Wastewater Treatment and Disposal

Activity Management Plan

Long Term Plan 2015–2025

As amended through the Annual Plan 2016/17

1 July 2016

Christchurch City Council

Quality Assurance Statement

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1 Key Issues for the Wastewater Treatment and Disposal Activity

1.1 Community Outcomes

Everything that the Council does in its day-to-day work is focused on achieving community outcomes. All activities outlined in this plan aim to deliver the results required to achieve these outcomes, contribute to Council strategies and meet legislative requirements. Likewise, all Council capital and operating expenditure is directed towards a level of service that moves the community closer to these outcomes now or at some future point.

The effective management of Wastewater Treatment and Disposal for Christchurch means achieving the community outcomes that:

- Injuries and risks to public health are minimised;
- Statutory obligations are met by Council;
- City assets, financial resources and infrastructure are well managed, now and in the future;
- A greater proportion of energy used in the city is from renewable sources;
- There is a reduction in waste to landfill.

Section 4 shows how these outcomes flow down into and influence the Council's activities and levels of service in relation to Wastewater Treatment and Disposal.

1.2 Effects of growth, demand and sustainability

Population Growth and Demand:

A forecast of population growth has been used to determine where and when Council infrastructure needs to be developed and at what capacity. The Council has considered the influence of changing demographics, community expectations, industrial/commercial demand, technology and legislation on the demand for this service. As part of Wastewater Treatment and Disposal planning Council has:

- Used the medium growth scenario from the Land Use Recovery Plan;
- Assumed the proportion of wastewater flow and load from commercial sources remains constant;
- Assumed the current wastewater production per connection will remain unchanged.

No major wastewater treatment or disposal projects are proposed to meet growth or additional demand. Demand on plants is periodically checked using calibrated flow and load computer models.

Sustainability:

The Local Government Act 2002 requires local authorities to take a sustainable development approach while conducting its business. Sustainable development is the fundamental philosophy that is embraced in Council's Vision, Mission and Objectives, and that shapes the community outcomes. The levels of service and the performance measures that flow from these inherently incorporate the achievement of sustainable outcomes as defined by:

- The Christchurch City Council Sustainability Policy;
- Christchurch City Council Biodiversity Strategy 2008-2035;
- Christchurch City Council Wastewater Strategy 2013;
- Sustainable Energy Strategy for Christchurch 2008-2018.

Major sustainability projects currently proposed for the wastewater treatment and disposal activity include:

- Biogas blending facility – maximising renewable energy production for environmental and economic reasons;
- Diverting Lyttelton Harbour Basin wastewater to the Christchurch Wastewater Treatment Plant (WwTP) – eliminating treated and disinfected effluent discharges to Lyttelton Harbour for social and cultural reasons; and
- Akaroa WwTP renewal – moving existing treatment infrastructure from a culturally sensitive site and reducing treated and disinfected effluent discharges to the harbour for social and cultural reasons.

1.3 Key Challenges and Opportunities for Wastewater Treatment and Disposal

In working towards the community outcomes and influenced by population growth and demand, Council faces the challenge of making decisions that prioritise resources to deliver the best mix of services at the right level and in a sustainable way. The key challenges and opportunities that have been priorities by Council are below in Table 1-1.

Table 1-1

Key Issue	Discussion
Earthquake and the Earthquake Rebuild	A series of earthquakes including a magnitude 7.1 on 4 September 2010, a magnitude 6.3 on 22 February 2011 and over 10,000 aftershocks, 2 of which were greater than 6.0 and 59 greater than 5.0. Damage occurred due to the quakes at Christchurch WwTP, Lyttelton, Governors Bay and Diamond Harbour WwTPs. Christchurch WwTP was further damaged and repair hampered due to large quantities of liquefaction silt in the influent. To date approximately 55% ($42 million of an estimated $77 million) of permanent repairs to the Christchurch WwTP are complete. Repairs completed to date have returned full process capability. Remaining repair works planned for the next three years will return redundancy and restore ancilliary buildings and facilities. Lyttelton, Governors Bay and Diamond Harbour WwTPs did not suffer the same extent of damage and repairs on these plants are complete except for a small number of assets installed for redundancy only. Small inflows of liquefaction silt remain in Christchurch WwTP influent. Removal or isolation of residential red-zone reticulation is anticipated to eliminate remaining most, if not all, of the remaining silt inflow.
Sustainability Requirements and Expectations	Increased awareness of sustainability practices, especially regarding social, cultural and environmental issues, has resulted in different requirements; both in terms of legislation and in community expectations. Iwi cultural desires include no discharges of human effluent to water bodies. This is also reflected in social desires where discharges to water are undesirable from food gathering and recreational standpoints. Environmental desires often include the treatment of wastewater to the highest standard possible before discharge. High levels of treatment and discharge to land are expensive which conflicts with the public requirement of low costs. Finding an acceptable balance of cost, social, cultural and economic factors may prove difficult. Christchurch WwTP currently has a 30year discharge consent; however the continual increase in community expectations may require plant improvements before they are required by resource consents.
Changes in Legislation	Legislation changes have the potential to limit plant operation or require upgrades for higher levels of treatment. Such changes could potentially increase levels of service or increase costs.
Sustainability	Council currently has a 30 year resource consent for treated effluent discharges; however community expectations are ever increasing and public pressure may demand WwTP upgrades prior to consent expiration.
Technology Advances	New technology provides opportunities to further decrease nutrient loads and recover economically beneficial resources from influent.
Self-Generated Power	The Christchurch WwTP is 90% self sufficient in terms of power (electricity and heat) requirements. Maintaining this level of self-sufficiency is a key issue due to the costs that would be incurred should an increase in power purchases be required.
Viruses and Hormones	Internationally concern regarding the presence of viruses or hormones from personal care products (PCPs) in treated wastewater. These concerns could lead to increased community expectations surrounding effluent qualities and public pressure for increased treatment (and therefore cost).

2 Proposed changes to activity

Table 2-1 summarises the proposed changes for the management of the Wastewater Treatment and Disposal activity since the Three Year Plan 2013-16 Activity Management Plan.

In recording these changes also identify what investigations will be needed, highlight the level of significance for the change and identify appropriate options for consultation and engagement.

Table 2-1 Proposed changes to activity

Key Change	Reason	Level of significance? What investigations are needed?	Options for consultation and engagement
Akaroa WwTP Replacement (estimated cost $29.3 million)	Increasing quality and quantity of treated and disinfected effluent discharges to Akaroa Harbour. Moving the existing WwTP off a culturally sensitive site.	Consents have been lodged. Detailed design is underway. A lab-scale land disposal trial is underway.	A working party has been consulting with the community and local Iwi for three years. The resource consent process will allow individuals to express their views.
Lyttelton Harbour Basin Wastewater Diversion (estimated cost $46.4 million)	Removal of treated and disinfected effluent discharges from Lyttelton Harbour.	A request for tender for concept designs will be released late 2014 or early 2015. Further investigations required for completing design will be completed by designers.	A working party has been consulting with the community and local Iwi for three years. The resource consent process will allow individuals to express their views.

3 Activity description

3.1 Focusing on what we want to achieve

Council undertakes activities in order to deliver on the community outcomes for Christchurch. The outcomes that relate most directly to the management of the city's wastewater treatment and disposal are that:

- Injuries and risks to public health are minimised;
- Statutory obligations are met by Council;
- City assets, financial resources and infrastructure are well managed, now and in the future;
- A greater proportion of energy used in the city is from renewable sources;
- There is a reduction in waste to landfill;

In addition to the above community outcomes, internal expectations are:

- Economic recovery of valuable resources from wastewater:
- The WwTPs are "good neighbours": and
- Resilient treatment facilities are provided.

3.2 How we will know we are achieving the outcomes

We will know we are achieving the above outcomes when we see the following results:

- **Well-maintained and managed treatment plants and disposal services** are provided to ensure wastewater is disposed of efficiently, safeguard public health and minimise adverse effects on the environment.
- Treatment plants are operated in a manner that **maximises economically beneficial by-products**, both internally and through partnerships with third party investors.
- Ongoing **monitoring and analysis** of wastewater services and processes is done to **measure and ensure compliance** with resource consents, processes, standards and **statutory requirements**.

The activities that follow in section 4 and the levels of service within them are all linked to the above results to ensure Councils stays focused on moving towards the community outcomes. This link aims to confirm why we are doing the activities – that they will realistically move us closer to our goals – and that service delivery remains relevant to strategic direction.

3.3 What services we provide

This activity includes the following services:

- Operate and maintain treatment plants, discharge structures/outfalls and biosolids reuse/disposal.
- Provide laboratory services as an integral part of monitoring and controlling treatment processes.

Ongoing initiatives to deliver these services include a balanced mix of business as usual maintenance and renewal to preserve levels of service plus a capital response where appropriate to respond to increasing demands. The earthquake recovery programme is repairing damage and adding resilience at the treatment facilities.

Assets at Christchurch, Duvauchelle Bay, Wainui and Tikao Bay WwTPs will continue to be replaced according to asset life schedules that are preliminary planned according to % asset life remaining and then modified according to condition assessment surveys.

Current plans developed as part of the Wastewater Strategy for Akaroa, Lyttelton, Governors Bay and Diamond Harbour wastewater treatment plants are:

- Replace/relocate the Akaroa WwTP from Takapuneke Reserve to a site North of the township in recognition of cultural importance of the current site to local Iwi. The new plant may dispose all or part of the effluent to land;

- Decommissioning of Lyttelton, Diamond Harbour and Governors Bay WwTPs and pumping wastewater to the Christchurch WwTP for treatment. This will remove effluent discharges to the Lyttelton Harbour;

Current renewals and maintenance to the plants are sufficient to reach their planned replacement dates; however should the above projects be deferred additional renewals and maintenance may be required to extend the lives of existing plants.

A IANZ accredited laboratory is currently operated at the Christchurch WwTP providing all water and wastewater sample testing.

Growth

Pre-quake the Christchurch WwTP had installed capacity to meet the projected growth of the City out to 2035. Terminal pump stations have a lower combined hydraulic capacity than the WwTP therefore a treatment plant hydraulic upgrade will not be required until terminal pump stations are also upgraded. The draft Wastewater Strategy details a number of options for additional treatment capacity once the current plant load limit is reached. These options will be reviewed in more detail in future LTP's.

Influent flows to the Christchurch WwTP have increased approximately 40% since the earthquakes. These increases are due to increased inflow and infiltration through damaged wastewater collection infrastructure. Subject to satisfactory renewal or repair of all damaged infrastructure the inflow is anticipated to return to pre-quake levels. There are current concerns that the infrastructure rebuild of wastewater services will not deliver this outcome.

There is current and future capacity availability at the treatment facilities on the Banks Peninsula. When the Akaroa upgrade occurs the new plant will be sized appropriately to cater for future growth. Wainui, Tikao Bay and Duvauchelle Bay WwTPs are for defined scheme sizes with residences outside scheme boundaries utilising on-site treatment. Expansion of these three plants would only be required if Council decides to provide a new service and expand the scheme area.

Betterment / Aspirational

Betterment and aspirational concepts being developed for Christchurch WwTP include renewal and upgrade of the trade waste (sucker truck) reception facility and investigating renewable gas (Landfill and Digester biogas) blending and distribution to maximise energy efficiency and reuse. The improved trade waste facility is under construction.

Banks Peninsula wastewater treatment and disposal aspirational and betterment projects include the Akaroa WwTP upgrade and the transfer of Lyttelton, Diamond Harbour and Governors Bay wastewater to the Christchurch WwTP. In addition trials to investigate land disposal from the Duvauchelle Bay WwTP have been proposed. Land disposal trials may include irrigation to forested areas or a golf course.

Resilience is a key concern at all plants. Renewal and realignment of pressure main 15 through the Christchurch WwTP is being carried out solely to improve plant resilience. In addition a resilient design requirement has been added to all projects at all WwTPs.

The discharge channels at the CWTP have also been cross-connected to improve plant resilience.

An upgrade of the flow control in the CWTP grit tanks and primary tanks has improved resilience and operability as part of a renewal project. These three resilience benefits have been founded on learnings from the Christchurch earthquake sequence.

Assets included in the Wastewater Treatment and Disposal activity are 8 WwTPs, 1 outfall pump station, 6 ocean outfalls and 2 land irrigation schemes..

3.4 Benefits and Funding Sources

3.4.1 Who Benefits?

Who benefits?	
Individual	
Identifiable part of the community	
Whole community	Full

Key:
Full
Majority
Some

Explanatory Comments:

The entire community benefits from this activity.

There are health and environmental benefits from a wastewater treatment and disposal system for the whole community.

3.4.2 Who pays?

Funding - Fees / User Charges	Other revenue Grants & Subsidies	General rate	Targeted rate
23%	0%	0%	77%
Some			Majority

Note, Funding Split % is derived from the 'Summary of Cost for Activity' (section 13).

Key:		Typically
Full	*All or almost all the cost is funded from that source. If the comment is made in the general or targeted rate columns it does not preclude making minor charges for the service but indicates that the charges are a negligible part of the fund.*	*95%+*
Majority	*The majority of the activity is funded from this source.*	*50%+*
Some	*Some revenue is derived from this source.*	*<50%*

Does this Activity generate surplus funds that can be applied to other areas? **No**

Explanatory Comments:

The majority of the cost of this service is covered by Targeted Rate.

3.5 Key legislation and Council strategies

National legislation relating to the wastewater treatment activity includes:

The Water Related Services Bylaw 2008; Trade Waste Bylaw 2006;

- Local Government Act 2002
- Hazardous Substances and New Organisms Act 1996
- Health Act 1956
- Resource Management Act 1991
- Canterbury Earthquake Recovery Act 2011
- Health & Safety in Employment Act 1992

Relevant Council bylaws and strategies include the Christchurch City Council Wastewater Strategy 2013, Christchurch City Council Water Supply Strategy 2009-39, Christchurch City Council Surface Water Strategy 2009-39 and the Christchurch City Council Sustainable Energy Strategy 2008-18.

- Christchurch City Council Water related services Bylaw 2008;
- Christchurch City Council Trade waste bylaw 2006:
- Christchurch City Council Wastewater Strategy 2013:
- Christchurch City Council Water Supply Strategy 2009-39:
- Christchurch City Council Surface Water Strategy 2009-39:
- Christchurch City Council Sustainable Energy Strategy 2008-18.
- Christchurch City Council Waste Management and Minimisation Plan 2013

Other relevant Acts, Regulations, Bylaws and strategies are detailed in the Wastewater Asset Management Plan.

4 Levels of service and performance measures

Table 4-1 summarises the levels of service and performance measures for the Wastewater Treatment and Disposal activity.

Table 4-1

Performance Standards Levels of Service (we provide)		Results (Activities will contribute to these results, strategies and legislation)	Method of Measurement (We will know we are meeting the level of service if…..)	Current Performance	Benchmarks	Future Performance (targets) Year 1 2015/16	Year 2 2016/17	Year 3 2017/18	Future Performance (targets) by Year 10 2024/25
Operate and maintain treatment plants discharge structures/outfalls and biosolids reuse/disposal									
11.1.2	Maintain consent compliance for wastewater treatment plants.	Statutory Requirements	*Compliance with territorial authority's resource consents for discharge from its sewerage system, measured by the number of:* *- Abatement notices* *- Infringement notices* *- Enforcement orders, and* *- Convictions* *Sewerage and the Treatment and Disposal of Sewage mandatory performance measure 2a-d.*	*2013/14: 0* *2012/13: 0* *2011/12: 0* *2010/11: 5** *2009/10: 1** ** Due to earthquake damage at CWTP*		11.1.2.1 Number of major and/or persistent breaches of resource consent for WwTPs or associated discharges: 0 11.1.2.2: Number of abatement notices: 0 11.1.2.3: Number of infringement notices: 0	11.1.2.1 Number of major and/or persistent breaches of resource consent for WwTPs or associated discharges: 0 11.1.2.2: Number of abatement notices: 0 11.1.2.3: Number of infringement notices: 0	11.1.2.1 Number of major and/or persistent breaches of resource consent for WwTPs or associated discharges: 0 11.1.2.2: Number of abatement notices: 0 11.1.2.3: Number of infringement notices: 0	11.1.2.1 Number of major and/or persistent breaches of resource consent for WwTPs or associated discharges: 0 11.1.2.2: Number of abatement notices: 0 11.1.2.3: Number of infringement notices: 0

Performance Standards Levels of Service (we provide)		Results (Activities will contribute to these results, strategies and legislation)	Method of Measurement (We will know we are meeting the level of service if.....)	Current Performance	Benchmarks	Future Performance (targets) Year 1 2015/16	Year 2 2016/17	Year 3 2017/18	Future Performance (targets) by Year 10 2024/25
						11.1.2.4: Number of enforcement orders: 0 11.1.2.5: Number of convictions: 0	11.1.2.4: Number of enforcement orders: 0 11.1.2.5: Number of convictions: 0	11.1.2.4: Number of enforcement orders: 0 11.1.2.5: Number of convictions: 0	11.1.2.4: Number of enforcement orders: 0 11.1.2.5: Number of convictions: 0
11.1.1	Minimise odour complaints from wastewater treatment plants	Well maintained and managed treatment plants and disposal services. Statutory requirements.	*Measuring and managing significant odour issues associated with wastewater treatment plants.*	*2013/14: 0* *2012/13: 0* *2011/12: 0* *2010/11: 0.27** *2009/10: 0* *per 10,000 properties* ** Due to earthquake damage at CWTP* *2013/14: Met* *2012/13: Met* *2011/12: Not reported* *2010/11: Mostly met** *2009/10: Met*	*Watercare: three odour complaints from Mangere Treatment Plant, seven from other plants (equivalent of 0.00 complaints / 1000 properties served) (Watercare Annual Report 2010-2011)*	11.1.1.1: Number of odour events per 10,000 properties served: ≤0.1 11.1.1.2: Compliance with ECan resource consents for discharges to air: 100%	11.1.1.1: Number of odour events per 10,000 properties served: ≤0.1 11.1.1.2: Compliance with ECan resource consents for discharges to air: 100%	11.1.1.1: Number of odour events per 10,000 properties served: ≤0.1 11.1.1.2: Compliance with ECan resource consents for discharges to air: 100%	11.1.1.1: Number of odour events per 10,000 properties served: ≤0.1 11.1.1.2: Compliance with ECan resource consents for discharges to air: 100%
11.1.3	Divert bio-solids from landfill	Maximise beneficial by-products.	*Monitoring the amount of biosolids diverted from landfill and being put to beneficial use (with an aim to continue diverting biosolids from landfill).*	*2013/14: 95.6%* *2012/13: 100%* *2011/12: 100%* *2010/11: 100%* *2009/10: 100%*	*Watercare diverted from landfills 80% of solid waste generated from treatment of wastewater*	Proportion of bio-solids diverted from landfill: ≥95%	Proportion of bio-solids diverted from landfill: ≥95%	Proportion of bio-solids diverted from landfill: ≥95%	Proportion of bio-solids diverted from landfill: ≥95%

Performance Standards Levels of Service (we provide)		Results (Activities will contribute to these results, strategies and legislation)	Method of Measurement (We will know we are meeting the level of service if.....)	Current Performance	Benchmarks	Future Performance (targets) Year 1 2015/16	Year 2 2016/17	Year 3 2017/18	Future Performance (targets) by Year 10 2024/25
11.1.5	Manage Christchurch Wastewater Treatment Plant (CWwTP) electricity use	Well maintained and managed treatment plants and disposal services.	*Measuring and managing the operational energy efficiency of the Christchurch Wastewater Treatment Plant, accounting for electricity imported/used from the national grid and electricity generated and used on site. Targets allow for annual fluctuations.* *COD = chemical oxygen demand*	*2013/14: 0.17kwh/m3* *2012/13: 0.19kwh/m3* *2011/12: 0.157kwh/m3* *2010/11: 0.20kwh/m3* *2009/10: 0.18kwh/m3* *2013/14: 0.30kwh/kg COD removed* *2012/13: 0.32kwh/kg COD removed* *2011/12: 0.307kwh/kg COD removed* *2010/11: 0.40kwh/kg COD removed* *2009/10: 0.33kwh/ kg COD removed*	*Hutt Valley Water Services: 450 kwh / ML for the treatment plant (equivalent of 0.45 kwh / m3)* *Moa Point 0.47kw/m3* *Tahuna 0.183kwh/m3 (primary treatment only)*	11.1.5.1: kWh of electricity per m3 flow through the plant: ≤0.20 11.1.5.2: kWh of electricity per kg COD removed from wastewater: ≤0.37	11.1.5.1: kWh of electricity per m3 flow through the plant: ≤0.20 11.1.5.2: kWh of electricity per kg COD removed from wastewater: ≤0.35	11.1.5.1: kWh of electricity per m3 flow through the plant: ≤0.20 11.1.5.2: kWh of electricity per kg COD removed from wastewater: ≤0.33	11.1.5.1: kWh of electricity per m3 flow through the plant: ≤0.20 11.1.5.2: kWh of electricity per kg COD removed from wastewater: ≤0.33
11.1.6	Effectively use self-generated energy	Maximise beneficial use of by-products.	*The digesters breakdown solids and sludge which is harvested to produce methane which is used in a combined heat and power engine to produce heat and electricity for the site.*	*2013/14: 81%* *2012/13: 63% [1]* *2011/12: 48% [2]* *2010/11: 54%* *2009/10: 74%* **Impacted by Earthquakes*	*Watercare achieved 32% of energy internally sourced from biogas and hydro*	Proportion of energy used at the CWwTP that is self-generated from bio-gas: ≥75%	Proportion of energy used at the CWwTP that is self-generated from bio-gas: ≥75%	Proportion of energy used at the CWwTP that is self-generated from bio-gas: ≥75%	Proportion of energy used at the CWwTP that is self-generated from bio-gas: ≥75%

[1] Installation of a new engine during this period reduced the quantity of self-generated energy.

[2] Earthquake damage to the WwTP reduced gas production in 2010/11 and 2011/12.

Performance Standards Levels of Service (we provide)	Results (Activities will contribute to these results, strategies and legislation)	Method of Measurement (We will know we are meeting the level of service if.....)	Current Performance	Benchmarks	Future Performance (targets)			Future Performance (targets) by Year 10
					Year 1	Year 2	Year 3	
					2015/16	2016/17	2017/18	2024/25
Provide laboratory services as an integral part of monitoring and controlling treatment processes								
11.1.4	Sample testing meets statutory and quality requirements.	Monitoring and analysis to measure and ensure compliance with statutory requirements.		*2009-13 - Testing Laboratory maintained IANZ accreditation.*	*IANZ accredited NZ Council laboratories for chemical and biological testing: Hamilton City Council, Environment Bay of Plenty, Rotorua District Council, Tauranga City Council, Whangarei District Council*	Proportion of externally reported sampling and testing completed by an IANZ accredited laboratory: 100%	Proportion of externally reported sampling and testing completed by an IANZ accredited laboratory: 100%	Proportion of externally reported sampling and testing completed by an IANZ accredited laboratory: 100%	Proportion of externally reported sampling and testing completed by an IANZ accredited laboratory: 100%

5 Review of cost effectiveness - regulatory functions and service delivery

Service: Wastewater Treatment and Disposal

Current Arrangements			
Governance	**Funding**	**Delivery**	Estimated Cost
CCC	CCC	CCC and CCO (City Care Ltd)	$22.6 million

Service delivery is completed in-house, through CCOs and through consultants.

Banks Peninsula WwTPs are automated with any manual intervention or maintenance performed under the Christchurch City Council Maintenance of City Water and Wastewater Network Contract.

Arrangements that cannot reasonably be changed in next two years			
Governed by Legislation	**Contract or binding agreement**	**Not cost effective to review**	**Option**
	Christchurch City Council Maintenance of City Water and Wastewater Network Contract.	This contract has been in place for less than 6 years and has greater than 2 years remaining.	No review necessary at this time
	Solid Energy Dried Biosolids Contract. DBO with Pioneer Generation for Biosolids Energy Centre	Annual rolling term for biosolid reuse. This contract has been in place less than 6 years and has more than 2 years remaining.	No review necessary at this time. No review necessary.
	CH2M BECA agreement for capital design work and project management.	7 year term expires June 2015. New contract from 1 July 2015.	EOI and tender process being developed,
	Polymer supply contract with Chemiplas	New tender let 2014	No review necessary at this time
	Screenings cartage contract.	New tender let 2013	No review necessary at this time

Banks Peninsula WwTP operation and maintenance is carried out by City Care Limited under the Christchurch City Council Maintenance of City Water and Wastewater Network Contract. The contract commenced 1 July 2010 with a 9 year maximum term. Award of the contract was on a non-competitive, negotiated basis.

Review of options			
Option	**Date of Last Review**	**Findings**	**Estimated Cost**
1, 2 & 5	2013/14	The status quo has CCC providing governance and funding with delivery by CCC and a CCO (City Care). CCC operates the laboratory and Christchurch City WwTP while the CCO operates and maintains Banks Peninsula WwTPs. Christchurch WwTP is maintained by CCC and external contractors. CCC delivery is currently under review as part of the 2013/14 CCC restructuring.	$22.6 million
3	N/A	There are no CCOs in which CCC is one of several shareholders with capacity to undertake this work	Not cost-effective to pursue
4	N/A	Adjacent local authorities already outsource portions of this work to CCC. No adjacent local authorities have capacity to meet CCC demands.	Not cost-effective to pursue
6 - 9	N/A	There are no joint committees or other arrangements in place at the present time, nor would there be time to investigate the feasibility of these prior to the deadline for preparing this long term plan.	Not cost-effective to pursue

6 Long Term Infrastructure Strategy

6.1 Issues, principles and implications

Earthquake Legacy

In order to optimise the rebuild and add resiliency additional types of wastewater system have been approved, these include lift stations, pressure sewer systems and vacuum sewer systems. All three of these new designs incorporate pumps and therefore result in increased operational and maintenance costs, especially in the short term. The shallow installation and small diameters of pressure and vacuum system pipes cost less to install and therefore decrease renewal costs; however these savings will only occur over an 80-120 year timeline.

Silt ingress is anticipated to be the major long-term issue to WwTPs. Additional operational costs for silt removal and disposal will be incurred. In addition the abrasive nature of silt will increase wear on mechanical plant and therefore increase maintenance costs. Silt ingress will decrease as damaged pipes are renewed.

6.1.1 Aging Network

Wastewater collection services were first installed in Christchurch between 1876-1885. Wastewater network construction resumed with significant periods of construction in the 1900-1912, 1924-1933, 1950-1975 and 1984-2008 periods. Materials changed over time with the first two construction booms using earthenware pipes, a mixture of earthenware and concrete between the wars, a mixture of reinforced concrete and asbestos cement post war, and plastic in modern times. The different effective life spans of each material in conjunction with different life reductions from earthquakes have resulted in renewal dates of the different materials overlapping.

To date the required wastewater pipe renewals were 2-3km per year. As the end of life approaches the required renewals will increase to 5km in 2020, 10km in 2027 and reach 30km in 2041. Detailed advance planning will be required to prioritise and complete these works.

Increased failures in the aging network will result in increased I&I and silt ingress; therefore causing downstream cost increases at the WwTPs.

6.1.2 Expectations of Service Delivery

In the mid to late twentieth century wastewater collection, treatment and disposal was seen as a basic human right and only noticed when problems existed. In the late twentieth century and early twenty-first century the expectation for wastewater to disappear remains, however additional expectations have developed including compliance with cultural beliefs and improving discharge qualities. These new expectations could potentially change the statutory requirements that must be met under resource consents for the wastewater system.

Iwi cultural desires include no discharges of human effluent to water bodies. This is also reflected in social desires where discharges to water are undesirable from food gathering and recreational standpoints. Environmental desires often include the treatment of wastewater to the highest standard possible before discharge. High levels of treatment and discharge to land are expensive which conflicts with the public requirement of low costs. Finding an acceptable balance of cost, social, cultural and economic factors may prove difficult.

Increased environmental and cultural awareness is resulting in the public being less tolerant of wastewater overflows to water bodies and public pressure for overflow elimination may eventuate.

7 Review of cost-effectiveness - infrastructure delivery

The Local Government Act requires local authorities to review the cost effectiveness of current arrangements for delivering infrastructure. The same criteria and options as defined in section 5 above apply (*Review of cost effectiveness - regulatory functions and service delivery*).

Wastewater

Current Arrangements			
Governance	**Funding**	**Delivery**	Estimated Cost
CCC	CCC	CCC, CCO and External Parties	Varies

Arrangements that cannot reasonably be changed in next two years			
Governed by Legislation	**Contract or binding agreement**	**Not cost effective to review**	**Option**
Local Government Act	Council Procurement Policy	Design work is tendered or completed in-house dependant on cost, resources and specific skills requirements. All construction work is tendered.	No review necessary

Review of options			
Option	**Date of Last Review**	**Findings**	**Estimated Cost**
1, 2 & 5	2013/14	The status quo has CCC providing governance and funding with delivery by CCC and a CCO (City Care). CCC operates the laboratory and Christchurch City WwTP while the CCO operates and maintains Banks Peninsula WwTPs. Christchurch WwTP is maintained by CCC and external contractors.	$38.0 million
3	N/A	There are no CCOs in which CCC is one of several shareholders with capacity to undertake this work	Not cost-effective to pursue
4	N/A	Adjacent local authorities already outsource portions of this work to CCC. No adjacent local authorities have capacity to meet CCC demands.	Not cost-effective to pursue
6 - 9	N/A	There are no joint committees or other arrangements in place at the present time, nor would there be time to investigate the feasibility of these prior to the deadline for preparing this long term plan.	Not cost-effective to pursue

8 Significant Effects

The significant negative and significant positive effects are listed below in Tables 7-1 and 7-2 respectively.

Table 8-1 Significant Negative Effects

Effect	Description
Cost to Council/Ratepayers of operating wastewater treatment systems.	Follow documented procedures and adopt relevant industry best practices for cost minimisation. Process KPIs focus on cost efficiency.
Environmental effects of treated effluent discharge.	Maintain resource consent compliance. Monitor trade waste discharges to ensure potential pollutants are not released to the WwTP.
Environmental and social impacts of discharges to air.	Operate odour control systems in accordance with procedures. Robust work planning to avoid odour events.
Environmental and economic impacts of biosolid disposal.	Dry biosolids to reduce volume, kill pathogens and enable reuse. Monitor trade waste discharges to ensure potential pollutants are not released to the WwTP and carried over into the biosolids. This maintains quality of dried biosolids. Investigate disposal to land where possible.
Cultural impact of effluent discharge to water bodies.	Work with local Iwi to find cost effective solutions that recognise cultural sensitivities.
Illegal discharges to wastewater systems	Illegal discharge of chemicals or toxins to the wastewater system can cause inefficiencies, odours or process failure in the treatment systems leading to discharge of untreated or undertreated effluent.

Table 8-2 Significant Positive Effects

Effect	Description
Public Health	Treatment and disposal of wastewater significantly reduces the risks of water and faecal born diseases.
Economic Development	Provision of wastewater treatment and disposal systems promotes economic development by permitting intensification of land and industry whilst protecting health and environment.
Environmental Protection.	Treatment and disposal of wastewater reduces the load on the receiving environment. Environmental advantages of wastewater treatment and disposal include pathogen reduction, nutrient reduction and avoiding anaerobic ,dead zones or algal blooms in receiving areas.
Sustainability	Reuse of materials previously thought of as waste – biosolids and biogas. Recovery and reuse of water for irrigation. Future nutrient extraction (phosphorus) for reuse on Canterbury farms.

8.1 Assumptions

Council has made a number of assumptions in preparing the Activity Management Plan. These are discussed in detail in Appendix Q. Table 8-3 lists the most significant assumptions and uncertainties that underline the approach taken for this activity.

Table 8-3 Major Assumptions

Financial assumptions.	That all expenditure has been stated in 1 July 2015 dollar values and no allowance has been made for inflation.	The LTP will incorporate inflation factors. This could have a significant impact on the affordability of the plans if inflation is higher than allowed for, but Council is using the best information practically available from Business and Economic Research Limited (BERL).
Asset data knowledge.	That Council has adequate knowledge of the assets and their condition so that the planned renewal works will allow Council to meet the proposed levels of service.	There are several areas where Council needs to improve its knowledge and assessments, especially in regards to Banks Peninsula WwTPs. There is a low risk that the improved knowledge will cause a significant change to the level of expenditure required as assets lacking data are typically small and low value.
Growth forecasts.	That the district will grow as forecast in the LURP and Growth Demand and Supply Model.	If the growth is very different it will have a moderate impact. If higher, Council may need to advance capital projects. If it is lower, Council may have to defer planned works.
Network capacity.	That Council's knowledge of network capacity is sufficient enough to accurately programme capital works.	If the network capacity is higher than assumed, Council may be able to defer works. The risk of this occurring is low and will have little significance. If the network capacity is lower than assumed, Council may be required to advance capital works projects to address congestion. The risk of this occurring is low; however the impact on expenditure would be significant.
Emergency funding.	That the level of funding in these budgets and held in Council's disaster fund reserves will be adequate to cover reinstatement following emergency events.	Funding levels are based on historic requirements. The risk of requiring additional funding is moderate and may have a moderate effect on planned works due to reprioritisation of funds. Council does not hold activity specific incident funds. Event responses are from Council-wide budgets as needed.
Timing of capital projects.	That capital projects will be undertaken when planned.	The risk of the timing of projects changing is moderate due to factors like resource consents, funding and land purchase. Council tries to mitigate these issues by undertaking the consultation, investigation and design phases sufficiently in advance of the construction phase. If delays are to occur, it could have significant effects on the level of service.

Accuracy of capital project cost estimates	That the capital project cost estimates are sufficiently accurate enough to determine the required funding level.	The risk of large under estimation is low; however the importance is moderate as Council may not be able to afford the true cost of the projects. Council tries to reduce the risk by including a standard contingency based on the projects lifecycle.
Changes in legislation and policy, and financial assistance.	That there will be no major changes in legislation or policy.	The risk of major change is high due to the changing nature of the government and politics. If major changes occur it is likely to have an impact on the required expenditure. Council has not mitigated the effect of this.

9 Risk Management

This approach includes risk management at an organisational level (Level 1). The treatment measures and outcomes of the organisational level risk management are included within the LTP.

At an asset group level (Level 2), Council has identified 17 high risks, and has planned mitigation to reduce them to 10 high risks. Council has planned controls for the remaining 10 high risks but even with the controls, they remain high. Council has decided to accept these risks, which are listed in Table 9-1.

Table 9-1 Risks and Control Measures relating to Treatment and Disposal (Draft)

	Risk	Risk Rating	Mitigation	Preventative Controls	Reactive Controls
WW-17	Wastewater treatment plant/s overloaded due to excessive organic or solids load coming via the networks.	H	Increased odour complaints, breach of resource consent, potential process collapse, extra operating costs.	Develop load models for each plant and compare regularly against actual loads to determine needs for upgrades or process changes. Enforce trade waste bylaws. Operate plants inline with SOPS. Monitor and record key plant process indicators on a regular basis.	Plant specific operational changes as needed.
WW-18	Objectionable odour generated at the boundary.	VH	Public complaint, resource consent breach.	Contractor effectively operates and maintains odour control facilities according to SOPS and contractor plans. Odour treatment facilities designed into WWTP and pump stations as required. Enforce trade waste bylaws. Proactive monitoring in industrial area.	Investigate all odour complaints. Modify process where able to overcome problem. Open communication with affected stakeholders. Deploy masking sprays to neutralise odours.
WW-22	Staff not properly inducted.	VH	Staff illness due to working in wastewater environment. E.g. Cellulitis.	Staff and contractors to be properly inducted and trained in wastewater maintenance and operations. Staff and contractors to suitably inoculated to protect against microbiological hazards. Staff and contractors to be trained/certified in chemical handling.	Immediate medical attention. Absent from site until fully recovered.
WW-26	Significant component failure takes a wastewater line out of service.	H	Delay in commissioning projects. Increased costs. May trigger discussions with regulator and other stakeholders.	CCC to standardise pipeline sizes and materials through renewals programme. CCC & Contractor to conduct logistics risk appraisal, identify critical spares. Have suppliers hold critical spares for CCC at predetermined levels as part of supply contract.	Liaise with other water authorities to quickly aquire spares as required.
WW-28	Incorrect operation of wastewater plant/s results in process failure.	H	Potential breach of consent. Extra operating costs. Equipment damage. Odour complaints. Overflows.	Operate plant in accordance with SOPS/Contractors Plan. Develop and train staff in emergency and incident response procedures.	Implement emergency and incident response procedures.
PS-20	National/local fuel supply shortage to feed back up	M	Loss of service and/or overflows.	CCC to investigate emergency fuel supply agreement with Fuel companies. CCC	Ship in fuel from alternate sources (road/rail/sea).

	Risk	Risk Rating	Mitigation	Preventative Controls	Reactive Controls
	generators.			holds tanks minimum 50% full and minimum 30,000 litres at treatment plant.	
	Risk	Grade	Mitigation	**Preventative Controls**	**Reactive Controls**
S-1	Failure to adhere to technical specification and corporate security requirements.	VH	Potential data corruption and loss of control of network.	Scada Strategy and associated processes and procedures implemented. Security audits of Scada system. Undertake regular strategy reviews to ensure objectives achieved.	Rework to proper standard. Shut down, cold reboot and reload configuation files
S-2	Inappropriate technology selected for renewals/upgrades of SCADA/PLCs and instrumentation	E	System benefits not realised. Added complications in operating and maintaining the network. Reduced reliability of network.	Strict change control procedures. Avoidance of cutting edge technology until well proven in network applications. Standardised functional descriptions and electrical designs.	Fix it up in programmed manner in line with latest standards and procedures.
S-3	Failure to follow Scada Strategy	E	Haphazard development of systems. System benefits not realised. Wasted capital and manpower.	Deployment of Scada Strategy and associated governance. Regular review of system development against performance indicators. Implementation of Scada Improvement Plan.	Fix things as they cause problems. Re-prioritise improvement on regular basis as needed.
S-6	Failure of IT and business communications technology to transfer field data into asset systems.	E	Data accuracy likely to be impaired. Poorer quality decision making. Volume of data required not collected.	Implement B2B processes with contractors. Enable smart field technology for data collection and transfer. Review IT's systems and process management to remove "Road blocks" and double handling of data. Update improvement plan.	Work around or make do until project is delivered under asset management improvement plan.
EHS-1	"Short Term" Natural disasters (extreme wind event, large fires, land slides, snow storms, floods)	H	Damage likely to be minor and for some events isolated. Personnel unable to get to place of work. Problems with power and logistics support. Loss of communications.	Business continuity plan in place. CDEM plan in place and practiced. Mutual Aid agreement with other water authorities. Participate in Lifelines activities and implement resilience measures. Contractual relationships with key contractors contain CDEM commitments in emergencies.	Implement CDEM instructions and Business Continuity Plans. Activate contractor response plans.
EHS-3	"Long Term" Natural disasters (earthquakes, tsunami, meteorites, volcanic eruption, pandemic event).	H	Damage moderate to much with potential to lose service to large parts of the City. Personnel maybe injured/infected and can't come to work. Personnel unable to get to place of work. Problems with power and logistics support. Loss of communications. Loss of transport groups and fuel supplies. Potential health outbreaks.	Business continuity plan in place. CDEM plan in place and practiced. Mutual Aid agreement with other water authorities. Participate in Lifelines activities and implement resilience measures. Tsunami warning system in place. Lessons learnt built into infrastructure rebuild standards. Contractual relationships with key contractors contain CDEM commitments in emergencies.	Implement CDEM instructions and Business Continuity Plans. Activate contractor response plans and mutual aid agreements as required.

10 Improvement Plan

City Water and Waste have developed a Contract Management Improvement Plan. Version 1.0 dated May 2014 is saved in TRIM – reference 14/995771.

Appendix A of the plan – Actions Table - sets out the actions, responsibilities, expected benefits and owner of the various actions identified. It is a snapshot as at May 2014. It is intended that the Improvement Plan is continually updated and monitored as a live document.

Contractors report their innovations, improved work practices and application of technology through contract management workshops.

Due to the recent major upgrade of Christchurch WwTP including acquisition of new resource consents there are few renewals or improvements anticipated during the LTP period. Improvements at Banks Peninsula WwTPs include the Akaroa and Lyttelton Harbour Basin projects summarised in section 12.

Council staff keep informed regarding innovation in process design and efficiency through attendance at conferences and participation in specialist technical groups.

11 Operations, Maintenance and Renewals Strategy

11.1 Operations and Maintenance

Council uses a combination of in-house and external agencies to perform professional engineering services and physical maintenance works at the wastewater treatment facilities Operation and maintenance of the Christchurch WwTP differs to the Banks Peninsula WwTPs.

Christchurch WwTP is operated and maintained by Council Staff with specialist contractor support. Sample analysis is performed by Council laboratory staff. Large or significant maintenance tasks may be contracted out by competitive tender where Council staff do not have the required skills or resources. Professional engineering and asset management services to the Christchurch WwTP are currently provided by an external consultant. Renewal of the professional services contract will be a competitive tender process.

Banks Peninsula WwTPs are largely automated requiring only occasional manual intervention. Operation (manual intervention), routine and minor maintenance tasks are completed under the Christchurch City Council Maintenance of City Water and Wastewater Network Contract. Professional engineering services and contractors for significant maintenance work are obtained by competitive tender as required.

11.2 Renewals

Assets are considered for renewal based on condition, performance, obsolescence and criticality. Under the professional services contract,a consultant provides an asset management model to determine renewals requirements. Model outputs are incorporated into the asset management plans, activity management plans and LTP.

Minor renewals projects such as mechanical or electrical plant are completed by Council maintenance staff (Christchurch WwTP) or the maintenance contractor (Banks Peninsula WwTPs). Major renewals (structures, etc) are completed under individual contracts awarded through a competitive tender process.

12 Key Projects

Table 12-1 details the key capital and renewal work programmed for years 2015 to 2025.

Table 12-1

Candidate Title	Candidate Description	FY16 Planned CAPEX	FY17 Planned CAPEX	FY18 Planned CAPEX	Years 4 - 10 ($ 000's)	Primary Driver
	For details of the capital works relating to this activity refer to the draft Capital Programme, draft Long Term Plan, volume 1					

Note: G = Growth, LoS = Levels of Service, R = Renewal

1 See Appendix F for a full detailed list of new capital works projects driven by growth and / or an increase in level of service.

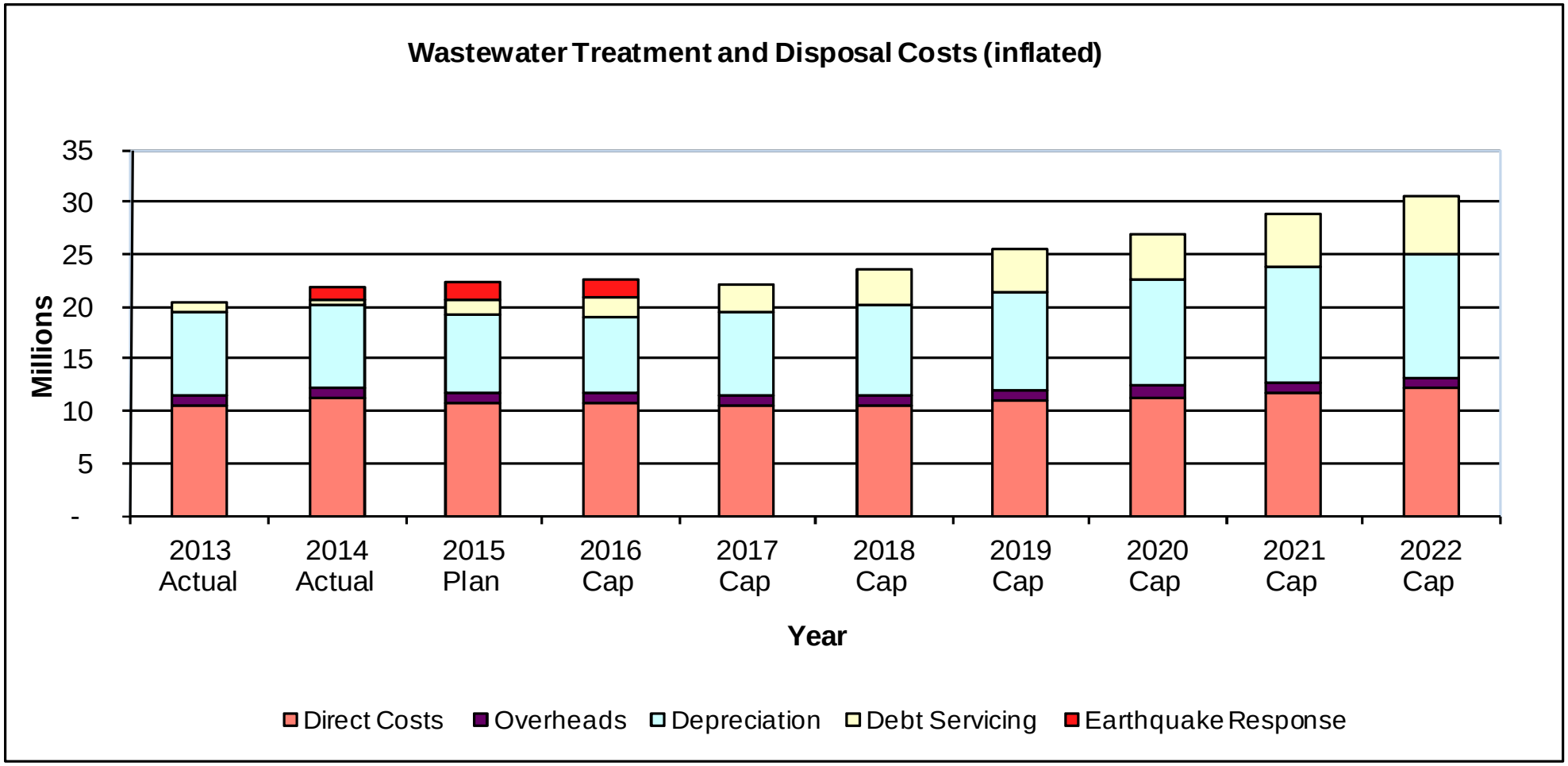
2 See Appendix I for a full detailed list of renewal projects.

13 Summary of Cost for Activity

Figure 13-1

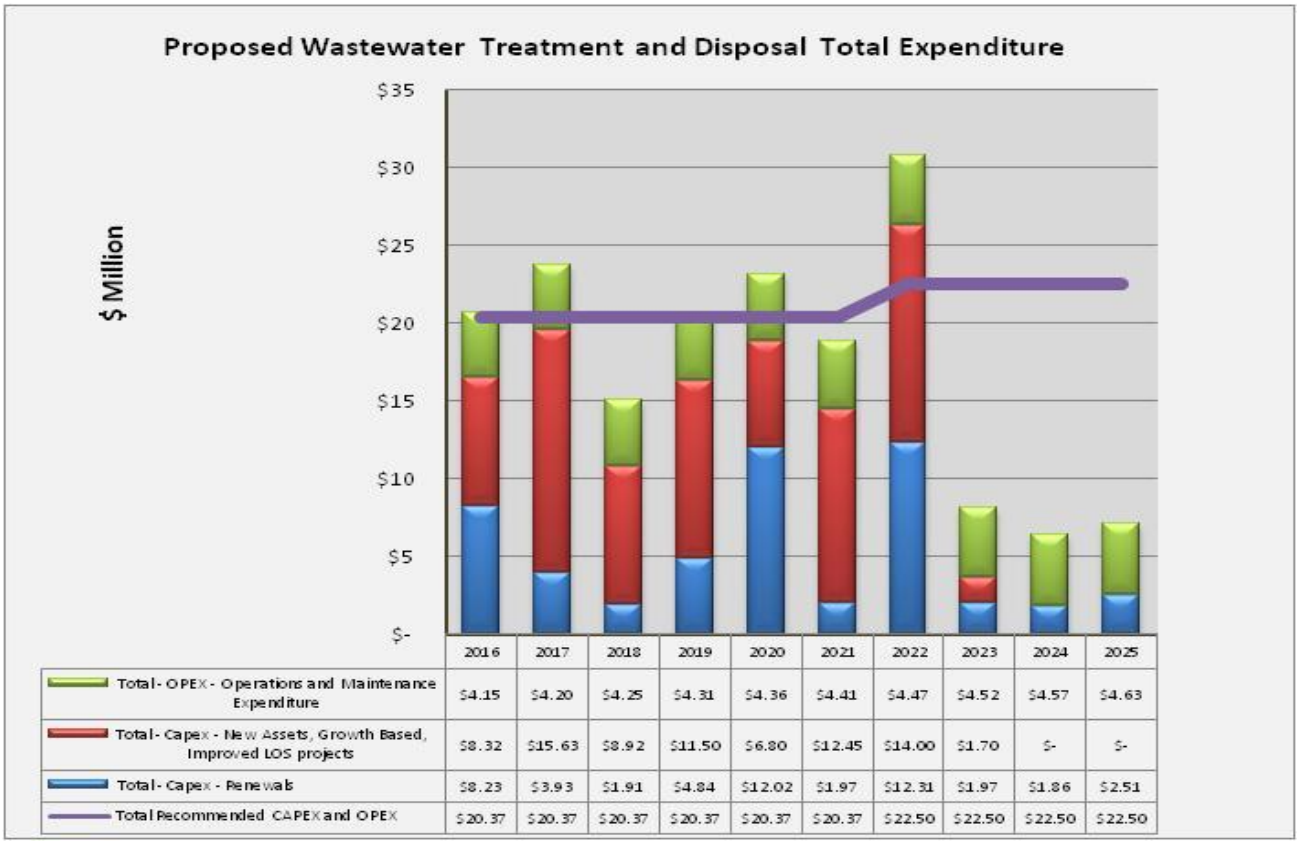
SEWERAGE COLLECTION, TREATMENT AND DISPOSAL - WASTEWATER TREATMENT & DISPOSAL		Funding Caps in 2015/16 Dollars				*Funding splits exclude EQ Costs from all calculations*					
	2014/15 Annual Plan	2015/16	2016/17	2017/18		Funding - User Charges	Other revenue	General rate	Targeted rate	Period of Benefit (years)	Comments
	000's										
Operational Budget											
Treatment Plants, Discharge Structures	10,299	10,288	9,801	9,494							
Laboratory Services	510	518	493	452							
Activity Costs before Overheads	10,809	10,806	10,294	9,946							
Earthquake Response Costs	1,667	1,728	-	-							
Corporate Overhead	970	929	919	884							
Depreciation	7,393	7,275	7,638	8,207							
Interest	1,414	1,867	2,499	3,150							
Total Activity Cost	**22,253**	**22,605**	**21,350**	**22,187**		21%	0%	0%	79%		
						Availability			Majority		
Funded By:											
Fees and Charges	4,672	4,395	4,395	4,395							
Grants and Subsidies	-	-	-	-							
Earthquake Recoveries	800	412	-	-							
Total Operational Revenue	**5,472**	**4,806**	**4,395**	**4,395**							
Net Cost of Service	**16,781**	**17,799**	**16,955**	**17,792**							
Funded by:											
Rates	**15,914**	**16,482**	**16,955**	**17,792**							
Earthquake Borrowing	**867**	**1,317**	**-**	**-**							
	16,781	**17,799**	**16,955**	**17,792**							
Capital Expenditure											
Earthquake Rebuild											
Renewals and Replacements											
Improved Levels of Service											
Additional Demand											

Figure 13-2


Wastewater Treatment and Disposal Costs (inflated)
Millions
35
30
25
20
15
10
5
-
2013 Actual
2014 Actual
2015 Plan
2016 Cap
2017 Cap
2018 Cap
2019 Cap
2020 Cap
2021 Cap
2022 Cap
Year
Direct Costs
Overheads
Depreciation
Debt Servicing
Earthquake Response

The following figures have been developed from forecasts of the operations, maintenance, renewal, creation and disposal cost requirements. Forecast preparation used all available information including modelling, the LURP and information from SCIRT. Inflation is excluded from the figures and all costs are presented in 2015 dollars.

Figure 13-3 Total Expenditure



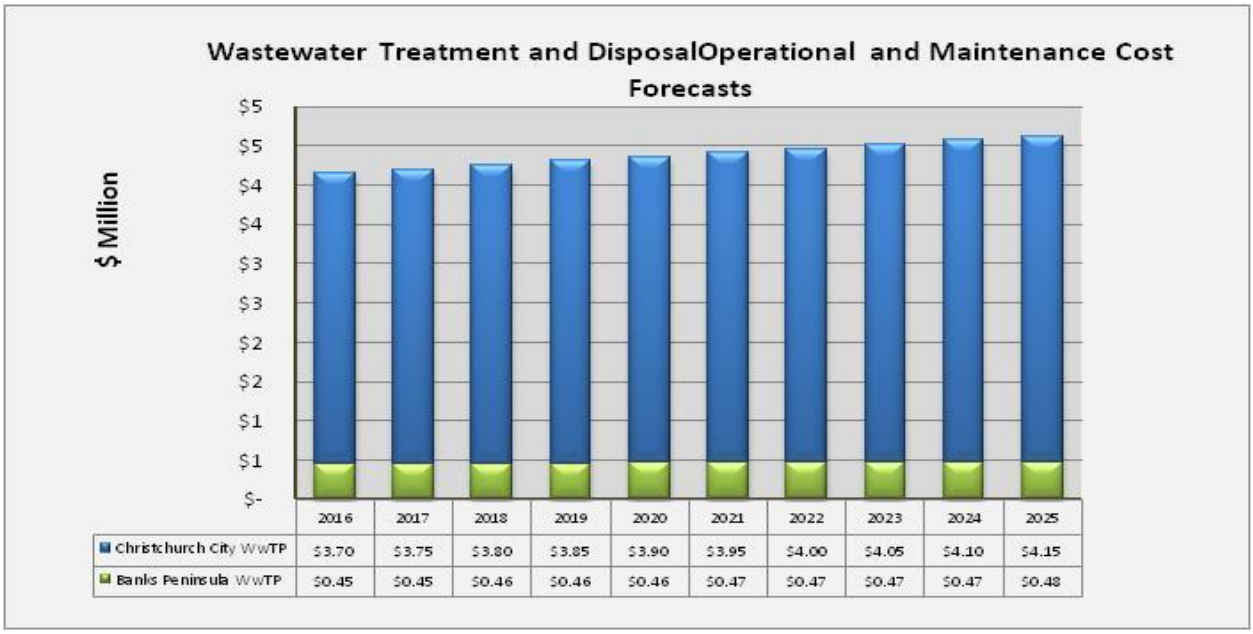
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total - OPEX - Operations and Maintenance Expenditure	$4.15	$4.20	$4.25	$4.31	$4.36	$4.41	$4.47	$4.52	$4.57	$4.63
Total - Capex - New Assets, Growth Based, Improved LOS projects	$8.32	$15.63	$8.92	$11.50	$6.80	$12.45	$14.00	$1.70	$-	$-
Total - Capex - Renewals	$8.23	$3.93	$1.91	$4.84	$12.02	$1.97	$12.31	$1.97	$1.86	$2.51
Total Recommended CAPEX and OPEX	$20.37	$20.37	$20.37	$20.37	$20.37	$20.37	$22.50	$22.50	$22.50	$22.50

Wastewater treatment and disposal total expenditure is highly variable due to different projects being completed in each year. Through careful timing of projects is should be possible to smooth the expenditure as shown by the recommended line.

Growth and LoS based projects have not been modelled for the 2023-25 period and are as yet unknown. A assumed budget has been recommended for this period which will be confirmed in the next LTP.

Figure 13-3 assumes earthquake repair costs are already funded and are therefore not included in the forecasts.

Figure 13-4 Operating Expenditure

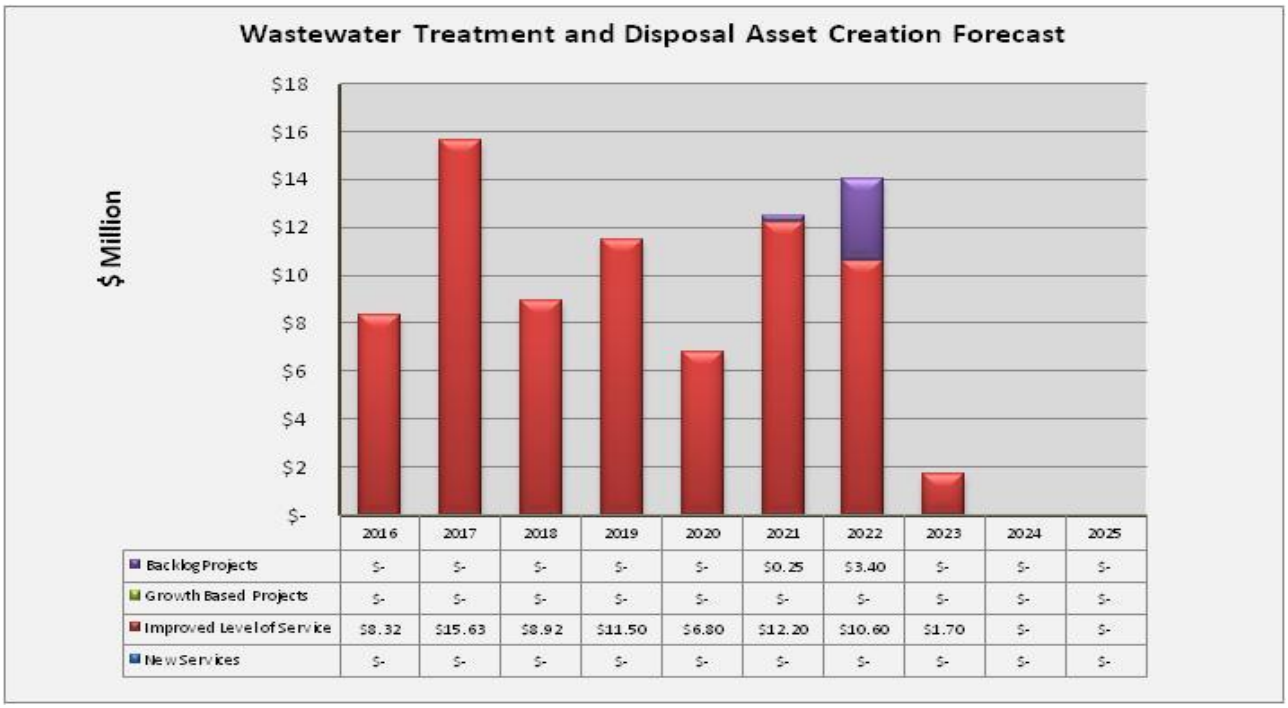


	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Christchurch City WwTP	$3.70	$3.75	$3.80	$3.85	$3.90	$3.95	$4.00	$4.05	$4.10	$4.15
Banks Peninsula WwTP	$0.45	$0.45	$0.46	$0.46	$0.46	$0.47	$0.47	$0.47	$0.47	$0.48

Wastewater treatment and disposal operational costs are predominantly growth dependant and increase as he population increases.

Wastewater disposal to land is significantly more expensive than disposal via ocean outfalls. Should disposal to land projects go ahead an increase in operational expenditure will be required.

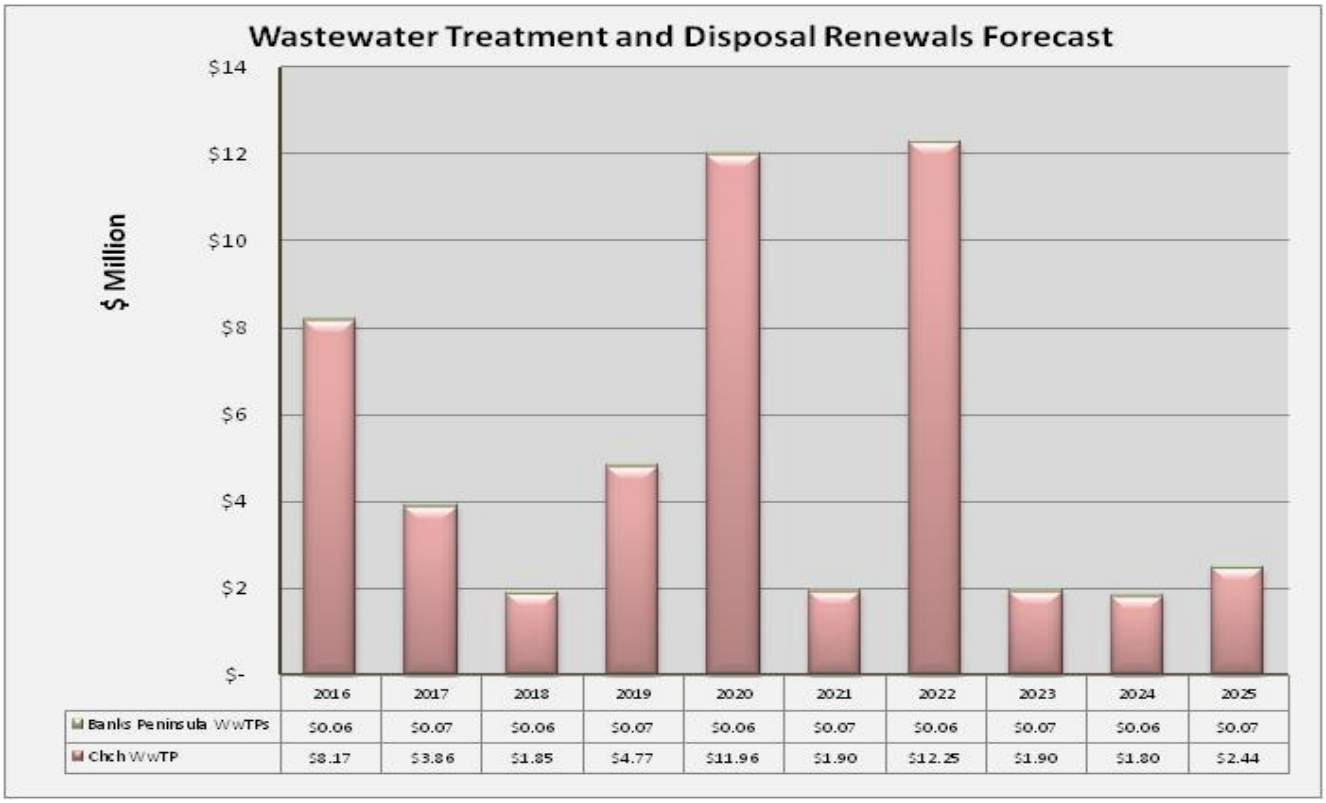
Figure 13-5 Capital Expenditure



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Backlog Projects	$-	$-	$-	$-	$-	$0.25	$3.40	$-	$-	$-
Growth Based Projects	$-	$-	$-	$-	$-	$-	$-	$-	$-	$-
Improved Level of Service	$8.32	$15.63	$8.92	$11.50	$6.80	$12.20	$10.60	$1.70	$-	$-
New Services	$-	$-	$-	$-	$-	$-	$-	$-	$-	$-

LoS improvements are the drivers for increased capital expenditure. Of the forecast expenditure shown I Figure 13-6 the majority of costs fall to the Akaroa WwTP replacement project and the Lyttelton Harbour Basin wastewater projects.

Figure 13-6 Renewals Expenditure



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Banks Peninsula WWTPs	$0.06	$0.07	$0.06	$0.07	$0.06	$0.07	$0.06	$0.07	$0.06	$0.07
Chch WWTP	$8.17	$3.86	$1.85	$4.77	$11.96	$1.90	$12.25	$1.90	$1.80	$2.44

Renewals costs are variable depending on the assets requiring renewal. Peaks in 2020 and 2022 are for renewing media in the two trickling filters. These are discrete projects which may not be able to be spread across multiple years. Smaller peaks exist in 2016 and 2019 for grit tank renewal and upgrade, trade waste reception facility renewal and upgrade, step screen renewal and initial work on the trickling filter media.