



Adopted – October 2009



# STORMWATER STRATEGY

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Stormwater is defined as rain water that flows either into surface or subsurface watercourses or is channelled into pipes, channels or constructed infiltration facilities which constitute stormwater systems to be discharged into receiving environments.

In recent years territorial local authorities have given greater attention to managing urban stormwater. In Taupo District the effect of current stormwater management, in most cases, has been to convey the water directly to Lake Taupo or to on-site ground soakage. More recent engineering has retained volumes of stormwater for natural sediment and contaminant deposition and eventual infiltration or slow release downstream within the catchment. This latter approach has the potential to reduce any degradation of the environment through gully and watercourse erosion and transportation of pollutant loads directly into the Lake. This can help to promote public health and safety, local infrastructure, ecological health and the recreational amenity of the lake and streams.

Taupo District Council recognises the need for a stormwater strategy for the District's Urban Areas (refer to Glossary, page 9). The strategy will coordinate stormwater management through a variety of management plans and codes of practice. Its purpose is to help Council to meet its Long Term Council Community Plan [LTCCP] objectives of protecting and enhancing the environment and improving living and working environments in the Urban Areas of the Taupo District.

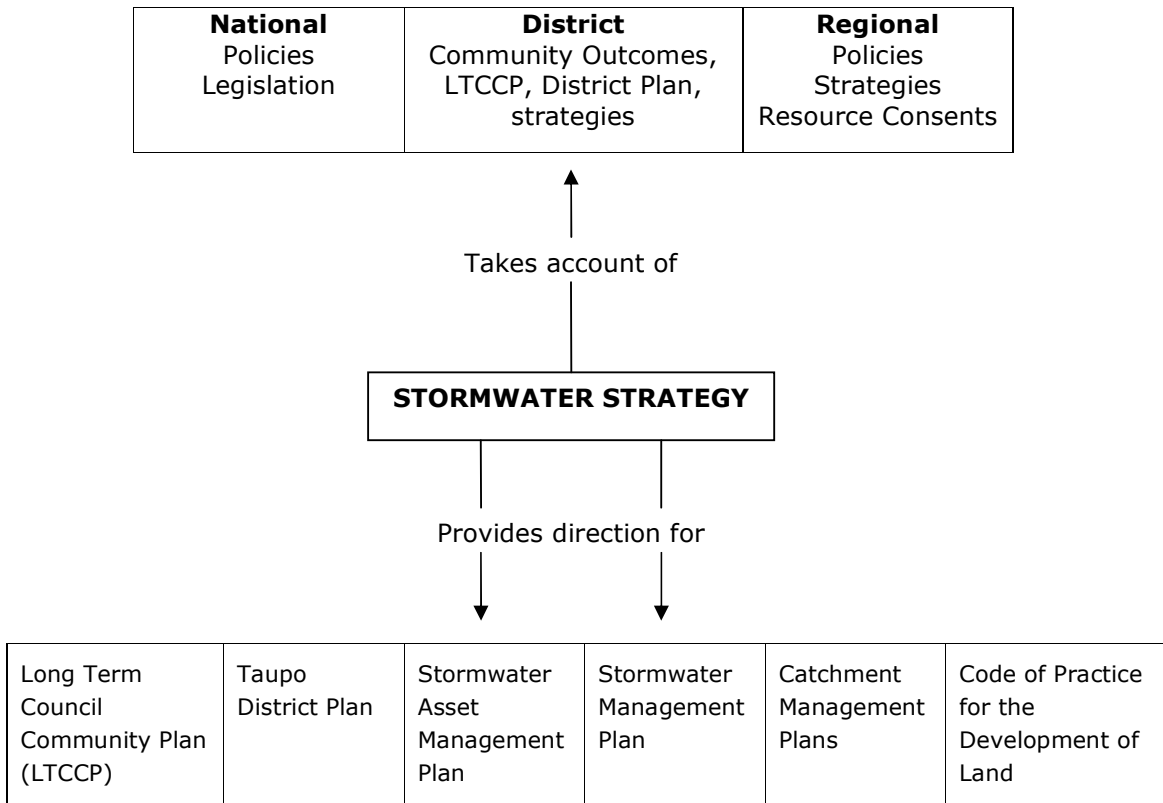
Council's aim is to develop and manage a public stormwater drainage system in both current Urban Areas and future Urban Growth Areas that fully complies with the Comprehensive Discharge [Resource] Consents issued to Council by Environment Waikato. This will enable people, property and the environment to be better protected from the adverse effects of flooding, erosion and water pollution. To achieve this Council will:

- manage stormwater with regard to financial investment and social, cultural and environmental benefits
- minimise adverse effects of overland flow and flooding

- reduce stormwater sediment discharges to the local environment
- contribute to the protection and enhancement of the Lake, rivers, streams (including geothermal streams), ponds and wetlands
- reduce the amount of stormwater-borne contaminants getting into the receiving environments, and
- ensure the provision of effective stormwater systems as far as practicable, taking into account long-term operability, whole of life costs and industry best practice whilst retaining current stormwater disposal options within the same catchment as the stormwater source.

This strategy is concerned with managing stormwater in Urban Area catchments before it is discharged into Lake Taupo, the Waikato River system or any other receiving environment. The management of erosion along the Lake Taupo foreshore is considered as part of the Taupo District Council *Lake Taupo Erosion and Flood Strategy*.

The stormwater strategy is influenced by legislation and national, regional and other local policies. It is the main document directing the development of a suite of other documents that address managing the District’s stormwater to achieve Council’s objectives. These documents include the *District Plan*, the *Stormwater Asset Management Plan*, catchment management plans, the *Stormwater Management Plan*, the *Stormwater Monitoring Programme* and the *Code of Practice for the Development of Land*. Council proposes reducing the number of documents by consolidating the information contained in some of them into the Stormwater Asset Management Plan.



The stormwater strategy highlights the main issues which stormwater management must address. These are

- flooding
- degradation in the functioning of overland flowpaths
- degradation of Lake Taupo and its tributaries, the Waikato River system and other aquatic environments in terms of local effects on water quality
- public health and safety.

Council's objectives in tackling these issues are

- to minimise the potential effects on the community from stormwater flooding
- to maintain the functioning of overland flowpaths
- to reduce the amounts of sediments and contaminants entering the receiving environments (e.g. Lake Taupo, the Waikato River, wetlands and other important aquatic environments) from Council's stormwater management systems
- to provide health and safety risk management for the community around stormwater management systems whilst encouraging the active use of some parts of those systems.

A number of policies have been developed to guide Council in achieving these objectives.

- Council will implement stormwater industry best practice to manage stormwater, overland flowpaths and ephemeral gullies and to treat stormwater as close to its source as possible.
- Primary stormwater systems will be designed to manage stormwater up to a 10% annual exceedence probability (AEP) rainfall event agreed for the catchment (where AEP is a measure of the probability of a particular storm event occurring in any single year, based on historical meteorological data).
- For higher intensity rainfall events (greater than 10% AEP), excess stormwater will be managed by secondary flowpaths, ponds and other suitable methods up to a 1% AEP event agreed for the catchment.
- Stormwater management provisions of Structure Plans for each identified urban growth area shall be in accordance with the requirements of a catchment management plan.
- Council will encourage and require a range of industry best practice stormwater disposal methods on private property and development sites.
- Council will educate developers on the effects of stormwater disposal, industry best practice techniques and the prevention of stormwater flooding (including flowpath maintenance).
- Council will identify known overland flowpaths in existing Urban Areas.

- Council will seek protection for overland flowpaths from development or obstructions through acquisition or a range of regulatory or legal mechanisms.
- Council will promote and maintain the independence of the stormwater and wastewater networks.
- Council will encourage the dual use of ephemeral flowpaths on public land for stormwater and recreational use.
- Council will prevent unauthorised access to the stormwater infrastructure.

Council has identified several measures that need to be implemented to give effect to these policies. These include

- a review of the stormwater provisions in the *Taupo District Plan*
- a review of the stormwater guidelines and design standards in the *Code of Practice for the Development of Land*
- ongoing development and implementation of the *Stormwater Asset Management Plan* and the *Environmental Education Programme*
- reviews and development of reserve management plans
- an annual monitoring report.

Council expects, through implementing its policies, that the development and ongoing management of stormwater in the urban areas of Taupo District will address the stormwater concerns of the community into the future, including the effects of any potential changes in rainfall patterns and climate variability.

## GLOSSARY OF TERMS AND ABBREVIATIONS

<b>AEP</b>	Annual Exceedence Probability (see 6.5.2). A measure of the probability of a particular storm event occurring in any single year.
<b>Aquatic environments</b>	Includes streams, rivers, ponds, wetlands, lakes and geothermal streams.
<b>ARI</b>	Annual Recurrence Interval (see 6.5.2). The long term average number of years between occurrences of a storm event as big as, or larger than, a selected event.
<b>Catchment</b>	The area contributing flow to a point on a drainage system.
<b>Catch pit</b>	An opening in a street or curb designed to direct stormwater off the streets and into the reticulation and to intercept stones, silt and debris to prevent blockages.
<b>CDC</b>	Comprehensive Discharge Consent (see 3.2.5).
<b>CMP</b>	Catchment Management Plan (see 3.4.1 and 6.5.1).
<b>Code of Practice</b>	Code of Practice for the Development of Land (see 3.4.2)
<b>Contaminants</b>	Any physical, chemical, biological substance or matter that has an adverse effect on water, or soil.
<b>Council</b>	Taupo District Council.
<b>Deposition</b>	Soil particles suspended in stormwater that settles in watercourses, and which may disrupt the natural flow of the stormwater.
<b>Detention pond</b>	An area designed to hold stormwater until the effects of percolation, evaporation and/or controlled release return the area to its normally dry state.
<b>Discharge</b>	The flow of water from a pipe or drainage system, or the flow of surface water toward or into a receiving environment.
<b>District</b>	The area administered by Taupo District Council.



<b>Ephemeral flowpath or watercourse</b>	A watercourse where overland flow occurs intermittently but whose bed is likely to be dry at other times.
<b>Erosion</b>	The separation and movement of rocks and soil from land or a streambed or bank into the watercourse or other receiving environments.
<b>EW</b>	Environment Waikato (Waikato Regional Council).
<b>Greenfield site</b>	Land on which no urban development has previously taken place.
<b>High Risk Facility Site</b>	Commercial and industrial sites as listed in section 3.5.12 of the Waikato Regional Plan (see Appendix 2).
<b>Impermeable surface</b>	Surface through which water cannot pass, or that sheds water (e.g. roads, paths, roofs)
<b>Industry Best Practice</b>	The most effective techniques available to the stormwater management 'industry' which minimise stormwater run-off, reduce stormwater velocities and peak flows and improve stormwater quality as close to source as possible. Taking account of local conditions, the techniques attempt to minimise the adverse effects of the stormwater on the receiving environments within the constraints of social, cultural and financial expediency. May include Low Impact Urban Design.
<b>LGA</b>	Local Government Act 2002.
<b>LTCCP</b>	Long-Term Council Community Plan, produced every three years. Council's main planning document that establishes what will be done, how much it will cost and how it will be funded.
<b>Overland flowpath</b>	The route taken by the surface flow of stormwater.
<b>Peak flow</b>	The maximum flow rate of water at any point during a rainfall event.
<b>Primary stormwater system</b>	Catchpits, reticulation, flowpaths, detention ponds, etc that manage rainfall events up to a 10% AEP event.
<b>Receiving environment</b>	The environment into which treated or untreated stormwater is finally discharged.
<b>Resource Consent</b>	Has the same meaning as in section 87 of the Resource Management Act 1991
<b>Reticulation</b>	The system of pipes, drains, culverts and overland flowpaths that convey stormwater.

<b>RMA</b>	Resource Management Act 1991.
<b>Runoff</b>	The flow of rainwater across the ground or an artificial surface generated by the rain falling on it.
<b>Secondary flowpaths</b>	Flowpaths that manage stormwater that overflows the primary stormwater system.
<b>Stormwater</b>	Stormwater is defined as rainwater that flows either into surface or subsurface watercourses or is channelled into pipes, channels or constructed infiltration facilities which constitute stormwater systems to be discharged into receiving environments.
<b>Stream profile</b>	A section view of a length of stream or watercourse
<b>SW AMP</b>	Stormwater Asset Management Plan
<b>SWMP</b>	Stormwater Management Plan
<b>TD2050</b>	Taupo District 2050 Growth Management Strategy
<b>Trade waste</b>	Any liquid, with or without matter in suspension or solution therein, that is or may be discharged from trade premises in the course of any trade or industrial process or operation or in the course of any activity or operation of a like nature.
<b>Urban areas</b>	Areas of the District which are zoned as 'Town Centre', 'Residential' or 'Industrial' in the Taupo District Plan (i.e. where Council has existing stormwater assets).
<b>Urban Growth Areas</b>	Areas identified in the Taupo District 2050 Growth Management Strategy and in the Taupo District Plan for future urban growth.
<b>Wastewater</b>	Water that has been used and contains unwanted dissolved and/or suspended substances from communities including homes, business and industries.
<b>Watercourse</b>	A channel, either natural or modified or manmade that conveys water – either continually or intermittently - to a receiving environment.

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## 1. INTRODUCTION

This Stormwater Strategy relates to the provision of stormwater services that are the responsibility of Taupo District Council in urban areas. It does not cover stormwater provisions or responsibilities in rural areas or Lake and river flooding/erosion.

The local issues which Council is seeking to address are:

- flooding of property during some high-intensity storm events
- erosion of land and overland flowpaths caused by stormwater discharges
- sedimentation in receiving environments near stormwater outlets
- water quality in receiving environments downstream of stormwater outlets
- public health and safety around stormwater management systems.

The Stormwater Strategy has been developed to assist the Council in meeting two of its strategic objectives: these are to protect and enhance the environment and to improve living and working environments in the urban areas of Taupo District. Changing international trends in stormwater management over the last 15 years as well as recent changes to regional and national legislation have necessitated a review of the way in which stormwater is managed in Taupo District. The Council's vision is to manage stormwater to ensure that in current and future urban areas of the District, people, property and the environment are protected from the adverse effects of flooding, erosion and water pollution.

Key objectives for the Council are to:

- give effect to the Waikato Regional Policy Statement by ensuring consistency with its objectives and policies;
- comply with the Resource Consent conditions contained within the Comprehensive Discharge Consents;
- minimise adverse effects of overland flow and flooding on property
- reduce sediment discharges to the environment
- contribute to the protection and enhancement of the state of our lakes, rivers, streams and wetlands [receiving environments], helping to improve water quality in Lake Taupo with its subsequent positive impacts on the Waikato River
- reduce the amount of stormwater-borne contaminants entering our receiving environments

- ensure provision of effective stormwater systems as far as practicable, taking into account long-term operability and whole of life costs
- protect natural overland flowpaths and gully systems
- manage stormwater with regard to levels of financial investment, social, cultural and environmental benefit.

Meeting these objectives requires a complex process of balancing three often-conflicting requirements: flood management, watercourse management and water quality management.

This Stormwater Strategy forms part of a suite of documents that address the management of stormwater in the District. These include the Taupo District Plan, the Stormwater Asset Management Plan, catchment management plans, the Stormwater Management Plan, the Stormwater Monitoring Programme and the Code of Practice for the Development of Land (see section 3.4 for further information on these documents). Council proposes to reduce the number of documents by consolidating the information contained in some of these plans into the Stormwater Asset Management Plan.

The Stormwater Strategy will be one of the main documents directing the development of the catchment and asset management plans. These documents are required to deliver on the objectives set in this strategy. They are also a key requirement of the Waikato Regional Plan and Comprehensive Discharge Consents. The Strategy must therefore be comprehensive and address all aspects of Council's stormwater management.

This strategy proposes the following basic approach:

- Avoiding and minimising flooding in sensitive areas by integrating stormwater management objectives into all new developments,
- Incorporating stormwater management initiatives in existing urban areas as and when redevelopment occurs;
- Retrofitting stormwater management solutions in existing urban areas where there are identified flooding or damage risks. This will be carried out in accordance with a project prioritisation process and the availability of funds;
- Upgrading existing stormwater infrastructure according to priorities identified from the results obtained by Council's Stormwater Monitoring Programme;
- Designing new stormwater infrastructure to take account of local topography, geology, soils and hydrology.

Public expectations and our methods for managing stormwater are continually evolving, especially as Council attempts to plan and design for climate variability and predicted changes in rainfall patterns.

Within the Taupo District are a number of Iwi that have traditional practices and important values that are associated with water. In addition to this, the District's largest Iwi, Ngāti Tūwharetoa has ownership of the bed of Taupo moana or Lake Taupo and a number of adjoining tributaries including the Waikato River down to Huka Falls. This

ownership is managed by the Tūwharetoa Māori Trust Board on behalf of Iwi, and in the case of the tributaries, for the adjoining hapū or subtribes. Beyond the Huka Falls, the Waikato River draws input from other Iwi/hapu with vested cultural and spiritual interests including Te Arawa, Raukawa and Waikato/Tainui. Collectively these have contributed to the vision and strategy developed by the Guardians Establishment Committee born out of the Waikato River settlement negotiations. The focus of this collaboration is to restore the river to a healthier state.

It is commonly known that water is central to the Māori cultural and personal identity and has direct impact on an individual's physical and spiritual well being. Rivers, streams and lakes carry ancestral connections, identity and wairua for whānau, hapū and iwi. The involvement of Iwi and hapū in providing infrastructure for good quality water stems from some of Council's water takes from Lake Taupo through to this particular strategy which returns much of the stormwater in to the water flows without interfering with Māori cultural and social practices. It is this involvement which remains an important outcome for Tāngata Whenua as identified in the Iwi Management Plan lodged by Ngāti Tūwharetoa in 2006.

## 2. STORMWATER MANAGEMENT VISION AND OBJECTIVES

### 2.1 Strategic vision

To provide and manage a public stormwater drainage system in urban areas so that people, property and the environment are protected from the adverse effects of flooding, erosion and water pollution through:

- good urban design and lot design.
- planning all physical works to incorporate stormwater management as close to source as possible.
- the collection and use of rainwater as a resource where practicable.

### 2.2 Primary stormwater management objectives

The Council will manage its urban area stormwater systems to avoid, remedy or mitigate adverse effects of stormwater discharges and in particular to:

- comply with the conditions of its Comprehensive Discharge Consents
- minimise adverse effects of overland flow and flooding
- reduce sediment and contaminant discharges to the receiving environment
- protect and enhance the state of our Lake, rivers, streams, wetlands and natural overland flowpaths, including gully systems

- ensure provision of effective stormwater systems as far as practicable, taking into account long-term operability and whole of life costs.

Stormwater management will be guided by the following key principles:

- Prevention or minimisation of the effects of stormwater is preferable to mitigation after a storm event
- Solutions are to be financially, socially, environmentally and culturally sustainable
- Best management practices are to be employed
- Industry best practice options are to be used taking account of local topography, geology, soils and hydrology.
- Management options are to be assessed for risk and any identified risks are to be mitigated
- Management options are to be reviewed and subject to continuous improvement.

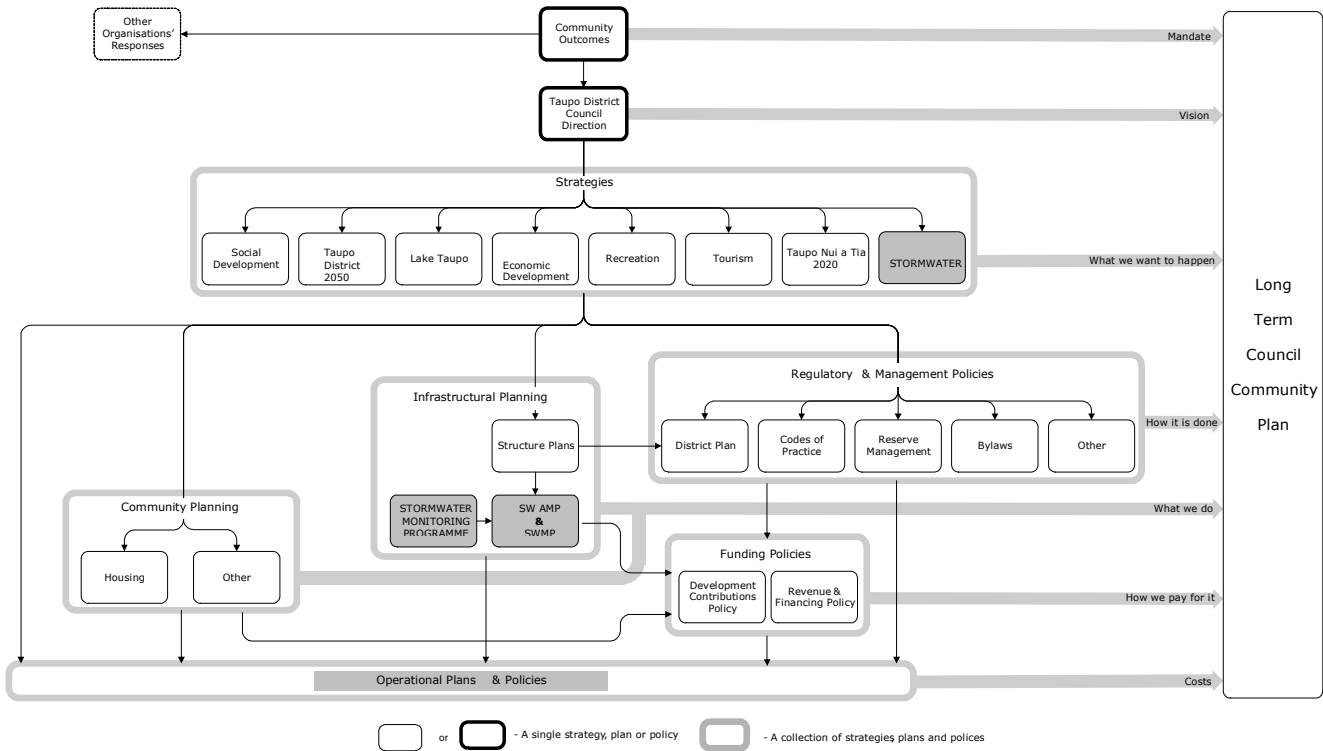
### 3. STRATEGIC AND LEGAL FRAMEWORK FOR STORMWATER MANAGEMENT

This document provides a framework for managing stormwater in Taupo District, in order to meet the relevant outcomes, strategies and legal requirements found in the Council's Long-Term Council Community Plan, the Taupo District Plan, discharge consents, regional plans and legislation. The main documents that this strategy links to are the Stormwater Management Plan, the Stormwater Asset Management Plan and the catchment management plans.

**Figure 1: How the Stormwater Strategy relates to Taupo District Council's Strategy, Planning and Policy Framework**



# Taupo District Council **STORMWATER STRATEGY (2009)**



## 3.1 The national and statutory context

### 3.1.1 RESOURCE MANAGEMENT ACT 1991

The Resource Management Act 1991 (RMA) is an effects-based statute which has an overarching purpose to promote the sustainable management of natural and physical resources (including watercourses, and receiving environments):

*"Managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety" (section 5 RMA).*

Part of this purpose is to safeguard the life-supporting capacities of the environment while avoiding, mitigating or remedying any adverse environmental effects arising from activities.

Section 6 of the RMA outlines matters of national importance, which includes the preservation of the natural character of lakes, rivers and wetlands, and their margins, and the protection of them from inappropriate subdivision, use and development. The water quality of Lake Taupo is considered to be a national asset for which there is central government funding towards its maintenance and improvement.

Section 7 of the RMA outlines additional matters of importance including the maintenance and enhancement of amenity values and of the quality of the environment, the intrinsic values of ecosystems and the protection of the habitat of trout, among other matters.

In relation to stormwater, the RMA contains provisions instructing local authorities to:

- control land use for the purpose of the maintenance and enhancement of the quality of water in water bodies or water courses
- control discharges and contaminants and water into water
- control the taking and diversion of water, and the control of the quantity, level and flow of water in any water body.

Section 15 of the RMA places restrictions on the discharge of contaminants into the environment such that persons will require a Resource Consent to discharge any:

- contaminant or water into water, or
- contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water.

Council will fulfil its legal obligations by taking all reasonably practicable measures to comply with its Resource Consents/Comprehensive Discharge Consents.

### 3.1.2 LOCAL GOVERNMENT ACT 2002

The Local Government Act 2002 (LGA) requires Council to:

- assess the provision of stormwater drainage services in the District as part of the Water & Sanitary Services Assessment
- plan and consult the community for future demand and the consequential environmental and health impacts of stormwater discharges
- include the environmental and public health impacts of all options proposed to address stormwater issues.

### 3.1.3 BUILDING ACT 2004

The Building Act 2004 and the associated Building Code control the construction of buildings as defined in section 8 of the Act. For example, residential properties should be built with a freeboard sufficient to prevent flooding of the house during a 2% AEP storm event. There is no similar rule for commercial or industrial properties.

## **3.2 The regional context**

### 3.2.1 WAIKATO REGIONAL POLICY STATEMENT

The Regional Policy Statement, prepared by Environment Waikato, provides an overview of the resource management issues in the Waikato Region. The aim of the policies and objectives is to maintain or reinstate resources of high quality. Lake Taupo is considered to be a resource of high quality.

The three objectives of particular relevance to stormwater management, especially erosion and contaminants, are:

- a net reduction in the adverse effects of the destabilisation of river and lake beds;

- a net improvement of water quality across the Region; and
- the protection of significant geothermal features from the adverse effects of stormwater discharges.

Taupo District Council boundaries overlap with Bay of Plenty, Hawke's Bay and Horizons Regional Councils' boundaries. However, stormwater discharges in these three Regions do not affect stormwater flows in the District's urban areas: these Regions are outside the Lake Taupo and upper Waikato River watersheds.

### 3.2.2 ENVIRONMENT WAIKATO REGIONAL PLAN

The Regional Plan sets out the objectives, policies and rules to give effect to the Waikato Regional Statement. Comprehensive Discharge Consents have been issued to Council for this purpose (see 3.4.4 of this strategy).

Rule 3.5.11 provides for the discharge of stormwater to land and water. Provided that the stormwater is not sourced from either contaminated land or high-risk facilities unless there is an interceptor system in place, discharges are permitted. Otherwise, discharges may be controlled or discretionary activities depending on the sources of the discharges, or the receiving environments concerned. The discharge of stormwater to significant geothermal features is a discretionary activity under Rule 3.5.11.8. This is to ensure protection of rare and fragile highly-valued features from scouring, dilution, contamination, cooling and habitat destruction. Land-based disposal is promoted in preference to water-based disposal as a way to ensure that accidental spills of contaminants are not directly discharged into water bodies. Land-based disposal is also consistent with tangata whenua views.

Historically many of the District's urban environments have and still discharge stormwater direct to the Lake, rivers and streams. Accordingly, there remains need for continuing appraisal and review of existing stormwater systems and consideration of any mitigation processes.

Environment Waikato has reserved its control over issues relating to the effects of the discharge on the natural and human uses and values of the water, flooding, erosion, soil contamination and change in water levels downstream from the discharge.

Environment Waikato encourages a range of methods for managing stormwater at its source and/or treating stormwater prior to any discharge into the receiving watercourses. These methods include the use of resource [discharge] consents, the development of stormwater management plans to include details of stormwater system management as well as methods for avoiding, minimizing, remedying or mitigating the adverse effects of stormwater discharges. Land-based treatment of discharges and – potentially – the re-use of stormwater are encouraged (e.g. rainwater collection tanks for garden and other non potable uses).

### 3.2.3 PROTECTING LAKE TAUPO STRATEGY

The Protecting Lake Taupo Strategy is a multi-agency approach to reduce the manageable sources of nitrogen entering Lake Taupo by 20% by 2080. It is led by

Environment Waikato in partnership with Taupo District Council, Tuwharetoa Maori Trust Board and central government.

This document is relevant to stormwater management where surface run-off and groundwater containing nitrogen enter the urban catchments from upstream rural environments. While the effect of urban stormwater on the total nitrogen load of Lake Taupo may be insignificant relative to the nitrogen load from rural activities, the additional toxicity of urban stormwater from motor vehicles and roading remains important because it enters receiving waters at identifiable points as an addition to the nitrogen load.

#### 3.2.4 2020 TAUPO-NUI-A-TIA ACTION PLAN

As a project partner Council has agreed to undertake a range of actions to meet higher environmental standards for Lake Taupo. These include:

- avoiding, as far as practicable, any new stormwater outlets into the Lake
- managing stormwater catchments to reduce contaminants in run-off from entering the Lake
- developing guidelines for stormwater management in industrial areas
- planning for stormwater management for the Taupo-Nui-a-Tia catchment involving Ngati Tuwharetoa (while recognising statutory responsibilities)
- liaising with Ngati Tuwharetoa on the priorities for upgrading stormwater systems
- mapping existing discharges made to the lake and monitoring and reporting on the quality of the discharge

#### 3.2.5 COMPREHENSIVE DISCHARGE CONSENTS

Discharge Consents are granted under the Resource Management Act 1991 based on the provisions detailed in the relevant Waikato Regional Plans. They assess the discharge of contaminants into or onto land or water, and the discharge of water into water. In June 2007 Environment Waikato granted Council three Comprehensive Discharge Consents to divert and discharge urban area stormwater runoff and associated contaminants into receiving environments:

- Resource Consent 105048: for Taupo urban areas (Resource Consent Schedule B), including Taupo, Eastern Bays, Waitahanui, Acacia Bay and Kinloch
- Resource Consent 105049: for Turangi urban areas (Resource Consent Schedule C), including Turangi, Tokaanu, Motuoapa, Omori, Kuratau, Whareroa, Tauranga-Taupo and Hatepe
- Resource Consent 105050: for Waikato River urban areas (Resource Consent Schedule D), including Wairakei, River Road, Atiamuri, Whakamaru and Mangakino.

These consents impose legally binding conditions for stormwater management in the District, which include the provision of Catchment Management Plans for greenfield

developments and a Stormwater Management Plan prepared by Council. Existing infrastructure will be upgraded in response to compliance issues and priorities identified through Council's Stormwater Monitoring Programme. It is Council's aim to achieve 100% compliance with the conditions of the Comprehensive Discharge Consents.

### **3.3 The local context**

#### **3.3.1 COMMUNITY OUTCOMES**

Community outcomes are the long-term objectives, goals or aspirations that the community sees as important for its well-being. They guide and inform decision making within the Council and provide a common set of objectives for everyone to work to, to benefit the District.

The community outcomes are identified at least once every six years. The *Long-Term Council Community Plan (LTCCP)* sets out Council's priorities over the medium term and how Council intends to contribute towards achieving the community outcomes over the lifetime of the plan. Each *LTCCP* covers a period of ten years, but at least once every three years the Council reviews and updates the plan.

Of the many community outcomes that were identified in 2006, the following are relevant to the provision of Council's stormwater services:

- Recognising the special cultural relationships Ngāti Tūwharetoa and its hapū have with land and water
- Looking after lakes, rivers and streams
- Respecting, understanding and managing natural resources and features
- Providing access to affordable, quality facilities and services
- Promoting healthy, active lifestyles
- Promoting well-being through tikanga Māori
- Ensuring that infrastructure and operational services keep pace with growth.

#### **3.3.2 TAUPO DISTRICT 2050 GROWTH MANAGEMENT STRATEGY**

The Taupo District Growth Management Strategy provides a strategic overview of growth within the Taupo District. It takes a 50-year vision for the District but focuses on the period up to 2027. It sets out the key trends in the District's population growth and discusses how these affect the growth demands and pressures that need to be addressed.

The strategy identifies the need to ensure that development occurs in the right locations and at densities that can be serviced. This is particularly important with regard to infrastructure and providing for stormwater management that is both efficient and sustainable. The number of growth areas will be limited and primarily provided for in, or adjacent to, existing urban areas.

The provision of a wide variety of densities in development not only reflects the varied demand within the District, but also allows for a variety of stormwater management options to be employed.

### 3.3.3 TAUPO DISTRICT PLAN

The Taupo District Plan helps Council to carry out its functions in order to achieve the purpose of the Resource Management Act 1991. Through rules and performance standards, the plan sets minimum standards for the use of land in order to avoid, remedy or mitigate adverse impacts on the environment, and to ensure that the sustainable management of the District's environment and resources – including the general amenity of the District - are maintained.

The urban communities and individuals of the District can be adversely affected when activities and development are located in areas subject to the effects of high-intensity rainfall events such as flooding and erosion. The risks of such natural hazards can also be increased or altered. The storage or transportation of sediment and stormwater pollutants can adversely affect the health and well-being of the community and the receiving environment.

The plan has a role in protecting both the community and the environment from potential technological hazards associated with activities carried out within the District (e.g. urban development), and from natural processes present within the natural environment (e.g. high intensity rainfall events). Levels of protection for communities need to be established so that activities and developments do not increase the level of threat, or increase the potential for hazards to occur. Therefore, storm and flood hazards must be identified to enable the community to identify where protection is required. Methods of reducing hazards from pollutants such as heavy metals and erosion sediment must be developed.

The provisions of the District Plan are continually being reviewed for their completeness and effectiveness. Changes are made when required.

### 3.3.4 STRUCTURE PLANS

Structure planning is a tool for managing the effects and demands of development or redevelopment in an integrated, holistic and orderly way. A Structure Plan may be particularly useful when there is a need or desire to:

- provide integrated management of complex environmental issues within a defined geographical area (e.g. urban growth, natural hazards management, improved water quality and stormwater management, and protection of natural and cultural heritage values)
- coordinate the staging of development over time, particularly where large areas are to be developed
- ensure co-ordinated and compatible patterns and intensities of development in order to manage the effects of development across parcels of land in different

ownerships, and between existing and proposed areas of development and redevelopment

- provide a co-ordinated approach to infrastructure provision and other services across land parcels in different ownerships, or over different local authority or regional council areas
- provide higher levels of certainty to developers, Council, the public and affected parties regarding the layout, character and costs of development in an area earmarked for growth or redevelopment.

The Taupo District Plan describes the Structure Plan process which must be followed before proceeding the development of greenfield areas.

Structure Plans provide opportunities to focus on stormwater and erosion within specific development areas through the consideration of landforms, catchment characteristics, vegetation coverage, the existing capacity and availability of infrastructure, and other requirements of catchment management plans. Following the assessment of the Structure Plan area, options for stormwater management will be developed prior to community consultation, the selection of a preferred option and implementation. Stormwater management options should normally include industry best practice techniques.

The Taupo District 2050 Growth Management Strategy has identified the areas of the District where Council will undertake integrated structure planning to facilitate future growth. These include Turangi, the eastern lakeshore settlements, the western lakeshore settlements, Taupo town, Mapara Valley and the commercial/industrial area around Taupo Township. Urban Growth Areas subject to Structure Plans will be zoned in the Taupo District Plan accordingly when development commences, whereupon the Stormwater Strategy will be implemented in these areas. Until then, in the absence of any stormwater assets which will later be vested with Council, the areas are zoned as Rural Environment and the Stormwater Strategy will not apply.

### 3.3.5 LAKE TAUPO EROSION AND FLOOD STRATEGY

Environment Waikato and Taupo District Council are developing the Lake Taupo Erosion and Flood Strategy to inform decisions relevant to erosion and flood risks around Lake Taupo. The volume of stormwater entering the Lake is considered negligible compared to the volume of the Lake itself, and therefore is unlikely to contribute to any significant increase in Lake water levels. Stormwater services, their location and design, may contribute to some local scour and erosion issues where surface water run-off flows from foreshore outlet pipes. These pipes may also impede the natural drift of sediment causing localised sedimentation. However, the focus of this Stormwater Strategy is the management of stormwater flows and potential flooding in catchments before the stormwater enters Lake Taupo.

### 3.4 Council’s stormwater management documents

Figure 2 (below) summarises the key policy and strategic inputs influencing the Stormwater Strategy and the management outputs that will enable on-going stormwater management.

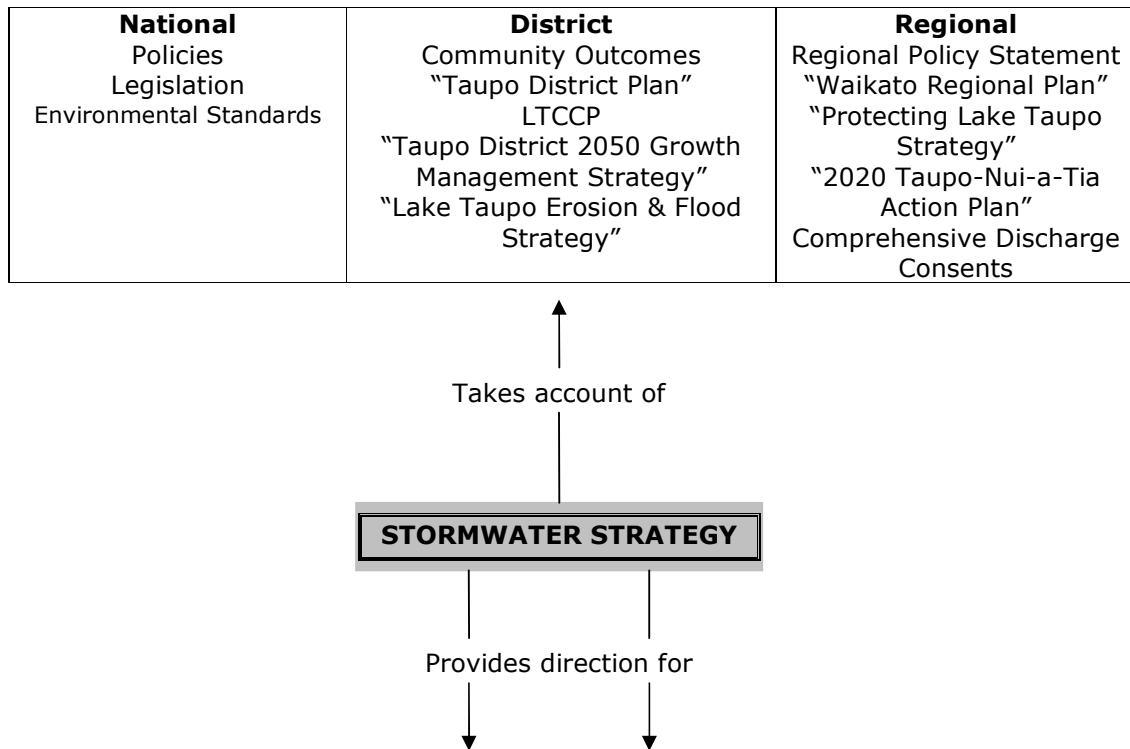
#### 3.4.1 CATCHMENT MANAGEMENT PLANS

Catchment management plans are plans for dealing with the run-off generated in a catchment. They are normally prepared to determine how to meet specified water quantity or quality objectives). Council’s Comprehensive Discharge Consents require the preparations of CMPs in advance of new developments.

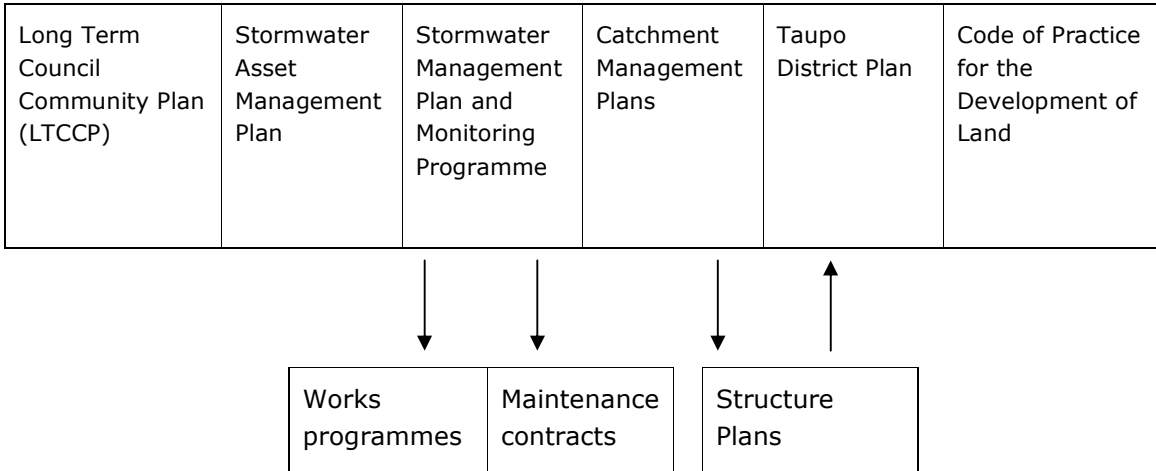
A catchment management plan is required to manage development within a catchment and resulting stormwater effects on the receiving land and water environments. It will be directed by the requirements of the Regional Plans, the Stormwater Management Plan, Discharge Consents and the Stormwater Strategy.

Catchment management plans are intended to provide the ‘blueprint’ for sustainable stormwater management in greenfield catchments. The preparation of these plans is largely to enable the environmentally sustainable provision of new municipal stormwater diversion and discharge activities within catchments that are designated, or become designated, for new urban growth and development.

Figure 2: Stormwater Strategy – Key Inputs and Outputs







### 3.4.2 CODE OF PRACTICE FOR THE DEVELOPMENT OF LAND

The Code of Practice provides a guide to subdivision and developments within the Taupo District including procedures and minimum technical standards for development of land. It sets the minimum design standards that infrastructure must meet, particularly where it is to be acquired by Council.

The Council wishes to promote greater innovation in developments in order to provide for industry best practices in terms of both design and provision of services, taking into account the maintenance and whole of life costs associated with any stormwater management system. However, Council acknowledges that some developments will be more suited to a more traditional approach.

The Code of Practice encourages developers to use industry best practice to dispose of and treat stormwater, both on-site and off-site, in order to reduce its environmental impacts. The best practice options available will be determined by the considerations and findings of the relevant Catchment Management Plan.

The Code of Practice is Council’s document for developing new infrastructure to meet any challenges to stormwater management arising from potential or actual variations and changes to the local climate. In establishing relevant design standards to meet climate change, Council has followed guidelines from the Ministry for the Environment.

### 3.4.3 STORMWATER ASSET MANAGEMENT PLAN

The overall purpose of asset management planning is to meet a required level of service in the most cost-effective way (through the creation, operation, maintenance, renewal and disposal of assets) to provide for existing and future customers. This document includes information relating to the maintenance, management and monitoring of Council’s existing stormwater infrastructure and systems.

The Stormwater Asset Management Plan is the umbrella document describing the provision of stormwater services in the District. The plan provides details on the current

capacities and conditions of stormwater assets, catchment hydrology, legal requirements, agreed levels of service, technical practices and operational and financial requirements. It is updated on a three-yearly cycle in conjunction with the *LTCCP*.

The information originally provided in the Stormwater Management Plan, Stormwater Monitoring Programme and Comprehensive Discharge Consents will be incorporated into the Stormwater Asset Management Plan. The Stormwater Monitoring Programme will identify repairs or upgrades to the existing stormwater infrastructure in order to achieve or continue compliance with the Comprehensive Discharge Consents. These works will be included in the Stormwater Asset Management Plan and prioritised according to need, resources available and the expected relief to be achieved.

#### 3.4.4 STORMWATER MANAGEMENT PLAN

Condition 37 of Taupo District Council's Comprehensive Stormwater Discharge Consents requires that a Stormwater Management Plan be developed and maintained. Within the Stormwater Management Plan are procedures to maintain a Spill Response Plan (for dealing with accidental chemical spills into the stormwater system), the monitoring of stormwater quality as it enters the receiving environment.

This plan records the way in which the existing municipal system is operated. It will guide the development of the stormwater assets to maintain, manage and improve the quality of stormwater entering the receiving environment.

This plan will be incorporated into the Stormwater Asset Management Plan.

In June of 2007 Council was granted Comprehensive Stormwater Discharge Consents in order to divert and discharge urban area stormwater runoff and associated contaminants into receiving environments.

Granting of the Comprehensive Discharge Consents was subject to a number of general conditions, one of which requires a monitoring programme in order to investigate actual and potential adverse effects of stormwater diversion and discharge on the environment.

A Stormwater Monitoring Programme was prepared as part of the Stormwater Management Plan and was initiated in 2008. The information produced through this monitoring programme will be used to determine upgrades to existing stormwater assets and future management initiatives to avoid, remedy or mitigate any such adverse effects and to improve water quality. If the Monitoring Programme identifies where Council is failing to meet its Levels of Service, works to rectify the problems can be prioritised.

The programme includes monitoring to:

- locate and analyse sedimentation in aquatic environments including bottom sediments
- identify any scour and erosion effects caused by stormwater diversion and discharge
- identify any adverse flooding effects to land and property caused by stormwater diversion and discharge

- identify any visual signs of contaminants in stormwater, such as conspicuous oil or grease films, scum or foams, floatable suspended materials and conspicuous changes in colour or visual clarity
- identify any stormwater diversion and discharge structures that are impeding the upstream and downstream movement of fish and aquatic invertebrates
- identify whether stormwater quality treatment devices are achieving optimal contaminant removal efficiency
- ensure that efficient and effective street and catch pit cleaning operations and frequencies are maintained
- determine stormwater collection points that are at risk from non-routine contaminant discharges.
- assess the quality of stormwater discharges
- to determine any stormwater effects on the ecology and fisheries of Lake Taupo and other aquatic environments, including the effects of structures which may impede the in-stream movement of fish and aquatic invertebrates.

The Comprehensive Discharge Consents require Council to submit an annual management report to Environment Waikato. This will include the stormwater monitoring results, detailed summaries of the findings with comparisons to relevant literature, and a critical analysis of the data. The annual monitoring report will be published by Council and made available for public access.

## 4. RESPONSIBILITIES FOR STORMWATER MANAGEMENT

Stormwater management in the District is ultimately the responsibility of every person or property owner living or working in the urban environments. The effects of stormwater and stormwater-borne contaminants on the environment are best avoided by managing stormwater at, or close to, its source.

### 4.1 Regional and District Council responsibilities

In relation to stormwater, Environment Waikato is responsible for:

- water quality in rivers, streams, Lake Taupo and groundwater
- discharges to Lake Taupo and the Waikato River system
- wetlands
- riparian management
- soil conservation and river control
- flood/hazard management
- protecting significant geothermal features.

In practice, Environment Waikato has an overseeing role in relation to stormwater. However, in respect of natural hazard management (which includes flooding) Environment Waikato will:

- develop specific objectives, policies, rules and/or other methods in regional plans for the avoidance or mitigation of natural hazards in the beds of rivers and lakes
- develop, in conjunction with Council and the wider community, hazard specific mitigation plans for managing the risks associated with natural hazards
- implement those aspects of mitigation plans that are relevant to Environment Waikato's functions
- support the development and implementation of environmental education programmes related to specific natural hazards.

Council's responsibilities extend to:

- complying with its Comprehensive Discharge Consents
- developing, maintaining and managing stormwater infrastructure
- stormwater monitoring and enforcement
- developing specific objectives, policies, rules and/or other methods in the Taupo District Plan that control the use of land (except for in the beds of lakes and rivers) for the avoidance or mitigation of natural hazards, including activities on land such as subdivisions and new buildings
- delivering environmental education programmes about stormwater to the community
- implementing relevant hazard-specific mitigation plans through building consents and other regulatory and non-regulatory methods
- providing information on the presence of natural hazards at specific sites (e.g. overland flow paths) through land information memoranda and project information memoranda where such information is known by Council
- reserves management where there is an interface with stormwater management systems
- ensuring efficient and effective responses to natural hazard events including planning for emergencies
- reducing the level of nuisance and environmental effects to an environmentally sustainable level.

## **4.2 Management of urban development**

The development of the urban landscape has an effect on the way stormwater runs off the land and its effects on the environment. The management of development of land is therefore important when managing stormwater and also the future provision of stormwater services within the District.

Stormwater systems that include the latest industry best practices are most easily developed in greenfield situations where they can be fully integrated into the development. Opportunities to incorporate them in existing urban areas are limited and may entail high financial costs. The triggers for potential upgrades to existing stormwater systems are flooding, degradation of overland flowpaths, effects on receiving environments and public safety, as identified by monitoring. However, there are limitations on Council's ability to install new overland flow attenuation and treatment facilities in existing developments. These limitations are greater by comparison with those in greenfield sites (e.g. working within an existing built environment with developed sections, additional costs).

In areas of new development, new stormwater systems are provided by developers to Council's design standards. These are provided in the Code of Practice for the Development of Land. The full extent of Council's responsibilities and the levels of service are detailed in the Stormwater Asset Management Plan.

### **4.3 Provision of public stormwater services**

Council provides reticulated public stormwater services within the Taupo Central Business District (CBD) and industrial zones, Turangi, Mangakino and the District's roading corridors. These services are aimed at reducing the level of nuisance and environmental effects caused by stormwater run-off and include the provision of stormwater reticulation or other means of stormwater management. The provision of these stormwater services varies across the urban areas: a number of methods are used to dispose of stormwater runoff. District Plan provisions for stormwater disposal may vary between areas of different land use or planning zone within the urban area.

Where there are flooding or property issues in urban areas identified through the Stormwater Monitoring Programme, Council may decide to upgrade the provision of stormwater services. In practice Council's ability to improve the current management of stormwater and its effects on the environment can be limited in existing urban areas. Council will generally be required to fund any stormwater management initiatives in existing urban areas unless these occur in conjunction with re-development, when the developer pays.

Council does not provide any stormwater service to rural areas of the District, which must rely on natural topography and watercourses for stormwater disposal.

### **4.4 Management of private stormwater**

Property owners are responsible for private stormwater drainage systems on their properties and for the effects of stormwater run-off onto neighbouring properties. They are also responsible for all aspects of stormwater management (e.g. on-site soakage) where there is no community stormwater collection and disposal system in the vicinity. The construction of these is controlled to some extent through the issuing of resource or building consents. In many cases the maintenance of on-site systems remains the responsibility of the private property owner.

## 5. ISSUES FOR STORMWATER MANAGEMENT

Most of the community and property effects of current stormwater management and their causes can be attributed to one or more of just four main issues. These are flooding, the degradation of overland flowpaths (rendering them less effective), the degradation of the receiving environments (mainly Lake Taupo or other aquatic environments), and public health and safety.

**Table 1:** Summary of Stormwater Issues and Effects

<b>Issue</b>	<b>Possible causes</b>	<b>Potential effects</b>
Flooding	Increased stormwater run-off caused by increased impermeable area and land use change Increasing storm intensities (possibly due to climate change) Poor on-site landscaping Compaction of soils Past regulatory and development controls Limited range of stormwater disposal technologies employed Inappropriate or inadequate stormwater disposal for current needs (e.g. connections into public sewers or insufficient on-site soakage) Run-off from non-maintained soakage systems Lack of capacity in stormwater system Overland flow or poorly formed overland flowpaths Lack of appropriate vegetation planting in overland flowpaths Obstructions in overland flowpaths Buildings located in flood plain or overland flowpath	Risk to human health and safety Nuisance to residents and property owners Damage to buildings and structures Erosion of property Personal distress to residents and property owners Increased cost or unavailability of insurance cover Decrease in water quality Impeded functioning of infrastructure

<b>Issue</b>	<b>Possible causes</b>	<b>Potential effects</b>
<p>Degradation of overland flowpaths (including ephemeral gullies)</p>	<p>Increased stormwater run-off caused by increased impermeable area and land use change</p> <p>Run-off from urban and rural land uses, including roads, car parks, buildings, gardens and driveways</p> <p>Run-off from non-maintained soakage systems</p> <p>Increased stormwater volumes and velocities</p> <p>Erosion of flowpath and banks</p> <p>Deposition of sediment and contaminants</p> <p>Illegal disposal of waste</p> <p>Past regulatory or development controls</p> <p>Poor site management practices during development and earth-disturbing activities</p>	<p>Increased erosion and deposition</p> <p>Changes in stream profile</p> <p>Diversion of flowpaths</p> <p>Increased flooding</p> <p>Damage to property</p> <p>Decrease in water quality</p> <p>Decrease in biodiversity (e.g. loss of rare geothermal ferns)</p> <p>Destruction or degradation of geothermal habitats</p> <p>Loss of amenity value</p>
<p>Degradation of Lake Taupo and aquatic environments</p>	<p>Changes in water flow patterns resulting from increased peak flows and reduced low flows</p> <p>Site management practices during development and earth-disturbing activities</p> <p>Inappropriate or inadequate stormwater disposal for current needs (e.g. connections into public sewers or insufficient on-site soakage)</p> <p>Erosion around outlet structures placed within receiving environments</p> <p>Run-off from roads, car parks and other urban areas</p> <p>Run-off from rural land uses, gardens, buildings and driveways</p> <p>Inappropriate disposal of waste</p>	<p>Filling in of in-stream pools, and Lake bed depressions by sediment deposition</p> <p>Localised smothering of aquatic environments by sediment deposition</p> <p>Decrease in water quality</p> <p>Reduced drinking water source quality near treatment plants</p> <p>Toxic effects on aquatic organisms</p> <p>Negative effects on ecology and biodiversity</p> <p>Increase in weeds, algae and slimes near outlets</p> <p>Loss of amenity/recreation values</p> <p>Negative effects on tourism and recreation</p> <p>Negative effects on public perceptions of environmental quality</p>

<b>Issue</b>	<b>Possible causes</b>	<b>Potential effects</b>
	and contaminants into stormwater Lack of stormwater treatment Erosion of stream banks/property	
Public health and safety	Exposure to point-source contamination discharges Flooding of properties and ephemeral flowpaths Erosion, including the formation of tomos Connections into, and flowpaths through, wastewater infrastructure Sharing of ephemeral waterways with recreation facilities Design of existing detention ponds and inlets/outlets to reticulations increasing fall risks etc Placement of security features around infrastructure and ponds Children entering stormwater systems Human contributory negligence around stormwater systems	Waterborne diseases and vectors Injury/death in reticulation, ponds and tomos Undermining of property, land and infrastructure

## 6. STORMWATER MANAGEMENT

The policies and policy objectives for each of the four main stormwater management issues are set out below. Following the policy statements are explanatory notes (section 6.5).

### 6.1 Flooding

#### OBJECTIVE

To minimise the potential adverse effects on the community from stormwater flooding.

#### POLICIES

- 6.1.1 Council will implement stormwater industry best practice to manage and treat stormwater, overland flowpaths and ephemeral gullies. [See 6.5.1.]
- 6.1.2 Stormwater systems will be designed to manage stormwater to a minimum 1% AEP rainfall event agreed for the catchment. Primary systems will be designed to



manage a minimum 10% AEP rainfall event with the balance managed by overland flow. [See 6.5.2.]

- 6.1.3 Stormwater management provisions of Taupo District Structure Plans for each identified Urban Growth Area shall be in accordance with the requirements of a Catchment Management Plan. [See 6.5.3.]
- 6.1.4 Council will encourage and require a range of industry best practice stormwater disposal methods on private property and development sites. [See 6.5.4.]
- 6.1.5 Council will provide education on the effects of stormwater disposal, industry best practice techniques and the prevention of stormwater flooding. [See 6.5.5.]

## **6.2 Degradation of overland flowpaths**

### OBJECTIVE

To maintain the functioning of overland flowpaths.

### POLICIES

- 6.2.1 Council will implement stormwater industry best practice to manage and treat stormwater through its overland and ephemeral flowpaths/gully systems. [See 6.5.1.]
- 6.2.2 Council will identify overland flowpaths in existing urban areas.
- 6.2.3 Council will seek protection for overland flowpaths from development or obstructions through a range of measures such as acquisition, legal measures, maintenance agreements or other non-regulatory mechanisms. [See 6.5.6.]
- 6.2.4 Council will provide education on the function, hazards, importance and maintenance of overland flowpaths. [See 6.5.5.]

## **6.3 Degradation of Lake Taupo and aquatic environments**

### OBJECTIVES

To improve water quality in receiving environments by, if necessary, reducing the volumes and concentrations of sediments and contaminants entering those receiving environments (e.g. Lake Taupo, the Waikato River, geothermal streams, wetlands and other aquatic environments) from Council's stormwater management systems.

To comply with Council's Comprehensive Discharge Consents.

### POLICIES

- 6.3.1 Council will monitor the effect of stormwater contaminants on local receiving environments

- 6.3.2 Council will implement stormwater industry best practice to manage and treat stormwater within the network. [See 6.5.1.]
- 6.3.3 Council will advocate for riparian fencing and planting initiatives to reduce the effects of livestock on watercourses in catchments upstream of urban areas. [See 6.5.7.]
- 6.3.4 Council will provide education to the community to encourage improvements to stormwater management and the quality of discharges and to reduce negative environmental effects. [See 6.5.5.]
- 6.3.5 Council will minimise erosion around stormwater outlet infrastructure by the use of stormwater industry best practice design. [See 6.5.4]

## **6.4 Public health and safety**

### OBJECTIVE

To provide health and safety risk management for the community around stormwater management systems whilst encouraging the active use of some parts of those systems.

### POLICIES

- 6.4.1 Council will implement stormwater industry best practice to manage stormwater and infrastructure to ensure that public health and safety is protected. [See 6.5.1.]
- 6.4.2 Council will promote and maintain the separation of the stormwater and wastewater networks. [See 6.5.8.]
- 6.4.3 Council will encourage and provide for the dual use of ephemeral flowpaths on public land for stormwater and recreational use. [See 6.5.8.]
- 6.4.4 Council will prevent unauthorised access to the stormwater infrastructure [See 6.5.8.]

## **6.5 Explanatory notes**

These explanatory notes provide background information to aid understanding of the above policies.

### 6.5.1 STORMWATER INDUSTRY BEST PRACTICE

Several documents have been produced by other councils in New Zealand describing best practice for stormwater management. The New Zealand Water Environment Research Foundation also produces a guide to best practice and this is continually updated and evolving. Council's best practice will be based on these guidelines. However, the guidelines will be adapted and made applicable to Taupo conditions.

Council is prepared to adopt and adapt new practices to suit the topography, geology, soils and hydrology typical of the Taupo District.

Best practice may include the use of low impact design features: land redevelopment may be designed and undertaken in a way that minimises or mitigates the risks of flooding, sediment run-off and contaminants entering Lake Taupo and other aquatic environments.

Simple and effective low-impact design methodologies include:

- clustering buildings
- minimising impervious areas (reducing road widths, driveway sizes and building footprints)
- dispersing stormwater flow rather than concentrating it
- disposing of stormwater close to its source
- collecting rainwater from roofs for garden use

Broadening the range of best practice options will enable stormwater to be disposed of and treated by the method most suitable to the circumstances. However, in considering industry best practice options, a balance needs to be achieved between the environmental, economic, social and cultural outcomes that can be achieved.

#### 6.5.2 ANNUAL EXCEEDENCE PROBABILITIES (AEP)

Annual Exceedence Probability is defined as "the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year".

A 1% AEP therefore has a 1% probability of occurring in any one year at one particular location. It is possible, using meteorological data, to estimate the probability that a particular rainfall depth will be equalled or exceeded at a particular place, within a particular time interval (duration), and over any given period of time.

The probability of a particular rainfall amount for a particular location being equalled or exceeded in any one-year period can also be expressed as "on the average once in every 100 years" (an average recurrence interval, or ARI, of 100 years).

However, this can be misunderstood because an ARI of 100 years does not mean that the event will only occur once every 100 years. For each and every year, there is a 1% chance (a 1 in 100 chance) that the event will be equalled or exceeded once or more than once. The use of an AEP to describe the chance of a particular rainfall event is preferred because it conveys the probability or chance that exists for each year.

The reason that the '100-year event' may be perceived to occur more frequently than its name implies is that, instead of focusing on a single location, and a single duration, an area of significant size and a wide range of durations are often considered. There is a greater probability of a 1% event occurring at more than one location within the wider area.

Within a 1% AEP rainfall event of 1 hour duration there may still be a burst of rainfall of a higher intensity that potentially causes system failure because the resulting peak flow

exceeds the capacity of the system. Therefore, in establishing storm duration for a 1% AEP event, consideration needs to be given to the effects of high intensity, short duration rainfall events.

Council's policy is to design new primary stormwater systems (catchpits, reticulation, primary flowpaths, detention ponds etc) to manage stormwater up to a 10% AEP rainfall event. During most rainfall events this is expected to be sufficient to move water offsite, protect houses and prevent property loss. This is consistent with the standard in clause E1 of the New Zealand Building Code (enabled by the Building Act 2004).

For higher intensity rainfall events, excess stormwater will be managed by secondary flowpaths and further detention ponds, etc, designed to manage up to a 1% AEP event (consistent with the New Zealand Building Code). This is expected to prevent loss to people and environmental and building damage from most rainfall events. For even higher intensity rainfall events (<1% AEP event) Council will continue to manage the excess stormwater to be best of its ability.

The 1% and 10% AEP rainfall events are measurements of probability and therefore risk. They are accepted industry standards and best practice. To implement them as the best practice standards to which stormwater management systems should be adapted or constructed, Council will first need to identify and agree exactly what the meteorological conditions are that give rise to these risks in each local catchment. The data for any other place in New Zealand cannot be applied in Taupo District. By adopting the 1% and 10% AEP measurements, Council will be able to accommodate any changes which may arise from future variations or changes in the local climate in each of the urban stormwater catchments. Any changes to the design of infrastructure arising from a future need to accommodate different storm intensities will be made through reviews of the Code of Practice.

### 6.5.3 CATCHMENT MANAGEMENT PLANS (CMP)

To comply with Environment Waikato Comprehensive Discharge Consent conditions a Council must have catchment management plans prepared for greenfield developments. An assessment of stormwater management must also be included as a part of any Structure Plan for a new urban growth area in the District. A CMP can therefore be prepared for identified Urban Growth Areas by Council or developers (whoever initiates the Structure Plan process), or by developers for other sites not in identified Urban Growth Areas.

A catchment management plan and a Structure Plan must include:

- catchment maps
- social, economic, ecological, amenity and cultural objectives for the catchment
- identification of key stakeholders and details of consultations
- classification of receiving waters (in accordance with the Waikato Regional Plan)
- an assessment of the current status of the catchment and the receiving environment (as detailed in the Comprehensive Discharge Consents 105048, 105049 and 105050) and any existing Resource Consents

- identification of potential urban growth, development and land use changes including intensification
- an assessment of the potential effects of stormwater diversion and discharge activities on the catchment and receiving environment (as detailed in the Comprehensive Discharge Consents 105048, 105049 and 105050)
- details of the cumulative effects of stormwater diversion and discharge activities within the catchment
- general management options available and the best practicable option to prevent or minimise the adverse effects of stormwater diversion and discharge activities, taking account of local topography, geology, soils and hydrology, and the potential for scouring, ephemeral flow and tomo formation that can lead to sub-surface flows which may be different from surface flows.
- an assessment of the effectiveness of District Plan provisions to implement the management approach adopted by the catchment management plan
- education initiatives to support the catchment management objectives
- methods for managing stormwater diversion and discharge activities
- a description of Council's scheduled infrastructure works which may significantly affect stormwater management within the catchment

In catchments that have already been developed, catchment studies (similar to catchment management plans but of a smaller scale and not required by the Comprehensive Discharge Consents) may be prepared to analyse the performance of the catchment and its stormwater drainage system and to evaluate options and identifying solutions for addressing any deficiencies.

#### 6.5.4 STORMWATER DISPOSAL

Stormwater disposal options need to consider the local circumstances, including topography, geology, soils, hydrology and cost. The methods to be considered include:

- on-site soakage into the ground (this is assisted by local pumice soils, but even these can become saturated)
- connecting to existing stormwater reticulation
- disposing to gully flowpaths to filter stormwater and reduce flows
- installing new reticulation and on-site or off-site detention ponds. This is a general preference for new developments, having 'open' systems of ponds with high storage volumes rather than 'closed' systems of soakage pits. Open systems are easier to maintain and they reduce the reliance on high on-site soakage rates during rainfall events. High initial soakage rates are not maintained in the long term. On-site soakage may be preferred on steeper ground where open pond systems are prone to creating tomos.

Different rules or preferred options for stormwater disposal could be applied in different planning zones or to suit different catchments.

Stormwater outlet infrastructure can act as groynes and contribute to scouring and erosion of receiving environments, with subsequent deposition elsewhere. Alternative best practice design solutions will be considered.

#### 6.5.5 ENVIRONMENTAL EDUCATION

Council has developed an Environmental Education Programme for Infrastructure Services covering aspects of stormwater, wastewater, water and solid waste.

The aim of the stormwater element of this programme has been to minimise the quantity of pollutants entering the stormwater network.

The main messages conveyed have been:

- that stormwater flows directly into Lake Taupo (or other lakes and watercourses)
- that stormwater is not treated
- what stormwater currently contains
- the environmental effects of stormwater (including the effect of excess water from large areas of impervious surface).

Past and current stormwater education initiatives include:

- **Taupo for Tomorrow** – this has targeted primary school children and teachers and is run in partnership with Department of Conservation and Genesis Energy
- **Tama the Trout** – a radio advertising campaign revolving around “ ‘what goes down the grate ends up in the Lake’ ”
- **Aluminium fish** fixed on grates in Taupo, Mangakino and Turangi - visual reminders that what goes down the grate goes to the District’s lakes and watercourses, and that we should “tip no waste”
- **Enviroschools** – a number of Taupo schools have joined in this nationwide programme. Students are guided to take action for the environment and teachers to feel competent to teach environmental education units.

Enviroschools no longer receive EW-funded support for any environmental programmes. Facilitation by Taupo District Council has become an essential element in the programme’s success.

New stormwater education initiatives will need to be targeted at different sectors of the community (e.g. building industry, trade waste operators) and deliver specific messages to help the implementation of this strategy.

#### 6.5.6 OVERLAND FLOWPATH PROTECTION

Overland flowpaths may cease to function effectively if they are blocked or obstructed. Such obstructions may include walls, fences, embankments, buildings, vegetation or waste. The effects of these may be:

- flooding as flows are stopped or reduced and water backs up along the flowpath

- diversion of stormwater discharges into other flowpaths that have not been anticipated and where there is no stormwater management
- increased erosion as stormwater is diverted along new channels within the flowpath itself, potentially altering the channel profile and increasing the sediment load of the stormwater.

Council's ability to actively manage flowpaths is generally limited to those on public land within the responsibility of Council. Where new development occurs, Council's preference is to acquire the main secondary flowpaths as local purpose reserves for stormwater. Council is in a position to advocate for greater protection and maintenance of overland flowpaths on private premises by negotiating protections using a range of legal instruments such as:

- easements
- covenants
- development controls
- maintenance agreements.

Overland flowpaths across private property need to be identified and the information must be included on Land Information Memoranda and provided to property owners. Council will also use this information for with future catchment and asset management.

Natural stormwater overland flow paths are present on many Council recreation reserves. Open space should be utilized to "soak up" stormwater wherever possible without significant disruption to patterns of recreation use. Recreation opportunities can also be enhanced by incorporating ponds and wetlands into areas where there is little recreation potential. If the use of an area for stormwater management has a significant impact on its ability to be used for recreation purposes, then that area should be classified as a Local Purpose Reserve (stormwater management).

#### 6.5.7 STOCK ANIMALS

Council supports Environment Waikato and the initiatives of landowners to exclude stock animals from overland flowpaths. Council is interested in the exclusion of stock from stormwater flowpaths in catchments upstream of urban areas.

The adverse effects of stock animals on stormwater include:

- degradation of flowpaths by trampling, including the loss of vegetation
- overgrazing of vegetative cover which would have slowed stormwater flows
- potential contamination of stormwater and receiving environments from faecal waste and carcasses.

#### 6.5.8 PUBLIC SAFETY

Council recognises that there is a degree of public safety risk associated with managing stormwater and has a programme of hazard and risk assessments for all of its stormwater outfalls and accessible infrastructure.

Council will employ a range of methods for promoting a reasonable level of safety around stormwater infrastructure according to the degree of associated risk, including:

- best practice design which incorporates safety and security
- information and advice to the community and to private property owners
- signs adjacent to the infrastructure
- grills over potential entry points to stormwater reticulation
- security fencing around stormwater infrastructure.

Council strives to maintain the separation of its stormwater and wastewater systems so that pathogens from wastewater can not enter a wider and more publicly accessible environment. Stormwater entering the wastewater systems can negatively affect the operation of wastewater treatment plants due to the excessive volumes of water. Where Council does not have sufficient control over the disposal of stormwater (on private property, for example), information and advice will be made available to property owners.



## 7. POLICY IMPLEMENTATION

Issue	Policy	Policy actions	Implementation	Timescale
Flooding	6.1.1 Council will implement stormwater industry best practice to manage and treat stormwater, overland flowpaths and ephemeral gullies.	Review the District Plan and Code of Practice to make allowance for utilising the full range of industry best practice technologies for stormwater disposal and treatment close to the source	District Plan Code of Practice	2009 2009
	6.1.2 Stormwater systems will be designed to manage stormwater to a minimum 1% AEP rainfall event agreed for the catchment. Primary systems will be designed to manage a minimum 10% AEP rainfall event with the balance managed by overland flow.	<ul style="list-style-type: none"> <li>• Identify and agree an intensity for a 10% AEP storm event for each catchment using meteorological data and include within the Code of Practice</li> <li>• Identify current capacities of individual infrastructure assets and flowpaths, and where there are identified flooding issues, include upgrades in future work programmes</li> </ul>	Code of Practice Asset Management Plan	2009 On-going
	6.1.3 Stormwater management provisions of Taupo District Structure Plans for each identified Urban Growth Area shall be in accordance with the requirements of a Catchment Management Plan	<ul style="list-style-type: none"> <li>• Identify Urban Growth Areas</li> <li>• As part of a Structure Plan a catchment management plan will be produced and adopted with amendments to the District Plan as required</li> </ul>	Structure Plans	

Issue	Policy	Policy actions	Implementation	Timescale
Flooding	6.1.4 Council will encourage and require a range of industry best practice stormwater disposal methods on private property and development sites.	<ul style="list-style-type: none"> <li>• Review District Plan provisions for stormwater disposal, waste disposal from vehicle wash-bays, compacted soils, on-site stormwater retention</li> <li>• Enforce stormwater retention and disposal on development sites</li> <li>• Consider the use of bylaws for the regulation and enforcement of trade waste and stormwater management</li> <li>• Identify areas at particularly high risk of tomos and introduce development controls based on geotechnical advice</li> <li>• Ensure adequate sediment control measures are employed on building sites</li> </ul>	District Plan Code of Practice Resource Consents Building Consents Part 8, Local Government Act 2002 (bylaws) Catchment management plan Asset Management Plan	2009 2009 As required As required 2009-2010 As required On-going
	6.1.5 Council will provide education on the effects of stormwater disposal, industry best practice techniques and the prevention of stormwater flooding	<ul style="list-style-type: none"> <li>• Provide information to property owners (especially sites on the Register of High-risk Facility Sites in the Stormwater Management Plan) on maintenance of private stormwater systems and landscape design to prevent flooding</li> <li>• Advise property owners of the risk of flooding up to the level of the</li> </ul>	Environmental Education Programme Asset Management Plan GIS / Land Effects Database District Plan	On-going On-going 2009-2015 2009

Issue	Policy	Policy actions	Implementation	Timescale
Flooding		agreed 1% AEP storm event for each catchment, and possible remedial action		
Degradation of overland flowpaths	6.2.1 Council will implement stormwater industry best practice to manage and treat stormwater through its overland and ephemeral flowpaths/gully systems	<ul style="list-style-type: none"> <li>• Review the District Plan and Code of Practice to encourage utilisation of the full range of industry best practice technologies for stormwater treatment and flowpath management</li> <li>• Review Code of Practice guidelines to incorporate infrastructure designs to manage the agreed 10% AEP storm event and 1% AEP for overland flow for each catchment</li> <li>• Install sediment traps at the entry points from roads to the reticulation where identified by the Monitoring Programme</li> <li>• Contain sediments and contaminants to detention ponds and/or dense vegetation in ephemeral watercourses</li> <li>• Encourage industry best practice maintenance of gullies and overland flowpaths including appropriate vegetative cover to slow discharge velocities and assist with soakage</li> </ul>	District Plan Code of Practice Asset Management Plan Reserve management plans Part 8, Local Government Act 2002 (bylaws) Solid Waste Bylaw 2007	2009 2009 On-going 2009-2015 2009-2010

Issue	Policy	Policy actions	Implementation	Timescale
Degradation of overland flowpaths		<ul style="list-style-type: none"> <li>• Identify all primary and secondary flowpaths and their capacities</li> <li>• Where necessary avoid or mitigate obstructions in flowpaths by alternative infrastructure</li> <li>• Enforcement of illegal dumping rules</li> </ul>		
	6.2.2 Council will identify known overland flowpaths in existing urban areas.	<ul style="list-style-type: none"> <li>• Identify overland flowpaths across private property and road reserves (where these are on secondary flowpaths)</li> <li>• Include flowpath and flood information in Land Information Database</li> <li>• Identify buildings situated in floodplains and flowpaths</li> </ul>	Asset Management Plan GIS / Land Effects Database	On-going 2009-2015
	6.2.3 Council will seek protection for overland flowpaths from development or obstructions through a range of measures such as acquisition, legal measures, maintenance agreements or other non-regulatory mechanisms	<ul style="list-style-type: none"> <li>• Review District Plan provisions, Code of Practice guidelines and the Stormwater Asset Management Plan to protect overland flowpaths</li> <li>• Identify criteria for protecting overland flowpaths in the District Plan</li> <li>• Identify criteria for acquiring significant overland flowpaths</li> </ul>	District Plan Code of Practice Asset Management Plan Reserves Strategy	2009 2009 On-going 2009-2010

Taupo District Council **STORMWATER STRATEGY (2009)**

<b>Issue</b>	<b>Policy</b>	<b>Policy actions</b>	<b>Implementation</b>	<b>Timescale</b>
Degradation of overland flowpaths		<ul style="list-style-type: none"> <li>Review means of enforcing avoidance or mitigation of obstructions in overland flowpaths</li> </ul>		
	6.2.4 Council will provide education on the function, hazards, importance and maintenance of overland flowpaths	<ul style="list-style-type: none"> <li>Provide information to property owners on landscape design and management to maintain the functions of overland flowpaths</li> </ul>	Environmental Education Programme	On-going
Degradation of Lake Taupo and aquatic environments	6.3.1 Council will monitor the effect of stormwater contaminants on local receiving environments	<ul style="list-style-type: none"> <li>Implement Stormwater Monitoring Programme in receiving environments</li> <li>Determine potential effects by comparisons with published research</li> </ul>	Asset Management Plan	2009-2012
	6.3.2 Council will implement stormwater industry best practice to manage and treat stormwater within the network	<ul style="list-style-type: none"> <li>Install sediment traps at the entry points from roads to the reticulation where identified by the Monitoring Programme</li> <li>Require stormwater discharges to be treated as close as possible to source where disposal is into the Council's reticulation</li> </ul>	District Plan Code of Practice Asset Management Plan	2009 2009 On-going
	6.3.3 Council will advocate for riparian fencing and planting initiatives to reduce the effects of livestock on watercourses in	<ul style="list-style-type: none"> <li>Advocate regarding restrictions on stock animals entering and contaminating flowpaths and watercourses, especially within the</li> </ul>	EW: Long Term Council Community Plans EW: Regional Policy Statements	On-going as required

<b>Issue</b>	<b>Policy</b>	<b>Policy actions</b>	<b>Implementation</b>	<b>Timescale</b>
Degradation of Lake Taupo and aquatic environments	catchments upstream of urban areas	Lake Taupo catchment and upstream of urban catchments	EW: Waikato Regional Plans	
	6.3.4 Council will provide education to the community to encourage improvements to stormwater management and the quality of discharges and to reduce negative environmental effects	<ul style="list-style-type: none"> <li>• Provide information to property owners (especially sites on the Register of High-risk Facility Sites in the Stormwater Management Plan) on maintenance of private stormwater systems and disposing of waste into stormwater</li> <li>• Raise public awareness of the environmental effects of agricultural, green/garden waste and household chemicals in stormwater</li> </ul>	Environmental Education Programme	On-going
	6.3.5 Council will minimise erosion around stormwater outlet infrastructure by the use of stormwater industry best practice design	<ul style="list-style-type: none"> <li>• Implement best practice design during upgrades to the existing outlet infrastructure and to new outlets during development.</li> </ul>	Asset Management Plan	On-going
Public health and safety	6.4.1 Council will implement stormwater industry best practice to manage stormwater and infrastructure to ensure public health and safety are protected.	<ul style="list-style-type: none"> <li>• Review and risk-assess the design of existing stormwater management structures</li> <li>• Incorporate design guidelines into the Code of Practice</li> <li>• Ensure infrastructure exceeding 450mm diameter is covered by</li> </ul>	District Plan Code of Practice Asset Management Plan	2009 2009 On-going

Issue	Policy	Policy actions	Implementation	Timescale
Public health and safety		security grates <ul style="list-style-type: none"> <li>Advocate for restrictions on stock animals accessing overland flowpaths and watercourses</li> </ul>		
	6.4.2 Council will promote and maintain the separation of the stormwater and wastewater networks	<ul style="list-style-type: none"> <li>Identify all primary and secondary flowpaths where inflows to wastewater systems may occur, and take any actions to maintain the separation of the wastewater and stormwater systems</li> <li>Undertake risk assessments with the Wastewater Asset Manager</li> </ul>	Asset Management Plan (Stormwater) Asset Management Plan (Wastewater) Environmental Education Programme	On-going On-going On-going
	6.4.3 Council will encourage and provide for the dual use of ephemeral flowpaths on public land for stormwater and recreational use	<ul style="list-style-type: none"> <li>Recreation facilities (such as pathways) should be situated above flood levels in flowpaths where possible</li> <li>Install signage to warn users of the dual recreation/stormwater use of the ephemeral waterway and the possibility of flooding where required</li> </ul>	Reserve management plans Code of Practice	2009-2015
	6.4.4 Council will prevent unauthorised access to the stormwater infrastructure.	<ul style="list-style-type: none"> <li>Review and risk-assess the design of existing stormwater management structures</li> <li>Incorporate design guidelines into</li> </ul>	GIS / Land Effects Database Code of Practice Asset Management Plan	2009-2015 2009 On-going

<b>Issue</b>	<b>Policy</b>	<b>Policy actions</b>	<b>Implementation</b>	<b>Timescale</b>
Public health and safety		the Code of Practice <ul style="list-style-type: none"> <li>• Action any risk management requirements to avoid, reduce or mitigate hazards arising from stormwater infrastructure</li> <li>• Ensure that infrastructure exceeding 450mm diameter is covered by security grates</li> <li>• Provide community information on the dangers of stormwater infrastructure</li> </ul>	Reserve management plans  Environmental Education Programme	2009-2015  On-going



## 8. FINANCING THE STORMWATER STRATEGY

The implementation of the Strategy will place the onus on developers to design stormwater systems within developments to a higher standard to meet the 10% and 1% AEP requirement, as well as provide for treatment of stormwater prior to it reaching the receiving environments. Stormwater management systems within new subdivisions will be financed by the developers.

Council has existing funding for maintaining the stormwater network. The Stormwater Monitoring Programme will assist Council in prioritising where funding will be allocated within the network to enable improvements in stormwater quality.

The strategy identifies a number of other initiatives to assist Council in prioritising the allocation of funding. These include the identification of overland flow paths, risk assessments on existing infrastructure and possible Bylaw development. These initiatives will be incorporated into future LTCCP and subsequent annual plan processes. The development of annual business plans will be based on monitoring data and the Stormwater Asset Management Plan.

## REFERENCES

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Taupo District Council, *Taupo District 2050 Growth Management Strategy*, 2006

## APPENDIX 1

### **Taupo District “District Plan” Environments and Urban Growth Areas**

- Taupo, Acacia Bay, Kinloch, Wairakei, Waitahanui
- Mangakino, Whakamaru, Atiamuri
- Turangi, Tokaanu, eastern lakeshore settlements, south-western lakeshore settlements

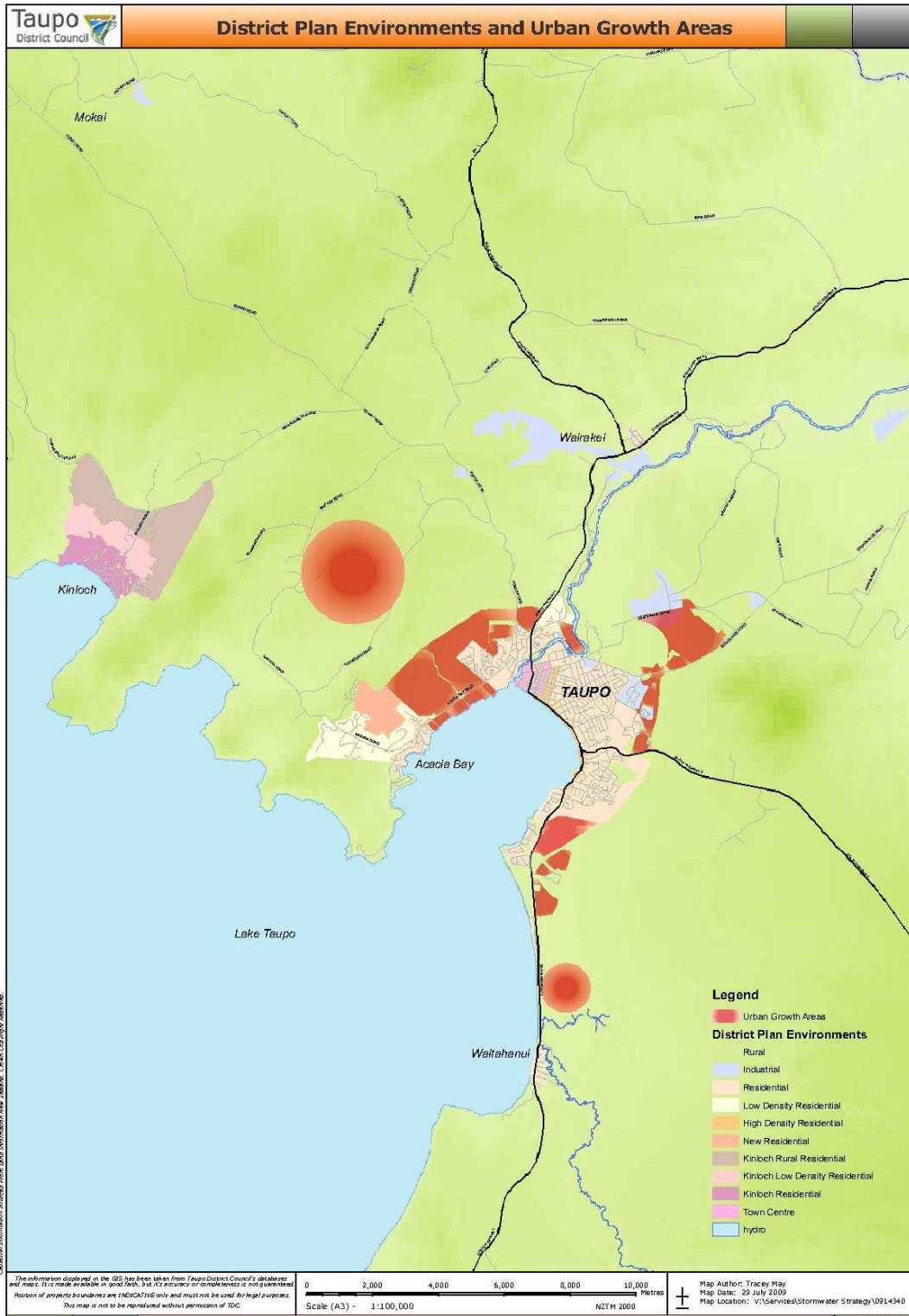
Please note: the Stormwater Strategy applies to the following Taupo District Plan environments:

- Residential
- Industrial
- Town centre

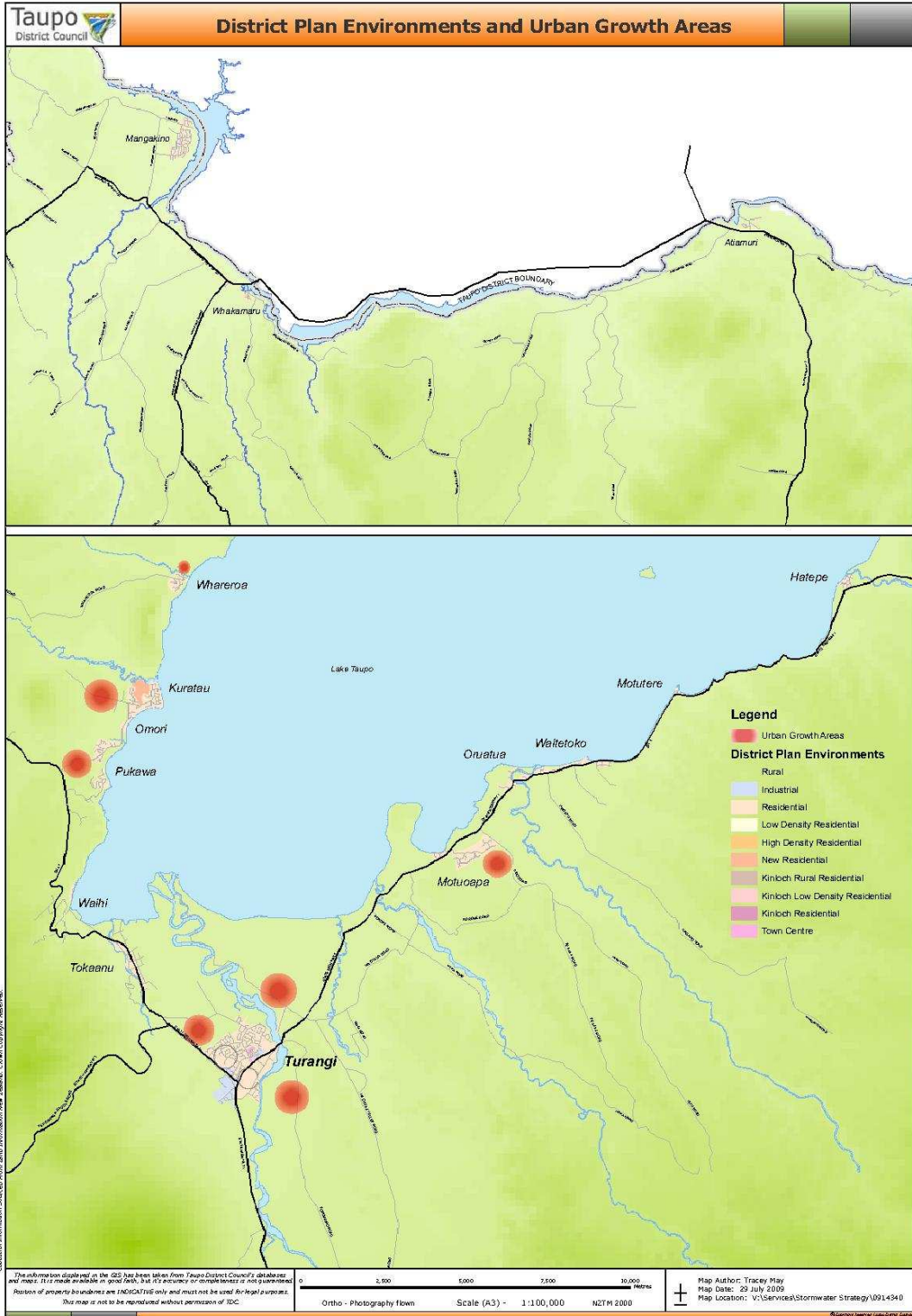
and

- Urban Growth Areas when these are developed with stormwater infrastructure

Taupo District Council **STORMWATER STRATEGY (2009)**



Taupo District Council **STORMWATER STRATEGY (2009)**



## APPENDIX 2

### Environment Waikato Regional Plan Rule 3.5.12:

#### Facilities and activities considered to be “High Risk” for the purposes of stormwater discharges

[Note: BOD means “Biological Oxygen Demand” - The amount of oxygen required by aerobic biological processes to break down the organic matter in water. A high BOD is usually an indicator of higher levels of pollutants in water.]

Activity	Reason for High Risk Classification
1. Mechanical workshops and service stations.	These sites use and handle large volumes of oils and other petroleum products. Spillages of these substances are not uncommon, hence the greater risk of stormwater discharges to the environment.
2. Printers.	Relatively large quantities of dyes and paints are handled at these sites. The risk of spillages is relatively high.
3. Spray painting facilities.	Paints can not only be spilt at these sites but can enter stormwater as a consequence of drift from spray painting operations.
4. Meat, fish and shellfish processing industries.	Wastes from these industries can typically have a high BOD. This can cause significant adverse effects.
5. Dairy products processing.	Wastes from these industries can typically have a high BOD. This can cause significant adverse effects.
6. Waste management sites (transfer stations, compost sites, landfills etc.).	Litter, hazardous substances and high BOD wastes can all enter stormwater systems from these sites.
7. Truck wash facilities	The activity of truck washing can wash hazardous contaminants of trucks as well as sediments and wastes from spillages on site.
8. Unenclosed manufacturing and bulk storage of fertiliser.	Fertilisers can give rise to high levels of nutrient in stormwater discharges. Where fertilisers are manufactured or stored in such a way that fertilisers can enter stormwater the risk of adverse effects is unacceptably high.
9. Textile fibre and textile processing industries where dyeing and washing of fabric occurs.	Large quantities of dye and high BOD wastes (from wool scourers for instance) are handled on these sites. The risk of spillages that could enter stormwater is high.
10. Tanneries and leather finishing.	Large quantities of dye and high BOD wastes are handled on these sites. The risk of spillages that could enter stormwater is high.
11. Footwear manufacture.	Large quantities of dye and high BOD wastes are handled on these sites. The risk of spillages that could enter stormwater is higher.

12. Manufacture of paper and paper products.	Hazardous substances such as chlorine based bleaches and dyes are regularly handled on these sites. The risk of spillages etc. entering stormwater can be high.
13. Manufacture or processing of chemicals, and of petroleum, coal, rubber and plastic products.	The risk of spillages associated with hazardous substances used in these industries can be high.
14. Manufacture of clay, glass, plaster, masonry, asbestos and related mineral products.	The risk of spillages associated with hazardous substances used in these industries can be high.
15. Manufacture of fabricated metal products, machinery and equipment.	The risk of spillages associated with hazardous substances used in these industries can be high.
16. Electroplaters, Foundries, galvanizers and metal surfacing.	The risk of spillages associated with hazardous substances used in these industries can be high.
17. Concrete batching plants and, asphalt manufacturing plants.	The risk of spillages associated with hazardous substances used in these industries can be high.
18. Stock sale yards.	High BOD run-off can be associated with these sites.
19. Bakeries.	Outside washing of trays, dishes and pans can result in high BOD, fats, greases and detergents entering stormwater systems.
20. Car wash and valet services.	High oil, solvent and solid discharges can occur from these activities.
21. Commercial laundries (excluding self-service laundrettes and Laundromats).	The risk of spillages associated with detergents, alkalis and salts used in this industry can be high.
22. Furniture/wood manufacturing and refinishing industries.	Some of these industries work outside extensively, usually with no stormwater treatment, Contaminants such as sawdust, glues and alkali stripper solution in the stormwater coming of these sites can include high solids, BOD and high pH.
23. Timber preservation, treatment and storage sites where chemically treated timber is sorted.	A range of hazardous substances are used on these sites (e.g. Copper Chrome, Arsenic, Boron and copper-quinoline compounds). In addition, timber treatment chemicals have been shown to be able to leach from treated wood in storage.