking, cycling, passenger transport, or private vehicle, and businesses can efficiently move their goods and services.</p> <p>Citizens have easy access to a safe and attractive local park.</p>	<p>Plan and design stormwater solutions in conjunction with wider design initiatives for particular areas - structure plans, integrated subdivision design, locality planning, neighbourhood designs, town centre plans.</p> <p>Ensure that assessment of the costs and benefits of new urban development in an area, takes adequate account of potential adverse downstream effects on water quality, ecosystems, land instability and flooding. This may involve avoiding these effects by keeping upstream areas, particularly the top of catchments, clear of new development..</p> <p>Ensure that natural environments are integrated into urban areas and that ecosystems (such as streams) are a fully functional part of these areas.</p> <p>Encourage and regulate for the reduction in impermeable surfaces within the urban environment.</p> <p>Ensure that stormwater solutions wherever possible are consistent with particular contexts/ landscapes.</p> <p>Stormwater design solutions to take account of particular sites etc of importance to the community.</p> <p>Design roads and associated drainage to minimise the potential for land slippage and the entry of pollutants to water bodies.</p> <p>Invest directly and encourage investment in the reuse of stormwater.</p> <p>Encourage an attractive city by combining good design with the underlying form and qualities of the landscape.</p> <p>Encourage a city form that can be serviced in a financially sustainable way.</p> <p>Involve artists in designing the city and incorporate community art into everyday life.</p> <p>Reduce contamination of waterways from stormwater run-off from roads.</p> <p>Ensure that the stormwater component of roading design (e.g. kerb and channelling) is integrated with the wider stormwater system.</p> <p>Ensure that road design keeps up with and includes new stormwater management systems - e.g. swales.</p> <p>Design new subdivisions to reduce reliance on roads as stormwater paths.</p>

<i>Strategic Plan - Relevant Objectives and Measures</i> DEMOCRACY, MONITORING AND OPERATIONS	<i>Implications for Stormwater Management</i>
<p>The City maintains open and positive formal partnerships with iwi and pan-tribal organisations</p> <p>Iwi and pan-tribal organisations satisfied with the Council's consultation methods.</p> <p>The management of services and assets is fair, efficient and cost effective. Resources are allocated to support high quality services and assets and the risk is minimised.</p>	<p>Facilitate the role of kaitiaki in safeguarding the health of the physical and spiritual environment.</p> <p>Design all Council stormwater consents to include consideration of impacts on the mauri of waterways.</p> <p>Work with iwi at the strategic and catchment planning stage to ensure appropriate design.</p> <p>Work with iwi and other Maori residents to monitor impacts on both the physical and spiritual state of the environment.</p> <p>Avoid infrastructure investment that is inflexible over time and commits the community to major long term investment and maintenance regimes - e.g. traditional stormwater transportation.</p>
SUSTAINABLE BUSINESS	
<p>The City has a strong, adaptable and sustainable local economy and more local jobs available.</p> <p>Encourage business which gains a competitive edge from promoting environmental sustainability - such as 'green' technology.</p>	<p>Ensure that stormwater managers work with people involved in business development to encourage innovative use of on-site stormwater.</p> <p>Increase investment in initiatives to ensure stormwater discharged into waterways is of an adequate standard.</p> <p>Foster a business community which is interested in and involved with local stormwater issues.</p> <p>Invest directly and encourage investment in the reuse of stormwater.</p>
SOLID WASTE	
<p>Minimise the residue of waste being disposed of into the environment</p> <p>Eliminate the disposal to the environment of persistent toxic substances including PCBs, Organohalides and heavy metals.</p> <p>Minimise the wasteful use of environmental resources.</p>	<p>Focus in industrial and commercial areas on promoting and carrying out on-site initiatives with businesses.</p> <p>Work with businesses and households to reduce polluting discharges into stormwater systems.</p> <p>Reduce the amount of litter and rubbish entering the stormwater system.</p>



<i>Strategic Plan - Relevant Objectives and Measures</i> WATER	<i>Implications for Stormwater Management</i>
<p>The City's water and wastewater systems are sustainable, respond to growth pressures and integrate well with the natural water cycle and aquatic ecosystems</p>	<p>Take action to minimise illegal stormwater connections to the wastewater system.</p> <p>Take action to minimise stormwater infiltration into the wastewater system.</p> <p>Manage water and wastewater to promote water conservation and recycling</p> <p>Encourage investment in the reuse of stormwater.</p>
WELLBEING SUPPORT	
<p>There are plenty of safe places, facilities, services and opportunities for children and young people in Waitakere City.</p> <p>The City has a comprehensive range of safety, health and support services which are accessible, affordable and appropriate for all groups. Crime and injury prevention in the City are reduced and people have access to help in times of need.</p> <p>Citizens of the City have a safe and healthy environment.</p>	<p>Ensure that the stormwater system, for example culverts, treatment ponds and wetlands, are designed with safety in mind.</p> <p>Ensure that riparian plantings conform with the safety guidelines for plantings in the Green Network.</p> <p>Ensure an adequate water quality monitoring programme.</p> <p>Investigate and follow up reports of illegal discharges to streams or other parts of the stormwater system.</p>

Note: some of the objectives and measures in the table above have been paraphrased.  
For the full text, refer to the Annual and Strategic Plan 2000/01 - 2009/10.

**APPENDIX D:*****Relevant excerpts from the Waitakere City Proposed District Plan***

The Plan's key policies and objectives, which relate to stormwater management, are listed below:

***Objective 1***

To manage the effects of land use on the environment and, in particular, avoid, remedy or mitigate effects on the quality and quantity of the City's water resource, including maintaining:

- the life-supporting capacity of water;
- the ability to use aquatic ecosystems as a food source;
- the availability of water as a healthy place of recreation.

***Policy 1.10***

Impermeable surfaces and stormwater infrastructure should be designed and managed in a way that avoids adverse impacts on water quality, including the life-supporting quality of water, arising from the discharge of stormwater into the City's watercourses.

***Objective 7***

To preserve and enhance the natural character of the City's coastal environment and rivers and wetlands and their margins, including preserving the action on the land of those processes which form that natural character.

***Policy 7.6***

Restoration and rehabilitation of the natural character of coastal areas, wetlands, lakes and rivers and their margins should occur where appropriate.

***Objective 8***

To protect and maintain those aspects of the environment that are of significance to tangata whenua, including:

- protecting the spiritual dimension and the mauri (life force) of natural and physical resources and of humans;
- recognising and protecting the kaitiaki of these resources and significant sites and waahi tapu within the City;
- providing for those institutions that are integral to the relationship of tangata whenua with their environment;
- in a way that promotes the expression and practice of kaitiakitanga (guardianship).

Set out below are the policies that have been adopted in relation to this Objective:

***Policy 8.1***

Any activity involving the intensification of settlement or subdivision within the Green Network, the Waitakere Ranges, Bush Living, Foothills and Countryside Environments, should be managed in a way that avoids, remedies or mitigates adverse effects on the quality of water, soils and native vegetation and fauna habitat, and the mauri of those resources.

***Policy 8.4***

Any activity within the Riparian Margins/Coastal Edges Natural Areas, Coastal Natural Areas and Protected Natural Areas that involves:

- disturbance of soils and removal of rock;
- alteration to the natural character of the coastal area or impeding of any natural process that forms that character;
- alteration to the interface between land and water;
- removal of vegetation;
- should be managed in a way that avoids, remedies or mitigates adverse effects on the natural character and mauri of the coastal area.



## **APPENDIX E:** ***Water Cycle Strategy - Goal 7***

To provide efficient stormwater systems

### ***Policies***

To provide efficient systems by:

- Preparing and implementing comprehensive stormwater catchment management plans
- Riparian management of watercourse and streams
- Enhancing and maintaining stream corridors
- Promoting regional solutions to achieve enhanced stormwater quality, including regional water quality standards
- Developing and implementing contingency plans for floods, spillages

To promote good practice by:

- Encouraging sustainable self-sufficient new urban development
- Providing information, awareness, consultation
- Ensuring the District Plan is consistent with this direction
- Developing Asset Management Plans which reflect this direction
- Monitoring and reviewing and advising the community of trends and changes

### ***Long Term Targets***

Reduce stormwater flows and pollution through urban design changes for new development, by 2000.

Enhanced stream corridors, including riparian strips, by 2000.

### ***Environmental Target***

Commitment to supporting the progressive improvement and restoration of all water bodies, including the Manukau and Waitemata Harbours, towards a healthy natural state.

**APPENDIX F:*****Relevant excerpts from the EcoWater Business Plan******Objective 1:***

Ensure Public Health and Safety

***Strategy 1.2***

Reduce wastewater and contain spills.

This strategy is designed to improve public health standards and minimize risks including adverse environmental effects.

PROGRAM NAME / GOAL	PROGRAM ACTIONS / INITIATIVES
<b>Wastewater spills containment</b> <i>(Goal: no adverse public health effects)</i>	<ul style="list-style-type: none"> <li>Update spillage containment plan</li> </ul>
<b>Wastewater Infiltration</b> <i>(Goal: to reduce inflow and infiltration)</i>	<ul style="list-style-type: none"> <li>Implement New Lynn Program for catchments MC9 + MC21</li> <li>Develop policy for private drains and obtain approval by the Council</li> <li>Complete citywide infiltration model, based on the critical areas identified in Project Storm. Establish city-wide infiltration priorities</li> </ul>

***Strategy 1.3***

Manage flood hazards and risks

This strategy is designed to mitigate the effects of flooding on public health and safety.

PROGRAM NAME / GOAL	PROGRAM ACTIONS / INITIATIVES
<b>Manage flood hazards and risks</b> <i>(Goal: to improve public safety and protection of property)</i>	<ul style="list-style-type: none"> <li>Identify chronic problem areas develop programs to resolve.</li> <li>Develop Stream Clearing Program (Oratia, Opanuku, Swanson and Waitakere) (AP)</li> <li>Complete Stormwater catchment Management Plans for Oratia Stream and Opanuku Stream</li> <li>Develop Integrated Stormwater Management Action Plan</li> <li>Develop of 2000/01 operations and maintenance program.</li> <li>Develop field safety hazard manual</li> </ul>



**Objective 2:**

Ensure Reliability of Service Delivery

**Strategy 2.2**

Manage the wastewater and stormwater networks.

This strategy is designed to meet customer expectations of wastewater and stormwater service reliability.

PROGRAM NAME / GOAL	PROGRAM ACTIONS / INITIATIVES
<b>Scheduled wastewater maintenance</b> <i>(Goal: to reduce wastewater network blockages)</i>	<ul style="list-style-type: none"> <li>• Develop 2000/01 fault repair program.</li> <li>• Implement 99/00 Renewal Program.</li> </ul>
<b>Scheduled stormwater maintenance</b> <i>(Goal: to reduce stormwater network blockages)</i>	<ul style="list-style-type: none"> <li>• Develop 2000/01 fault repair program.</li> <li>• Implement 99/00 Renewal Program. Project Storm. Establish city-wide infiltration priorities</li> </ul>

**Objective 3:**

Ensure the Provision of Adequate Infrastructure and Services for Growth

**Strategy 3.3**

Ensure growth requirements are met through appropriate Service Connections arrangements

This strategy is designed to ensure that new connections are provided to the network.

PROGRAM NAME / GOAL	PROGRAM ACTIONS / INITIATIVES
<b>Service Connections Contract</b> <i>(Goal: to ensure connections meet quality standards)</i>	<ul style="list-style-type: none"> <li>• Develop and implement service connections contract and processes</li> <li>• Review processes and develop new contract</li> </ul>

**Objective 5:**

Ensure continual improvement of environmental outcomes

**Strategy 5.1**

Environmental management communication

This strategy is designed to ensure effective communications on environmental matters and implementation of practical projects.

PROGRAM NAME / GOAL	PROGRAM ACTIONS / INITIATIVES
<b>Our Water, Our Future</b> <i>(Goal: to promote community awareness and education of the Water Cycle Strategy)</i>	Promote Three-Waters Action Plan for:- <ul style="list-style-type: none"> <li>• Wastewater</li> <li>• Water</li> <li>• Stormwater</li> </ul>
<b>Demand management</b> <i>(Goal: to improve community awareness and education of the benefits of water conservation)</i>	<ul style="list-style-type: none"> <li>• Promotion of demand management in business, industry and households</li> </ul>

### **Strategy 5.2**

Improve the quality of the aquatic receiving environment

The strategy is designed to improve the city's aquatic environment supported by environmental monitoring through internal and external partnerships.

PROGRAM NAME / GOAL	PROGRAM ACTIONS / INITIATIVES
<b>Wastewater network overflows</b> <i>(Goal: to reduce overflows and adverse environmental effects)</i>	<ul style="list-style-type: none"> <li>• Implement Infiltration Control Program</li> </ul>
<b>Stormwater quality</b> <i>(Goal: to reduce and adverse effects on the receiving environment)</i>	<ul style="list-style-type: none"> <li>• Construct stormwater treatment facilities</li> <li>• Manage the rural wastewater scheme (septic tank pump outs)</li> <li>• Carry out assessment of environmental effects of overflows and stormwater</li> </ul>
<b>Stream restoration</b> <i>(Goal: to restore riparian areas)</i>	<ul style="list-style-type: none"> <li>• Implement stream restoration programs</li> </ul>