Christchurch City Council

Wastewater Strategy 2013

Otautahi/Christchurch and Te Pataka o Rakaihautu/Banks Peninsula*

Christchurch City Council

Disclaimer: There is no binding commitment on the Christchurch City Council to proceed with any prospective project detailed in this document. Council spending priorities are reviewed frequently, including through the Council's Long Term Plan (LTP) process. All decisions as to whether or not a project will commence remain with the Council.

Foreword

Our wastewater network is a vital asset for Christchurch and its residents which is why the Christchurch City Council has developed its Wastewater Strategy. Having a resilient and sustainably managed wastewater network protects public health and the environment. It enables growth of our expanding city, and serves the essential needs of our current and future generations.

The Strategy aligns with the Council's other Healthy Environment strategies, in particular the Water Supply and Surface Water 2009–2039 strategies.

The Wastewater Strategy outlines our vision for resilient and sustainable wastewater management for the next 100 years. The Strategy's aim is to ensure that our wastewater network is managed efficiently, effectively and sustainability, with one eye on the present and one eye on the future. It will serve as a guide to the Council's asset management and planning processes surrounding wastewater.

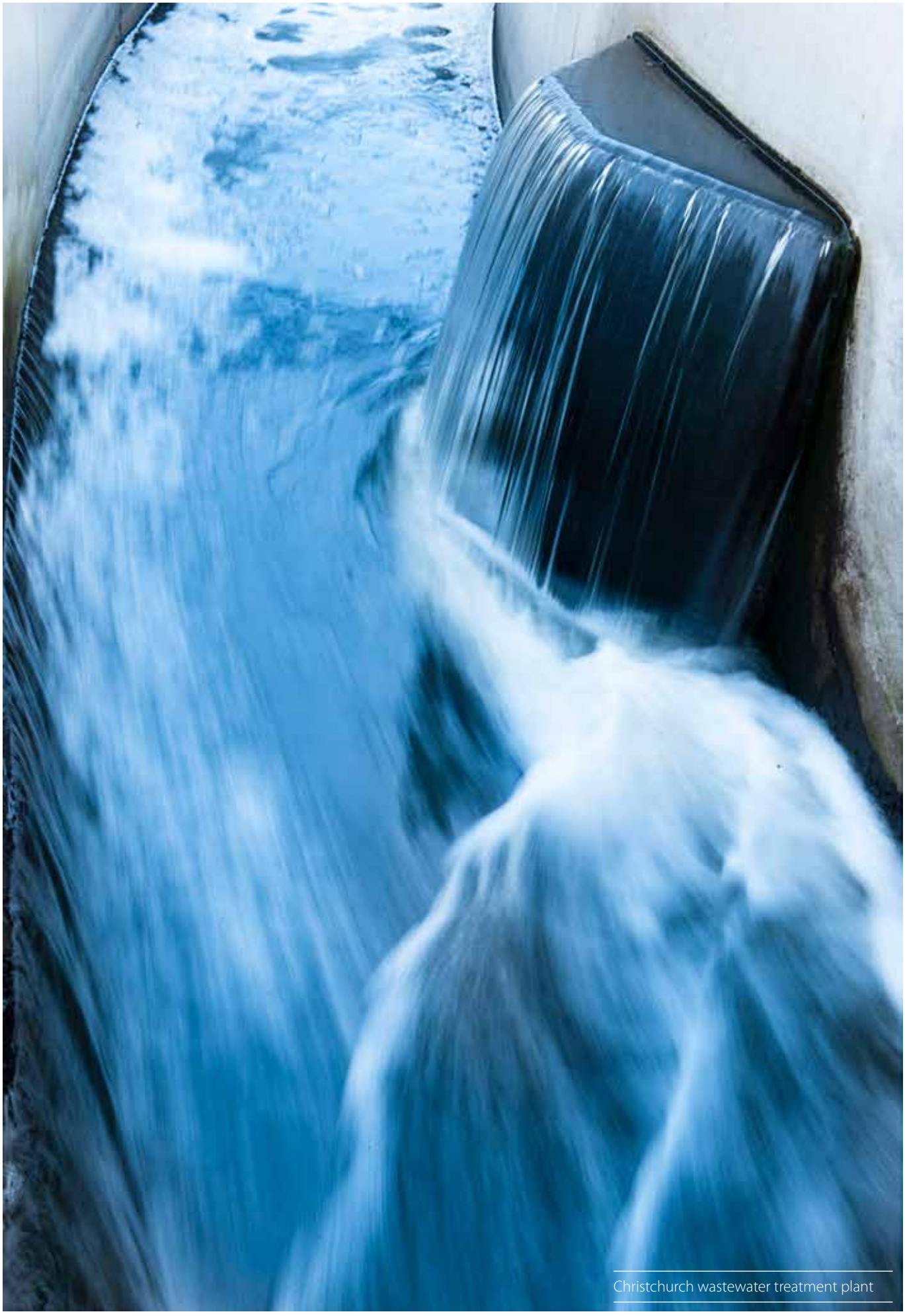
We have a commitment to our Christchurch residents to provide them with a resilient wastewater network that is managed in a manner that supports our vision, and the environmental, cultural, economic and social well-being of current and future generations.

Bob Parker

Mayor

CHRISTCHURCH CITY

Sustainable management of the City's wastewater system is vital to our future.



Christchurch wastewater treatment plant

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Christchurch wastewater treatment plant

Executive Summary

The Christchurch City Council's Wastewater Strategy (the strategy) will guide future asset management, planning and investment processes for the wastewater system.

The strategy applies to the public wastewater system within the jurisdictional boundaries of the Christchurch City Council, including urban Christchurch and Banks Peninsula.

The strategy's aim is to establish the Council's strategic direction for sustainably managing wastewater over the next 10, 30 and 100 years. The Wastewater Strategy is one of the Healthy Environment Strategies developed by Council.

The strategy's vision is for the Council to provide an affordable, reliable, culturally acceptable, ecologically sustainable and resilient wastewater system that protects public health and meets the needs of present and future communities.

The three goals of the strategy are:

- The wastewater system manages public health risks effectively
- The wastewater system is resilient and meets community needs for environmental, social and cultural sustainability
- The wastewater system supports the future growth and economic wellbeing of Christchurch City.

The five key issues identified in the development of the strategy are:

- sewer system resilience
- wet weather overflows
- Christchurch urban area long-term wastewater treatment and disposal
- Banks Peninsula long-term wastewater treatment and disposal
- reuse of treatment products (e.g. treated wastewater, biosolids).

Each of these key issues is described in the strategy, along with the options considered and selected.

An Implementation Plan has also been developed, which sets out the action plan for implementing the strategy, including timeframes and indicative costs that will inform and guide future Long Term Plans.

The strategy will be formally reviewed on a five-yearly basis, with the first formal review scheduled for 2017. The Implementation Plan will be reviewed annually. It should be noted that all elements of this strategy may not necessarily be achieved in event of another major seismic event. The inclusion of a project within this document does not commit the Council to commence the project. All projects are contestable each time a new Long Term Plan is prepared.

View of oxidation ponds from Port Hills

Part One: Technical and background information

01

Introduction

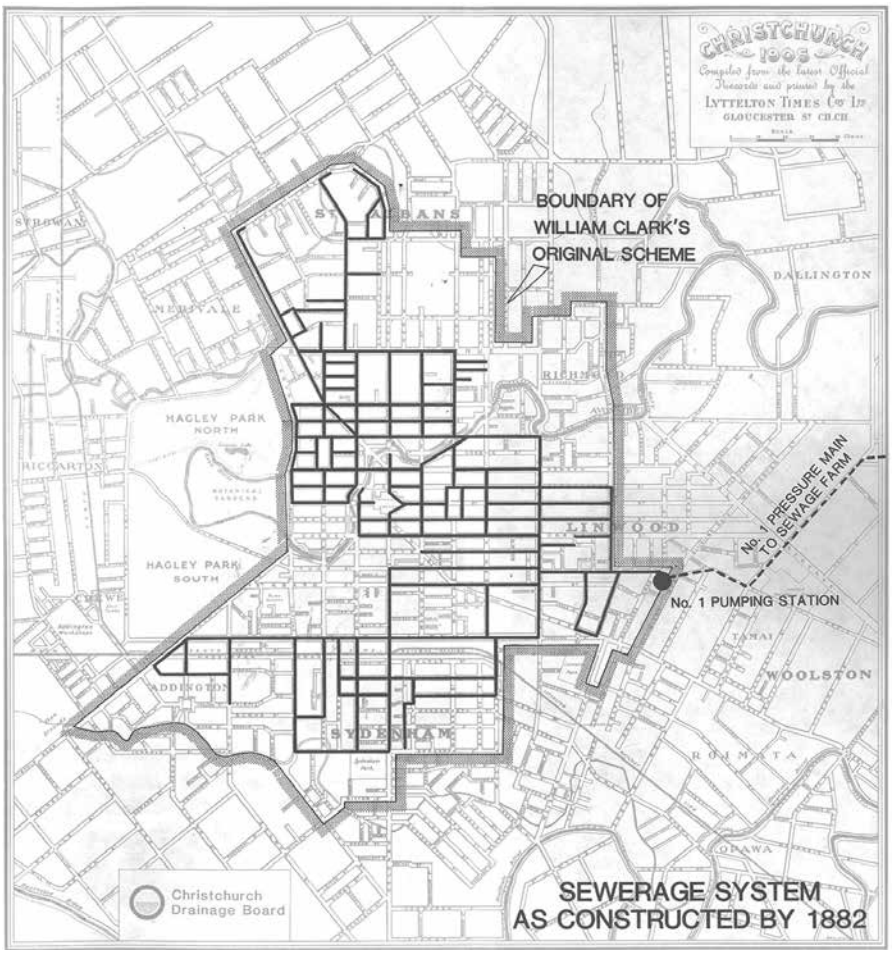
1.1 BACKGROUND

1.1.1 WHAT IS WASTEWATER?

Wastewater, also known as sewage, is all the used water collected in internal drains from homes, businesses and commercial and industrial properties, such as water from sinks, basins, tubs, toilets, washing machines and dishwashers. It also includes trade waste such as chemicals and food production by-products. Wastewater is not stormwater, which is rainwater collected by external drains.

From a tangata whenua perspective, water is a taonga to be protected. The creation of wastewater through its use as a medium for processing waste, particularly human waste, and its discharge into waterways, even once it has been through a treatment system, is culturally inappropriate. Discharging wastewater into waterways is culturally offensive. It can destroy the mauri (life force) of a water body, and the ability of tangata whenua to undertake traditional practices including mahinga kai (food gathering) can be seriously affected. The maintenance of water quality and quantity are therefore of the utmost importance to Ngāi Tahu.

Figure 1.1
Sewerage system in 1882[1]



[1] *From Christchurch Swamp to City – A Short History*

Levelling sandhills for Christchurch Drainage Board's Sewage Farm in Bromley 1904

1.1.2 HISTORY

Christchurch's wastewater system has grown over time, beginning with the city's first permanent sewerage system in 1882 that served an area of approximately 200 acres including parts of St Albans and Sydenham along with small portions of Addington and Linwood as shown in Figure 1.1.

The sewerage system was devised to protect public health. By the mid-to-late 1800s Christchurch had the highest death rate of any New Zealand town, and water-borne diseases such as dysentery, typhoid and diphtheria were more prevalent than elsewhere in the country. A typhoid epidemic in 1875 was the impetus for the move to a permanent public sewerage system.

The Christchurch and Banks Peninsula wastewater systems now comprise eight treatment plants, 120 pump stations, over 25,000 manholes and more than 2700 kilometres of piping.

1.2 SCOPE OF STRATEGY

The scope of the strategy is:

1.2.1 DIRECTION

a) To provide Council's vision, strategic direction and desired outcomes for sustainably managing the City's wastewater system over the next 10, 30 and 100 years. This work will be informed by stakeholder input.

b) To establish the key steps and methods for implementing the strategy. This will recognise not only the Council's responsibilities and impact on the Council's resources, but also those of the community and private sector, to promote long-term integration of water resource management by taking into account the other Healthy Environment Strategies.

c) To monitor, review and report progress towards achieving the strategy outcomes.

d) To inform future Council Long Term Plans (LTPs) relating to capital and operational investment and expenditure.

e) To form a component of the Council's future Three Waters Strategy. This will incorporate three separate but inter-related documents: the Water Supply Strategy, the Surface Water Strategy and the Wastewater Strategy.

1.2.2 COVERAGE

a) To encompass within the Council's boundaries, the resources managed by the Council for wastewater reticulation, treatment and disposal purposes.

b) To include all Council owned wastewater treatment systems within the Council's territorial boundaries.

c) To include the continued sustainable management of biosolids and options for the use of this material, and potential re-use of treated effluent.

d) To continue the management of trade waste entering the wastewater system.

e) To cover 10, 30 and 100 year periods and be regularly reviewed to take into account the present and future social, economic, environmental and cultural aspirations of the community and to align outcomes with the Greater Christchurch Urban Development Strategy, relevant Council LTP outcomes and other key strategies as listed in Section 1.6. Consideration will need to be given to securing and/or identifying options for managing increased volumes of wastewater as the population grows or the industrial base of Christchurch changes or relocates.

f) To include consideration of effects and mitigation of stormwater inflow and groundwater infiltration on the wastewater system, and the influence of wastewater discharge events on the water quality of the receiving environment.

g) To develop a position on the extension of reticulated services in currently unserviced areas with input from Community Boards.

Early morning, Bromley oxidation ponds

h) To consider a policy on the condition of private onsite septic systems and their impact on groundwater.

i) To include wastewater system asset condition and the integrity of the system in the context of a life of the LTP assets/renewals programme.

1.2.3 ALIGNMENT

a) To recognise potential conflicts between wastewater management and the management of other water resources used by the Council, other key stakeholders, and the wider community.

b) To gain community and private sector support and commitment for the integrated management of water and wastewater through participative and innovative approaches.

1.3 TIMEFRAME

Allowances are normally made in a strategy for the growth and expansion of wastewater infrastructure but the development of this strategy has been confounded by the earthquake sequence following September 2010. There is the short-term need to address the effects of earthquake on the system and the long-term need to provide for future growth, without precluding technologies and opportunities that are not currently available.

The strategy has been developed based on three timeframes. The first timeframe will address the next 10 years as the operation of the existing wastewater system returns to "normal" and the city transitions to its new shape (its geography and demography).

The second timeframe is for 30 years, based on currently estimated population growth in the Greater Christchurch Urban Development Strategy. This timeframe assumes population distribution is non-uniform, reflecting the new red zones and expected areas of accelerating development in the south, west and north of the city.

The third timeframe reflects the long-life nature of wastewater assets—particularly gravity sewers and rising mains—which will be needed in response to the changed (post-quake) urban development patterns which will be decided in the first 10 years of the strategy. By forecasting what the 100 year wastewater system will look like, including treatment plants and receiving environments, the Council can determine if the 30 year system plan is compatible with the long-term vision, and is consistent with the major decisions made over the next 10 years. The Council's LTP and Annual Plan processes will be aligned with the wastewater strategy as they are progressively developed and implemented.

The strategy will be formally reviewed on a five-yearly basis, with the first formal review scheduled for 2018. The Implementation Plan will be reviewed annually to assess whether there are additional approaches that can be taken, or whether changes to current methods are required.

1.4 PROCESS OF DEVELOPMENT

The Council has developed the Wastewater Strategy for Christchurch communities, as part of its Healthy Environment Strategies programme. This involved preparing a series of four documents:

- Situational Analysis report – this describes the current situation and defines the key issues.
- Issues and Options report – this takes each of the key issues from the Situational Analysis report and explores options to address those issues, along with cost estimates and recommendations.
- Internal working draft Wastewater Strategy – this describes the recommendations in more detail.
- Consultation draft Wastewater Strategy.

Representatives from the Council, Stronger Christchurch Infrastructure Rebuild Team (SCIRT), Mahaanui Kurataiao Ltd (MKT), CH2M Beca Ltd, Canterbury Earthquake Recovery Authority (CERA), Waimakariri District Council (WDC) and Selwyn District Council (SDC), participated in the crafting of each report.

1.4.1 CONSULTATION

As the strategy was being developed, informal consultation was conducted with community and interest groups. Two workshops were held with external stakeholders in March and June 2012 to examine wastewater issues and alternatives to address those issues. Two hui with urban Christchurch and Banks Peninsula iwi were held in June and July 2012.

There was also a workshop for the Combined Community Boards in April 2012 and a Council seminar in May 2012.

The draft strategy was released for public consultation between 8 October and 8 November 2012.

A Hearings Panel was convened 29 November 2012 to consider oral and written submissions on the draft strategy.

The strategy has been updated to incorporate the recommendations of the Hearings Panel.

1.4.2 PROJECT PARTICIPANTS

A project team and an advisory group were established to assist with developing the Wastewater Strategy. The project team consisted of representatives from the Council, SCIRT, MKT and CH2M Beca Ltd. The advisory group consisted of representatives from Christchurch City Council, CERA, WDC, SDC, MKT and CH2M Beca Ltd.

1.5 KEY ISSUES

Five key issues have been identified:

- Sewer system resilience.
- Wet weather overflows.
- Christchurch urban area long-term wastewater treatment and disposal.
- Banks Peninsula long-term wastewater treatment and disposal.
- Reuse of treatment products (e.g. treated wastewater, biosolids).

These are described in more detail in section four, along with the options considered and recommended.

1.6 RELATIONSHIP TO OTHER STRATEGIES AND PLANS

A number of related plans and strategies were taken into account in the development of this wastewater strategy. Key strategies with links to this strategy are summarised below.

1.6.1 HEALTHY ENVIRONMENT STRATEGIES

This strategy is one of the Council's suite of Healthy Environment Strategies, which include the Biodiversity, Water Supply, Public Open Space, Surface Water and Climate Smart strategies. The Council's Healthy Environment Strategies were developed to guide the sustainable management of the city's environmental resources, including water supply, surface water, open spaces and biodiversity, as well as wastewater management. These strategies overlap in various ways, particularly those related to water.

1.6.2 RELATIONSHIP TO OTHER WATER STRATEGIES

Human activities (domestic, commercial and industrial) using water generate wastewater, which eventually returns to the wider environment, as illustrated in Figure 1.2. In an urban environment, this wastewater is collected and conveyed by a reticulation system to a treatment plant, which removes contaminants from the water before it is discharged to the environment. If this collection and treatment system fails, through overflows, leaks, damage or insufficient treatment, there may be uncontrolled wastewater discharges that introduce contaminants into the local environment.

These contaminants can find their way into surface water or groundwater either directly or through stormwater runoff. Contaminants from wastewater include pathogens, nutrients (which promote eutrophication of waterways) and toxins.

It is important that this strategy recognises the impact of discharges on the quality of water bodies that may be used as a source for drinking water and for industrial, recreational or other use. In addition to coordinating the current strategies, opportunities to further integrate the Council's role in the management of the "three waters", i.e. surface water, drinking water and wastewater will be explored.

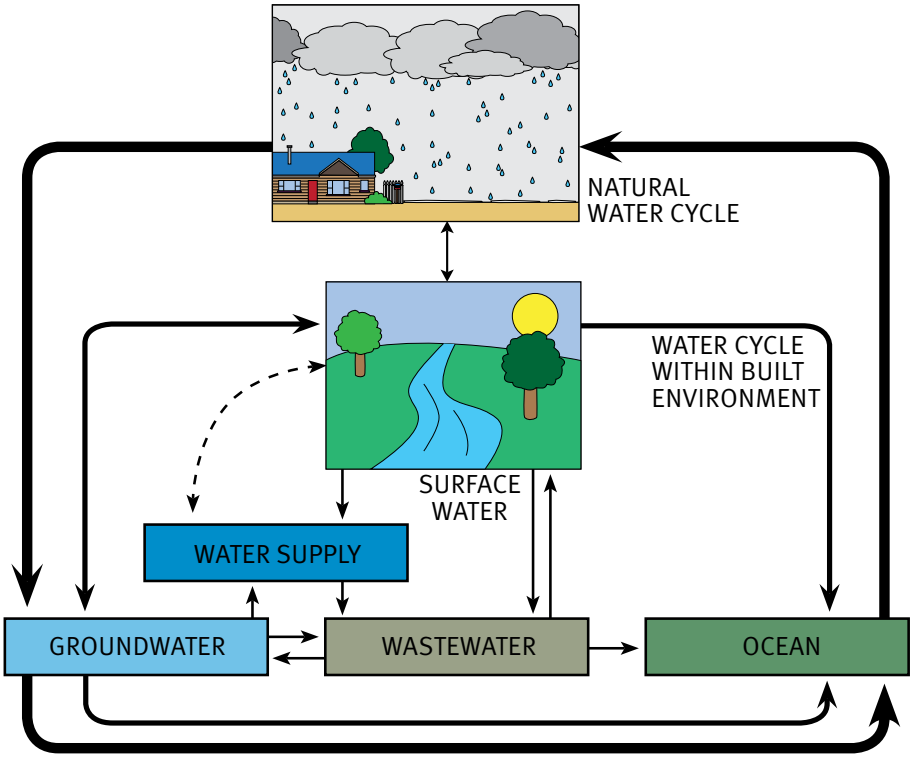


Figure 1.2
Simplified water cycle relationships

1.6.3 RELATIONSHIP TO OTHER PLANS AND STRATEGIES

While this report forms part of a wastewater strategy for the Council, the plans and strategies of the neighbouring Selwyn District Council and Waimakariri District Council were taken into account, as well as CERA's Recovery Plans.

1.7 POLICY FRAMEWORK

1.7.1 NATIONAL LEGISLATION

The Resource Management Act 1991 (RMA) is the most relevant legislation for the management of wastewater discharges. The purpose of the RMA is to promote the sustainable management of natural and physical resources. It provides for the preparation of national policy statements and environmental standards, regional policy statements and plans and district plans. The control of specific activities is achieved through rules in regional and district plans and through resource consents. The RMA does not explicitly provide for the management of wastewater, rather it provides for the management of environmental effects, including those which arise from the discharge of wastewater to land or water.

Section 15 of the RMA prohibits the discharge of contaminants (such as wastewater, biosolids, or odour) into the environment unless the discharge is expressly allowed by a national environmental standard (NES), a rule in a regional plan or a resource consent. This section stipulates that no person may discharge any contaminants into water, onto land where it may enter water, or from an industrial premises into air or onto land. Therefore, unless the relevant regional plan or NES specifies the discharge as permitted, resource consent will be required for any discharge from a wastewater treatment facility.

The Local Government Act 2002 (LGA 2002) requires local authorities to assess their communities' needs for sanitary services, to provide sanitary services and to maintain their capacity to provide these services (Part 7 sections 125 and 130).

The Canterbury Earthquake Recovery Act 2011 (CERAct) was enacted as a response to the Canterbury earthquakes. The purpose of the CERAct is wide ranging but is generally to provide appropriate measures to enable a focused, timely and expedited recovery of greater Christchurch from the impacts of the Canterbury earthquakes, including for resource consents for repair of the wastewater infrastructure.

Wastewater treatment plant, Diamond Harbour

1.7.2 TE TIRITI O WAITANGI - TREATY OF WAITANGI

Te Tiriti o Waitangi established a partnership between the Crown and tangata whenua. Māori were guaranteed possession of their lands, forests, fisheries and other possessions.[2] This means that today the management of natural resources is significant to Māori.

The Treaty partnership requires both parties to act in good faith and to make informed decisions.[3] The principles of the Treaty recognise and guarantee the protection of tino rangatiratanga (sovereignty) and empower kaitiakitanga as customary trusteeship to be exercised by tangata whenua over their taonga, such as sacred and traditional places, built heritage, traditional practices and cultural heritage resources including water. Of particular importance is the principle for the Crown to actively protect Māori interests.[4]

The requirement for Council to take into account Te Tiriti o Waitangi arises through requirements in the Local Government Act 2002 and the RMA. In the context of wastewater management, this is particularly important as Part II of the RMA requires decision makers to take into account the principle of the Te Tiriti o Waitangi, in addition to recognising and providing for the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga and their role of kaitiakitanga, as matters of national importance.

Te Tiriti o Waitangi and the RMA are therefore particularly relevant to the management and decisions on wastewater, in particular the discharge of wastewater to the environment, due to the cultural significance to tangata whenua.

[2] *Lands Case at p672 per Richardson J., 1987*
[3] *Lands Case at p80-681 per Richardson J., 1987*
[4] *Waitangi Tribunal, p95 1985*

1.7.3 RECOVERY PLANS

The Canterbury Earthquake Recovery Act 2011 gives the Minister the power to direct a recovery plan to be prepared for a particular infrastructure. Recovery plans are mandated under the Canterbury Earthquake Recovery Act 2011. An infrastructure recovery plan that includes a five-year schedule for the rebuild of Christchurch's infrastructure, including the wastewater network and assets, was released in September 2012.

The Council must not act inconsistently with a recovery plan including making decisions / recommendations on resource consent applications, notices of requirement, plans and policy statements.

If a recovery plan directs, the Council must amend a plan or policy statement to change (include or delete) objectives, policies or methods. This must be undertaken as soon as practicable and without the RMA Schedule 1 process.

The infrastructure recovery plan and the Council's Wastewater Strategy are complementary documents that place a strong emphasis on resilience.

1.7.4 THE COUNCIL'S LTP

Section 130 of the Local Government Act 2002 requires the Council to assess the provision of sanitary services within its district and most often this forms part of the Council's LTP. Based on input from the community, the LTP is a statement of how the Council plans to meet community needs and lists the activities it intends to undertake over a 10 year period. The LTP sets out the cost of these activities and the standard of performance that is expected. A review is carried out every three years and in interim years the Council publishes an Annual Plan, focusing on year-to-year budgets and performance. The most recent LTP was adopted in June 2009.

As of the date of this wastewater strategy

Wastewater treatment plant, Tikau Bay

the next LTP has been deferred to 2015. In the interim the Council will undertake a Three Year Plan that will focus on financial years 2013/14, 2014/15 and 2015/16.[5]

The reason for the Council's wastewater collection and treatment activities is given in the 2009-19 LTP as: "the Council collects and treats wastewater to safeguard public health and protect the environment. Untreated wastewater would cause outbreaks of disease and environmental pollution."

The 2009-19 LTP objectives for wastewater collection and treatment are to provide reliable and efficient wastewater collection, treatment and disposal services that:

- Protect public health.
- Are environmentally sustainable.
- Are culturally acceptable.
- Meet the needs of present and future generations.

The key community outcomes for the Council's wastewater collection and treatment activities include:

- Safety: provides a sanitary wastewater collection and treatment service.
- Community: provides equal access to wastewater services.
- Environment: protects the environment by treating wastewater.
- Governance: enables community participation in decision-making by consulting on wastewater plans and projects.
- Prosperity: provides wastewater services for commercial users, helping businesses to function smoothly.
- Health: provides a sanitary wastewater collection and treatment service.
- Knowledge: raises awareness of water conservation.
- City development: beautifies the wastewater ponds and manages sewer overflows.

1.7.5 NATIONAL POLICY STATEMENTS

A National Policy Statement (NPS) enables central government to prescribe objectives and policies for resource management matters of national significance. Two NPSs are relevant to wastewater; the New Zealand Coastal Policy Statement 2010 (NZCPS), and the National Policy Statement for Freshwater Management. These are discussed further below.

The purpose of the NZCPS is to achieve the purpose of the RMA in relation to the coastal environment of New Zealand. The NZCPS contains seven objectives and 29 policies.

The NZCPS recognises one of the key issues facing the coastal environment is poor and declining coastal water quality in many areas as a consequence of point and diffuse sources of contamination (such as wastewater discharges). A number of the objectives and policies contained in the NZCPS are relevant to wastewater discharges to the coastal environment and seek to maintain coastal water quality and enhance it where it has deteriorated due to discharges associated with human activity.

In managing discharges of human sewage, the NZCPS directs that a discharge directly to the coastal environment without treatment is not allowed. The discharge of treated sewage to water in the coastal environment is only allowed where there has been adequate consideration of alternative methods, sites and routes and the values of tangata whenua are taken into account.

The National Policy Statement for Freshwater Management (NPS Freshwater Management) sets out the objectives and policies that direct local government to manage water in an integrated and sustainable way. This NPS contains eight objectives and 15 policies. In particular, the NPS Freshwater Management seeks to safeguard the life-supporting capacity, ecosystem processes and indigenous species in sustainably managing the discharge of contaminants.

The NPS Freshwater Management directs regional councils to make rules requiring the adoption of best practicable options to prevent or minimise adverse effects on the environment of any discharge of a contaminant into freshwater or onto land where it may enter freshwater. The NPS Freshwater Management also recognises the values of tangata whenua in relation to freshwater and seeks that they are involved and their interests are reflected in the management of freshwater.

[5] *To be adopted by 30 June 2013, per the agreement between the Council and the Government announced on 11 February 2013.*

1.7.6 REGIONAL POLICY STATEMENTS

Regional policy statements set out the resource management issues, objectives and policies for a particular region and must not be inconsistent with an NPS (section 62(3) of RMA). The relevant policy statements for Christchurch are the Canterbury Regional Policy Statement 1998, and the Canterbury Regional Policy Statement 2013.

The Canterbury Regional Policy Statement 1998 (CRPS 1998) provided an overview of Canterbury's resource management issues and sets out how natural and physical resources are to be managed in an integrated way, with the aim of sustainable management. As of the date of this wastewater strategy, Plan Change 1 (PC1) of the CRPS 1998 was under appeal. PC1 includes Chapter 12A, which addresses land use and urban growth management in greater Christchurch for the next 35 years. It sets urban limits and requires territorial authorities to provide for sequencing of urban development within those limits and to restrain urban activities locating outside these limits.

The Canterbury Regional Policy Statement 2013 became operative on 15 January 2013 and replaced the 1998 Canterbury Regional Policy Statement. The CRPS 2013 recognises that patterns of development can impact on the efficiency and effectiveness of public sewerage (and other) infrastructure and requires these services to be designed, built, managed and upgraded to maximise their on-going effectiveness. Sewerage infrastructure should be designed, located, developed and used so adverse effects on significant natural and physical resources are avoided or mitigated and other adverse effects on the environment are appropriately controlled.

Tanker waste reception facility, Christchurch wastewater treatment plant

The CRPS 2013 also recognises the direct discharge of human sewage into the coastal marine area is highly undesirable, although it may be necessary and justified in some cases. The CRPS 2013 identifies that the discharge of contaminants, particularly treated and untreated sewage, is abhorrent to the values of Ngāi Tahu as tangata whenua.

In relation to odour, the CRPS 2013 notes that odour generated from waste treatment and disposal may cause localised health and nuisance effects on social, cultural and amenity values.

The CRPS 2013 states that waste management in the region could be more efficient and integrated to reduce the likelihood of adverse effects occurring on the environment and the social, economic and cultural wellbeing of people and communities.

1.7.7 REGIONAL PLANS

Regional plans are intended to give effect to NPSs and the RPS. All Canterbury's regional plans must be consistent with each other (Sections 67(3) and (4) of RMA). Currently there are three regional plans that are relevant to the Council's wastewater services: the Natural Resources Regional Plan, the Regional Coastal Environment Plan and the Waimakariri River Regional Plan.

The Natural Resources Regional Plan (NRRP) contains objectives, policies and rules for the management of natural resources such as water, and consists of eight chapters which address sustainable management of natural resources in the Canterbury Region. Chapters 3 (Air Quality) and 4 (Water Quality) are the most relevant to wastewater management.

The rules which are relevant to the discharge of wastewater include WQL14 – WQL16 and WQL45 of Chapter 4. According to these rules, any new discharge of treated sewage to land or water will require resource consent. Any new discharge of untreated sewage is a prohibited activity, unless it is a spill or overflow, in which case resource consent is required. Rules AQL63 – AQL69 in Chapter 3 provide for discharges to air from waste management processes. Municipal sewage treatment facilities and land application of effluent are likely to require resource consent.

The proposed Land and Water Regional Plan (pLWRP) replaces Chapters 1, 2, 4, 5, 6, 7 and 8 of the NRRP. The pLWRP was publicly notified in August 2012 and had immediate effect. The pLWRP proposes that discharges from spills overflows or equipment failure would be non-complying activities.

The Regional Coastal Environment Plan (Coastal Plan) sets out the issues, objectives, policies and rules relating to the protection, development and enhancement of Canterbury's coastal marine area, which is generally defined as the seaward side of mean highwater springs. This includes the control of the discharge of contaminants to the coastal marine area. In particular Rules 7.3 and 7.6 of the Coastal Plan require resource consent for the discharge of wastewater to the coastal marine area.

The Waimakariri River Regional Plan (WRRP) controls point and non-point source discharges of contaminants to water bodies in the Waimakariri River catchment although currently the Council does not discharge any wastewater to the Waimakariri River or its tributaries.[6]

1.7.8 RESOURCE CONSENTS HELD

Christchurch City Council holds resource consents to authorise the discharge of wastewater from their treatment plants in Christchurch City (including Banks Peninsula) to the coastal marine areas. The Council also holds consents to authorise the discharge of sewage in the event of wet weather to water bodies such as the Avon and Heathcote Rivers. These consents require renewal periodically or when the nature of the activities changes.

As a consequence of the extensive earthquake-induced damage compliance with the existing wet weather overflow consent will not be possible until the infrastructure rebuild is sufficiently advanced. A compliance strategy has been negotiated with Environment Canterbury to address this.

1.7.9 DISTRICT PLANS

District plans are generally concerned with land use and subdivision. The Council is responsible for both the Christchurch City Plan (City Plan) and the Banks Peninsula District Plan (BPDP).

The City Plan provides special provisions for utilities such as the pipe network and pumping stations in recognition that the on-going operation of utilities needs to be protected. Resource consent is generally not required for underground utilities but may be required for large scale utilities which could generate adverse effects on the environment.

The Christchurch Wastewater Treatment Plant (CWTP) is located within the Conservation 1B (Bromley) Zone. This zone covers a large and strategically placed area adjacent to the Avon Heathcote Estuary and recognises both the sewage treatment facilities and the significant wildlife values. The Council's wastewater network/facilities (including the sewage treatment facilities) are not designated under the City Plan.

The BPDP recognises that basic services (including wastewater) are fundamental to the health and welfare of the residents and are a critical constraint upon future growth and development. The BPDP generally designates wastewater facilities rather than relying on a zoning/resource consent procedure.

1.7.10 BYLAWS

a) Council Water Related Services Bylaw 2008

   The purpose of this bylaw is to manage and regulate the Council's water supply, wastewater and stormwater drainage (excluding matters provided for under other Acts). Under this bylaw, approval is required from the Council to connect to the wastewater network for those activities that are generally not normal household or commercial activities.

b) Council Trade Waste Bylaw 2006

   This bylaw regulates the discharge of trade waste to a sewerage system operated by the Council and requires approval from the Council to discharge trade waste to the sewerage system where this is not a permitted discharge. This normally applies to industrial discharges.

[6] *Puharakekenui/Styx River is no longer part of the WRRP.*

1.7.11 CANTERBURY WATER MANAGEMENT STRATEGY

The Canterbury Water Management Strategy (CWMS) establishes a framework for addressing Canterbury's water resources issues to enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from the water resources within an environmentally sustainable framework. The strategy sets out targets for water management in Canterbury for the next 30 years. The strategy establishes 10 zone committees made up of community members, council representatives and Rūnanga.

The role of these committees is to make consensus-based decisions about water management within the applicable zone. Each committee will produce a set of water management recommendations that will be submitted to the relevant councils in the form of a Zone Implementation Programme (ZIP). This is a non-statutory document that outlines actions, responsibilities and timeframes for activities to achieve the principles, targets, and goals set out in the CWMS.

The ZIPs will primarily focus on water allocation but will address issues such as wastewater discharges. The actions set out in the ZIPs will be implemented through the sub-regional plans and district plan, as well as through non-regulatory means.

The three zone committees which have been established for the greater Christchurch area are the Christchurch-West Melton Zone Committee, the Banks-Peninsula Zone Committee and the Selwyn-Waihora Zone Committee. The Selwyn-Waihora Zone Committee formally presented their ZIP to Environment Canterbury (ECan) in December 2011 and Selwyn District Council in early 2012.

Morning fog, Christchurch wastewater plant

The Christchurch-West Melton and Banks-Peninsula Zone Committees are recently formed and have yet to finalise their ZIPs as of the date that this strategy was prepared.

The Strategy is aligned with the general direction of the draft Christchurch-West Melton and Banks Peninsula ZIPs.

1.7.12 IWI MANAGEMENT PLANS

Ngāi Tahu value freshwater as a life sustaining taonga and through their role as kaitaiaki work to protect and maintain the mauri (life force) and cultural values of freshwater within their takiwā. The development of iwi management plans is an expression of kaitiakitanga and rangatiratanga and the aspirations that tangata whenua have for their future.

It is vital for the identity and wellbeing of Ngāi Tahu that their customary practices and values for water are recognised and actively protected, and this is reflected strongly within their iwi management plans. Ngāi Tahu policies and objectives relating to wastewater are consistent in their approach towards the removal of wastewater from all waters and in particular where mahinga kai is or was once gathered.

The preferred option for Ngāi Tahu for the treatment and management of waste, including wastewater, is discharge to land.[7] Current wastewater discharges have damaged and continue to degrade cultural sites and mahinga kai areas. This practice of discharging to water and in particular to food gathering areas is offensive to Ngāi Tahu cultural values.

[7] *Pauling, C. & Ataria, J. (2010). Tiaki Para: a study of Ngāi Tahu values and issues regarding waste. Lincoln, N.Z. : Manaaki Whenua Press, Landcare Research.*

There are several iwi management plans that are relevant to the Wastewater Strategy:

The Te Rūnanga o Ngāi Tahu Freshwater Policy 1999 is a recognised iwi management plan and sets out key Ngāi Tahu policies with respect to freshwater. Its specific purpose is to provide the starting point for a process of consultation and discussion to further define;

- The specific priorities and needs of Papatipu Rūnanga, and
- The ways in which these priorities and needs can best be met.

Other relevant iwi management plans include;

- Te Whakatau Kaupapa 1990 - Ngāi Tahu Resource Management Strategy for the Canterbury Region,
- Te Taumutu Rūnanga Natural Resource Management Plan (2003),
- Mahere Tukutahi o Te Waihora - Te Waihora Joint Management Plan (2005), and
- The Mahaanui Iwi Management Plan (in preparation, this plan has policy and objectives related to wastewater for the entire territory of Christchurch City)

1.7.13 CROSS-BOUNDARY OPTIONS

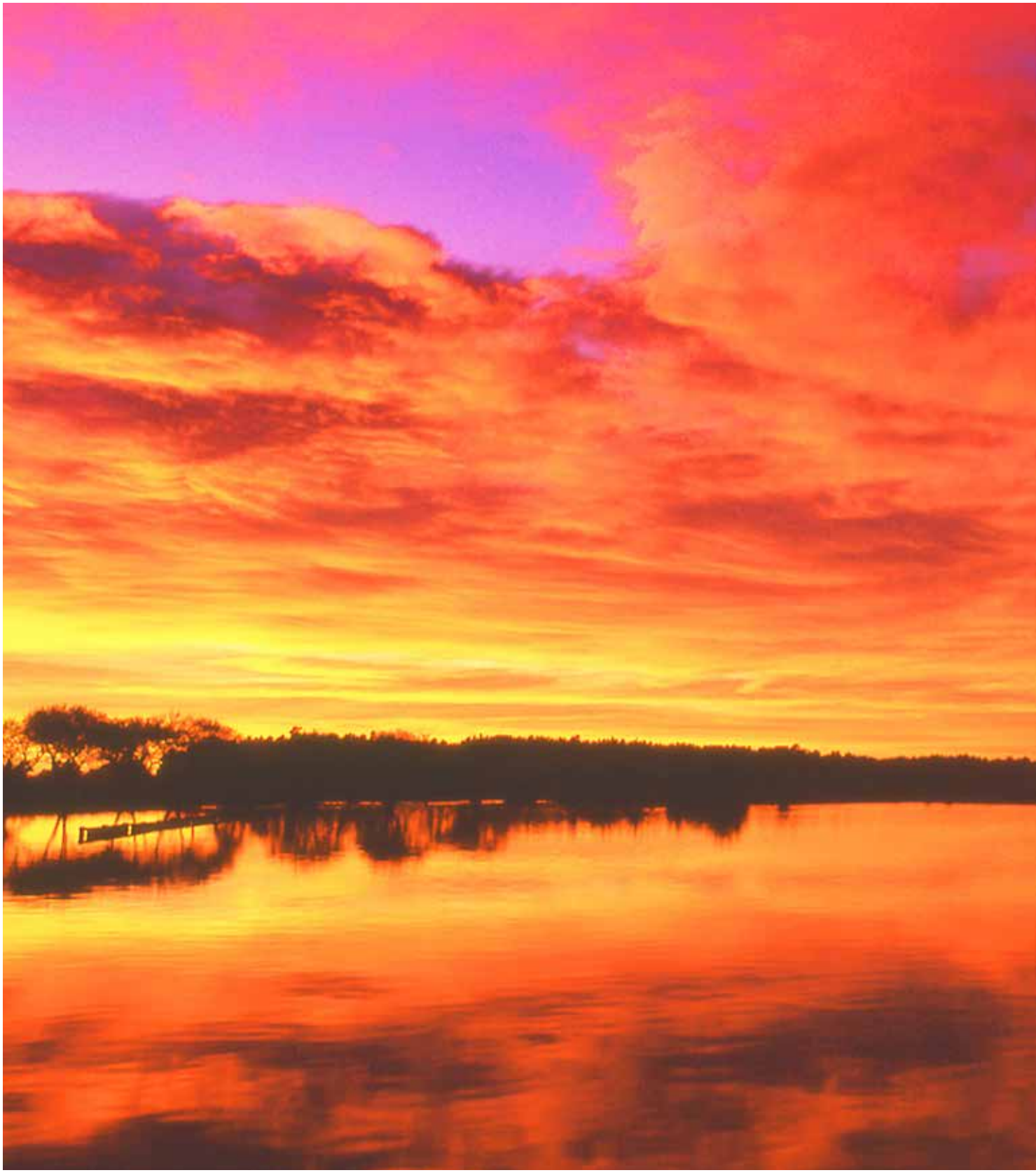
During the development of the Wastewater Strategy, opportunities to connect to treatment and disposal schemes in neighbouring districts were considered in collaboration with representatives from Waimakariri District Council and Selwyn District Council.

A) Waimakariri District Council

The Waimakariri District Council (WDC) completed a major upgrade to the Eastern District Sewage Scheme in 2005 with a 30 year design horizon, including upgrading four wastewater treatment plants and building a new ocean outfall for disposal from all four plants. Since then the population served by this wastewater infrastructure has grown faster than anticipated and the system is going to reach capacity significantly ahead of the original design horizon. As a result there is little obvious synergy between Christchurch wastewater treatment requirements and those of WDC. Furthermore, the separation distance between the two networks is significant, with the additional barrier of the Waimakariri River also needing to be addressed for any network cross connection. Taking these factors into account, provision of a cross connection between Christchurch City and Waimakariri District, for use as a contingency or other purpose, would be very costly to implement with limited potential benefits.

B) Selwyn District Council

The Selwyn District Council (SDC) operates the Pines wastewater treatment plant and land disposal scheme near Rolleston. This scheme is being progressively upgraded over time to reach an ultimate population equivalent of 60,000. Additional capacity is being phased in over time to meet the load requirements for the expanding population at Rolleston. Several of the Christchurch satellite treatment options identified in this report indicate that there could be the potential for a facility based on a one cubic metre per second satellite scheme to be located somewhere to the southwest or west of the city near Rolleston. This would typically be located separate from SDC's facility. However, if a one cubic metre per second treatment scheme in this area was to be investigated in the future, one option may include the opportunity to collaborate with SDC on the future management of such schemes to achieve operational efficiencies, provided that the strategic interests of both the Council and SDC can continue to be met, and a suitable operational and cost-sharing model can be put in place.



Oxidation pond in early morning

Part Two: The Strategy

02

Aim, vision and principles

2.1 AIM

The aim of this strategy is to establish the Council's strategic direction for sustainably managing wastewater over the next 10, 30 and 100 years.

2.2 VISION

The strategic vision is an affordable, reliable, culturally acceptable, sustainable and resilient wastewater system that protects public health and the natural environment and meets the needs of present and future communities.

2.3 GUIDING PRINCIPLES

The following guiding principles are taken into account in this strategy:

- Wastewater services will be delivered cost effectively while balancing social, cultural and environmental effects.
- Effects on the environment from wastewater systems will be avoided, mitigated or minimised.
- The Council will work with communities, including businesses and other stakeholders, and Rūnanga to achieve wastewater management goals and objectives.
- Maintenance, renewals and expansion works will be planned and implemented so costs are affordable and appropriately distributed over time.
- Infrastructure resilience will be optimised using standardised risk assessment methods to categorise system risks and develop and implement risk management solutions that are efficient and represent best value.
- The Council will take a flexible approach to new technologies for conveyance, treatment, reuse and disposal and will consider adopting new technologies in future where the benefits and risk are well defined.
- The Council will develop infrastructure that supports a sustainable economy.

Wastewater sampling

03

Goals and Objectives

To meet desired outcomes for the community, as defined in Council plans, strategies and bylaws, the following set of goals and objectives were developed.[8]

GOAL 1:

The wastewater systemprotects public health effectively.

Objectives

- Conveyance, treatment and disposal facilities provide efficient and reliable service under normal operating conditions and are resilient to natural hazards.
- A loss of service from system failure and the impact of earthquakes or other natural hazards will be minimised as far as is practicable.
- A consistent risk management approach will be applied to decision making over system renewals and expansion, to ensure risks are properly identified and the optimal degree of risk reduction is achieved for the lowest cost.
- Where loss of service cannot be avoided during major adverse events due to inherent risks, business continuity plans will be regularly reviewed and tested, to manage potential public health, and environmental and cultural, risks.
- Sludge, biosolids and other treatment by-products are managed in an efficient and sustainable way.

GOAL 2:

The wastewater system is resilient and meets community needs for environmental, social and cultural sustainability.

Objectives

- The Council will progressively improve the resilience of the wastewater system through renewals, maintenance and expansion activities implemented over the life of the system.
- An appropriate balance between economic costs and benefits, environmental, social and cultural effects of wastewater systems will be maintained.
- The Council will consult with community stakeholders about the level of service provided and future wastewater developments to make well informed decisions in economic, social, cultural and environmental terms.
- Wastewater conveyance, treatment and disposal facilities comply with their resource consents.
- The Council will monitor scientific evidence regarding emerging contaminants.

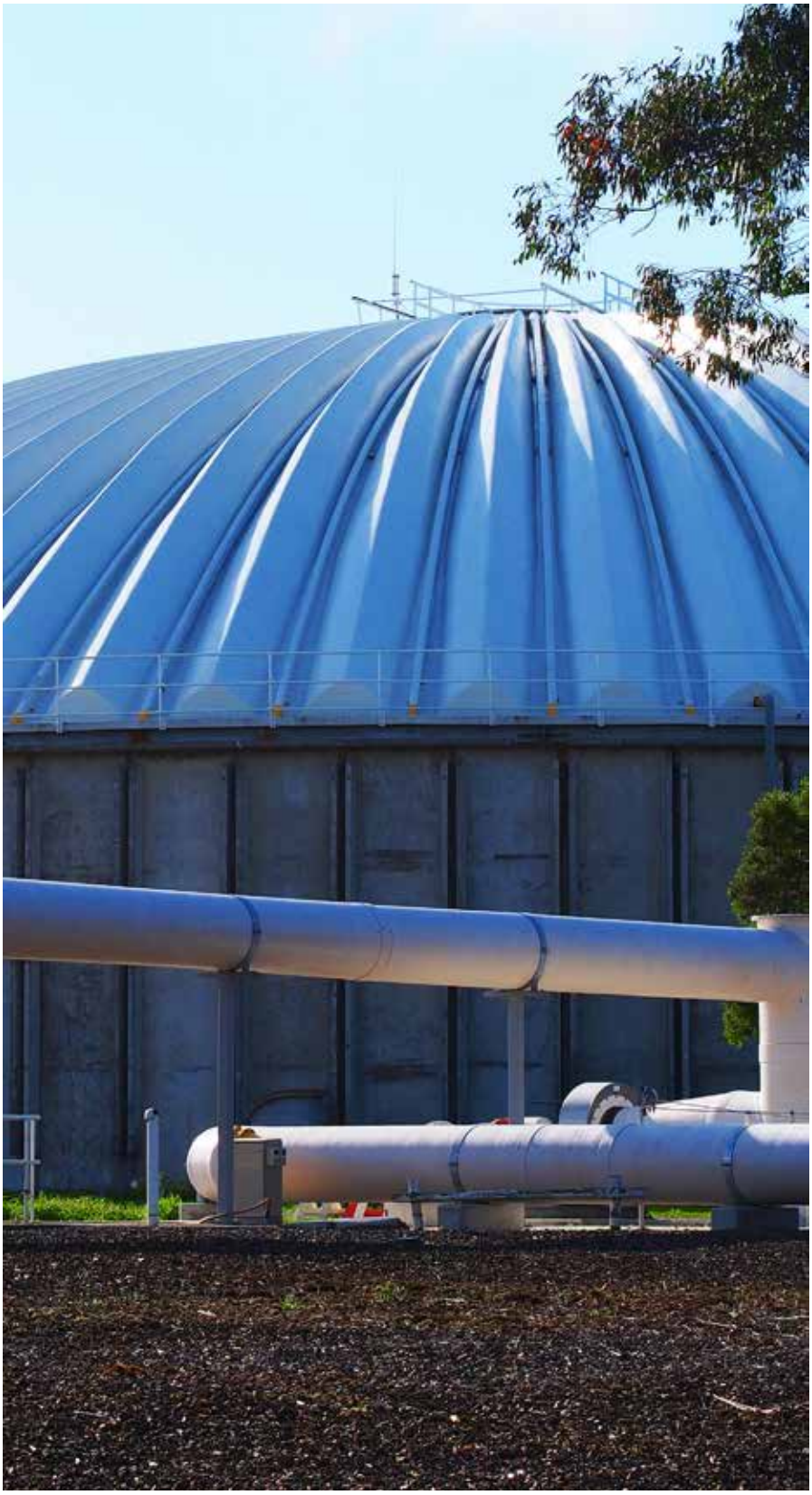
[8] *http://www.ccc.govt.nz/thecouncil/policiesreportsstrategies/index.aspx.*

GOAL 3:

The wastewater system supports the future growth and economic wellbeing of Christchurch.

Objectives

- The wastewater system will be developed to support the planned growth of the city, both in terms of location and timing.
- Trade waste policies and mechanisms will encourage cleaner production for the benefit of industry and the environment.
- Renewals, maintenance, and expansion of the wastewater system will be planned for and implemented so costs to the community are affordable and spread over time.
- The Council will consider and implement future alternative treatment, conveyance and disposal or reuse options and technologies on their merits, only where the risks and benefits are well defined.
- Wastewater reuse by the Council or by others will be considered and implemented where the public health risks can be managed effectively, and only where it is economically viable and environmentally sustainable.



Tricking filters with their iconic roofs, Christchurch wastewater treatment plant

04

Analysis of current situation

The Situational Analysis report described the current situation and summarised the key issues for Christchurch (including Banks Peninsula) wastewater. The Christchurch wastewater system, which incorporates a gravity sewer network, pumping stations, treatment and disposal facilities, has been severely affected by the Christchurch earthquake sequence in 2010 and 2011.

It should be noted that existing services in residential red zone areas will be retained until Government offers have finished and these areas have been predominantly vacated. Wastewater infrastructure that passes through residential red zones to service other areas will be retained in the near term and in future may be relocated or re-engineered for greater resilience in the medium to long term.

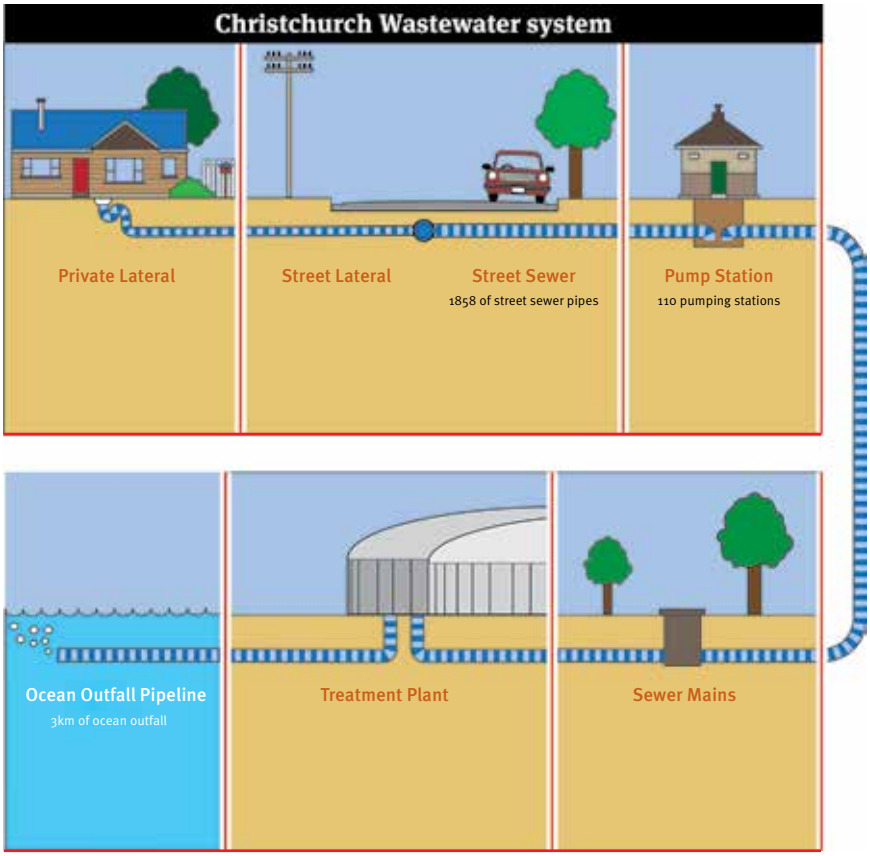
The Issues and Options report described the options to address each issue, and made recommendations. These are summarised below.

4.1 SEWER SYSTEM RESILIENCE

4.1.1 DESCRIPTION OF ISSUE

The wastewater collection and conveyance system suffered significant damage due to earthquakes. Figures 4.1 and 4.2 show a schematic of the Christchurch wastewater system and the post-earthquake state of the wastewater system. Reconstructed infrastructure should be more resilient in future earthquakes and also to other natural hazards.

Figure 4.1
Schematic of Christchurch wasterwater system



4.1.2 OPTIONS

SCIRT is developing options for repairing and rebuilding the earthquake-damaged wastewater network and is also responsible for implementing repairs once they have been approved by the Council. There are several ways the repair methods being employed will improve the resilience of the network:

- More ductile/flexible materials may be used for pipe repair or replacement (e.g. PVC and welded polyethylene pipes). Ductile materials are more resistant to earthquake damage.
- Pipeline and pump station design options are being developed to cope better with earthquakes, including more flexible connections at manholes and pump stations, which are a common failure point in earthquakes.
- Rebuilt pump stations in areas of significant land damage (e.g. alongside rivers) may be relocated to areas with improved ground conditions.
- Gravity sewers may be constructed at shallower depths, where this is practicable, so they would be easier to repair after an earthquake.
- Alternatives to traditional wastewater conveyance are being considered, including vacuum systems and pressure systems for areas where the ground conditions pose high risk of further infrastructure damage during ongoing aftershocks. As these are constructed using welded polyethylene, and can cope with level changes occurring due to earthquake-induced ground settlement, they may be more cost-effective for repairing damaged sewers in vulnerable areas than conventional gravity sewers.

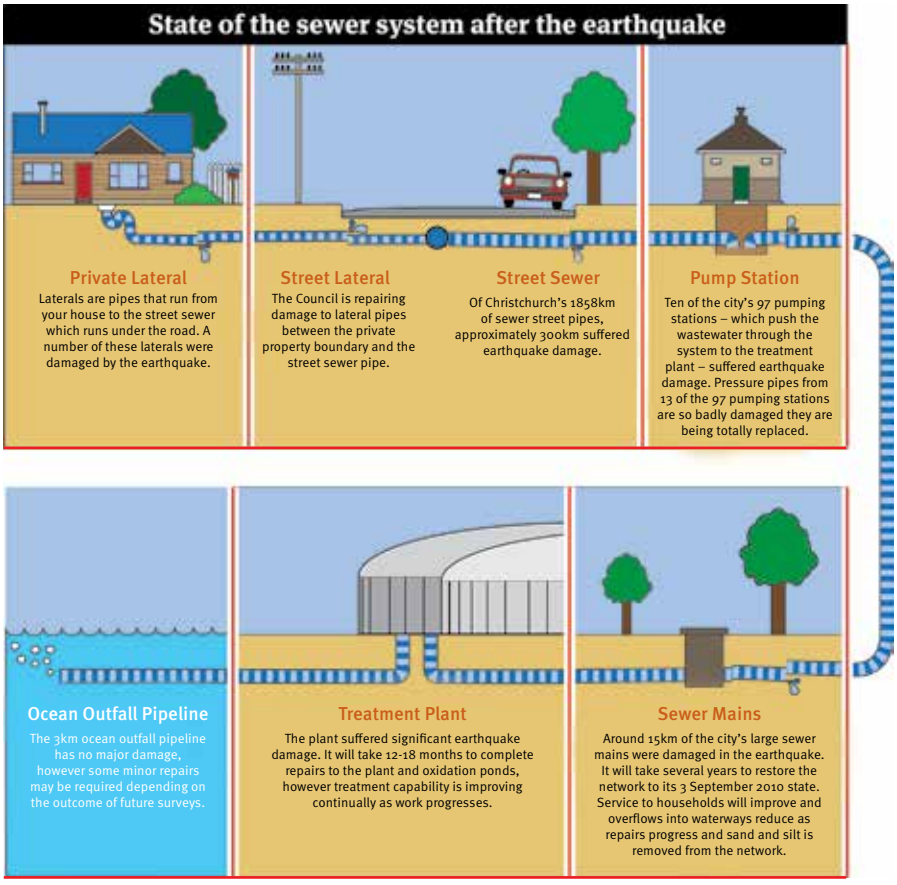


Figure 4.2
State of Christchurch wastewater system after earthquakes

4.1.3 RECOMMENDATIONS

- Alternative sewer options will be assessed on an area-by-area basis and specified for use as determined using whole-of-life or net present value (NPV) cost analysis. The NPV analysis should take into account the comparative cost of future earthquake damage repairs, including environmental and cultural costs, as well as comparative capital and operating costs over their operating life.
- Ductile pipe materials will be used for repairs or replacements providing they represent best value for the community in terms of balancing risk reduction and increased costs.
- Pump station relocation and redesign decisions will be based on a standardised risk assessment method, including consideration of environmental and cultural risks, to ensure that design and location options.
- An analysis of network asset criticality and seismic vulnerability will be undertaken and recorded in a Wastewater System Asset Risk Register. (Asset criticality in this instance is defined as the risk to the whole of wastewater system operation if a particular asset that is part of the system fails.) The risk register will inform decisions over renewals and maintenance work as well as for expansion or replacement works.

4.2 WET WEATHER OVERFLOWS

4.2.1 DESCRIPTION OF ISSUE

Average dry weather wastewater flows in Christchurch are currently about 40 per cent higher than pre-earthquake, primarily due to damage to the wastewater conveyance systems resulting in increased inflow of groundwater through cracked pipes and damaged joints. With flows already relatively high during dry weather, when wet weather comes there are more frequent overflows into the Avon and Heathcote Rivers. These will require major remedial efforts to meet the currently consented two year average return interval overflow frequency within the next ten to twelve years.

A compliance strategy has been negotiated with Environment Canterbury, which will give the Council five years' relief from compliance requirements with its current overflow discharge consent. This is on the basis that earthquake damage to the network is preventing the Council from achieving the required overflow standard.

This gives the Council the opportunity to monitor the impact of SCIRT's rebuild on overflow compliance and to develop and implement a network upgrade programme to comply with the overflow containment standards at the end of the specified five year time frame.

Earthquake damaged pipe

4.2.2 OPTIONS CONSIDERED

The options considered for addressing wet weather overflows were:

- Improvements to the conveyance network due to earthquake repairs undertaken by SCIRT as described in Section 4.1.2 will reduce wastewater overflows by reducing the inflow of stormwater and the infiltration of groundwater. These options include using more ductile materials for repairs and replacements, using shallow gravity sewers and considering alternatives to traditional gravity sewers where these alternatives may be more cost-effective than conventional resewering on a whole-of-life cost basis, or where these are the most suitable option for greenfield subdivisions.
- The Council is reviewing options to accelerate the construction of the Wairakei Diversion sewer line to allow the Northern Relief sewer line to be partially bypassed to allow earthquake-related investigation and repair works. This project provides for a new trunk sewer that will link the Northern Relief to the new Fendalton Duplication and Western Interceptor. This will allow part of the flow to be diverted away from the Northern Relief, which is expected to result in a reduction in overflows from the Northern Relief in the short to medium term, particularly at the Grassmere and River Road overflows.

Bank of oxidation pond, Bromley

- The Council is also developing a hydraulic computer model of the wastewater network. Once calibrated, the model will be able to predict the current frequency and scale of wet weather overflows from the wastewater network to check the current status against the two year annual recurrence interval (ARI) consent requirement. The model will also be able to predict future overflow performance as sewer repair and replacement works are put in place.
- The hydraulic model can be extended to consider further options for overflow mitigation such as interconnecting branches of the network or providing network storage. Adding storage tanks at overflow locations reduces overflow frequency by providing local wastewater storage during peak flow periods. Once peak flows have abated, the storage tank is emptied into the wastewater system.
- Other options to manage overflows involve reducing inflows and infiltration on private property sewers. This is a challenging area for the Council as it has no jurisdiction over the private lateral since it is owned by the private landowner and is located on private property. This could involve undertaking closed circuit television (CCTV) inspection or pressure testing of the private laterals.
- Work on options to reduce inflow and infiltration in Banks Peninsula has been focused on Diamond Harbour and Akaroa townships. Good progress has been made in reducing inflow and infiltration effects on the networks in these settlements. Inflow and infiltration are particularly high in Lyttelton and it is planned to address this area as work completes in Akaroa and Diamond Harbour.
- Areas prone to stormwater flooding that adds to stormwater inflow to the sewers in wet weather should be identified and addressed.

Overall, a considerable amount of further work is required to develop a comprehensive wet weather overflow strategy and agree on timelines and funding for its implementations. Long term objectives are described in this document and further computer modelling will be required as the SCIRT rebuild progresses to refine these.

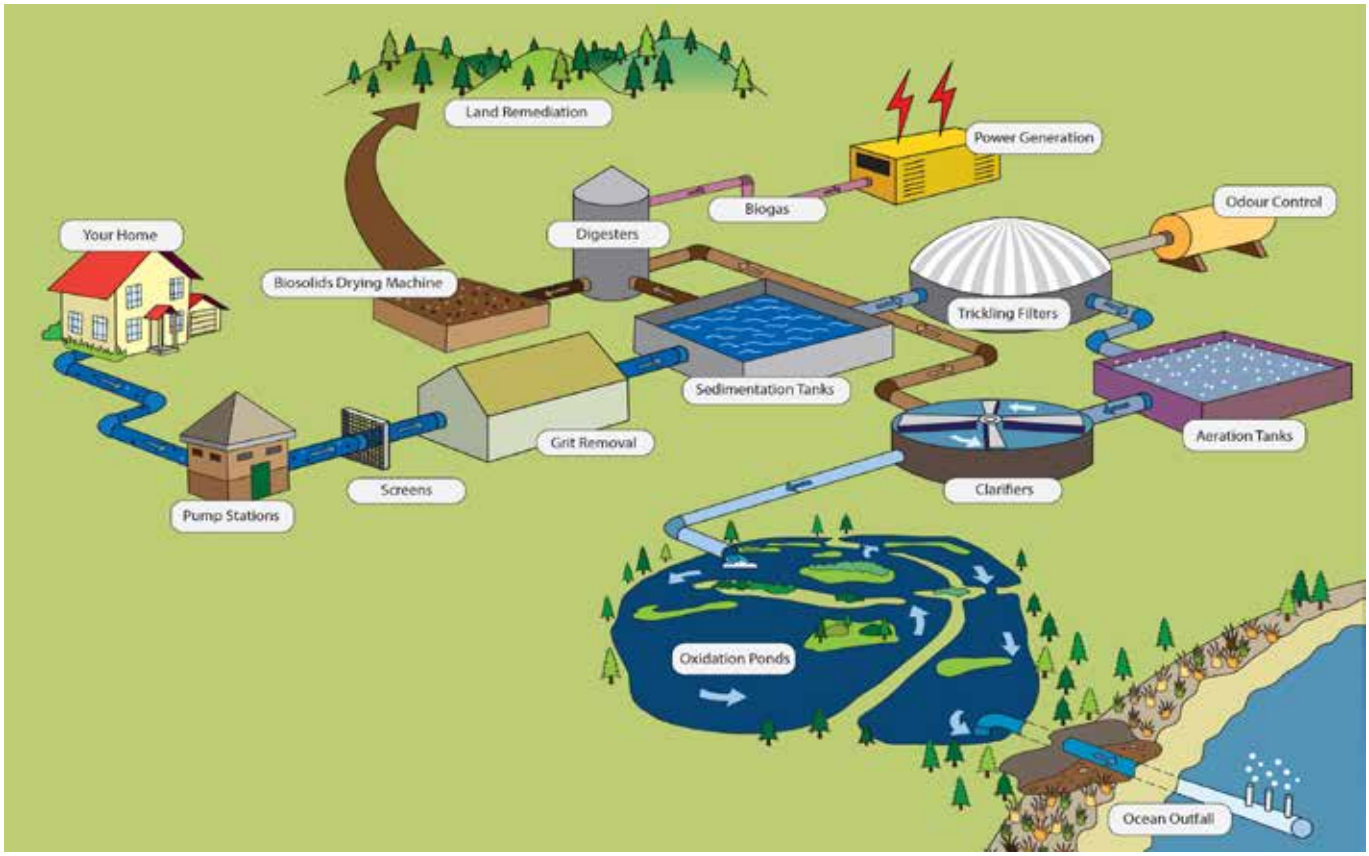
4.2.3 RECOMMENDATIONS

Some overflows are unavoidable, as Christchurch was built on swampy land, is relatively flat and low lying, and is subject to surface flooding in significant rain events. The construction of a network that would be able to convey all storm flows in all rain events would be prohibitively expensive. Significant capital expenditure would be required on assets that might never be used. It would also lead to operational problems due to low flow velocities, sedimentation and resultant odour issues during periods of normal flows. As such, the achievement of zero sewer overflows in wet weather is unrealistic. Nonetheless, the Council is committed to continuing to strive to reduce the volume and frequency of wet weather overflows throughout the earthquake rebuild and future capital works program.

- The Council will annually review the status of network overflows to confirm the position with respect to compliance with the two year ARI network overflow standard. If necessary, prior to the expiry of the ECan compliance agreement, the Council will renegotiate the agreement to account for the actual progress made in reducing overflows and to incorporate revised and achievable standards and timelines.
- Sewer system repairs and replacements using alternative options (likely to include pressure and vacuum sewer systems for vulnerable parts of the network and greenfield areas) will contribute to reduced inflows of stormwater and infiltration of groundwater and will assist the Council in meeting the wet weather overflow standard. The Council will develop a process for incorporating potential benefits in reducing wet weather overflows into repair and replacement decisions. The purpose of this activity is to make the most cost-effective choices overall for repair and replacement works without compromising environmental and statutory standards.
- The Council will implement the Wairakei Diversion commencing in 2013.
- The Council will carry out a performance assessment of the network in its current condition using the wastewater network hydraulic model to establish the current ARI for each overflow point. The Council will also use the model to assess the effectiveness of the improvements in the wastewater network from the SCIRT rebuild and capital projects (e.g. Wairakei Diversion).
- Level and discharge volume data will be collected at each of the consented overflow locations, as required by the conditions of the overflow discharge consent.
- The hydraulic model will be updated and recalibrated as necessary during the next five years to confirm the status of overflows and progress towards the two year ARI performance standard.
- Once the SCIRT design programme is complete, the model will be re-run to establish the revised ARI for each overflow point, and will then be used as a basis to identify further works that may be required to reduce overflows to a two year ARI (e.g. network storage).

In addition, it is recommended the following programmes are put in place:

- Undertake CCTV inspection pressure testing of all laterals connecting to rebuilt pressure and vacuum sewer networks, and require the property owner to repair any damage on their property through their insurance cover.
- Encourage property owners with gravity laterals to CCTV their private lateral and repair under their insurance policy as required.
- Continue inflow and infiltration reduction on Banks Peninsula, particularly for Lyttelton once Akaroa is completed.
- Analyse the relative environmental benefits of improving stormwater discharge quality and reducing wastewater overflow frequency.
- Identify and mitigate areas prone to stormwater flooding that adds to stormwater inflow to the sewers in wet weather.
- Undertake an investigation of screens on overflows.



Process flow diagram, Christchurch wastewater treatment system

4.3 LONG-TERM WASTEWATER TREATMENT AND DISPOSAL

4.3.1 DESCRIPTION OF ISSUE

The CWTP has proven to be reasonably resilient through the 2010–11 earthquake sequence and provides cost-effective and reliable treatment of Christchurch wastewater on a day-to-day basis. Structures that were significantly damaged including the secondary clarifiers and oxidation pond embankments have been repaired and strengthened against further earthquake damage. The CWTP has an N-1 power supply system, multiple sources of cooling water, plant redundancy, dual PLC processor capability and a range of other measures to mitigate against plant failure.

Nevertheless, as the urban area expands increasingly to the north and southwest, the costs of reticulating wastewater from these peripheral areas to CWTP will increase and options to provide separate or satellite treatment facilities in these areas warranted consideration.

As a baseline for comparison purposes, the strengths and weaknesses of CWTP are discussed below. The essential strengths of CWTP are as follows:

- The plant has existing capacity to treat forecast flows and loads to Year 2035.
- Network connections to the treatment plant have been strengthened post-earthquake.
- The treatment process is multi-layered with a number of treatment stages acting in series and a high level of redundancy provided within many of the individual treatment stages. If any stage suffers partial failure the downstream stages are able to respond to mitigate the impact on treated wastewater quality.
- The site's infrastructure is robust.
- The CWTP oxidation pond system provides treatment backup as well as hydraulic buffering.

The essential weaknesses of CWTP are as follows:

- It is vulnerable to sand ingress following earthquakes, and this poses risks to treatment processes.
- Poor ground conditions enhance the risk of structural damage during future earthquakes. However, steps have been taken to reduce seismic risks by strengthening the clarifiers and oxidation ponds and associated structures that penetrate below groundwater level.
- The plant is located near the coastline but is still reasonably well elevated and therefore protected against coastal hazards including tsunami and sea level rise.

4.3.2 OPTIONS

A range of alternatives to the continued development of the CWTP treatment facility have been investigated in terms of resilience, whole of life or NPV cost, and social cultural and environmental performance. These options are:

- A satellite plant at Belfast treating one or three cubic metres per second with discharge to land or sea.
- A satellite plant at Rolleston treating one cubic metre per second with discharge to land or sea.

Capital costs for alternative treatment options are summarised in Figure 4.3.

An NPV comparison of the alternative treatment schemes with the centralised and upgraded Bromley treatment facility is provided in Figure 4.4.

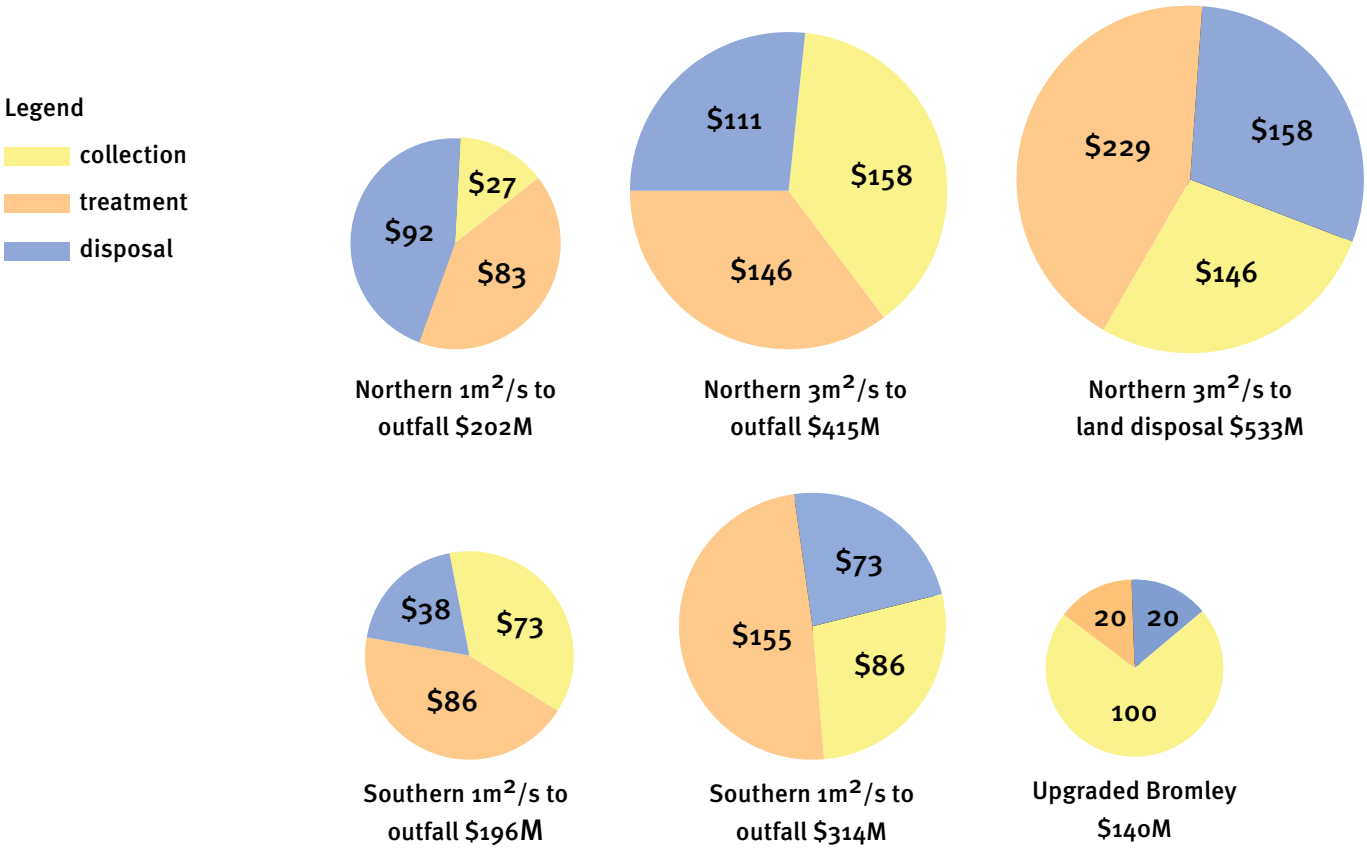
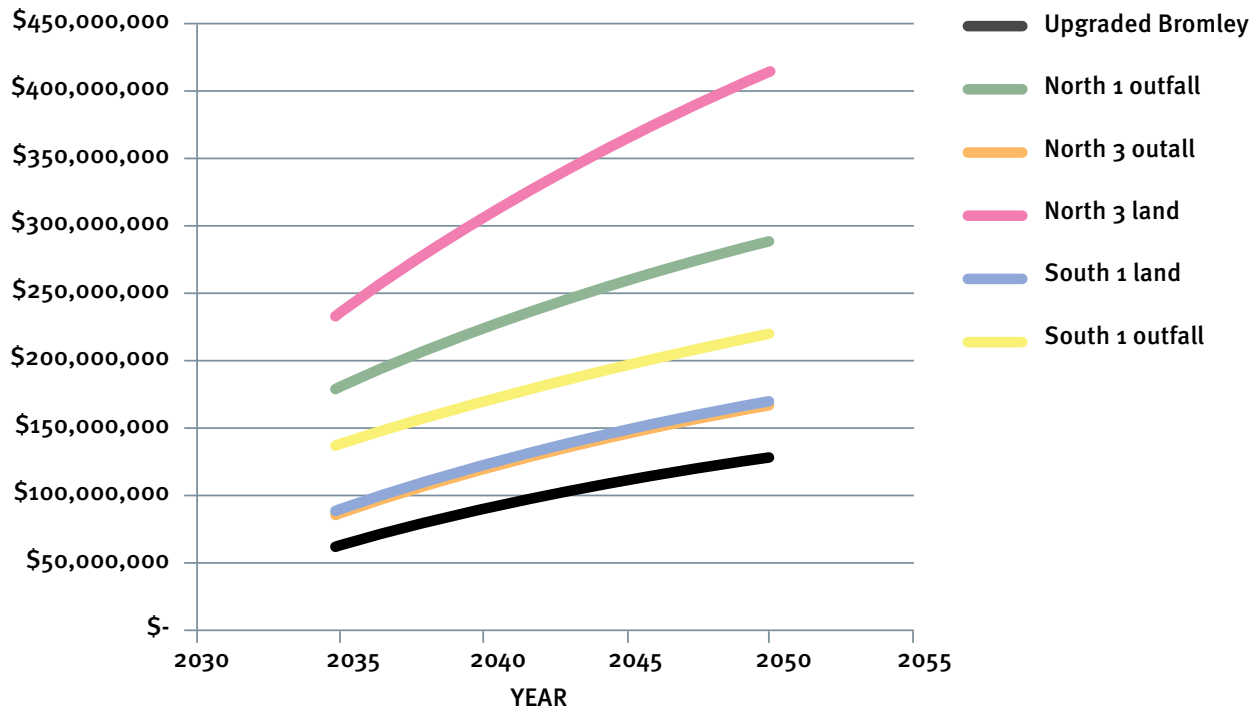


Figure 4.3
Indicative cost pie charts for wastewater treatment and disposal options

Figure 4.4
Cumulative cash flow curves for treatment scheme options



A clarifier at Christchurch wastewater treatment plant

OPTION	ITEM	CULTURAL	SOCIAL (INCLUDING PUBLIC HEALTH)	ENVIRONMENTAL	ECONOMIC	RESILIENCE	TOTAL SCORE
Central wastewater treatment plant at Bromley to ocean	Conveyance	3	2	3	1	3	**31**
	Treatment	1	2	2	1	2	
	Disposal	3	2	2	1	3	
South wastewater treatment plant 1m^3/s to land	Conveyance	2	2	2	4	3	**33**
	Treatment	1	2	2	3	2	
	Disposal	2	2	2	2	2	
North wastewater treatment plant 1m^3/s to ocean	Conveyance	2	1	2	1	3	**37**
	Treatment	1	3	3	3	2	
	Disposal	3	3	2	5	3	
South wastewater treatment plant 1m^3/s to ocean	Conveyance	2	2	2	4	3	**37**
	Treatment	1	2	2	3	2	
	Disposal	3	1	2	5	3	
North wastewater treatment plant 3m^3/s to land	Conveyance	1	1	1	5	2	**38**
	Treatment	1	4	4	5	2	
	Disposal	2	3	2	4	1	
North wastewater treatment plant 3m^3/s to ocean	Conveyance	1	1	1	5	2	**44**
	Treatment	1	4	4	5	2	
	Disposal	3	4	3	5	3	

Table 4.1
Preliminary evaluation of wastewater treatment and disposal options

The NPV comparison is based on the implementation of any chosen treatment scheme in 2035 to match the increase in demand for treatment and incorporates operating costs over 15 years to 2050. The upgraded Bromley treatment plant has the lowest NPV cost of all options analysed.

Treatment schemes have also been ranked overall against cultural, social environmental and economic and resilience parameters as shown in Table 4.1.

Options are ranked from one as best to 5 as worst. Colour coding has also been used to indicate the ranking with green as best and red as worst.

The total score for each option was calculated by simply adding the scores together – in other words each attribute has equal weighting. This weighting is considered to represent a balanced assessment against the wastewater strategy goals and objectives. No sensitivity analysis has been conducted.

The evaluation of options is summarised below. Schemes involving a satellite treatment plant are based on CWTP continuing to operate and treat residual flows and loads that are not diverted to a satellite treatment plant.

4.3.3 CENTRALISED CWTP FACILITY TO OCEAN

A centralised and upgraded treatment facility at Bromley with continuing discharge to Pegasus Bay is ranked first overall. The main factors in this ranking are the lowest NPV cost, a moderate level of resilience and well defined and well managed cultural, social and environmental effects.

4.3.4 SOUTHERN TREATMENT PLANT TREATING ONE CUBIC METRE PER SECOND TO LAND

A southern treatment plant treating one cubic metre per second combined with the Bromley treatment facility is ranked second overall. This scheme has similar resilience to the centralised CWTP option, with slightly higher costs and slightly improved performance on cultural and environmental effects.

4.3.5 NORTHERN TREATMENT PLANT TREATING ONE CUBIC METRE PER SECOND TO OCEAN

A northern treatment plant treating one cubic metre per second with disposal to sea is ranked third overall. Building a new treatment plant to the north as well as a new ocean outfall poses social, environmental and cultural risks. The resilience of this option is similar to the centralised CWTP option.

4.3.6 SOUTHERN TREATMENT PLANT TREATING ONE CUBIC METRE PER SECOND TO OCEAN

A southern treatment plant treating one cubic metre per second with discharge to ocean, combined with the Bromley treatment facility is ranked fourth overall. The cost of a southern ocean outfall is substantial and this adversely affects the overall scheme's NPV. The resilience of this option is similar to the centralised CWTP option.

4.3.7 NORTHERN TREATMENT PLANT TREATING THREE CUBIC METRE PER SECOND TO OCEAN AND LAND

The northern treatment plant schemes treating three cubic metres per second with the continued operation of the Bromley facility are ranked fifth and sixth respectively. These schemes suffer from high NPV costs while being marginally more resilient than the centralised Bromley option. The land disposal-based scheme generally scores lower (is more preferred) than the ocean disposal option in terms of cultural, social and environmental impacts.

4.3.8 RECOMMENDATION

The recommended option for future expansion of wastewater treatment facilities in Christchurch is the centralised and upgraded CWTP treatment plant option. A major expansion of the CWTP is likely to be required around 2035. Between 2012 and 2035 renewals and maintenance work should continue to address risks from natural hazards while maintaining the facility in accordance with asset management plan requirements.

This recommendation should be reviewed before the likely expansion of CWTP in 2035 is confirmed when growth factors and other considerations relevant to this decision are more clearly defined.

Ocean outfall pipe section on its way to seabed

4.4 BANKS PENINSULA LONG-TERM WASTEWATER TREATMENT AND DISPOSAL

4.4.1 DESCRIPTION OF ISSUE

The Council has conducted extensive consultation and scheme development on Banks Peninsula wastewater systems over the last six years. This has included consideration of environmental impacts on receiving environments as well as community desires and cultural concerns.

The consents for the treatment plants in Lyttelton, Governors Bay and Diamond Harbour expire on 03 August 2029, 31 December 2018, and 31 December 2021 respectively.[9]

In summary, the Council proposes to:

- Convey untreated wastewater that is currently treated at the Lyttelton, Governors Bay and Diamond Harbour wastewater treatment plants to CWTP.
- Expand the wastewater reticulation for Diamond Harbour to include Charteris Bay.
- Remove the Wainui wastewater treatment plant discharge from Akaroa Harbour, and dispose to land instead.
- Relocate the Akaroa wastewater treatment plant away from Takapuneke Reserve and construct a new mid-harbour outfall.
- Provide a reticulation and treatment scheme for Little River.
- Look at options for providing wastewater a scheme for Birdlings Flat.
- Investigate options for Duvauchelle wastewater treatment plant discharge.

A key issue for consideration is how overflows are managed in Lyttelton Harbour once the wastewater treatment plants are decommissioned.

4.4.2 OPTIONS

Nine options were considered for wastewater for Lyttelton Harbour, including land application and conveying wastewater to CWTP, against a base case option of improved treatment and continued discharge to Lyttelton Harbour (MWH, 2007). Five sub-options for conveying wastewater to CWTP were considered (Harrison Grierson, 2008), all of which involved piping wastewater across the floor of Lyttelton Harbour. Two further options were considered in the Issues and Options report (CH2M Beca, 2012):

- Providing peak flow storage at Diamond Harbour, Governors Bay and Lyttelton and pumping buffered flows from Diamond Harbour and Governors Bay to a pump station at Lyttelton wastewater treatment plant, and the combined flows through the rail tunnel to Pump Station 15 (which has sufficient capacity and is being repaired by SCIRT). This option would also include mothballing the Lyttelton wastewater treatment plant, which could be restarted in a couple of days to provide emergency treatment of the combined flows from Lyttelton, Governors Bay and Diamond Harbour. This is likely to have a similar cost to the preferred option in the Harrison Grierson (2008) report.
- As above, but instead of piping across the floor of Lyttelton Harbour, pipe in the road corridor from Diamond Harbour to Governors Bay, and from Governors Bay to Lyttelton wastewater treatment plant. While the pipelines are longer, this significantly reduces risks during construction and the risk of tsunami damage. This is likely to be slightly more expensive than the above option, due to the longer pipe lengths.

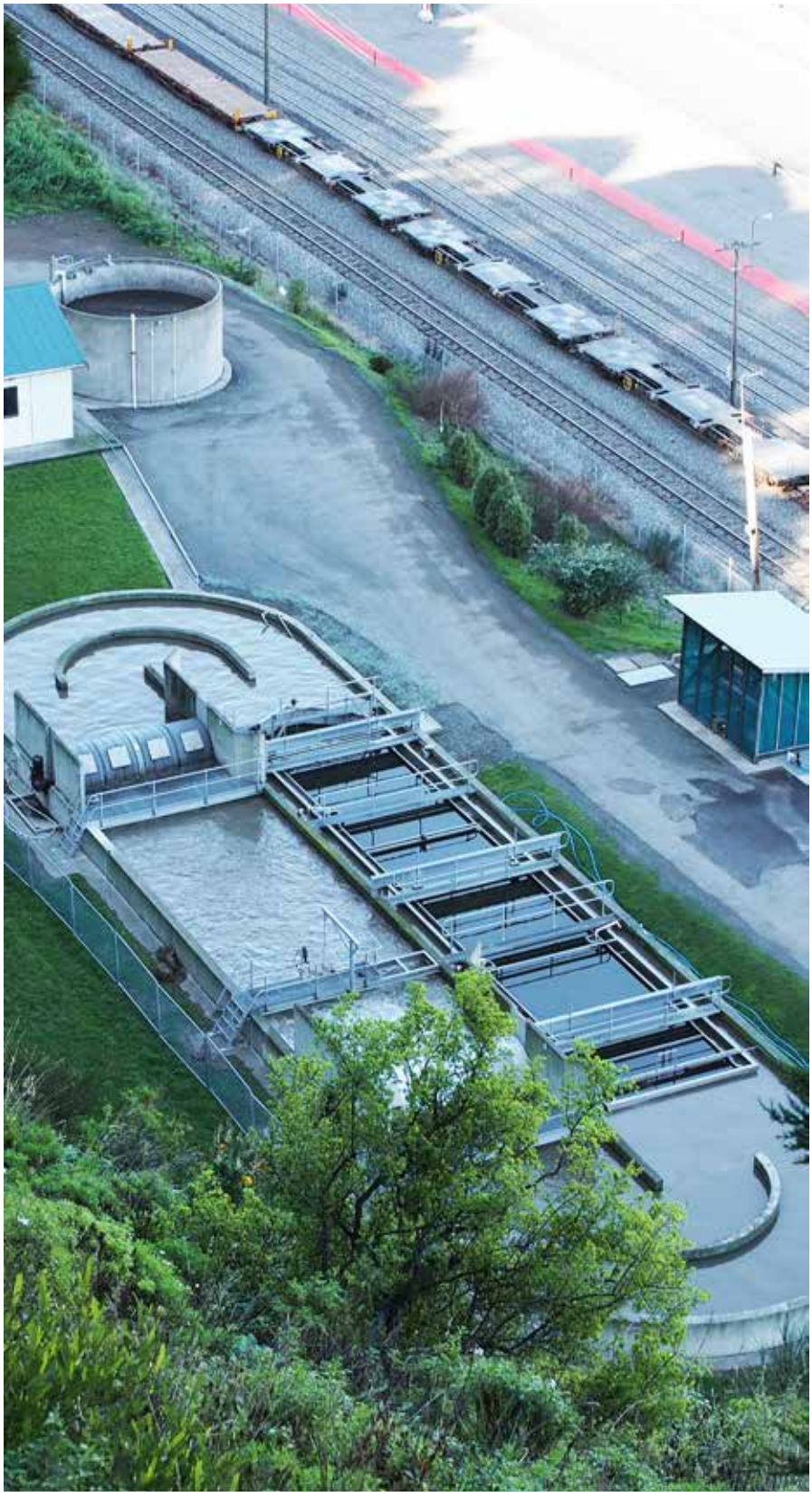
A preliminary evaluation of these two options was carried out, along with the other five sub-options for conveyance to CWTP, and the option of upgrading the Lyttelton Harbour wastewater treatment plants and continuing to discharge to Lyttelton Harbour. The evaluation took into account cultural, social, environmental, economic, and resilience factors.

The two preferred options are the two additional options described above. This is because these provide the greatest resilience (due to the provision of peak flow storage, and the ability to bring the mothballed Lyttelton wastewater treatment plant back online if the pipeline to CWTP is damaged), are among the lowest cost options (when compared on a like for like basis) and have the least environmental effects (with peak flow storage reducing the likelihood of overflows and all wastewater discharges being removed from Lyttelton Harbour).

[9] *Resource consent numbers CRC940690A, CRC101760 and CRC101835.*

4.4.3 RECOMMENDATION

It is recommended that the option of providing peak flow storage at Diamond Harbour, Governors Bay and Lyttelton is investigated in more detail. It is also recommended that the option of constructing the pipeline in the road corridor rather than across the harbour is further explored. The Council will investigate the options for Lyttelton Harbour in more detail closer to the planned time of implementation (2016 – 2019).



Wastewater treatment plant, Lyttelton

4.5 REUSE OF TREATMENT PRODUCTS

4.5.1 WATER REUSE

Description of issue

Very little water reuse is practiced in Christchurch due to abundant, low cost and high quality fresh water from aquifers beneath Christchurch. Water reuse is unlikely to be economically viable or widely supported by the community until the structure of supply costs or availability changes.

Options

The Issues and Options report (CH2M Beca, 2012) developed an option of reusing treated wastewater from CWTP to irrigate land in the residential red zone alongside the Avon River.

Given that the future status and use of this land is in doubt, and the widespread community desire to see the eastern suburbs redevelop on the back of a quality greenspace and aquatic environment, this option does not warrant further consideration.

A more acceptable and cost effective reuse option would involve expanding the wastewater reuse scheme at the CWTP to reduce groundwater extraction. This project is already listed in the Christchurch Long Term Plan for Years 2017–18 and 2018–19. Currently about 2,000 m3/day of treated wastewater is reused for process cooling. This could be expanded to 5,000 m3/day at a cost of about $2M.

A preliminary evaluation of the two options was carried out, taking into account cultural, social, environmental, economic, and resilience factors.

Recommendation

The preferred option is to implement the proposed expansion of the CWTP water reuse scheme in 2018 as this scheme optimises environmental and other benefits while minimising costs. This expansion involves further treatment of final wastewater at CWTP for onsite reuse within wastewater treatment processes (i.e. non-potable reuse).

4.5.2 BIOSOLIDS

Description of issue

Significant quantities of biosolids are produced continuously at the eight Christchurch and Banks Peninsula wastewater treatment plants and they require disposal. Dewatered biosolids are pathogen-laden. They are difficult to handle and the costs involved in safe and environmentally sustainable disposal can be significant. There are economies of scale in centrally treating biosolids. Small quantities of biosolids produced at Banks Peninsula treatment plants may optimally be processed at a central site such as CWTP.

Options

The Council has developed an overall biosolids management strategy over the last seven years. This has included extensive public consultation specifically about the management of CWTP biosolids which amount to about 80 tonnes per day of material at 20 percent dry solids. Options reviewed included landfilling, land spreading, biosolids composting, thermal and solar drying, and incineration. Decentralised biosolids processing has not been investigated in depth because the implementation costs are very high on a per-tonne-of-biosolids-processed basis compared with central processing at CWTP.

After extensive investigations a decision was taken to implement a thermal drying facility located at CWTP utilising 100 per cent renewable fuels to process dewatered biosolids into stabilised dried Class Ab biosolids suitable for reuse as a fertiliser or fuel.[10] This facility was commissioned in 2010 and has capacity to process the biosolids from CWTP as well from the outlying treatment plants on Banks Peninsula.

The Council has also explored a range of options for disposing of the dried and stabilised biosolids that include landfilling, reuse in mine rehabilitation and use as fertiliser.

Recommendations

The recommendations for biosolids management are:

- Continue to dry CWTP biosolids at the biosolids drying facility using renewable fuels (landfill gas and wood) for the next 20 years.
- In the short term, continue transporting biosolids to the Stockton mine for use in land rehabilitation as agreed under the current reuse contract with Solid Energy.
- Continue to explore other reuse methods that can act as a second alternative to Solid Energy including use as a fertiliser and/or incineration over the next five years.

[10] *Per Guidelines for the Safe Application of Biosolids to Land in New Zealand (Ministry for the Environment and New Zealand Water and Wastes Association, 2003)*

Biosolids drying facility at Bromley

05

Monitoring, evaluation and review

The Implementation Plan should be reviewed annually to assess if there are additional approaches that can be taken, or whether changes to current methods are required. It is intended that this strategy is a living document that can be adjusted in the face of additional information.

The measures developed as part of the LTP process will be employed to review the progress of this strategy, particularly those measures developed for reducing wastewater overflows.

This strategy will be formally reviewed on a five-yearly basis, with the first formal review scheduled for 2018.

06

Resources and capability

The Council is committed to providing an affordable, reliable, culturally acceptable, ecologically sustainable and resilient wastewater system that protects public health and meets the needs of present and future communities. To achieve this vision the Council will take the following steps:

- Through the Wastewater Strategy Implementation Plan the Council will adopt and prioritise specific tasks and actions required to put this strategy into force.
- The tasks and actions in this strategy will be incorporated into the LTP and Annual Plan using standard Council processes.
- Engagement with stakeholders will be ongoing involving normal consultative processes. Specific consultation activities may be used for particular elements of the programme as required.
- Council resources will be allocated to implement the tasks and actions to meet programme and cost goals established by the Council.
- The progress of implementation will be monitored to ensure the goals and objectives of this strategy are achieved.
- This strategy and the Implementation Plan will be regularly reviewed as described in section five, and revised to bring them up to date with the rapidly changing circumstances that apply in Christchurch.

It should be noted that all elements of this strategy may not necessarily be achieved in event of another major seismic event. The inclusion of a project within this document does not commit the Council to commence the project. All projects are contestable each time a new Long Term Plan is prepared.

Clarifier discharge, Christchurch wastewater treatment plant

07

Implementation risks and tasks

7.1 RISKS

Key risks to delivering this strategy include:

- failure of the Council to provide sufficient resources to address issues
- failure of stakeholders to accept their respective responsibilities
- deferral of actions to future councils and generations
- reliance on a single approach (silver bullet) to address issues
- failure of the community as a whole to recognise the impacts of individual actions
- failure of the Council to secure appropriate resource consents (e.g. for overflows)
- key assumptions about population growth (and associated wastewater flows and loads) are incorrect.

7.2 TASKS

This strategy will be delivered through an Implementation Plan. Resourcing will be determined through the LTP process. Key to this process will be the recognition that budgetary priorities must include not only business-as-usual infrastructure renewals and replacements, but also proactive capital and operational projects to ensure the long-term sustainability of the wastewater system.

Duvauchelle wastewater treatment plant

Trickling filter, Akaroa wastewater treatment plant

List of abbreviations

ADWF	Average Dry Weather Flow
ARI	Annual Recurrence Interval
BPDP	Banks Peninsula District Plan
CCTV	Closed circuit television
CERA	Canterbury Earthquake Recovery Authority
CERAct	Canterbury Earthquake Recovery Act 2011
Council	Christchurch City Council
CRPS 1998	Operative Canterbury Regional Policy Statement 1998
CRPS 2013	Canterbury Regional Policy Statement 2013
CWMS	Canterbury Water Management Strategy
CWTP	Christchurch Wastewater Treatment Plant
ECan	Environment Canterbury
LGA2002	Local Government Act 2002
LTP	Long Term Plan
MKT	Mahaanui Kurataiao Ltd
NES	National Environmental Standard
NPS	National Policy Statement
NRRP	Natural Resources Regional Plan
NZCPS	National Coastal Policy Statement
m^3	Cubic metres
NPV	Net Present Value
PC1	Plan Change 1 of the CRPS
pLWRP	Proposed Land and Water Regional Plan
PVC	Poly Vinyl Chloride
RMA	Resource Management Act
SCIRT	Stronger Christchurch Infrastructure Rebuild Team
SDC	Selwyn District Council
WDC	Waimakariri District Council
WRRP	Waimakariri River Regional Plan
ZIP	Zone Implementation Programme

Glossary

Biosolids	Sludge is solids separated by wastewater treatment processes; if the sludge is stabilised to reduce pathogens and pest-attraction it is classed as biosolids (which can be beneficially reused)
Conveyance/reticulation	A network of pipes and pumps that collects wastewater from houses, commercial and industrial properties, and conveys it to a wastewater treatment plant
Net Present Value	Today's value of a future amount, before interest earnings and/or charges
Raw sewage	Untreated wastewater
Sewage	Another name for wastewater
Sewer	A pipe which carries wastewater to a wastewater treatment plant
Sewerage system	Another name for wastewater reticulation
Stormwater	Water that originates from rainfall and either soaks into the land surface or results in surface runoff
Treated effluent	Wastewater which has been treated in a wastewater treatment plant to reduce contaminants
Untreated effluent	Another name for raw sewage or raw wastewater
Wastewater system	The whole of the wastewater system including the connections to individual private sewer pipes, sewer networks, pumping stations, rising mains to wastewater treatment plants and disposal facilities to a point where wastewater is released into the environment

Photo credits

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Christchurch Swamp to City - A Short History of the Christchurch Drainage Board 1875-1989; John Wilson; 1989
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