The 3 Waters Strategic Direction Statement 2010 – 2060

An Integrated Approach to the Sustainable Management of Water, Wastewater and Stormwater in Dunedin

DUNEDIN CITY COUNCIL
Kaunihera-a-rohe o Otepoti

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Contents

Feedback

We welcome your feedback on the 3 Waters Strategic Direction Statement, which will help us prepare our detailed implementation plans over the coming months.

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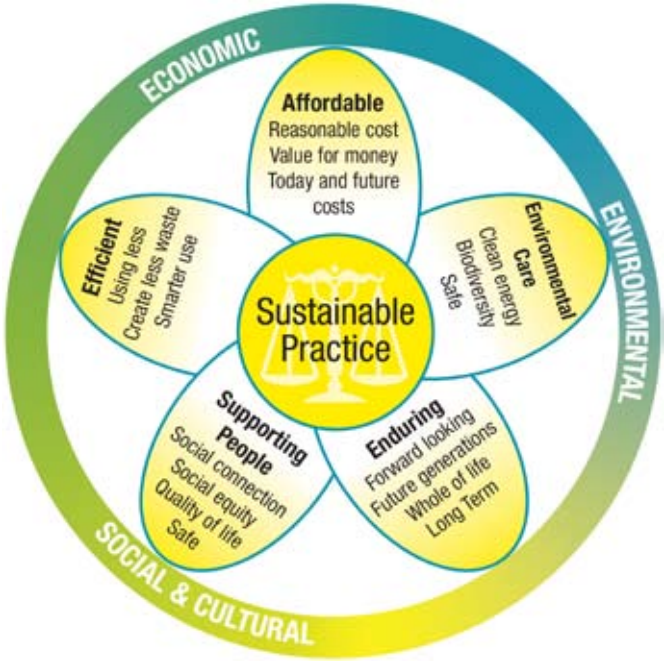
All financial information in the this document is stated in 2009/10 prices

The Strategy in Context

Dunedin City Council has a vision for a more sustainable Dunedin as:
'A City that makes the most of its natural and built environment and which meets the needs of today's community, without jeopardising the ability of future generations to meet their needs'.

The '3 Waters Strategic Direction Statement' is a cornerstone document for aligning the current and future management of the water, wastewater and stormwater with the City's sustainability principles. The 'sustainable practice' diagram below shows the principles used in decision making to ensure that the City moves towards its vision for a more sustainable Dunedin.



The effective and sustainable management of water, wastewater and stormwater contributes to the community outcomes of safe and healthy people, sustainable city and environment and wealthy community. The activity goals of providing clean and safe drinking water and ensuring that our wastewaters do not damage our inland and coastal environments are particularly important in this regard.

Much of the infrastructure used to deliver water, wastewater and stormwater services has a long life. Consequently, decisions that we make now have a long term impact on affordability and service delivery. This Strategy therefore looks 50 years forward, to ensure that today's decisions do not negatively impact on future generations.

In developing the Strategy, significant work has been undertaken to understand the technical constraints and challenges that face Dunedin City in managing water, wastewater and stormwater over the next 50 years. This work has included analysis of challenges such as climate change, in addition to obtaining a detailed understanding of the current capability of our network through development of network models. The Council has also involved a variety of stakeholders to identify priorities and areas of concern from a community perspective.

Content of this document

This document outlines the key technical issues, challenges and community priorities that have been identified in preparing the strategy. The areas that present both significant challenges to the Council and are of high priority to the community will require particular future effort and resource. The strategy provides direction for the Council's responses and decision making in this regard. It also provides the context for the next Long Term Council Community Plan.

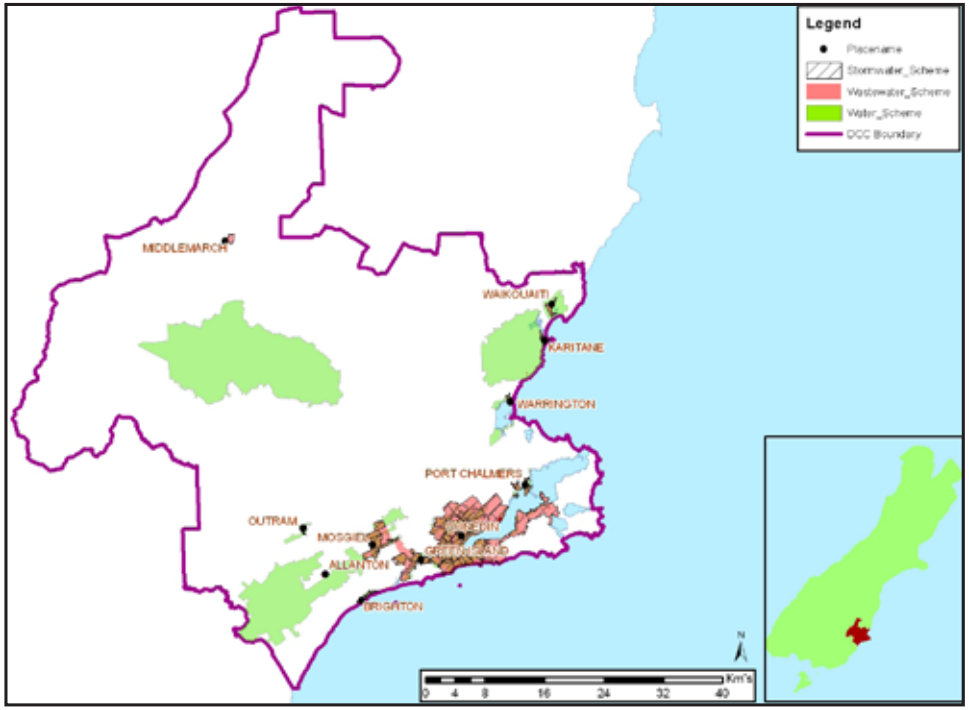
What the Strategy provides

The 3 Waters Strategy provides a generalised set of priorities and approaches for use in all areas of water, wastewater and stormwater management undertaken by the Dunedin City Council. It will provide the basis for the approach, focus and development of tactical management planning documents, which include specific improvement targets and actions. Furthermore, the strategic direction will be integrated into business processes such as decision making frameworks, so that the day to day operations and decision making become aligned to the strategic direction.

This strategic direction statement does not contain financial assessments. These will be developed through the Activity Management Plans and consulted on as part of the Long Term Council Community Plan. Nor does it discuss governance issues such as who manages water resources and what role the City Council should have.

Our Activities Today

The Dunedin City district boundary covers a geographic area of 3,350 square kilometres, making it the largest city in New Zealand by land area.



Quick Facts:

Dunedin City Council:

- Manages 21,000 hectares of water catchment.
- Provides water and wastewater services to approximately 49,000 and 48,000 properties respectively.
- Provides stormwater services to around 107,000 residential customers.
- Owns and manages 1,425km of water main, 1,232km of sewer, 12 operational water treatment plants, 7 wastewater treatment plants, 57 storage reservoirs and 124 pumping stations across the three networks.

Dunedin City takes the majority of its water supplies from the Deep Stream, Deep Creek, and Silver Stream. The Taieri Bores supplement these surface supplies with groundwater as necessary. Waitati and Warrington are now part of the city's main supply area, receiving water via the new Northern Pipeline. There are also a number of independent rural schemes.

The City boundaries extend to the Lammerlaws in the west, Waikouaiti to the north, the Pacific Ocean in the east and south-east, and the Waipori/Taieri River and the township of Henley in the south-west.

Māori arrived in the Otago region more than four centuries ago, but it was not until 1848 that Scottish migrants established a European settlement in Dunedin. With the discovery of gold in Central Otago, Dunedin became New Zealand's largest city. The first public water infrastructure was installed in 1860, with significant infrastructure development taking place in the first half of the 20th century. As a result, 40% of today's water and waste network infrastructure was laid before 1950.

Today, Dunedin is a city of over 124,000 people. Whilst the City's population is growing relatively slowly, the structure of the economy is changing, with a significant decline in water or wastewater intensive industries such as meat processing.

Our city includes:

- The 22km long Otago Harbour, with its internationally significant wildlife habitats, including colonies of the Hoiho (yellow eyed penguin) the world's rarest penguins, and the world's only mainland colony of Royal Albatross. This biodiversity makes Dunedin a popular centre for eco-tourism.
- A major deep water port at Port Chalmers; a stopping point for both commercial and cruise ships.
- Areas of mahika kai (customary fishing) as well as commercial seafood harvesting.
- A coastline vulnerable to sea level rise and erosion, but which has many recreational beaches.
- A varied geography, incorporating urban areas, alpine mountains, tussock grasslands and fertile agricultural plains.
- Areas of historic and cultural significance for Māori, Europeans and other early settlers.
- New Zealand's oldest and largest university, home to some 23,000 students and the Otago Polytechnic.

Although less seismically active than much of New Zealand, Dunedin is still at risk of experiencing infrequent moderate to large earthquakes due to its proximity to the Trans Alpine fault.

Operating Performance

Water Conservation

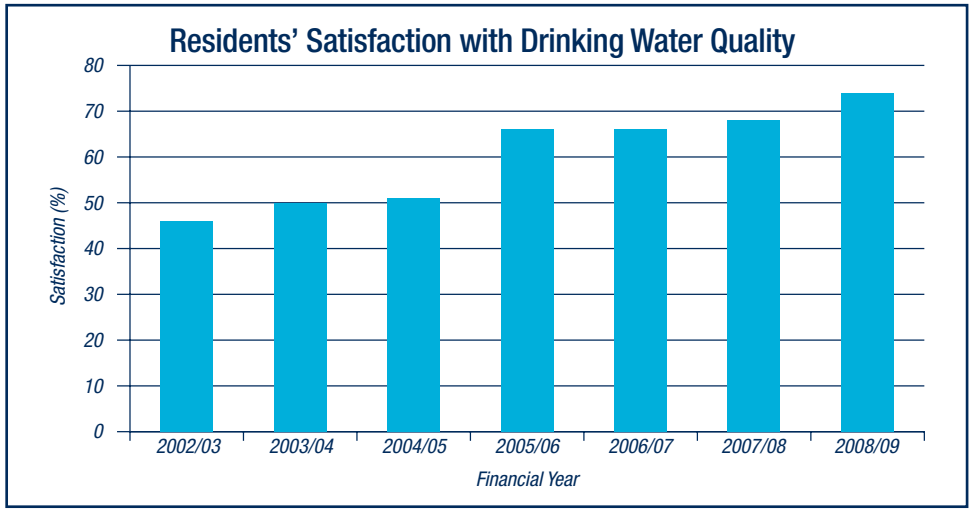
Contrary to popular belief Dunedin is among the driest areas in the country, with a mere 660mm average rainfall per year compared to the national average of 1850mm.

It is estimated that approximately 15% of Dunedin's treated water supply is lost through leakage which is comparable with the national average of around 14%. Residential consumption in Dunedin is around 220 litres daily per person, below the national average estimated at 250-300 litres per day, although consumption in some parts of the city is much higher. We recognise that there is still scope for improvement and increased efficiencies in water use and distribution through combined supply and demand management strategies. There are some areas with excessive leakage and the lack of high quality information means that we have a low level of confidence in our current water consumption estimates.

Drinking Water Quality

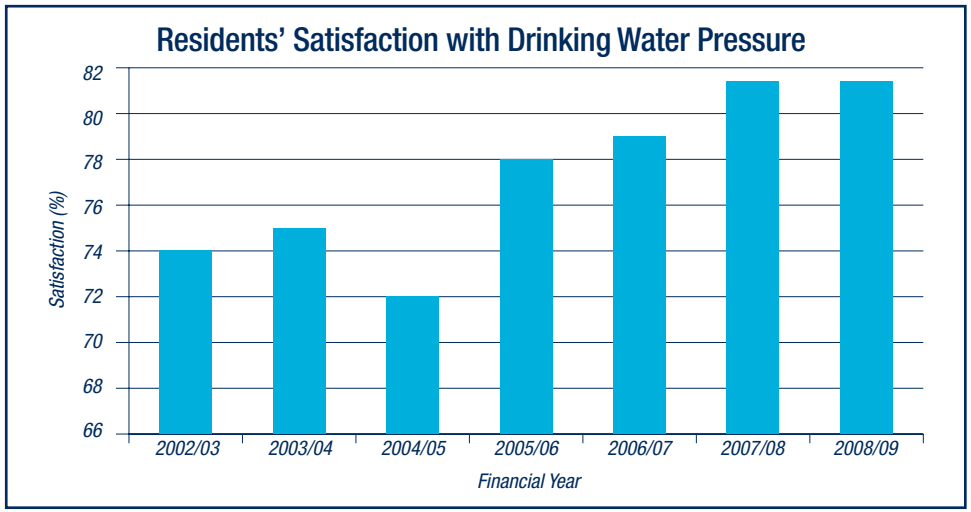
Significant investment (in excess of $80 million) over recent years now ensures that 83% of Dunedin's population receive A-grade water under Ministry of Health assessment. This is reflected in the steady increase in residents' satisfaction with drinking water quality (below).

Compliance with New Zealand Drinking Water Standards has also improved in recent years. The implementation of a strict sampling regime ensures that our level of compliance generally exceeds 95%.



Water Pressure

Residents' satisfaction with water pressure has increased over the past 7 years and now stands at 81% (below). This has been achieved through the ongoing pressure management programme and is further reflected by falling counts of low pressure and low flow complaints.



Stormwater and Wastewater Network Performance

Parts of the city occasionally experience flooding from wastewater and stormwater sewers as a result of localised network capacity being exceeded. This risk is exacerbated by ground and surface water entering cracked and damaged pipes, or cross connections between storm and foul sewer pipes - the result of an incomplete sewer separation programme. These increased flows, particularly during wet-weather events can lead to overflows at pump stations, manhole overflows, and backing up of household drainage.

The Council is currently developing flood hazard maps to increase our knowledge and enable us to target improvements in areas of potential network overflow, over-land flow paths and properties at risk.

There are also some low-lying areas where saltwater currently enters our wastewater network and can affect biological wastewater treatment processes.

Impact on the Environment

The Council currently spends over $300,000 per year on environmental and ecological monitoring of its water, wastewater and stormwater activities.

We monitor the impacts of the three waters activities from source to sea, with over 100 individual sampling programs. These range from residual flow monitoring at our fresh water intakes to the analysis of shellfish at stormwater outfalls to assess the accumulation of contaminants in the food chain. Additionally, 8 separate sites around the Dunedin coastline are monitored specifically for bathing water quality.

The completion of stage 2 of the Tahuna upgrade project, planned for 2011, will see over 99% of Dunedin's reticulated domestic wastewater and 100% of its trade waste receiving secondary treatment and UV disinfection prior to discharge. Since the commissioning of the Tahuna long ocean outfall in January 2009 (stage 1) there have been no closures of the local beaches due to wastewater contamination.

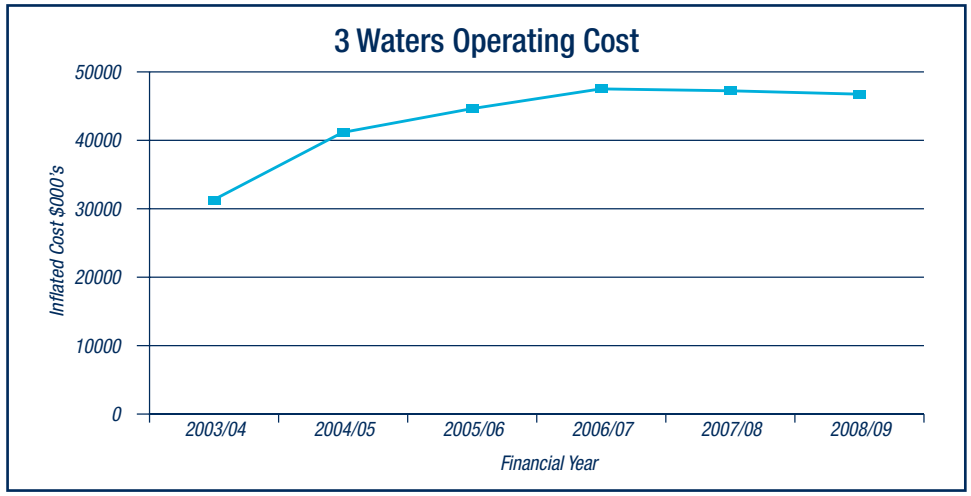
Customer Service

Our customer research indicates that on average 74% are 'satisfied' or 'very satisfied' with water services, with 60% and 65% 'satisfied' or 'very satisfied' with wastewater and stormwater services respectively. Only 12% of customers expressed 'dissatisfaction' with our water service with 22% and 16% dissatisfied with our wastewater and stormwater services respectively.

Our customers do occasionally experience interruptions and we feel that it is important to restore service rapidly following a pipe burst or break. We ensure that the average duration of an unplanned shutdown in our network is consistently less than 90 minutes. Approximately 70% of water main bursts and foul sewer overflows are responded to within an hour.

Cost

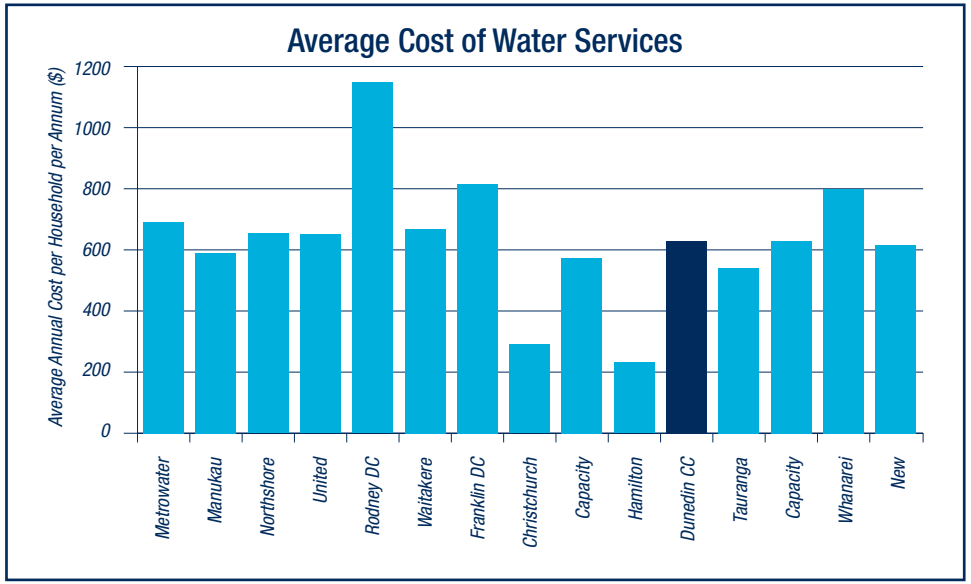
We recognise that the cost of our service is of real concern to customers. The combined cost of water and drainage rates has increased by $200 in real terms over the past 5 years. This is the result of significant investment to improve drinking water and wastewater quality. Over $137 million has been invested in infrastructure renewals and upgrades over the same time period, resulting in a 50% increase in operating costs.



Our operating costs peaked in real terms in 2007 and have decreased year on year since (left). Despite these significant increases in costs, Dunedin's water and waste services are still cheaper than many other similar cities elsewhere in New Zealand (below) and we aim to keep both our water and drainage rates below 1% of median income.

We continue to seek efficiencies in our operations to minimise costs to our customers and ratepayers. Recent initiatives have included investigating how we can use water from different catchments to balance pumping and chemical treatment costs.

However, a high proportion of our operating costs are fixed, with approximately 39% being depreciation and loan payments.



Source: NZ Water Industry Performance Review 2008

The Challenges We Face

Climate Change

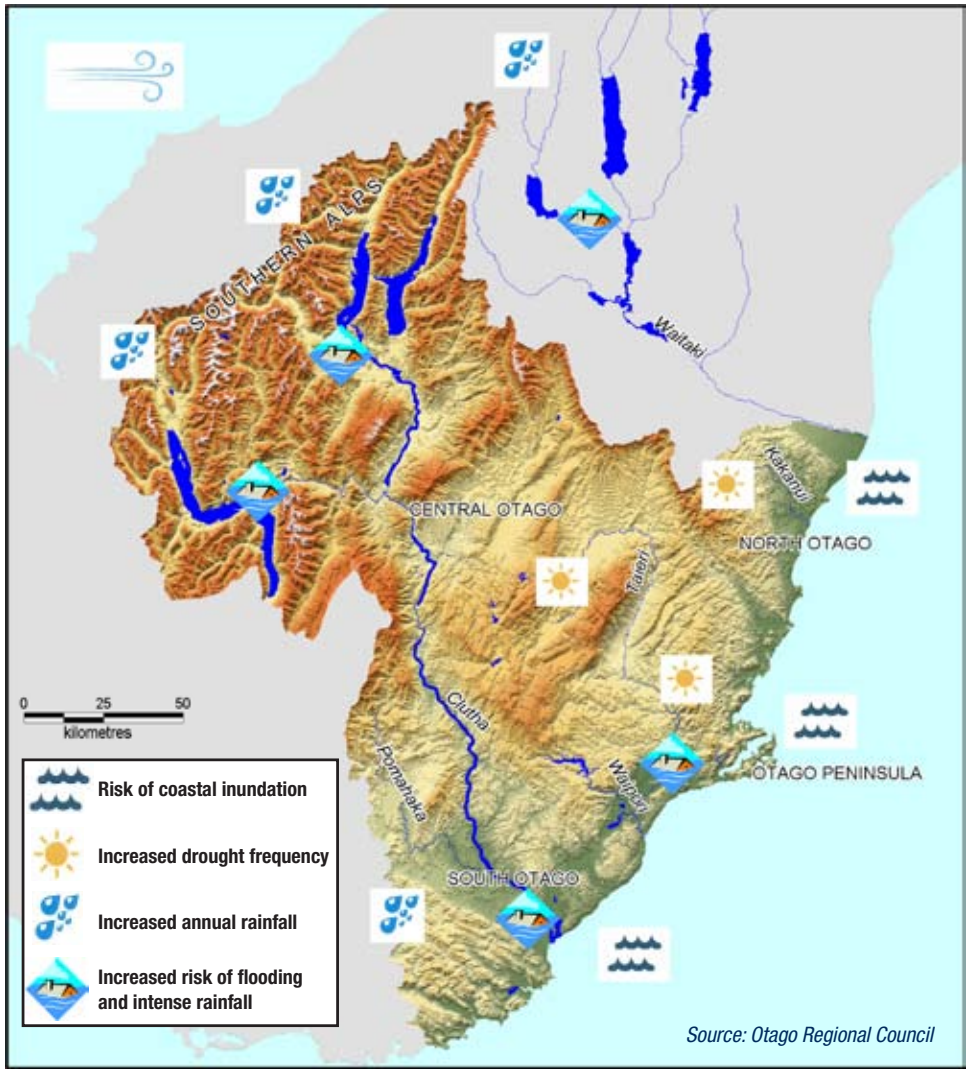
There is increasing scientific certainty that the climate is changing on a global scale which in turn is reflected in changes to national, regional and local weather patterns.

It is predicted that Dunedin's climate will become drier for extended periods with increased mean temperatures and daily temperature extremes. Rainfall events are likely to become heavier but less frequent and sea-level is predicted to rise with increased occurrence of associated storm surges.

The Intergovernmental Panel on Climate Change (IPCC, 2007) predicts that mean sea-level around the Dunedin coast could be subject to a rise of up to 0.59m by the mid 2090's with a further 0.2m rise if the rate of ice sheet melt increases. Although IPCC predictions are among the more conservative, a rise of this magnitude would leave substantial areas of the city vulnerable to coastal inundation and a number of key assets susceptible to saltwater intrusion.

Dunedin may be at particular risk to the effects of sea level rise as it has significant areas of low-lying land (page 13), some of which is reclaimed. A lack of strategic raw water storage capacity (currently no more than 20 days) also leaves the City vulnerable to the impacts of climate change.

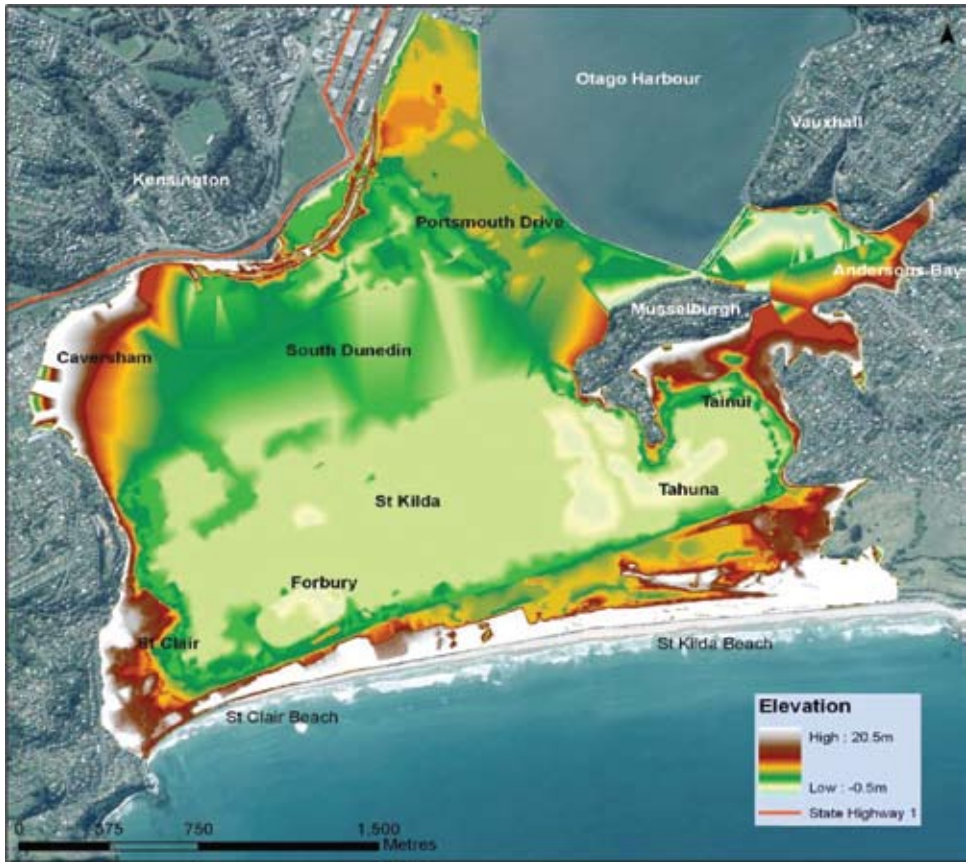
These challenges highlight that we need to increase the flexibility in the way we operate in order to maintain the level of service that our customers expect from us and reduce the vulnerability of our assets.



Source: Otago Regional Council

Climate Change Scenario	Potential Impact for the Three Water Activities
Increasing heavy rainfall events	» Increased runoff causing poor water quality and therefore higher treatment costs. » Increased pressure on stormwater and wastewater systems, flooding, pollution and heavier reliance on pumping.
Extended dry periods	» Reduced catchment yield and increased peak demand places pressure on ability to supply. » Increased fire risk in catchments. » Decreased average river 'low-flows' leading to increased competition for water, changes to resource consents, degradation of wetlands.
Sea-level rise	» Saline intrusion impacting on wastewater treatment processes and network corrosion. » Loss of assets through coastal inundation. » Change in location of residential population.
Increasing mean temperature	» Increased demand for water, higher rates of evapotranspiration, increased odour problems.

The IPCC defines vulnerability to climate change as *'the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes'*. Adaptation strategies that manage climate change uncertainties are therefore becoming a necessary part of any asset planning decisions regarding three waters service delivery.



Source: Otago Regional Council Data

The rate at which climate instability will impact upon the three waters activities is uncertain. As a result we must be able to adapt to change on a number of different levels. The three key levels are:

1. **Reactive:** Management of immediate risk or actual event occurrence (a flooding event for example).
2. **Planned:** Short term management of seasonal changes in climate through alterations in operational procedures.
3. **Strategic:** Ensuring that future capital investment is designed to be resilient to the impacts of climate change.

Our Planning Assumptions for Climate Change

We will use the best available climate science to underpin our planning. Currently we are using guidance from the Ministry for the Environment which is based on IPCC Fourth Assessment 2007 predictions.

Under this scenario, the following changes are predicted to occur by 2090 in the Otago region:

- Sea level rises of 0.5m to 0.8m (no upper bound)
- Temperature rise of 2.1°C (range of 0.8°C to 4.6°C)
- Winter rainfall change of 7% (range of -16% to +24%)
- Summer rainfall change of 0% (range of -29% to +19%)
- Increased frequency of intense storms (potentially 4 fold)

We will continue to monitor the evolution of climate change predictions and regularly review our planning assumptions against the best available data.

We will continue to design to current standards for sewer capacity, but will adopt any new industry standards in this area as and when they arise.

In our planning processes, we will use design storms that take into account best estimates for future rainfall intensities.

We also recognise that we are likely to experience indirect impacts of climate instability. These may include changing land use and its effects on surface run-off, and changes to industry and the subsequent effects on the nature and volume of water consumption and discharge. These feedbacks to the system are not presently well understood.

It is also important that we consider climatic instability holistically as we plan the provision of Dunedin's three waters services. This will help to ensure that mitigating actions are planned against entire scenarios rather than individual impacts.

Peak Oil

There is growing concern that global oil prices will rise dramatically once 'easy to reach' deposits have been used up and demand for oil outstrips supply. Many predictions suggest that the global peak in oil production will occur in the next few years with around 60% of oil producing countries having peaked already.

The three waters activities depend on oil and oil-based products in order to deliver core services. Oil is not only used to produce the fuels we consume such as petroleum; it is also a key constituent of a wide range of plastics and other synthetic materials used by the three waters activities. Unless alternatives are found, the increasing cost of oil will have consequential impacts for the cost of the three waters services.

Fortunately New Zealand is well placed to take advantage of renewable energy sources such as solar, hydro, geothermal and tidal power, which may be used as alternatives to fossil fuels in energy production.

However, oil forms a part of nearly every supply chain in some form, therefore the potential for dramatic fluctuations in oil prices, and the subsequent effects on the price of goods and services should not be under estimated.

Population Change

Much of Dunedin's water and wastewater infrastructure was designed during periods of rapid population and industrial growth and was consequently designed and built with additional capacity for the future.

Although areas such as the Taieri Plains are currently experiencing moderate growth, population for much of central Dunedin is forecast to remain relatively static and some areas expect population decline. This creates some specific challenges for Dunedin City, both with potential for stranded infrastructure and limitations on affordability of service improvements and maintenance of the existing infrastructure.

A continuing decline in 'wet' industry and a stable population, coupled with the systematic separation of the stormwater network from the foul sewer has led to a situation where normal flows can be insufficient to cleanse the pipes, allowing sediment to build up and causing sewer blockages. Significant changes in the volume and nature of wastewater, particularly through industry closure can lead to operational inefficiencies in wastewater treatment plants, which are designed for particular volumes and contaminant levels.

Whilst the population served is growing relatively slowly, the service area and number of residential connections is increasing at a faster rate, following the continuing trend for fewer occupants per household. Many of the identified growth areas are on flat land, where increased use of pumping would be required to avoid flooding.

New Zealand currently has agreements in place to permanently house climate change refugees from some neighbouring Pacific Islands. The United Nations has predicted that by 2050 climate change refugees worldwide may reach 150 million. It is unclear whether climate change refugees will have a significant impact on the population of Dunedin, therefore whilst we recognise this scenario we do not actively plan for it.

In light of such uncertainties, and the high cost of infrastructure, we must ensure that future urban design plans take account of water supply and drainage issues, and ensure that our infrastructure planning is flexible enough to adapt to different scenarios, whilst being affordable to current and future communities.

Our Planning Assumptions for Population Change

(Based on 2006 Census data)

Annual net new connected households to 2041

Water	312
Wastewater	293
Population growth 2010 to 2060	11%
Persons per household in 2010	2.52
Persons per household in 2060	2.26
Average household consumption in 2010	554 litres/day
Average household consumption in 2060	497 litres/day
Average total household demand in 2010	29,447,000 litres/day
Potential total household demand in 2060 (without demand management)	32,719,000 litres/day

Ageing Infrastructure

A key impact of Dunedin's modest growth is the constraint that it places on funding for the renewal and replacement of ageing infrastructure, parts of which date back to the 19th Century. The nature of Dunedin's growth over time meant that large quantities of network infrastructure were built over a short time period. Assets that were built at the same time generally require renewal at the same time, causing peaks in renewals cost.

Over 50% of our network is expected to reach the end of its useful life and require renewal by 2060, at a cost of over $820 million. With the cost of treatment infrastructure included, and excluding any additional costs associated with climate change or rising oil prices, the Council will need to invest over $1 billion to maintain current levels of service for the next 50 years.

Our knowledge of the location, material type, age and capacity of our network assets is generally good. However, due to the difficulties of assessing underground infrastructure our understanding of asset condition is currently poor. We are however beginning to understand the extent to which this ageing network is impacting on levels of service by analysing the association between performance and asset condition data.

Moving forward we need to understand which assets are most critical to maintaining the delivery of service and use this information to drive pro-active condition assessment. A key challenge will be to smooth the cost of renewals, and target renewals to areas where they will give the greatest benefits.

Key Planning Assumption for Infrastructure Investment

» The community will be willing to pay for reasonable investment in supporting technology, systems and processes to enable the three waters activities to at least maintain delivery of current service levels.

Legislation

Central Government has recently initiated a review of several pieces of legislation including the Emissions Trading Scheme (ETS) and the Resource Management Act (RMA).

Although the three waters activities are not currently included in the scope of any ETS proposal, they are likely to be consequentially affected. These may include: rising energy and material costs as polluting industries pass on the charges imposed by the scheme, pressure to increase forestry on catchment land to acquire carbon credits, and the rising costs for disposal of treatment sludge to landfill.

Changes in the RMA will affect all water utility providers and are likely to drive further legislative reform locally through the Otago Regional Council (ORC) Plans. Recent ORC Plan changes have placed great emphasis on limiting water use to within its local catchment and increasing the efficiency of water use. We are starting to see this increased focus on water conservation being incorporated into our resource consents. For example, our Mosgiel water take consent requires us to reduce unaccounted-for water to 10% by 2015.

We are also anticipating that increasingly stringent conditions will be applied when we review consents to discharge to the environment.

Key Planning Assumptions for Legislation

- We will comply with all statutory and regulatory requirements.
- Current resource consents will not be contested prior to their scheduled renewal date.
- Environmental legislation will continue to become more stringent as new technology enables better environmental practices.

Industry Structure and Governance

In conjunction with the RMA reform, Central Government is developing options for a new governance system. This has lead to the formation of an Environmental Protection Authority (EPA) 'Te Mana Rauhā Taiao', which became effective in October 2009. The EPA is a statutory office housed within the Ministry for the Environment under the Secretary for the Environment.

The EPA's principal function is to centralise and streamline the decision making process relating to nationally significant proposals. The organisation will drive improved environmental, economic and social outcomes through central governance, resource allocation and water management.

Locally, Dunedin City Council is also undertaking a governance review of the three waters activities. The options of a Council Controlled Organisation or Council Controlled Trading Organisation are being considered alongside options for improving service delivery whilst keeping core activities within the Council.

Key Planning Assumption for Industry Structure and Governance

The structure of the water industry nationally will continue to evolve, and will increasingly emphasise prudent financial management, environmental stewardship and public accountability.

Community Priorities

The community is central to the way we have planned our Strategy and we have consulted with our stakeholders to help us understand their priorities.

How we have engaged with stakeholders and the community

We have consulted with a range of stakeholders. This included:

- 3 workshops with stakeholders representing environmental, social, cultural and economic interest groups.
- 2 workshops with other Dunedin City Council departments and the Otago Regional Council.
- Meeting with all 6 community boards.
- Engaging in individual discussions with special interest groups.
- Conducting telephone surveys with 600 domestic customers.
- Meeting regularly with Kāi Tahu ki Otago.
- Attending the Environmental Hui 2009.
- Making use of the annual Residents' Opinion Survey results, the outputs from past Well-being forums and the recent Dunedin City Forum.

Our community expect us to maintain our quality of service and manage future challenges such as climate change and rising energy prices.

The provision of safe drinking water at an acceptable cost was the single highest priority from quantitative customer surveys. It is clear that we need to consider carefully the costs and benefits of investments, especially where they lead to a permanent increase in customer bills.

We do not expect to see substantially stricter drinking water quality standards in the medium term. Therefore, we believe that the completion of our existing programme of treatment plant upgrades will provide treated drinking water to acceptably high standards.

We will continue to use public health risk management plans to manage risks around drinking water safety, and we will target investment in water main renewals to improve localised problems with discolouration of drinking water.

Have Your Say…

Visit the DCC website

www.dunedin.govt.nz

to give us feedback on the

3 Waters Strategic Direction Statement

Householders Priorities

A representative sample of 600 Dunedin households were asked in a telephone survey to prioritise the issues identified in the stakeholder workshops. The relative priorities, based on pairwise analysis are shown above.

The water environment, particularly the harbour and beaches, is highly valued by our customers and stakeholders for its recreational, environmental and cultural values in addition to the economic potential for fisheries and tourism. There is a strong desire from the community to improve the quality of stormwater and wastewater discharges and, where possible, cease discharges to rivers and the sea.

With the completion of Stage 2 of the Tahuna upgrade project in 2011 approximately 99% of Dunedin's reticulated wastewater will receive secondary treatment and Ultra Violet disinfection before being discharged. The focus for the future is therefore on improving the quality of stormwater and improving the performance of our rural wastewater treatment plants.

Both the qualitative and quantitative research showed strong support and concern about reducing the demand for water. The business community in particular was keen to see economic incentives for reducing water consumption, whereas other stakeholders were keen to see greater education on the value of water and opportunities to reduce domestic water use.

The survey also indicated that there was general support for wider scale opportunities for use of 'low quality' water for purposes where drinking quality water was not required. Some stakeholders were also keen to see greater consultation over the use of chemicals such as chlorine and fluoride.

The need for the Council to reduce network leakage and other system losses, as well as to provide greater storage to balance peaks in demand was also a priority for several stakeholders.

The stakeholder groups recognised that in the face of climate change and increasing energy costs, it was likely to become increasingly expensive to maintain existing levels of service. Many stakeholders felt that the system could be managed 'smarter' to offset some of the increasing costs. In particular, opportunities to reduce cost by generating green energy or finding beneficial use for waste materials such as sewage sludge were particularly supported.

Stakeholders from rural communities tended to want a more flexible approach to providing water and wastewater services which balanced the resilience of small, local schemes with the cost efficiencies of larger, centralised systems. Rural stakeholders also tended to want the Council to gain a wider understanding of other water users in the catchments and seek out cost effective opportunities for better sharing of increasingly scarce water resources to deliver a better overall outcome for the community.

The qualitative research showed that stakeholders would like the Council to take a more active role in educating the community on issues relating to water, wastewater and stormwater management. In particular, they recognised the importance of individual responsibility and wanted the Council to advocate and educate in the areas of domestic water use, septic tank management and alternative technologies such as grey water recycling.

Stakeholder discussions have identified that the community would like to see a greater degree of integration in the management of the three waters. This includes greater integration between Council functions such as planning policy, building control and water and waste services. In particular, there was a strong desire to see more effective use of a range of controls to prevent water and waste management problems at source, rather than treating the effects.

There was also a desire to see better co-ordination between the City Council and the Regional Council and to develop holistic, catchment based management strategies that span the traditional boundaries of Council responsibilities for more effective outcomes.

Māori Perspective

Throughout the strategy development process the Council has engaged in discussions with Kāi Tahu ki Otago to understand key cultural concerns regarding the future management of the three waters.

The primary management principle for Māori is the protection of Mauri (life force) from degradation. Maintaining the integrity of Mauri is important for the physical and spiritual health and wellbeing of people and the vitality of Māori culture, values, beliefs and practices.

Early Māori settlement in the Dunedin area means there are many culturally significant and sacred places of Kāi Tahu whānui. Many of these are connected to the natural environment, and therefore are likely to be exposed or vulnerable to development of three waters services and activities.

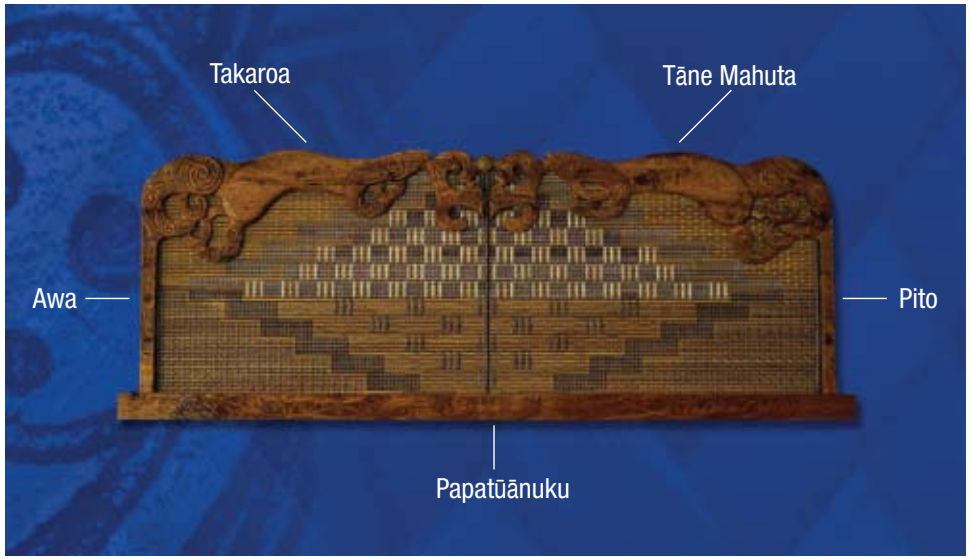
Specifically, discharge of treated wastewater to the sea and land is of high concern because coastal waters and kaimoana become vulnerable to contamination. Stormwater discharge raises similar concerns.

In addition, some wastewater sites are near old burial grounds and this negatively impacts the integrity of wāhi tapu (sacred places).

Low or obstructed in-stream flows (e.g. from water abstractions or structures) can affect the spiritual value of water, mahika kai, aquatic biota and water quality, if they are not managed sustainably. The Waikouaiti and Taieri Rivers are of particular concern.

The effects from such activities impact on the ability for Kāi Tahu whānui to access and use a range of natural resources, threaten the continuity of resource use between generations and negatively impact on cultural values.

Kāi Tahu whānui express the desire for wastewater sites and discharges to be re-located away from waterways and wetlands; to maintain continuity of water flowing in rivers and streams; and to ensure holistic management so that cumulative effects of activities are always considered.



Source: KTKO Ltd Natural Resource Management Plan

The intent of the Strategy is to consider whole 'water cycle' systems to enable a holistic approach to water resource management. Therefore, throughout the development process, we have sought alignment between the the Kāi Tahu Ki Otago Natural Resource Management Plan (2005) and the Strategy.

We recognise that the Natural Resource Management Plan is a continuing expression of guardianship, care and wise management (kaitiakitaka) for the Otago region. As such, the involvement of Kāi Tahu whānui in developing the strategy is seen as essential in guiding our consideration of cultural priorities and perspectives relating to the long-term management of three waters.

Key Strategic Issues

There are a number of key issues that will need to be managed in order to avoid undesirable impacts on service performance and community outcomes in the coming years and decades. The table opposite highlights these issues as they are today, under the future scenario with no strategic interventions, and under the future scenario resulting from implementation of the Strategy. It also identifies the strategic priorities that address the issue in question.

In determining the core elements of the Strategy, we have considered the key issues and challenges, in consultation with customers and other stakeholders, so as to balance service, risk and the impact on customer bills.

The choices we have made recognise that Dunedin's limited growth does not provide the same economic drivers to promote environmental initiatives that reduce demand for our services. As such, we need to take a more conservative approach that recognises the sunk costs in our existing infrastructure and makes best use of it to achieve our goals of delivering a reliable supply of clean, safe drinking water and effective wastewater services, in order to support the community outcomes of safe and healthy people, sustainable city and environment and wealthy community.

The strategic approach also recognises that the issues and future challenges are not independent of each other, but rather are a web of interrelated problems and opportunities. Consequently, the Strategy is integrated, with strategic priorities delivering benefits across multiple issues and drivers.

Issues	Current situation 2009/10	Future scenario under 'status quo'	Future scenario if the Strategy is adopted and implemented	Relevant strategic priority (see following page)
Security of Supply (drought)	A maximum of 20 days raw water storage at restricted supply, water restrictions for up to 2 months per year in most areas.	Moderate to high risk associated with a likely increase in frequency and severity of water restrictions.	Smarter management will ensure that water restrictions do not increase and new demands on the water supply will be met from existing sources.	1
Leakage	Estimated at approximately 15%, very low data confidence and little proactive means to measure, locate or control leakage.	Moderate risk associated with a likely rise in costs from water losses; need to exploit new sources, strained relationships with other water users competing for consent to take.	Economic level of leakage determined, zone metering and pressure management allows losses to be reduced.	1
Risk of Critical Infrastructure Failure	A number of 'single point dependencies' exist with the potential for large areas to experience prolonged water outage.	Very high risk associated with possibility of critical asset failure and subsequent water outages continues.	Risk is significantly reduced through criticality assessment and built-in flexibility.	2
Stormwater Contamination	Historical cross-connections and design overflows, diffuse heavy metal, PAH and bacteriological pollution from construction materials, roads and agricultural land.	Very high risk associated with further receiving environment degradation, prosecution under the RMA and cultural and community relationships damaged.	Known cross-connections and design overflows resolved, urban planning and 'green engineering' reduce diffuse pollution, healthier waterways and coastal environment.	4
Foul Sewer Overflows and Flooding	Cross-connections and cracked pipes result in foul sewer overflows, and habitable floor and urban area flooding during intense rainfall events.	Very high risk associated with increasingly common flooding and overflows, exacerbated by a predicted increase in rainfall intensity, urban development and network deterioration.	Targeted network renewals, upgrades and smarter urban planning help to alleviate the increasing pressure on the network and control flooding and overflows.	4, 5
Affordability	The cost of our service is comparable to our peers, historic underfunding of depreciation has left the need for considerable capital investment over the next 20 years.	Moderate to high risk that level of service will decline to maintain current affordability and underinvestment will continue whilst high reliance on oil based products may drive up costs.	Smarter renewals and maintenance planning will allow current service levels to be maintained at current affordability, whilst limiting supply chain vulnerability stabilises costs against rising oil prices.	3, 5, 6, 7

Key Strategic Priorities

Strategic Issues

Security of water supply (drought) • Leakage • Risk of Critical Infrastructure Failure • Stormwater Contamination • Affordability • Foul sewer overflows and property flooding

Our Activities Today

Low confidence in leakage and domestic water consumption data.

Good drinking water quality, with reasonably high customer satisfaction.

Improving beach quality with completion of Tahuna stage 2.

Stormwater quality problems exacerbated by cross connections and overflows from foul sewers.

Property flooding and sewage spills to the environment during wet weather events.

Key Strategic Priorities

1. We will meet the water needs of the City for the next 50 years from existing water sources.
2. We will be able to adapt to a variety of future scenarios for climate change and fluctuations in population.
3. We will reduce our reliance on non-renewable energy sources and oil based products.
4. We will improve the quality of our discharges to minimise the impact on the environment.
5. We will ensure that, as a minimum, key service levels are maintained into the future.
6. We will limit cost increases to current affordability where practical.
7. We will adopt an integrated approach to management of the three waters and embrace the concept of kaitiakitaka.

The Challenges We Face

Climate change will increase likelihood of heavy rainfall events and extended dry periods.

Possible sea-level rise of around 0.8m by 2100.

Relatively stable population with declining wet industry.

Ageing infrastructure.

Increasing costs of energy and oil based products.

Changes to industry structure and governance at a national level.

Community Priorities

"Carry on providing high quality drinking water at acceptable cost"

"Work smarter to reduce costs"

"Make systems more flexible and resilient"

"Manage the future challenges of climate change and rising energy prices"

"Maintain quality of service"

"Consult more on water and waste issues"

"Educate the community on water and waste issues"

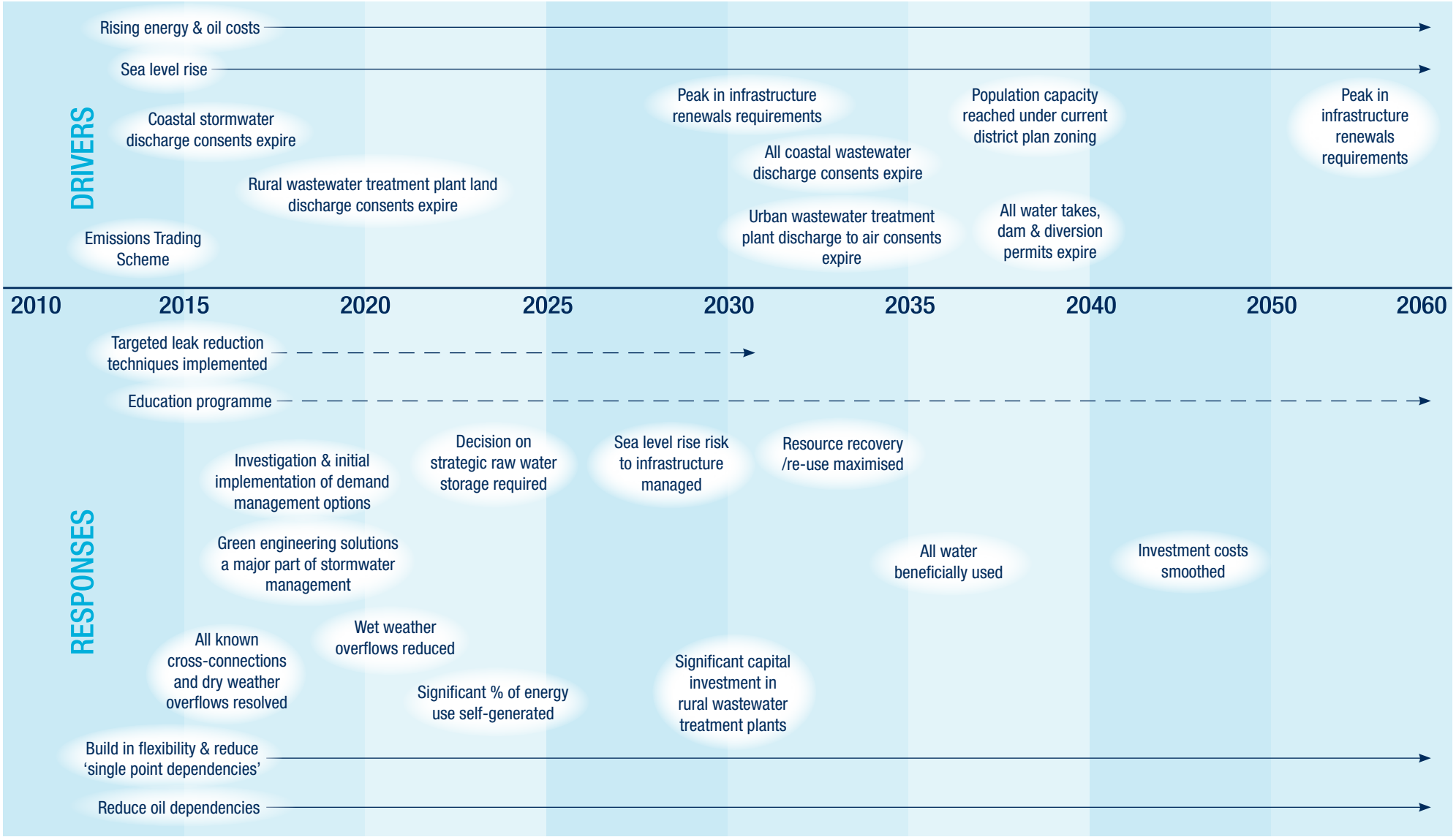
"Improve the quality of wastewater and stormwater discharges"

"Reduce demand for water"

"Manage water and waste holistically"

"Provide economic incentives for businesses to conserve water"

Strategic Timeline



Our Strategy for the Next 50 Years

1. We will meet the water needs of the city for the next 50 years from existing water sources.

- The Council will lead the way by reducing system losses to economic levels.
- The Council will help, educate and incentivise consumers to waste less water.

We recognise that water is a scarce resource and that the effects of climate change, together with the potential increase in Dunedin's population will only increase its scarcity.

Despite these challenges we are committed to meeting the water needs of the city for the next 50 years from our existing sources. This will enable us to limit the pressure we place on the natural environment and maximise the availability of water for other users.

Using water more efficiently

Water can be wasted in many different ways by both the producer and the consumer. To demonstrate that the Council are committed to using water more efficiently, we will reduce our system losses to sustainable economic levels by 2020.

We will target network leakage through better water accounting techniques and reduce it through better management of system pressure. Unnecessary production losses can be addressed through metering and auditing the water treatment process.

We will also be identifying ways to encourage the community to value water and help customers use water more efficiently. Initially this will be achieved through educating customers on the most common areas where domestic wastage occurs and how to prevent it.

A comprehensive study into demand management options will identify cost-effective ways to encourage water conservation. These may include promoting options such as rain water harvesting or other price incentives where deemed effective.

Challenges addressed:

- Climate change
- Population change

Issues Addressed:

- Security of Supply (drought)
- Leakage

Success Indicators

- Increased confidence in raw and treated water loss data from 'uncertain' to 'reliable'
- Reduction in average household water consumption

Short-term Actions	Additional Rates Requirements
Audit water processing losses	-
Complete bulk metering program	-
Calculate economic level of leakage	-
Analysis of demand management options	$0.95 for 1 year
Potential Future Requirements	

» Targeted leak reduction programme
» Demand management option implementation e.g.
  » Additional community education;
  » Universal metering / volumetric pricing
» Pressure zone management programme
» New strategic raw water storage
» Elimination of raw water overflows	

Short-term actions = *those that this strategy commits to implement/initiate within the LTCCP term.*

Potential future requirements = *actions which may or may not be identified as necessary following implementation of short term actions.*

Additional rates requirements = *required increase per full water charge to fund the proposed action. (Note that $50k on operating costs equates to approximately $0.95 per rated water user.)*

2. We will be able to adapt to a variety of future scenarios for climate change and fluctuations in population.

- We will increase the flexibility and resilience of our infrastructure to reduce the risk of prolonged service interruptions.
- We will ensure that where possible, new infrastructure is scalable to allow for increases or decreases in demand.

Flexibility and resilience

Dunedin is a dry region by New Zealand standards and we recognise that our limited water storage leaves us vulnerable to prolonged drought conditions. Whilst initially we will focus on reducing our need to take water through increased system efficiency, we will also investigate the options available for increasing resilience to drought, natural hazards and failure of critical assets.

These options may include: ensuring that there are multiple points of water supply and wastewater treatment for different areas and hence reducing the 'single point dependencies'; incentivising local or community storage options; or increasing strategic raw water storage.

Increasing the flexibility of the stormwater and wastewater networks is also a key part in the Strategy as it will enable us to better cope with extreme rainfall events and provide for shifting commercial and domestic demand patterns.

Scalable technology

Water and wastewater infrastructure typically has a lifespan in excess of 50 years. Variations in demand on the system over such large time periods are inherently difficult to predict, particularly when significant uncertainties surrounding climate change and population exist.

As a result, wherever practicable we will ensure that new infrastructure installations are able to be scaled to meet changing demand without compromising immediate performance.

Challenges addressed:

- Climate change
- Population change
- Peak Oil

Issues addressed:

- Risk of critical infrastructure failure.

Success Indicators

- Database of highly critical and or vulnerable / assets

Short-term Actions	Additional Rates Requirements
Conduct an asset criticality assessment	-
Asset vulnerability assessment (climate change)	-
Potential Future Requirements	
» Wastewater treatment plant relocation. » Invest in areas of network with 'single point dependencies' » New strategic raw water storage	

3. We will reduce our reliance on non-renewable energy sources and oil based products.

- We will prioritise the use of energy efficient technology.
- We will generate renewable energy from our network, catchments and other resources where it is cost effective to do so.
- We will reduce the reliance of our supply chain on oil based products.

The three waters activity relies heavily on oil. Not only is it used in the production of fuel, it is also a major constituent of nearly all plastics and is used in a range of other synthetic products that are part of the process chain for delivering three waters services to our customers.

With growing concerns over the rising costs of oil, we have adopted an approach to reduce our reliance on these non-renewable products. This Strategy protects our customers from the potential escalating costs of oil dependent products and also reduces the carbon footprint of the three waters activities.

Prioritising energy efficient technology

We will prioritise the use of energy efficient technology and low energy solutions in the design of any new infrastructure. We will also investigate ways to run existing systems more efficiently, such as reducing pump usage. Using more efficient technology will enable us to partially offset rising energy costs and, where the energy is from a non-renewable source, reduce our carbon emissions.

Although the three waters activities are not currently included in the Emissions Trading Scheme we will still feel the consequential effects, for example through the disposal of sludge to landfill. Limiting our involvement and reliance on emissions producing activities has both economic and environmental benefits.

Generating renewable energy

The Council is currently developing an Energy Management Strategy. This aims to make a concerted effort in reducing the water and waste service's contribution to climate change through:

- Reducing annual energy consumption by 5% across Council operations by 2015 based on a 2005 baseline.
- Achieving a 20% reduction in CO_2 emissions compared to 2005 by 2012.
- Generating 20% of energy from renewable sources by 2015.

The geography of Dunedin City means that parts of the gravity fed water distribution network operate at very high pressure. Some of these areas may be suitable for the installation of micro-hydro generators which use the high pressures to create electricity. We also have the possibility of utilising post treatment sludge as a resource.

As part of Stage 2 of the Tahuna upgrade project, we are investigating an integrated energy system where the treatment process could be used to generate methane gas or produce sludge to be incinerated directly as a fuel.

We will conduct a series of feasibility studies for these options and also investigate the economic potential for other resource recovery and re-use, such as road grit and heavy metal recovery from wastewater treatment plants.

Reducing reliance on oil based products

We recognise that we have significant dependencies on oil throughout our supply chain and services.

Initially we plan to carry out a supply chain vulnerability audit to establish precisely where and how significant these dependencies are. This will enable us to find practical ways to adapt our material choices and operating procedures to reduce such dependencies.

Challenges addressed:

- Peak Oil

Issues addressed:

- Affordability

Success Indicators:

- Reduction in energy consumption per unit of demand
- Areas of supply chain vulnerability are identified and mitigation plan completed.
- Increased percentage of energy from renewable sources.

Short-term Actions	Additional Rates Requirements
Incorporate energy efficiency considerations into the project prioritisation process	-
Supply chain vulnerability assessment	-
Investigation into the Tahuna sludge to energy options	-
Feasibility study of quick win options for renewable energy generation	-
Potential Future Requirements	

- Further investigation into resource recovery/reuse programmes
- Implementation of resource recovery/reuse programmes
  - Implementation of renewable energy generation projects
  - Additional feasibility studies of energy generation options	

An example of an existing 'micro-hydro' electricity generation project for Nelson City Council

4. We will improve the quality of our discharges to minimise the impact on the environment.

- We will resolve all known cross connections between the foul and stormwater networks by 2015, and have an ongoing programme to disconnect the systems as new issues are identified.
- We will reduce the contaminant load in our stormwater. We will use source control where practical, or otherwise consider effective stormwater treatment.
- We will reduce the number of foul sewer overflows arising as a result of capacity.
- We will assess the long term feasibility of wastewater treatment plant locations prior to individual consent renewal and consider alternatives such as land-based disposal.

Dunedin's reticulated networks discharge raw water, stormwater and treated wastewater to a range of environments including land disposal areas, watercourses, Otago Harbour and the surrounding coastline. The social, cultural, environmental and economic value of these environments is recognised in this Strategy and we are committed to reducing our impact on the receiving environment.

Stormwater quality management

The Council is committed to improving stormwater management. The Strategy places emphasis on improving the quality of stormwater discharges. We recognise that cross-connections between the wastewater and stormwater networks can cause contamination of stormwater discharges, and exacerbate flooding issues from foul sewers. Despite a historic programme of separating the storm and wastewater networks, recent work has identified that some connection points do still exist. We will remove these known cross-connection points by 2015 to improve the quality of stormwater discharges, and have an ongoing programme to disconnect the system as new issues are identified.

Contaminants in our stormwater include heavy metals such as zinc, copper and lead, which commonly stem from vehicle brake and tyre wear, un-sealed roofing materials and corrosion of old paints and pipes. We can also experience high levels of Polycyclic Aromatic Hydrocarbons (PAH's) from petrol, and bacteriological contamination from agricultural run-off and cross connections with the wastewater system.

Wherever possible we will resolve stormwater problems at source through educating the community on problem contaminants, and working across Council departments to target catch pit maintenance programs and promote urban planning that incorporates lower impact design and materials. Where control at source is unlikely to be effective, we will consider sustainable stormwater treatment. Evaluation of management options will be undertaken through the development of integrated catchment management plans which will involve community consultation and input.

Overflows

Most wastewater overflows occur during wet weather, although there are areas where these occur during dry weather due to inadequate capacity. Cross connections from the stormwater network, and groundwater infiltration through cracks in the wastewater pipes and joints can over stress the wastewater system during periods of bad weather. This additional flow can exceed pipe capacity and cause sewage to overflow at manholes or directly into the stormwater system and subsequently to a watercourse, harbour or coastline.

We recognise that this is unacceptable and aim to reduce the number of foul sewer overflows as a result of capacity. We are currently working on options for resolving the known issues, so that we can engage the community in debate on the appropriate improvement targets and associated costs.

Treatment Opportunities

We recognise that our treated wastewater effluent can have both environmental and cultural impacts. In planning to renew discharge consents, we will review the suitability of the location of wastewater treatment plants in relation to their proximity to environmentally and culturally sensitive areas, vulnerability to sea level rise, and the consideration of future opportunities for land-based or other culturally appropriate treatment.

Challenges addressed:

- Legislation

Issues addressed:

- Foul sewer overflows and flooding
- Stormwater contamination

Success Indicators

- Stormwater monitoring shows trend towards meeting guideline contaminant levels
- The number of overflows from the wastewater system is reduced

Short-term Actions	Additional Rates Requirements
Develop and implement Integrated Catchment Management Plans	-
Review of design standards to include 'green engineering' solutions	-
Separation of all known network cross connections	-
Reduce the number of foul sewer overflows arising from capacity issues	Options and costs being developed
Conduct a suitability assessment of the Waikouaiti treatment scheme	-

Potential Future Requirements

- Continued disconnection of the separate systems
- Further works to eliminate wet-weather overflows
  - Investment in stormwater treatment .
  - Increased community education to prevent stormwater contamination.
- Conduct suitability assessments of other rural treatment schemes, which could lead to requirements to upgrade or relocate

Work in progress - sustainable stormwater management initiative currently being constructed as part of a large residential development in Dunedin.

5. We will ensure that, as a minimum, key service levels are maintained into the future.

- We will invest adequately in renewals to maintain the performance of our infrastructure.
- We will plan our renewals effectively to avoid sharp increases in costs.
- We will continue with our planned programme of water upgrades and once completed, maintain our drinking water quality at those levels.
- There will be no increase in the number of residential or commercial properties at risk of sewer flooding, despite increasing pressure on the network.
- We will prioritise our investment based on the community's willingness to pay for improvements and what they are willing to sacrifice as a result.

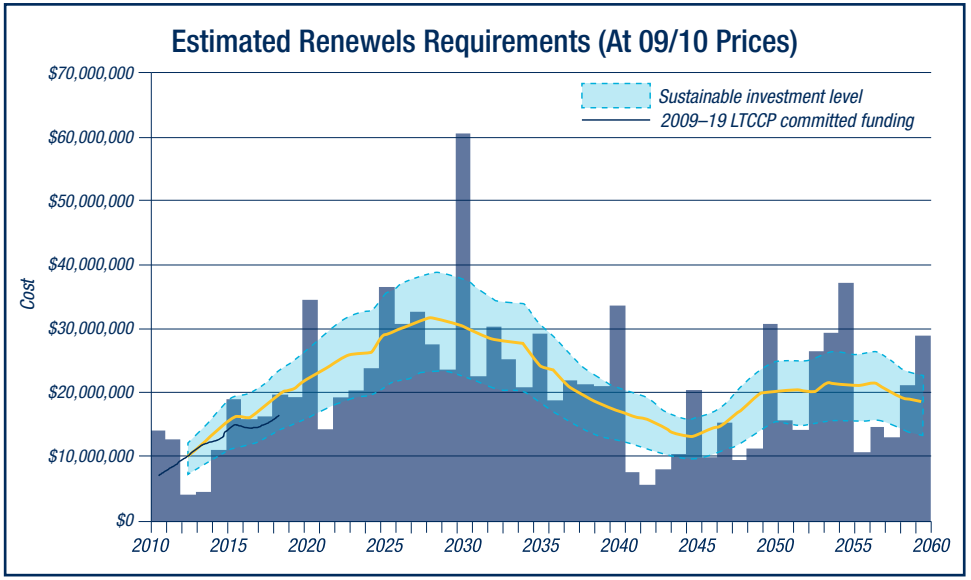
Timely and effective renewal of our infrastructure is key to ensuring that future generations enjoy the same benefits as current communities. However, Dunedin's early history of rapid growth means that, without careful management and forward planning, large amounts of infrastructure will require renewal in a small amount of time. The Council will take a long term (whole of life) view of renewals to avoid sharp increases in costs

In the short to medium-term, renewals spending will need to rise compared to recent years. The 2009 to 2019 Long Term Council Community plan includes a gradual increase in renewals spending across the planning period. These incremental increases will need to continue until a long term sustainable level of investment is achieved. At current costs, this is estimated to be an annual spend in excess of $25 million (right).

We currently have insufficient information on the condition of our assets, and only moderate confidence in our long range financial forecasts. We will continue to improve the confidence in our financial forecasts and work to identify ways that we can extend the life of our assets to reduce the overall cost of renewals.

We recognise that with the increasing costs to maintain existing service levels, and the potential costs associated with meeting the strategic challenges outlined previously, we will need to make trade offs to limit the costs to ratepayers. In preparing the Strategy, we have identified that drinking water quality, property flooding and the quality of wastewater and stormwater discharges are particular priorities for the public. We will therefore continue planned improvements in these areas.

We plan to conduct comprehensive consultation on customer's willingness to pay for further service improvements in these and other areas, as well as looking for areas where customers may accept lower service levels to manage cost increases. Once completed, we will use this information to prioritise our investment accordingly.



Challenges addressed:

- Ageing Infrastructure
- Climate change

Issues addressed:

- Foul sewer overflows and flooding
- Affordability

Success Indicators:

- Stable network condition
- No increase in risk of property flooding

Short-term Actions	Additional Rates Requirements
Research on community 'willingness to pay'	$0.95 for 1 year
Complete planned programme of water quality upgrades	-
Improve renewals programming	-
Potential Future Requirements	

» Increased funding of depreciation
» Increased funding of renewals
  » Investment in flood risk mitigation measures .
  » Trade offs between key and non key service levels	

6. We will limit cost increases to current affordability where practical.

- We will set water rates and charges that provide value for money and that ensure we can finance our services.
- As far as possible, we will meet the investment challenges of the future by driving efficiency in our core service.
- We will build long term visibility of investment needs to allow meaningful debate with the community on affordability.

The challenges of climate change, ageing infrastructure and rising energy prices mean that in the future it will become increasingly expensive to maintain current service levels. We will limit the impact of these cost increases as far as possible by making efficiencies in our core operations.

We currently have insufficient information about the condition and investment needs of our assets. We will therefore continue to work to understand the realistic lives of our assets and where possible, extend asset lives to reduce the cost of renewals. This will also improve the accuracy of our long range forecasting of investment and allow us to engage in meaningful debate with the community on affordability.

In order to maintain affordability in the long term, we need to look at whole of life costs before making investment decisions. Doing this will ensure that we have fully understood the long term impacts on rates and charges including initial capital outlay, asset operating costs and depreciation and loan financing costs.

Challenges addressed:

- Ageing Infrastructure
- Structure and Governance

Issues addressed:

- Affordability

Success Indicators

- Increases in water and drainage costs do not exceed the rate of economic growth.

Short-term Actions	Additional Rates Requirements
Asset condition assessment	-
Completion of proposed drinking water upgrade programme	-
Increasing renewals spending in line with LTCCP to smooth investment peak	-
Potential Future Requirements	
» New capital works to improve/maintain/adapt levels of service » Public consultation on willingness to pay for specific projects » Further increases in renewals spending	

7. We will adopt an integrated approach to management of the three waters and embrace the concept of kaitiakitaka.

- We will consider our activities in the context of the wider water cycle, and recognise the inter-relationships between drinking water, wastewater and stormwater.
- We will work more closely with other water users to understand potential conflicts and opportunities to make more efficient use of water resources.
- We will look for opportunities to implement strategic 'landscape-scale' sustainable drainage schemes as well as encouraging smaller schemes that service particular homes or developments.
- We will work with other stakeholders to simplify management of the three waters activities whilst developing and maintaining an integrated approach.
- We will work more effectively across Council departments to align spatial and water planning processes, so that decisions on the type, design and location of new housing can be made with a good understanding of the requirements for new infrastructure.

We acknowledge our reliance on the natural environment to sustain our economy and society. In order to deliver an integrated approach to management of the three waters, we must understand the natural environment as a whole system; from the sky to the mountains and the rivers to the sea.

Effective guardianship of the water cycle requires co-operation from a wide range of stakeholders. Good working relationships are key to understanding the dependencies of the three waters activities and their subsequent impacts on others.

Catchment & Network Management

Considering our activities in the context of the wider water cycle is fundamental to effective integrated catchment management. In implementing the Strategy, we will seek to strengthen relationships with other resource managers and users to further develop a holistic approach to management and to understand linkages within the water-cycle.

We also need to take an integrated approach to management between the three waters reticulation networks. We are currently developing hydraulic models for our water, wastewater and stormwater networks, due for completion in 2012. This will allow us to model various capital investment and operational scenarios, across all three networks in combination, to determine the impacts and dependencies of the system as a whole.

This will enable us to clearly define problems and, with improved stakeholder relationships, creates opportunities to develop integrated and innovative solutions to manage water and drainage schemes.

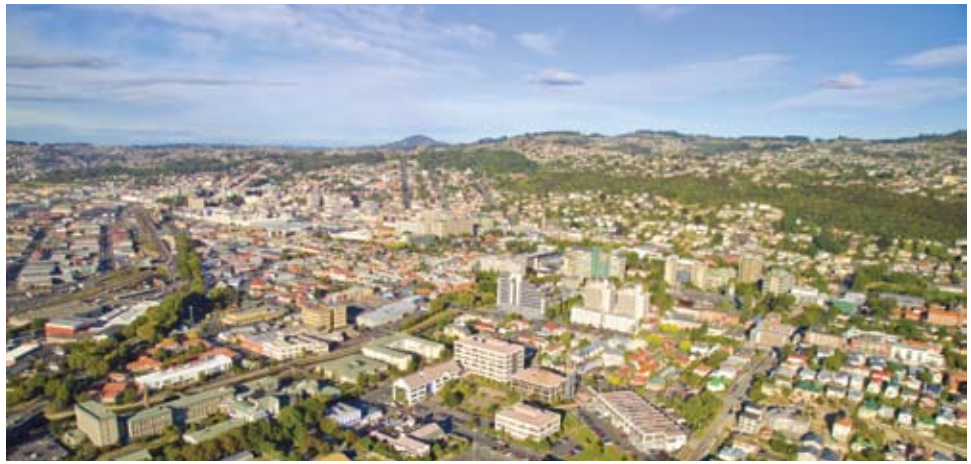
Working together

Decisions made across a variety of Council departments influence the management of the three waters. The importance of communication between different Council departments, and with the Regional Council, should therefore not be understated.

We will take a more pro-active approach to ensure that we maintain ongoing liaison across the Council to enable us to make informed and integrated strategic decisions. In particular, we will work to align spatial and water planning processes to make best use of existing infrastructure, and minimise the costs associated with new development.

This will include adopting a more coordinated approach to the management of networks assets that are not owned by Water and Waste Services, such as road drainage systems and many piped water courses.

We will also initiate discussions with the Regional Council and other stakeholders to clarify and simplify responsibilities for stormwater management.



Challenges addressed:

» Structure and Governance

Issues addressed

» Affordability

Success Indicators

» Improved relationships with other water users.

» Better aligned planning processes

Short-term Actions	Additional Rates Requirements
Improve stakeholder relationships (understanding issues and concerns)	-
Develop and implement integrated catchment management plans	-
Assessment of suitable 'landscape' solutions and sustainable drainage designs	50 cents annually
Potential Future Requirements	

Making the Strategy Work

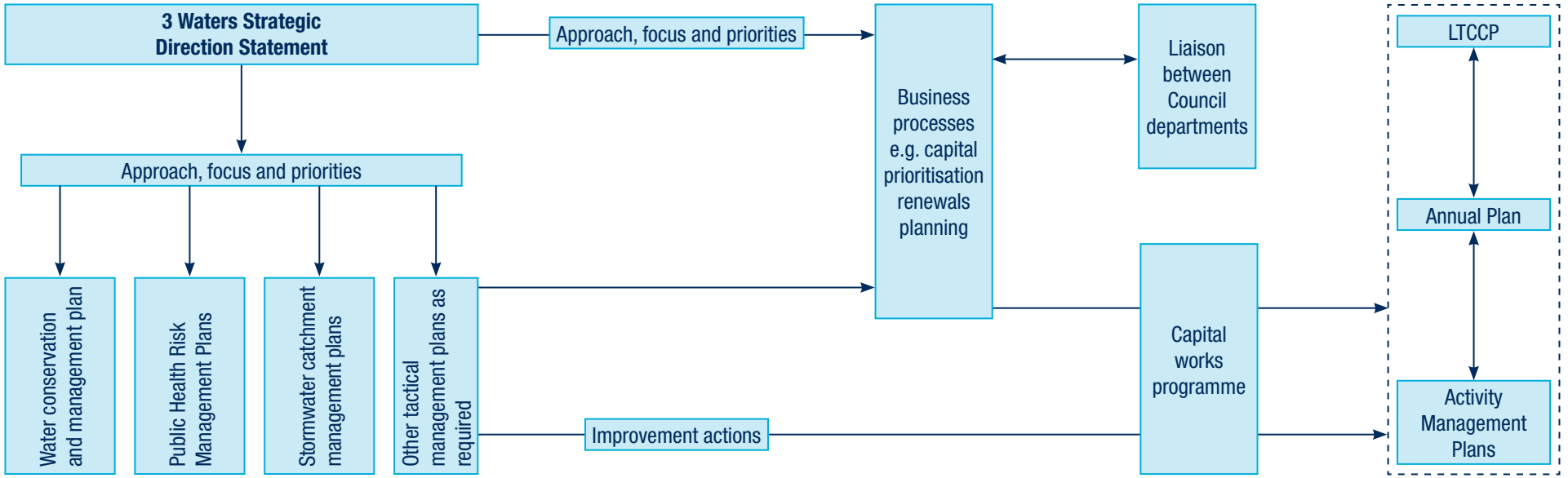
Implementing the Strategy

The Strategy will be implemented by incorporating the principles into tactical management plans. In many cases, these tactical plans already exist and will simply require updating. Where necessary however, new plans will be developed to assist the Council with the implementation of more detailed aspects of the Strategy. In order to be effective, the strategic principles need to be incorporated into day to day business processes, such as investment prioritisation. The Strategy will guide staff across Council when considering issues affecting the three waters and preparing detailed proposals for consideration by the Council.

Where investment is required, plans will be developed in line with the strategic priorities. These will be incorporated into the Annual Plan and Long Term Council Community planning processes.

At all stages of implementation of the Strategy, we will be looking to identify efficiencies by implementing solutions that align with multiple strategic priorities, while also effectively considering the wider social, environmental, cultural and economic implications.

The success of the strategy depends not only on how well it is implemented by the Council, but also on collaboration with the Otago Regional Council and the people of Dunedin.



Monitoring and Review

This Strategy represents the best of our current knowledge and understanding of the challenges that Dunedin City will face over the next 50 years. However, we recognise that the situation is constantly evolving. We plan to formally review the Strategy every 3 years. This will provide an opportunity to review new information on the strategic challenges and realign the strategic direction as community expectations change.

We will monitor the effectiveness of our responses in addressing the challenges that we face, and provide regular feedback to the community through the Council's annual reports. We will continue to refine the most effective places to allocate resources and funding.

Acknowledgements

We have consulted widely in producing our 3 Waters Strategy, and we would like to acknowledge the input of the following organisations in helping us define our future strategy. However, their contributions and inclusion in this list should not be taken as an endorsement of this strategy or any statement within it.

- Cadbury Confectionery Ltd
- Chalmers Community Board
- Chamber of Commerce
- City Forests Ltd
- Connor Consulting Ltd
- CPG New Zealand Ltd
- East Otago Taiapure Management Committee
- Federated Farmers
- Fish and Game, Otago Region
- Fluoride Action Network
- Forest and Bird Society
- Kāi Tahu Ki Otago Ltd
- Mosgiel Taieri Community Board
- MWH NZ Ltd
- NZ Fire Service
- Opus International Consultants
- Otago Peninsular Community Board
- Otago Polytechnic
- Otago Regional Council
- Public Health South
- Ratepayers and Householders Association
- Ryder Consulting Ltd
- Saddle Hill Community Board
- Save the Otago Peninsula Inc
- Speights Brewery Ltd
- Strath Taieri Community Board
- Sustainable Dunedin City Inc
- Transition Towns representative
- Upstart Business Incubator
- Waikouaiti Coast Community Board

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