



WATER

**ASSET MANAGEMENT PLAN
2020**



Asset Management Plan

Activity			
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Director Review			
Peer Review			
Council Adoption			

Changes to be Incorporated in Next Review

Number	Date of Change	Reason for Change
1	18 February 2021	Initial issue
2	11 March 2021	Changes as a result of audit

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Executive Summary

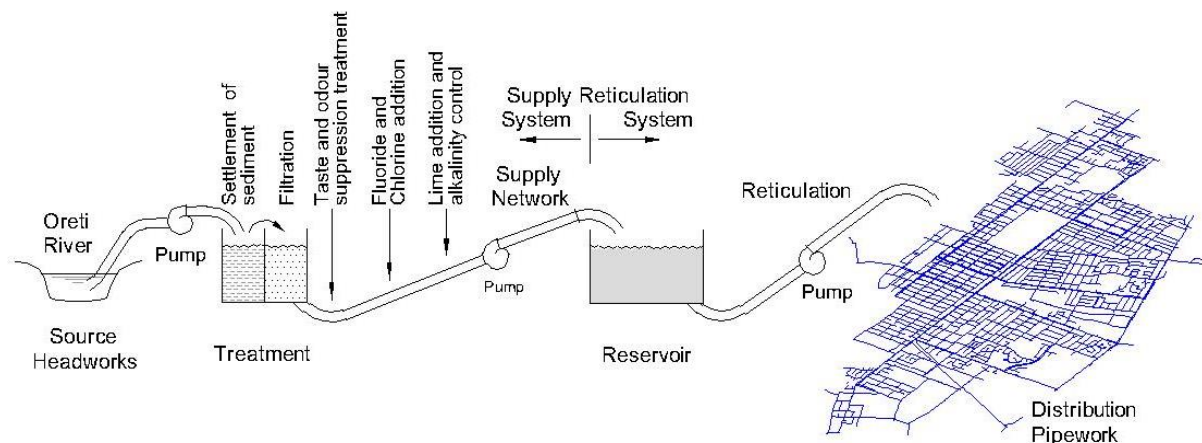
This summary highlights the main points only of the detailed document in following pages.

WHAT WE DO

The Water Activity of the Invercargill City Council is responsible for the supply of potable water to residential, industrial and commercial properties to protect public health, support city growth and contribute to the general well-being of the Community. In urban areas, potable water is most effectively supplied by means of reticulated (piped) community water supply. This allows the costs associated with maintaining high standards and efficient infrastructure to be spread over a wide population.

Council owns or maintains assets on behalf of the Community, providing water at pressure to the boundary of each property in the Bluff and Invercargill suburban areas, and also to properties where the main pipeline has been laid. The water is taken from the Oreti River, treated at Branxholme and piped to the district. Property owners arrange connection to the Council supply. Water is also used for firefighting via the street hydrants.

The figure below shows the schematic layout of the water supply system.



The Water Activity is one of the core infrastructural activities addressed in the Invercargill City Council Long Term Plan (LTP). The Water Asset Management Plan (AMP) is, therefore, strongly linked to the overall strategic direction for the District. It supports Council's initiative to encourage establishment of new industry (Awarua Industrial land holding) and an increase in population via the Southland Regional Development Strategy. The LTP is the document and process that alerts the Community to the key issues and strategies contained in this document.

This AMP is based on existing levels of service, currently available information, and the existing knowledge and judgement of Council staff.

WHO WE ARE



Water Activity assets are split into three categories:

- Headworks and Treatment
- Pipe network
- Reservoirs and pump stations

One supply source from the Oreti River, known as the Branxholme Water Supply scheme, serves the City of Invercargill and the Port of Bluff. It is the sole source of water for the community. The Branxholme Water Treatment Plant was upgraded in 2017 to perform at a level consistent with the Drinking Water New Zealand Standards and to eliminate a persistent summertime earthy taste and odour problem. It is capable of processing up to 45,000 metres per day. It is a conventional coagulation / flocculation / filtration plant.

The pipe network is divided into two sub groups:

- *Bulk Supply Pipes*
These pipelines supply water from the Branxholme Water Treatment Plant into reservoir storage in Invercargill, then onto reservoir storage at Bluff.
- *Pipe Distribution Network* (also known as the reticulation network)
These pipes are laid within the streets of urban Invercargill and Bluff, and also include service connections to properties.

Most of the pipe network is 100mm diameter of either asbestos cement or cast iron material. The total length of pipe excluding service connections totals 419.2 kilometres.



There are six pumping stations and seven reservoirs which distribute water throughout the reticulation system to the 53,750 consumers in Invercargill and Bluff.



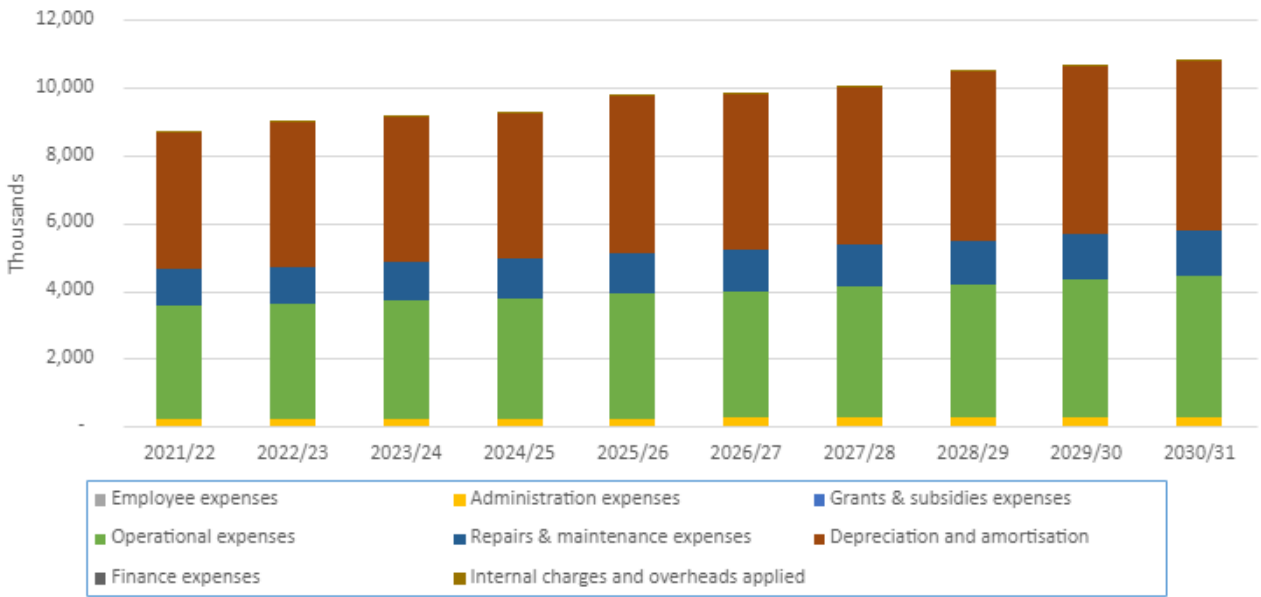
Water assets are valued at \$280.3 million, of which 77% relates to the pipe network.

Asset operation and management is overseen by Council staff with maintenance and capital construction works undertaken by outside contractors.

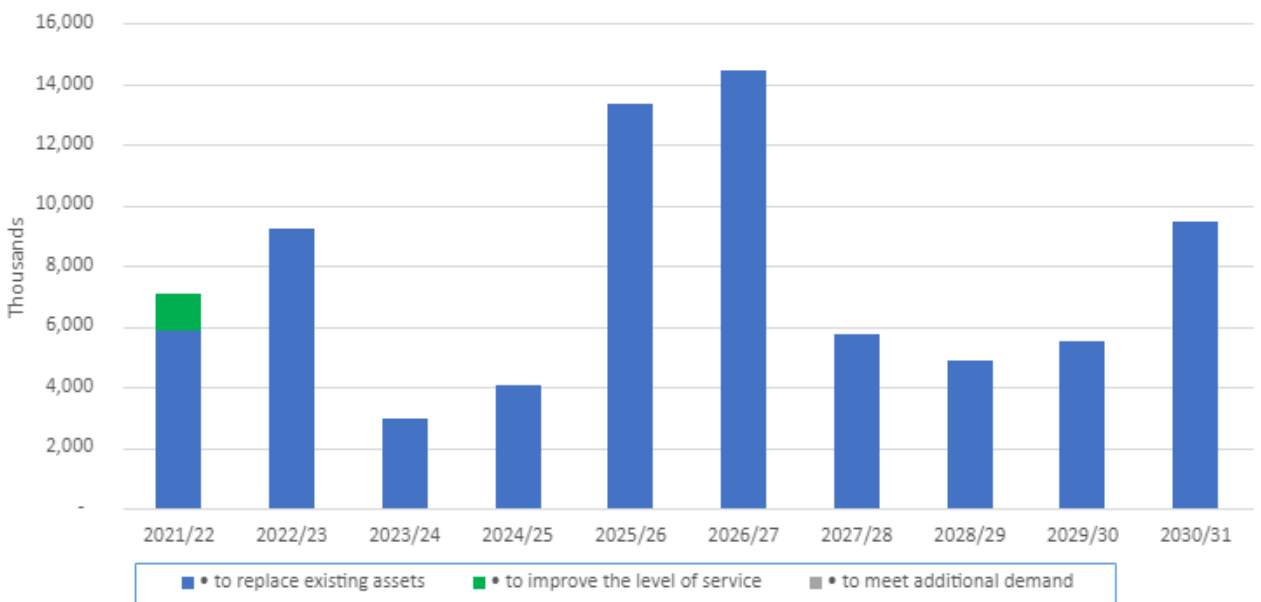
OUR BUDGET

Over the next 10 years we will spend \$163 million providing water supply to the Invercargill and Bluff community. This is reflected in the graphs below. The budget has been developed to ensure the least possible financial burden.

Operating Expenditure (10 years)



Capital Expenditure (10 years)



WHERE WE ARE GOING

Service Levels and Targets

Service levels and targets will be maintained at the level indicated in the previous plan. The service levels as required by the Local Government Act 2002 section 261B are as per the table below. Customer and technical service levels with their linkages back to Community Outcomes are described in Section 3.3 of the plan.

It is acknowledged that Central Government intends to reform water services delivery such that Council may in the future not directly manage and operate water supply. This plan is however prepared on the basis that Council will continue to manage and operate water supply services.

Level of Service #	Level of Service	Key Service Values	Performance Measure (Years 1-10)	Target (Years 1-10)	Timeline To Achieve
9(a)	Performance Measure 1 (safety of drinking water)	Quality	The extent to which the local authority's drinking water complies with:	100%	Maintain, already achieved
9(b)			(a) part 4 of the drinking-water standards (bacteria compliance criteria)		
10	Performance Measure 2 (maintenance of the reticulation network)	System efficiency	The percentage of real water Loss from the networked reticulation system (calculated according to the methodology outlined in Water NZ Water Loss Guidelines publication Feb 2010)	Less than 30%	Maintain, already achieved
11(a)	Performance Measure 3 (fault response times)	Responsive-ness	(a) Attendance for urgent call-outs: from the time that council receives notification to the time that service personnel reach the site	Median response times do not exceed: 4 hours	Maintain, already achieved
11(b)			(b) Resolution of urgent call-outs: from the time that the council receives notification to the time that service personnel confirm resolution of the fault or interruption	24 hours	Maintain, already achieved
11(c)			(c) Attendance for non-urgent call-outs: from the time that council receives notification to the time that service personnel reach the site	5 working days	Maintain, already achieved
11(d)			(d) Resolution of non-urgent call-outs: from the time that the council receives notification to the time that service personnel confirm resolution of the fault or interruption	10 working days	Maintain, already achieved

	Performance Measure 4 (customer satisfaction)		The total number of complaints received by council about any of the following:		
12(a)		Quality	(a) drinking water clarity		
12(b)			(b) drinking water taste		
12(c)			(c) drinking water odour		
12(d)		Quantity	(d) drinking water pressure or flow		
12(e)		Reliability	(e) continuity of supply		
12(f)		N/A	(f) council response to any of these issues		
			expressed per 1,000 connections to the Council's networked reticulation system	≤ 10	Maintain, already achieved
13	Performance Measure 5 (demand management)	N/A	The average consumption of drinking water per day per resident within the Invercargill City Council territorial district	Less than 300 litres/day (2018/19 – 490 litres/day)	By 30 June 2021

Risk to the Activity

Risk to the activity has been assessed. Significant risks together with protective measures are as per the table below. This includes critical assets that could be affected by low probability high consequence risk events, resulting in a combined “L” exposure rating.

Asset Group	Failure Mode	Risk Exposure Rating	Current Controls	Action
Intake	Flood / Earthquake	H	Apply restrictions	Establish emergency supply
Branxholme pipe lines Reticulation	Earthquake / Condition	H	Reactive repair	Programmed replacement
	Backflow	H	Reliance on protection at source by application of Building Act provisions	Backflow protection programme
Galvanised water connections	Condition	H	Replacement	Replacement
All pipework	Leakage	H	None	Leakage reduction programme
Pipe Network	Condition / Earthquake	H	Reactive Repair	Condition assessment and renewal
Branxholme WTP pipe work	Condition / Earthquake	M	Reactive Repair	Condition assessment and renewal
Bluff lagoons – East and West Hill reservoirs	Environmental damage	M	Inspect / maintain	Condition assessment
Non critical asbestos cement pipe lines	Earthquake / Condition	M	Repair	Condition assessment / replace
Water Tower	Earthquake	L	Inspect / maintain	Seismic strengthening
Waikiwi Bridge	Condition / Earthquake	L	Inspect / maintain	As per current
Bluff Pipeline	Condition / Earthquake	L	Programmed replacement	As per current

It should be noted that in reference to non critical asbestos cement (a/c) pipe work a financial risk has been taken in regard to their rate of renewal. Renewal has been planned to smooth the financial impact which will mean that much of the non critical a/c will be replaced after the expiry of their nominated service lives. This may reflect in increased maintenance cost and complaints regarding breaks in supply.

Assumptions in Preparing this Plan

Growth

- Population change will follow the Statistics New Zealand medium growth projection.
- There will be no significant change in per capita water consumption.
- Water demand is directly influenced by population numbers.
- The majority of infrastructure required to service new developments will be funded by developers.
- The resource consent to take water will have no adverse reviews or reduction on permitted water abstraction.
- The water reticulation area will not increase.

Levels of Service

- Continuation of the existing service levels and their targets will be acceptable.
- There will be no significant changes to Drinking Water Standards or water grading criteria.
- The reticulation water pressure regime will remain the same.
- The water quality of the Oreti River will not deteriorate from the present condition.
- There is no change to the pipework infrastructure as a result of urban development.
- Asset condition assessments do not indicate additional remedial / replacement works.
- The resource consent to discharge filter wash water at the Branxholme Water Treatment Plant will have no more conditions added.

Asset Renewal

Non critical asbestos cement will have a life expectancy in accordance with at least the longest prediction as indicated in the National Asbestos Cement Pressure Pipe Manual (2017).

Natural Disasters

No provision has been made in programmes for the cost of repairing damage or other additional costs consequent upon a natural disaster such as a major flood or substantial earthquake, apart from the costs of participation in the Local Authority Protection Programme Disaster Fund (LAPP scheme) and insurance of assets excluded from coverage by the LAPP scheme. It should be noted that the LAPP scheme is intended to cover major disasters and that the potential exists for substantial unbudgeted costs following a moderate disaster which is below the threshold for the LAPP scheme to come into effect.

Major Projects

There is no programme for growth as the existing water system can cater for forecast growth. If growth beyond that forecast or infrastructure is required outside the already reticulated area then that cost will be met by the developer. This includes the Council initiative at Awarua.

Capital Renewal Projects

- Replacement of the original Branxholme pipe line from Makarewa to the City.
Total cost of \$11 million scheduled over the three year period 2021 through to 2023.
- Replacement of the Doon Street Reservoir.
Total cost of \$5 million scheduled in 2031.

Capital Service Improvement Projects

- Development of an emergency water supply.
Total cost of \$17 million spread over the two years 2026 and 2027.

Improvement Programme

The maturity of asset management practices was assessed in 2017 and an improvement plan established to enable the activity to achieve “Intermediate” status as per descriptions in the International Infrastructure Management Manual (IIMM) 2015. Since then, progress has

been made in a number of areas, such as asset criticality, but there are still gaps that need to be addressed over the coming 3 year period.

The Improvement Plan proposed in this AM Plan also includes initiatives that have been identified during its preparation and peer review.

In summary, key improvement areas include the following:

- Develop effective customer engagement in setting service levels.
- Continue to improve asset data, and update the 2017 data confidence assessment.
- Apply alternative techniques for asset condition assessment of underground pipes (to improve integrity of overall assessment).
- Review and update the 'risk register annually.
- Carry out a natural hazards vulnerability and resilience assessment.
- Develop and test emergency response and business continuity plans.
- Develop internal service agreements with all internal service providers.
- Update the 2017 asset management maturity assessment.
- Develop sustainability strategy (Council-wide) and apply principles in activity decision-making.
- Continue to improve the AMP.

1. Introduction

1.1 ABOUT THIS PLAN

The Water Activity is one of the core Infrastructural Services activities addressed in the Invercargill City Council Long Term Plan (LTP). This Water Asset Management Plan (AMP) is, therefore, strongly linked to the overall strategic direction for the District. The LTP is the document and process that alerts the Community to the key issues and strategies contained in this document.

The purpose of this AMP is to outline Council's tactical planning response to the Water Activity. The AMP outlines the long term management approach for the provision and maintenance of Water Activity services. Under Council's significance policy, the Water network and connected infrastructure is deemed to be a strategic asset and therefore significant in ensuring Council's capacity to contribute towards Community Outcomes and the well-being of the Community.

The AMP demonstrates responsible management of the District's assets on behalf of customers and stakeholders, and assists with the achievement of strategic goals and statutory compliance. The AMP combines management, financial, engineering and technical practices to ensure that the level of service required by the customers is provided, and is delivered in a sustainable and efficient manner.

This AMP is based on existing levels of service, currently available information, and the existing knowledge and judgement of Council staff.

A programme of Asset Management improvement is planned to improve the quality of decision making and to improve the knowledge of Council's assets and customer expectations. These future enhancements will enable Council to optimise life cycle asset management activities and provide a greater degree of confidence in financial forecasts.

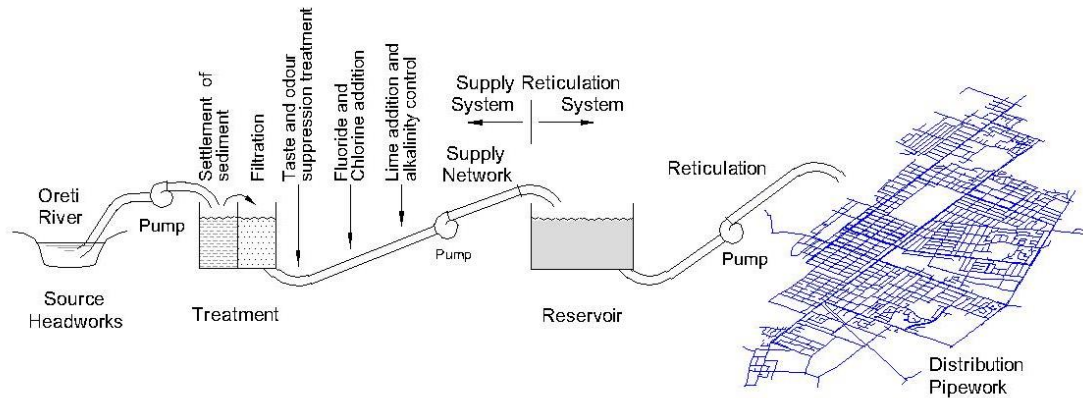
1.2 ACTIVITY OVERVIEW

The supply of potable water to residential, industrial and commercial properties protects public health, supports city growth and contributes to the general well-being of the Community. In urban areas, potable water is most effectively supplied by means of reticulated (piped) community water supply. This allows the costs associated with maintaining high standards and efficient infrastructure to be spread over a wide population.

Council owns or maintains assets on behalf of the Community, providing water at pressure to the boundary of each property in the Bluff and Invercargill suburban areas, and also to properties where the main pipeline has been laid. The water is taken from the Oreti River, treated at Branxholme and piped to the district. Property owners arrange connection to the Council supply. Water is also used for firefighting via the street hydrants.

Figure 1.1 shows the schematic layout of the water supply system (a detailed schematic is shown in Section 5):

Figure 1.1 Schematic Layout of the Water Supply System



The water supply system is managed and operated by staff employed directly by Council, and maintenance and capital works are carried out by contract under supervision by Council staff.

Section 9.3 describes the Council management structure.

No other communities within the Council's territory are supplied with water other than the suburban communities of Invercargill and Bluff. Similarly, schools, industry and properties outside suburban areas of Bluff and Invercargill which are not close to trunk water mains find their own supply which is normally in the form of rain water collection systems or underground bores.

2. Strategic Context

2.1 ALIGNMENT WITH STRATEGIC GOALS

2.1.1 Community Outcomes

Council has developed its own Council-focused “Community Outcomes” for the Long Term Plan that will fulfil the requirements of “Community Outcomes” under the Local Government Act.

The Community Outcomes have been derived from Council’s vision:

“Our City with heart” / “He Ngākau Aroha”

Table 2.1 The Community Outcomes

Community Outcomes		
Enhance our City	Preserve its Character	Embrace Innovation and Change
We will know success when:		
Invercargill’s population is over 1.2% of the New Zealand population.	Invercargill is celebrated for preserving its heritage character.	Invercargill’s culture is embraced through Community projects.
New residents feel welcomed and embraced by Invercargill culture.	Ease of access throughout the City is maintained.	The development of future industry is encouraged.
Healthy and active residents utilise space, including green space, throughout the City.	Our natural and existing points of difference are celebrated.	Technology is utilised in both existing and new City services.
Invercargill’s economy continues to grow and diversify.	The building blocks, including water, sanitation and roading, for a safe, friendly city is provided for all members of the community.	Residents of, as well as visitors to, Invercargill give positive feedback and have great experiences.
Invercargill’s business areas are bustling with people, activities and culture.	Strong, collaborative leadership of the City is demonstrated.	Invercargill has the ‘wow factor’ with the right facilities and events to enjoy.

2.1.2 Rationale for the Activity

Council has determined to manage the city’s water supply because:

- It fits the strategic objectives of the Council to safeguard public health and the environment, and supports economic growth of the Community.
- The Council can provide a specified level of service in a cost-effective manner.
- Local Government Act 2002 (section 130) requires Council to continue to provide water services and maintain its capacity to do so.
- The Health Act 1956, (sections 23 and 29) requires Council to ‘improve, promote and protect public health’ within the district as necessary. Section 29 defines what constitutes a nuisance for the purposes of the Act. The term nuisance includes situations, which may arise if no water supply services were provided. Section 30 provides that it is an offence to let a nuisance continue.

- The Community has indicated its support of Council involvement.
- However, Council does acknowledge Central Government intent to reform delivery of water supply to the extent that service delivery may be removed from direct Council control in the future. For the purpose of this plan however, it has been assumed that Council will continue to manage and operate the water supply service.

Water supply management activities are:

- Preparation and implementation of this Asset Management Plan.
- Public education on water supply services and the promotion of water conservation.
- Advocacy on water supply issues on behalf of the Community.
- Research, long term planning and policy development relating to water supply services.
- Risk assessment and the evaluation of risk alleviation options.
- Managing water head works, treatment facilities, pump stations, reservoirs and the pipe distribution network.

2.1.3 Activity Objectives

The principal objectives of the Water Activity are:

- To provide safe sparkling clear water free from unpleasant taste and odour in sufficient quantity to meet demand.
- To maintain water assets in good working order and plan for their renewal.
- To operate the Water Activity efficiently.
- To plan for the future water needs of the community.
- To meet all necessary legislative and standard requirement.

The alignment of the Water Activity and the Community Outcomes is demonstrated in the table below:

Table 2.2 The Water Activity Community Outcomes

Community Outcome	Council's Role	How the Activity Contributes
Preserve its Character	The building blocks, including water, sanitation and roading, for a safe, friendly city is provided for all members of the community.	The Water Activity provides a safe reliable supply of water.
Enhance our City	Invercargill's economy continues to grow and diversify.	The Water Activity provides a water network with sufficient capacity to meet demand and firefighting requirements.

How this activity achieves the Community Outcomes above is further developed in Section 3.3 – Levels of Service.

Council will know that it is achieving the above outcomes when the following results are realised:

- Full compliance with the Drinking Water Standards.
- It receives a full compliance rating in the Ministry of Health Annual Drinking Water Quality Survey Report.
- It has achieved customer satisfaction by recording no more than the maximum of complaints as permitted by the level of service targets.

- Response to service requests (callouts) are within the maximum time frames as permitted by the level of service targets.
- Availability of service as measured by the duration and number of water shut downs is within the service level target.
- Fire hydrant flow rates as surveyed meet or exceed service level targets.

2.2 BUSINESS DRIVERS

2.2.1 Regulatory Framework

Council operates under a number of legislative frameworks; the Local Government Act 2002 and Health and Safety at Work Act 2015 are the most prevalent to Council core business.

The Local Government Act is the overarching framework that regulates what Council's scope is as well as their ability to conduct day to day business.

The Health and Safety at Work Act ensures that as an employer we are meeting all requirements to care for our employees in a safe manner at all times.

Both aspects of legislation are paramount to the day to day running of business and most departments within Council will operate under specific provisions of both Acts, alongside any other relevant legislation.

2.2.2 District Plan and Council Policies

Under provisions provided in the Local Government Act 2002, Council has the ability to create policies, bylaws and plans.

Council operates under a number of policies, some internal. These policies are reviewed regularly in line with legislative requirements.

Council currently operates under a number of bylaws, some that were created out of need to resolve nuisance and others that are requirements under the Local Government Act or were resolved to become a bylaw through Central Government.

Further, Council operates under a District Plan. This Plan is derived through the Resource Management Act 1991. It gives effect to national policy statements on a variety of environmental issues, and is about managing the use, development and protection of natural and physical resources in a way that enables the community to provide for their holistic wellbeing.

Additionally, Council actively encourages an increase in population. Council also supports the Southland Institute of Technology (SIT) in attracting students to Invercargill, as well as the Southland Regional Development Strategy's (SoRDS) aim of increasing the Southland population by an additional 10,000 people by 2025.

The Water Activity applies the following policy, bylaw and plan:

- Connections to Water Supply. It sets the criteria to allow connection to the water pipe network.
- Water Supply Bylaw. It sets obligations to both the Council as the supplier and the customer.
- Water Safety Plan. It covers health related risks and how the Council will manage these risks to acceptable levels, and is a requirement under the Health (Drinking Water) Amendment Act 2007.

2.2.3 Long Term Plan

The Local Government Act 2002, Schedule 10 requires the development of a ten-year Long Term Plan. Asset Management Plans are the foundation to providing a robust basis for the long-term forecasts.

In 2014, an amendment to the Act inserted a statement that asset management planning should be a fundamental part of Council's prudent stewardship of community resources over the long term. Thus the requirement to produce a 30 year infrastructure strategy for core assets. The Infrastructure Strategy is required to address:

- Identification of strategic issues and options.
- Outline how infrastructure assets will be managed.
- Indicative capital and operating expenditure forecasts.
- Significant CAPEX decisions – cost options for each.
- Assumptions on lifecycle, demand, levels of service.

The Asset Management Plan records the current and desired Levels of Service and determines the Maintenance and Capital Works Programmes and their associated budgets required to make assets meet their desired Levels of Service.

The Long Term Plan confirms Maintenance and Capital Works Budgets that are approved by Council to meet community outcomes.

Asset Management Plan underpins the activities in the Long Term Plan and is implemented through expenditure programmes in asset areas. Adoption of the budgets for these programmes is carried out through the Long Term Plan process. Changes to budgets for programmes may occur during the consultation process and adoption of Long Term Plan budgets.

Variations between this Plan and the final adopted Long Term Plan / Annual Plan are recorded in the 'Table of Changes to be Incorporated in Next Review' at the beginning of this Plan. The consequences of any variations will be reflected in subsequent reviews of the Long Term Plan / Annual Plan.

The diagram below shows interactions in forming the Long Term Plan.

Figure 2.1 Context of Long Term Plan



2.2.4 Activity Management Framework

Figure 2.2 Activity Management Framework



The Asset Management System is the set of people, processes, tools and other resources involved in the delivery of asset management.

The ICC Asset Management Policy outlines the principles, requirements and responsibilities for asset management.

The ICC Asset Management Strategy sets out the asset management objectives, practices and audit and review processes.

2.2.5 NZTA Business Case Approach/Better Business Case

This discipline has not been applied to the financial planning and resultant programmes of work proposed in this plan. It is evident that this rigorous approach will be expected to be applied in future financial predictions.

2.3 STRATEGIC ISSUES AND CHALLENGES

The key corporate strategic issues and challenges facing the Invercargill City Council are:

- The City's changing demographic profile.
- The community's willingness and ability to pay.
- An expectation from the community to provide and retain services in a more effective manner at a lower cost.
- Encouraging growth projects whilst ensuring financial and operational sustainability for future generations.

- Ensuring that Council works in a financially prudent manner that promotes the current and future interests of the community.
- Responding to the changing natural environment.
- Retaining Invercargill's character within its built environment.
- How Council will adapt to technological changes.
- Balancing Council's regulatory obligations with customer service.
- Acknowledgement of Central Government intent to reform delivery of water supply services away from Territorial Authorities into a smaller number of corporate styled entities.

Issues and challenges specific to the Water Activity are:

- Confirm or develop service levels and their targets by improved consultation with customers.
- Meeting changed service levels and their targets that are set by external parties such as change to Drinking Water Standards or resource consent conditions.
- Change in demand, especially higher than projected demand that may result from an increase in supply area or establishment of industry with high volume water requirements or climatic change.
- Improve efficiency of water use by leakage reduction.
- Decrease high vulnerability risk of having only one water source.
- Decrease risk of contamination resultant from backflow.
- Improve asset condition assessment method.
- Widen decision making beyond lowest local value to consider global and intergenerational sustainability.
- Develop resilience.

2.4 KEY ASSUMPTIONS

The Infrastructure Strategy 2021-2031 document lists the key assumptions which have been assumed, and are as follows:

Table 2.3 2021-2031 Long Term Plan Assumptions

Population			
Assumption	Level of certainty	Impact of uncertainty	Council response
<p>Population growth At 30 June 2020, the estimated population of Invercargill was approximately 57,100¹².</p> <p>The population growth for Invercargill is around 1%³. This rate has been observed during eight of approximately the past twelve years, making it a reasonable assumption for the current plan.</p> <p>Based on a 1% growth assumption, the expected population for 2031 is estimated to be around 62,810.</p> <p>Covid-19 might significantly change the previous growth forecasts for Council. Population growth is expected to be minimal in the short term as a result of Covid-19 limiting the ability of students and migrant workers to travel, along with continued aging of the population.</p>	Medium	<p>Council is not planning for a major change in population during the life of the current plan.</p> <p>There are multiple uncertainties related to population growth in Invercargill:</p> <ul style="list-style-type: none"> • While International students currently in New Zealand are able to return to SIT for study, the number of EFTS⁴ to date for 2021 is only 337. This is compared to 775 in 2020. • Riding out recession impacts of Covid-19 Alert Levels 4 and 3 • Proposed Tiwai Aluminium Smelter closure • Mid-range population forecast but noting underlying increase in population that has already surpassed StatsNZ estimates 	<p>The critical infrastructure and resources that Council provides were designed for a city with a population larger than we are now. Council has appropriate infrastructure and resources to service our population without significant financial impact as we have plenty of room to grow.</p> <p>This is in line with the higher forecast of the Southland Regional Development Strategy.</p> <p>Council will continue to monitor change in population growth during the life of the current long term plan to prepare for/respond to any significant changes realised from the multiple uncertainties identified.</p>

¹ [Subnational population estimates \(TA, SA2\), by age and sex, at 30 June 1996-2020 \(2020 boundaries\) \(stats.govt.nz\)](#)

² [Stats NZ Overview of data quality ratings, interim coverage and response rates, and data sources for 2018 census](#)

³ As above.

⁴ EFTS – Equivalent Full Time Student

<p>Diversity The population will continue to become more diverse. The Maori population will grow from 17% to 19%⁵. The Asian population will grow from 6% to 9%⁶.</p>	<p>Medium</p>	<p>Interruptions to travel may affect international migration although it is not expected to effect this assumption significantly. Impact of uncertainty is low.</p>	<p>Council continues to explore new ways of engaging and ensures a balanced sample in customer research to ensure it understands changing needs and expectations.</p>
<p>Ageing population Those aged 65 and older will form 23% of the population in 2031, which is higher than the current aged population in 2020⁷ (estimated at 10,000 of 57,100, or 17.51%)⁸.</p>	<p>High</p>	<p>The pattern of aging in the population is a long-term trend which is not expected to be disrupted.</p>	<p>The needs of older people and younger people are different from those in the working age and Council will continue to consider the needs of all users of its services.</p>
<p>Households The number of households will increase as the population ages. The size of households will decrease slightly and may vary between 2.35 and 2.25 people over the time of the infrastructure strategy⁹</p>	<p>Medium</p>	<p>The impact of a potential decline in numbers of students and migrant workers on demand for housing is uncertain.</p>	<p>Council's infrastructure has sufficient capacity to accommodate the potential increase in population and/or demand.</p>

⁵ Growth in line with NZ stats estimate of 2% growth in the Southland region (NZ. Stats, population projections)

⁶ Growth in line with NZ stats estimate of 3% growth in the Southland region (NZ. Stats, population projections)

⁷ NZ Census Area unit forecast

⁸ [Subnational population estimates \(TA, subdivision\), by age and sex, at 30 June 2018-20 \(2020 boundaries\)](#)

⁹ To calculate the projected average occupancy rates we took past and projected population data from Statistics New Zealand and cross referenced this to past and projected number of households. The average occupancy is the total population divided by the total occupied households.

Economy			
Assumption	Level of certainty	Impact of uncertainty	Council response
<p>COVID-19 The lockdown and potential future impacts of COVID-19 may negatively impact residents' ability to pay rates. This could lead to a short term cashflow impact and increased rates arrears. Rates arrears could increase further.</p>	Medium	To date there has been little impact on our rates receipts and the response to the new rates postponement and remission policy has led to a number of ratepayers contacting Council to go onto a payment plan for their rates.	Council has adopted an additional policy for postponement and remission of rates. This policy allows ratepayers financially impacted by COVID-19, to delay payment of up to 1 year's rates. Council staff will work with affected ratepayers to set up affordable payment plans.
<p>Economy A recessionary period is expected for the first five years of the LTP and longer-term structural changes to the economy beyond this time. This will lead to higher unemployment and lower GDP.¹⁰</p>	Medium	The shape of the recession (u or v) is as yet unknown. The relative impact across regions, based on industries impacted most by COVID-19, as well as potential impacts of proposed Tiwai closure and SIT becoming a subsidiary of Te Pūkenga needs to be better understood by Council in order to reduce this uncertainty. Significant errors in this area could have a significant impact on Councils budgets over the forecast period ¹¹ .	<p>Council will focus on efficiency savings. Investment will only be made in activities which can be serviced.</p> <p>Council will continue to review its work programme and priorities as the level of uncertainty reduces.</p>
<p>Community funding Council can expect to see increased funding applications from groups as a result of Covid-19 and its impact on Community Trust of Southland and Invercargill Licencing Trust's ability to fund.</p>	Medium	The immediate impact of Covid-19 has been seen in the local community, with reduced funding available from major community funders including the Community Trust of Southland and Invercargill Licencing Trust and Foundation.	Council acknowledges the potential community expectation that Council will be positioned to distribute grants to fund community wellbeing related activities.
<p>Economic diversification Volatility in the global economy may affect one or</p>	Medium	The relative impact needs to be better understood by Council to reduce uncertainty, as significant errors could	Council will continue to monitor changes in the global markets.

¹⁰ BERL Local Government Cost Adjustor Forecasts – Three Scenarios Reference No: #6109

¹¹ <https://www.infometrics.co.nz/industry-concentrations-and-the-fall-of-think-big/> ; <https://www.infometrics.co.nz/examining-the-nz-industries-hit-hardest-by-the-covid-19-pandemic/> ; BERL Local Government Cost Adjustor Forecasts – Three Scenarios Reference No: #6109

more of Invercargill's key export industries. This will drive diversification but will slow growth. There may be a delayed effect through the risk of impacted industries abandoning properties.		have a significant impact on Council budgets over the forecast period ¹² . This may directly impact rates and ability of Council to fund projects.	
<p>Central Business District</p> <p>Following a period of static activity until 2023 when the City Block development is complete, the CBD will become more vibrant and have increased connectivity.</p> <p>Council will work in collaboration with others to enable strategic activities and initiatives to support the success of the CBD.</p>	High	<p>The city centre is at the centre of Council's vision. As with any major investment of this type there is a level of uncertainty as to the impact of the development on future use patterns within the city. If the development does not succeed in drawing people to the city centre it will have an impact on Council strategy.</p>	<p>Council strategic activities and economic development activities delivered through Great South will align to support the success of the city centre projects</p> <p>Streetscape works will be designed to support connectivity to the city centre. Council will need to plan for the structural change this is anticipated to involve.</p> <p>Council has support for heritage buildings through the Regional Heritage Strategy and associated funds to support businesses managing high costs of older buildings.</p>
<p>Tourism</p> <p>Tourism numbers will slowly increase, returning to 2019 levels by 2031.</p>	Low	<p>The tourism sector is the hardest hit in the economy and is not expected to fully recover out to 2030.</p> <p>This may have an impact on the Airport and other infrastructure needs that may or may not be required in short term as tourist numbers reduce.</p>	<p>Council expects some impact, but tourism is not a major proportion of Invercargill's GDP so the effect is expected to be relatively minor.</p>
<p>International education</p> <p>The numbers of International students studying at the Southern Institute of Technology will slowly increase back to 2019 levels by 2031.</p>	Low	<p>Students are an important part of the economy, creating significant demand. The impact on retail, hospitality and housing could be significant.</p>	<p>Council is working with Great South on economic development.</p>

¹² <https://www.infometrics.co.nz/industry-concentrations-and-the-fall-of-think-big/> and <https://www.infometrics.co.nz/examining-the-nz-industries-hit-hardest-by-the-covid-19-pandemic/>

Social and cultural

Assumption	Level of certainty	Impact of uncertainty	Council response
<p>Māori culture Māori culture will become more visible in the city.</p>	Medium	Increased awareness of the need to recognise Maori culture and tikanga (methodology), with a particular focus on partnership, participation and protection.	Council will invest more in Maori engagement to ensure strategic projects reflect Maori culture in the city.
<p>Socio-economic The impact of COVID-19 is yet to be realised, and there may be changes in Invercargill's socio-economic patterns over time.</p> <p>Māori have been disproportionately affected by the economic crisis brought about by the COVID-19 containment measures, and it is expected to continue to play out over the ten year recovery period.¹³</p>	Medium	<p>With GDP softening the long range economic outlook will hinge largely on the ability for the current and successive governments to provide economic stimulus.</p> <p>This may have an impact on Council activities that rely on users discretionary spend for revenue</p>	Council acknowledges the potential community expectation that Council will be positioned to distribute grants to fund community wellbeing related activities.

¹³ BERL (July 2020). Economic Scenarios to 2030. The post-COVID-19 scene.

Resilience

Assumption	Level of certainty	Impact of uncertainty	Council response
<p>Community wellbeing The COVID-19 response measures will have long term impacts on the wellbeing of communities, requiring a long term perspective response.</p>	Medium	<p>The situation is evolving and will continue to be monitored.</p>	<p>Council has tasked Great South, the regional development agency, to focus on resilience and economic diversification. A Community Wellbeing Fund has been established.</p>
<p>Community resilience The amalgamation of Southern Institute of Technology with Te Pūkenga, and the potential loss of zero fees advantage, will have an uncertain long-term effect on Invercargill's population and economy.</p>	Medium	<p>The effects of COVID-19 on immigration will impact student numbers in the short to medium term.</p> <p>The risk of losing the zero fees advantage could have an impact on our growth strategy.</p>	<p>Council funds Great South to promote the region and continues to monitor and plan for the impact.</p>
<p>Community resilience Tiwai Point Aluminium Smelter will continue to operate until 31 December 2024.</p>	Medium	<p>A transition plan will be developed to prepare for the eventual closure. It is not yet clear where and how the impact will be felt in the community.</p>	<p>Council is working with the Just Transition team and Great South on economic diversification.</p>
<p>Natural disaster No natural disaster is expected to impact the City during the life of the plan.</p>	Medium	<p>The impacts of a disaster will be assessed at the time and an appropriate response prepared.</p> <p>Infrastructure renewals are undertaken using resilient design practices.</p>	<p>Council has a focus on resilience. Council continues to support and invest in Emergency Management Southland.</p>

Environment – Climate Change

Climate change impacts will vary across regions in Southland. The following is a summary of impacts taken from the *Southland climate change impact assessment, August 2018* report.

Assumption	Level of certainty	Impact of uncertainty	Management response
<p>Mean annual and extreme temperatures (days where temp. exceeds 25°C) are expected to increase with time: By 2040: mean annual temperature increase of 0.5-1°C with 0-10 more hot days per annum. By 2090: mean annual temperature increase of 0.7-3°C, with 5-55 more hot days per annum.</p>	High	<p>Water - Longer period of drought may result in increased demand, whilst flood events create turbidity and increase the cost to treat for consumption.</p> <p>Flood Banks – increased temperature results in more extreme weather events, with a corresponding increase in height and frequency of storm surges.</p>	A planned pathway for the review of these assumptions and the impacts will minimise large impacts upon activities.
<p>Annual rainfall is expected to increase: By 2040: +0-10% By 2090: +5-20% Increased frequency of high rainfall days, i.e. increase in intensity of rainfall.</p>	High	<p>Roading - increased frequency and intensity of rainfall may require extra drainage works in the road network that may alter long-term maintenance costs</p> <p>Stormwater – increased frequency and intensity of rainfall events resulting in increased demand on the network.</p> <p>Wastewater - Increased frequency and intensity of rainfall events results in infiltration and inflows that increase volumes to be treated.</p>	A planned pathway for the review of these assumptions and the impacts will minimise large impacts upon activities.
<p>Mean sea level is expected to rise. By 2040: 0.2-0.3 m By 2090: 0.4-0.9 m</p>	High	<p>Errors in modelling will have significant impact on capital works programme required</p> <p>Stormwater – increased tailwater levels require consideration for outfall design.</p> <p>Flood Banks – Renewals need to consider increased sea level during design life.</p> <p>Sewerage – Clifton outfall may need to be pumped long term.</p>	A planned pathway for the review of these assumptions and the impacts will minimise large impacts upon activities.

Council operations

Assumption	Level of certainty	Impact of uncertainty	Council response
<p>Council services and structure Council is planning for the current structure to deliver the current set of services, with the exception of water and sewerage.</p>	Medium	If amalgamation does occur, costs to the ratepayer will remain the same, although revenue and financing will be done by a different operator.	Council will proactively engage with neighbouring authorities and central government to ensure that the best result is achieved from any amalgamation.
<p>Water Reform As a result of the Central Government directed Waters Reform, it is assumed there will be a change in water reticulation and sewerage delivery services within the life of the plan. This will result in a structural change for Council in relation to the ownership of assets and associated debt capacity. The services will continue to be delivered, but these will be provided by another party. This will include increased regulatory requirements as required by the new regulatory authority.</p>	High	<p>The services will continue to be delivered but these will be provided by another party.</p> <p>This will be managed in line with Government best practice, and will remain within the Council financial and 10-year assumptions.</p>	<p>Council will assess proposed reform options when Central Government has provided their final recommendations to Local Government entities.</p> <p>Council will proactively engage with neighbouring authorities and central government to ensure that the best result is achieved from any reforms.</p> <p>Council is incorporating management of this potential outcome through planning for management of debt.</p>
<p>Legislative changes There will be changes to legislation that have an impact on how Council will provide services. These changes may affect the Council organizational structure but not change the level of service received by the customer/ratepayer.</p>	High	Changes may affect the Council organizational structure but not change the level of service received by the customer/ratepayer.	Management will continue to engage with Government and plan for changes in services in response to policy and regulation changes as these arise.
<p>Consents Council will continue to carry out legislation-directed ordinary functions while factoring in an increase to required quality for consent conditions.</p>	Medium	If unexpected consent conditions are imposed there may be unexpected costs to compliance.	<p>Council will work with the Regional Council early to minimise the risk of unexpected consent conditions.</p> <p>The cost of obtaining consents, knowing environmental standards are increasing, will be built into activities.</p>
The Funding Assistance Rate (as advised from	High	Increase in demand on rate funding	Continue to engage with NZTA on funding

Waka Kotahi NZTA) will reduce by 1% each year until reaching 51% funding assistance in the 2023/2024 and then remain at 51% for the life of the plan.		for roading activities, including the forecast NZTA portion of the city centre streetscape project.	assistance.
<p>Asset life Assets will remain useful until the end of their average useful life, assuming asset average life expectancy assumptions are correct.¹⁴</p> <p>Infrastructure installed in the 1920s are nearing the end of their lives and require renewal within the term of the Infrastructure Strategy.</p>	High	Assets may need renewal earlier if this assumption is incorrect and change the renewal profile. Or may allow delayed renewal in other cases.	<p>Review the appropriateness of assets at the time of renewal including, where appropriate, whole of life cycle assessment.</p> <p>Increase knowledge of asset conditions to better predict the average use of life if assumptions are lower than expected.</p>
<p>Investment property and Forestry Investment Property and Forestry Assets are valued on a yearly basis. They are expected to increase in line with inflation. This is reflected in our Financial Strategy, and Accounting policies.</p>	High	Variation in valuations have no cash flow implications for Council	Continue to value Investment Property and Forestry assets on an annual basis.
<p>Capital programme delivery Implementation of a Project Management Office will increase effectiveness of delivery of the capital programme over the Long-term Plan. 75% of the capital programme will be delivered In Year 1, 80% in Year 2, 85% in Year 3.</p>	High	It may take longer to implement the Project Management Office than expected, including as a result of challenges in attracting qualified personnel. Availability of contractors may have a greater impact than expected. Delay in the programme will result in higher costs as a result of inflation.	Active management of project processes, including engaging consultants as required, active and early engagement with contractors. Management of the programme rather than individual projects will enable contractor availability as well as funding levels to be actively managed. The financial risk of higher levels of delivery than expected across multiple areas will be monitored. Any impact of delayed capital expenditure on renewals on maintenance budgets will be actively managed.

¹⁴ Council will use national standards is asset revaluation.

Financial forecasting

Assumption	Level of certainty	Impact of uncertainty	Council response
<p>Inflation Operational forecasts and capital work programmes will increase by the accumulated Local Government Cost Index inflation forecast by BERL.</p>	Medium	Cost change factors are based on information developed for Council's by Business and Economic Research Limited (BERL). Significant variations to inflation would have an impact on Council's financial management.	Council will continue on the planned pathway for the Capital Works programme and review operational revenue & expenses each year.
<p>Asset revaluation Asset values will increase by the accumulated Local Government Cost Index inflation forecast by BERL on the last valuation value. Revaluation occurs in 2021/22 and every third year therefore.</p>	Medium	Changes in the valuation or life of Council assets may have a significant impact on Council's financial management and capital programme.	Council will continue on the planned pathway for the Capital Works programme and monitor with after each revaluation cycle.
<p>Interest rates - Borrowing Expected interest rates on borrowing will be 2.5%.</p>	High	The treasury report from Bancorp projects the ICC Borrowing interest rate are currently at 2.20% in 2020, and is expected to fall and remain under 2% for the next 10 years. Significantly higher interest rates would impact Council's financial position.	2.5% would allow some upside if the situation changed (interest rates increase or credit rating decreases); but Council have potential to go to 2.25% or 2% to lower costs.
<p>Interest rates – Cash and Deposits Return on cash and term deposits are forecasted to expect a negative rate at some stage within 2020/2021.</p>	Medium	Term deposit rates currently vary from 0.5% for under 6 months to a flat 1% for longer. Most forecasts still expect a negative rate at some stage within 2020/2021.	An assumption of 0.5% should be comfortable and if rates do increase again in the future, this will put Council in a more positive position.
<p>Dividends from ICHL will be \$4.8m + CPI.</p>	Medium	This would have a negative impact on Council's overall revenue and cash position, which would increase the burden on ratepayers.	Council will consider strategic reliance on dividends noting increased levels of economic uncertainty.
<p>External Funding It is assumed Council will achieve the level of external funding as estimated.</p>	High	The immediate impact of Covid-19 has been seen in the local community, with reduced funding available from major community funders including the Community Trust of Southland and Invercargill Licencing Trust and Foundation.	<p>Council acknowledges the challenge of obtaining external funding at this time.</p> <p>Should Council not be able to obtain funding as indicated this would impact project scope and in some cases require further consultation.</p>

As assumptions deal with matters of uncertainty and complexity, actual results will likely vary, but are based on the best information available. If actual future events differ from the assumptions, it will result in material variances to this Plan. The Infrastructure Strategy document identifies the risks that underlie those assumptions, the reason for that risk and an estimated potential impact if the assumption is not realised.

Other assumptions that are relevant to the water supply activity and the development of the proposed financial programmes are described throughout this plan and summarised in Section 8.8.

3. The Service We Provide

3.1 CUSTOMER PROFILE

3.1.1 Our Stakeholders and Community

Council recognises there are a wide range of customers and stakeholders with an interest in how water supply is managed. The customers and stakeholders are listed below:

Table 3.1 External Stakeholders

External Stakeholders	Area of Interest	Engagement
Audit New Zealand	Governance and operation	Audit
Contractors, Consultants	Construction and maintenance works	Contract
Invercargill Community	Water quality and quantity	Liaise
Invercargill Ratepayers	Rates impact and level of service	Consultation and liaison
Iwi Groups	Culture/environment/sustainability	Liaise
SoRDS	Regional development	Liaise with Executive
Ministry of Health	Water quality	Drinking water Assessor and the Ministry of Health "Drinking Water Online" database
Environment Southland	Oreti River environment	Resource consent
Fire Emergency NZ	Pipe network hydraulic performance	Liaise
Visitors	Water quality	Liaise

Table 3.2 Internal Stakeholders

Internal Stakeholders	Area of Interest	Engagement
Councillors, Directors	Governance and leadership	Report
Finance and Corporate	Financial assistance and direction	Liaise
Information Technology	Technical support	Liaise
Regulatory and Planning	Compliance/local development	Liaise
Staff	This plan	Liaise

3.1.2 How We Engage our Communities

The Water Activity as a Council department does not actively initiate engagement with the community. The community, on the other hand, does engage with the Water department in seeking requests for service. This is mainly via telephoned requests to the 24 hours a day, 7 days a week water operations team, or by written or electronic communication to Council. Engagement at a Council corporate level is as described in Section 9.2.

3.1.3 Community Research

Council has conducted research into levels of service in 2013, 2016 and 2020. The last two adopted a general approach rather than examine where service could be improved. For example, the 2020 Research First research established that 98% of the surveyed participants considered water supply an essential service and 59% agreed that Council is doing enough to provide a safe and sustainable supply of water. There was no investigation into how Council could improve its levels of service.

In the absence of further detail, the attributes of water supply as identified as being important in the 2013 research exercise, have been taken together with those identified by the expert knowledge of the asset manager, to establish a foundation of service levels statement (refer to 3.1.4 below).

Customer requests for service are logged by customer service staff and attended to by the activity. This information is another platform which can be used to understand the community's requirements.

3.1.4 Key Service Attributes Valued by Customers

The 2013 survey results showed the most important attributes to be:

- Safe to drink
- Taste
- Smell
- Clarity
- Pressure

Although not canvassed by survey it is considered that in generic terms customers would also consider the key service values stated below as being important:

- Quality
- Quantity (pressure and flow)
- Responsiveness
- Environment
- Cost
- System efficiency
- Reliability

3.2 SERVICE DRIVERS

3.2.1 Community Expectations

Community expectations are that the water supply is: safe to drink, free from taste and smell, clear and of sufficient pressure and flow. The 2013 Customer Service Level survey measured degree of satisfaction as below:

- Safe to drink - 65% satisfaction
- Taste - 45% satisfaction
- Smell - 51% satisfaction
- Clarity - 67% satisfaction
- Pressure - 75% satisfaction

Although not surveyed, it would be reasonable to assume that customer satisfaction could be higher since the upgrade to the Branhholme Water Treatment Plant completed in 2017.

That survey also identified that most respondents accepted continuation of fluoridation and that up to two notified breaks per year in supply would be acceptable.

3.2.2 Legislative Requirements

Legislation applicable to the Water Activity is:

Local Government Act (LGA) 2002 Schedule 10 – requires that the Long Term Plan contain information on the assessment and management of the implications of changes in demand or service levels. Although not a specified Local Government Act requirement, the development of Asset Management Plans is prudent, and these documents form the foundation of information for the Long Term Plan.

Local Government Act 2002, section 261A (rules made by the Secretary for Local Government) – requires Council (from 30 July 2014) report against specifically stated non-financial performance measures. There are five measures relating to water supply, namely:

- Performance measure 1 (safety of drinking water)
- Performance measure 2 (maintenance of the reticulation network)
- Performance measure 3 (fault response times)
- Performance measure 4 (customer satisfaction)
- Performance measure 5 (demand management)

Local Government Act 2002, section 17A – requires local authorities to review the cost – effectiveness of current arrangements for meeting the needs of the community for good quality local infrastructure and local public service.

Resource Management Act 1991 – requires Council to:

- Sustain the potential of natural and physical resources to meet the reasonable foreseeable needs of future generations
- Comply with the District and Regional Plans
- Avoid, remedy or mitigate any adverse effect on the environment
- Take into account the principles of the Treaty of Waitangi in exercising functions and powers under the Act relating to the use, development, and protection of natural and physical resources
- Comply with resource consents issued for river management activities

Health Act 1956 – Under the Health Act 1956, the Council must promote and conserve the public health within the city. It does this by ensuring that an adequate and convenient supply of wholesome water is available to every household, and by ensuring that no water other than clean wholesome drinking water is present in the water mains.

The Health (Drinking Water) Amendment Act 2007 – Is intended to “provide for a proactive, risk management based approach that will assist in reducing the incidence of drinking-water disease both nationally and at the Community level, but especially in rural areas”, and requires drinking water suppliers to introduce and implement a Public Health Risk Management Plan (now termed Water Safety Plan). Full compliance with the Amendment Act has become mandatory for the Council from 1 July 2012.

Health and Safety at Work Act 2015 – requires Council to provide a safe and healthy work place, identify and document work place hazards, and take steps to eliminate, isolate or minimise hazards.

Hazardous Substances and New Organisms Act 1996 – requires Council to store hazardous substances in a compliant manner.

Heritage New Zealand Pouhere Taonga Act 2014 – requires Council to protect the Water Tower and old pump house as they are of historic significance.

Invercargill City Council Bylaw 2017/4 Water Supply

3.2.3 Industry Standards and Guidelines

Industry standards and guidelines:

- Ministry of Health Drinking Water Standards for New Zealand 2005 (revised 2018). Applies to water intended for human consumption, food preparation, utensil washing, and hygiene including personal hygiene. The standards list the maximum concentration of chemical, radiological and microbiological contaminants acceptable for public health in drinking water.
- Guideline for Drinking Water Quality Management.
- New Zealand Fire Service Fire Fighting Water Supplies Code of Practice (SNZ PAS 4509:2008). Provides storage, pressure flow and hydrant requirements for firefighting.
- International Infrastructure Management Manual (IIMM) 2015.
- ISO 55000 – Asset Management Standards.
- NZS 3910 – Construction Contracts.
- Society of Local Government Management (SOLGM).
- Local Government New Zealand (LGNZ).

3.3 LEVELS OF SERVICE

Levels of service comprise of three categories. The first being ‘customer levels’ which are worded in general terms as intended to be easily understood by the public. As such they are linked to desired community outcomes and are reflective of customer surveys.

The second, described as ‘technical levels’, are specific in technical terms, aligned to ‘key service’ values and are intended as support to the more general customer levels but in a more precise manner. The concept of linkage of levels of service back to concept, be it a desired community outcome or key service value, is emphasised.

The third category became mandatory as a requirement of the Local Government Act 2002, section 261B with application from the last plan. These have been described as ‘Non-Financial Performance Measures’ (NFPM).

All levels of service have been assigned an individual consecutive number throughout the complete category range.

3.3.1 Customer Levels of Service, Performance Measures and Targets

Current service levels showing linkages to the 2019 Community Outcomes and Service Values are stated in Appendix 17.05.

Future service levels and their targets are the same as those in the previous plan, with the exception of the following adjustments:

Table 3.3 Performance Measure and Target Changes

Level of Service #	Performance Measure	Target (Years 1-10)
1	Was – Ministry of Health Grade. Now – Ministry of Health Annual Drinking Water Quality Survey. Reason for change – The Ministry of Health no longer supports the grading exercise.	Invercargill – annual. Bluff – annual. Full compliance of all surveyed provisions.
2	No change.	No change but time line to achieve has been extended to June 2022 as current recording system has been proved to be in error and therefore needs to be developed.
4	Was – Compliance with NZ Drinking Water Standard 2005 (revised 2008). Now - deleted Reason for change – Covered by level of service numbers 9(a) and 9(b) and also revised level of service Number 1.	NA
8	Was – Operating costs as published in Water NZ National Performance Review. Now – Average annual residential charge for 200 cubic meters of water use (\$ / year) as published in Water NZ National Performance Review.	Be no greater than 25% above the median value. No change, as above.
12(a) to 12(f) inclusive	No change.	Was reported for each individually with target no more than 0.45 / month. Now reported collectively, i.e. all complaints with revised target of no more than 10/1,000 connections per year. This follows a practice used by other councils.

Customer Service levels have been linked to the community outcomes developed by Council. The linkage between the two has its origins in Section 2.1.3 where the contribution of the Water Activity has been aligned to the relevant community outcome.

This section then further develops that activity contribution into both customer and technical levels of service thus creating linkages between community outcomes and service levels. Additionally, service levels have been aligned to key service values established in Section 3.1.4 – refer table below. Targets for these levels of service relate to the full 10 year period of the long Term Plan.

Table 3.4 Future Customer Levels of Service

How the Water Activity Contributes towards the Outcome	Level of Service #	Customer Level Of Service	Key Service Values	Performance Measure	Target Level of Service		Timeline to Achieve
					Current	Proposed (Years 1-10)	
The Water Activity provides a safe reliable supply of water	1	The water supply is safe to drink	Quality	Ministry of Health Annual Drinking Water Quality Survey	Full compliance of all surveyed provisions	Full compliance of all surveyed provisions	Maintain, already achieved
	2	Reticulated properties receive a continuous supply of water	Reliability	Notification of planned shutdowns Duration of break	At least 24 hours by letter drop No more than 8 hours	At least 24 hours by letter drop No more than 8 hours	100% by June 2022 Maintain, already achieved
The Water Activity provides a water network with sufficient capacity to meet demand and firefighting requirements	3	There is sufficient water flow and pressure for firefighting purposes	Quantity	Hydrants meet firefighting standards	At least 97.5% of hydrants tested exceed 12.5 litres per second flow rate	At least 97.5% of hydrants tested exceed 12.5 litres per second flow rate	Maintain, already achieved

Table 3.5 Future Technical Levels of Service

Level of Service #	Level of Service	Relates To Customer Level of Service #	Key Service Values	Performance Measure (Years 1-10)	Target		Timeline to Achieve
					Current	Proposed (Years 1-10)	
5	The supply of water is reliable	2	Reliability	The availability of service	Total accumulated time of water shutdown to any consumer not to exceed 36 hours per annum (99.6% availability)	Total accumulated time of water shutdown to any consumer not to exceed 36 hours per annum (99.6% availability)	Maintain, already achieved
6	Residential properties are supplied with sufficient water	3	Quantity	Number of complaints where pressure and flow do not meet proposed target	No more than 10 complaints per year where flow is less than 25 litres/minute and pressure is less than 200Kpa	No more than 10 complaints per year where flow is less than 25 litres/minute and pressure is less than 200Kpa	Maintain, already achieved
7	Water treatment operations will be managed to protect the Oreti River environment	n/a	Environment	Compliance with Resource Consent conditions to take water from and to discharge filter backwash back to the Oreti River	For abstraction from Oreti River No more than 45,000 cubic metres per day No more than 20% river flow	For abstraction from Oreti River No more than 45,000 cubic metres per day No more than 20% river flow	Maintain, already achieved
					For discharge into the Oreti River Suspended solids - no more than 50gm/cubic metre Faecal coliform bacteria count - no more than 200/100ml	For discharge into the Oreti River Suspended solids - no more than 50gm/cubic metre Faecal coliform bacteria count - no more than 200/100ml	Maintain, already achieved
8	Operating Costs compare well with other Municipal Water Supplies	n/a	Cost	Average annual residential charge for 200 cubic metres of water use (\$ / year) as published in Water New Zealand National Performance Review	Be no greater than 25% above the median value (2018/19 16% below median)	Be no greater than 25% above the median value	Maintain, already achieved.

Table 3.6 Mandatory Non-Financial Performance Measures

The Water Activity **enhances our city** and **preserves its character** through providing a safe, reliable supply of water, ensuring reticulated properties receive a continuous supply, and providing sufficient water flow and pressure for firefighting purposes.

The Water Activity monitors the average consumption of drinking water per day per resident within the Invercargill City Council territorial district, ensuring that Council's drinking water supply complies with part 4 of the drinking-water standards (Bacteria compliance criteria). It meets community expectations for quality drinking water supply and timely response to any issues - including the median response and resolution times for urgent and non-urgent callouts.

LoS #	KPI 2021-2031	CURRENT PERFORMANCE	2021/2022 Target	2022/2023 Target	2023/2024 Target	2024-2031 Target
9(a)	The extent to which the Council's drinking water supply complies with part 4 of the drinking-water standards. (Bacteria compliance criteria)	100%	100%	100%	100%	100%
9(b)	The extent to which the local authority's drinking water complies with part 5 of the drinking-water standards (protozoal compliance criteria)	100%	100%	100%	100%	100%
10	The percentage of real water loss from the Council's networked reticulation system. (Calculated according to the methodology outlined in Water NZ Water Loss Guidelines publication Feb 2010)	Already achieved	Less than 30%	Less than 30%	Less than 30%	Less than 30%
11(a)	The median response time for urgent callouts. (from the time the Council receives notification to the time that service personnel reach the site)	Already achieved	4 hours	4 hours	4 hours	4 hours
11(b)	The median time to resolve urgent callouts (from the time the Council receives notification to the time that service personnel confirm resolution of the fault or interruption.)	Already achieved	24 hours	24 hours	24 hours	24 hours

11(c)	Attendance for non-urgent call-outs: from the time that council receives notification to the time that service personnel reach the site	Already achieved	5 working days	5 working days	5 working days	5 working days
11(d)	Resolution of non-urgent call-outs: from the time that the council receives notification to the time that service personnel confirm resolution of the fault or interruption	Already achieved	10 working days	10 working days	10 working days	10 working days
	The total number of complaints received by Council per 1,000 connections about any of the following: <ul style="list-style-type: none"> - Drinking water clarity - Drinking water taste - Drinking water odour - Drinking water pressure or flow - Continuity of supply - Council's response to any of these issues 	0.63	<10 in total	<10 in total	<10 in total	<10 in total
13	The average consumption of drinking water per day per resident within the Invercargill City Council territorial district.	490 litres / day (2018/19)	Less than 300 litres/day	Less than 300 litres/day	Less than 300 litres/day	Less than 300 litres/day

3.4 LEVELS OF SERVICE ISSUES AND CHALLENGES

Service levels and targets have been initiated and defined with awareness of the generalised customer surveys. There are others though that have been set to demonstrate compliance with standards and regulations which are set by parties external to this community. These are subject to ongoing review and so may result in changed service levels.

The challenge for the future continues to be engaging directly with customer groups to analyse their needs, then identify options and costs of delivery of alternative levels of service. This could result in changes to existing service level targets such as degree of customer satisfaction and fault response times or the formulation of an entirely new service level. Customer consultation will be fundamental in this exercise.

3.4.1 Current Levels of Service Gaps

The following measures, although not necessarily not meeting their targets may have issues in the future because of:

- i) potential risks associated with having only one source of supply, at the Oreti River
- ii) improved capture of infrastructure information
- iii) pressure to reduce target

Table 3.7 Current Levels of Service Gaps

Service Level Number	Performance Measure	Gap
Various	Various – associated with the reliability and long-term continuity of supply	There are risks associated with the current supply. The city's reliance on a single source of supply is a key level of service and resilience issue. This is further discussed in Section 6.2.
2	Notification of planned shut downs	Gap is unknown as recording system has been shown to be in error and therefore needs development.
10	The percentage of real water Loss from the networked reticulation system	Currently, there is no gap but future pressures may reduce the target maximum.
12(a) – 12(f)	The total number of complaints received by Council about any of the following: <ul style="list-style-type: none"> a) drinking water clarity b) drinking water taste c) drinking water odour d) drinking water pressure as flow e) continuity of supply f) Council response to any of these issues 	Currently there is no gap as recorded but it is expected that the number of complaints of dirty water has been under reported.

3.4.2 Possible Responses to Gaps

The following planned improvements are Council's response to gaps in the current levels of service:

Table 3.8 Planned Improvements to Meet Gaps in Levels of Service

Service Level Number	Planned Improvement	Cost
Various	Investigate and implement an emergency water supply to provide a level of redundancy in the event of disruption to or a failure of the Oreti River supply point	Capex cost – refer Sections 7.4 and 7.6. At this stage, only investigation costs have been allowed. Approval of capital works costs will be considered in the next AMP (2024).
2	Work with the pipe network maintenance contractor progressively to achieve 100% notifications of all planned shutdowns.	Nil, obligation by contractor to meet contract specification
10	Refine estimate of leakage and engage in leak detection programmes.	No extra budget, keep within maintenance budget.
12(a)	Planned Improvement: Establish practice of recording all reports of incidents of water clarity complaints.	Nil – internal resource

4. Demand for Our Services

4.1 DEMAND FORECAST

4.1.1 Factors Influencing Demand

Factors influencing demand on the Water Activity are:

- Population served
- Number of households served
- Consumer behaviour
- Type of industry/commercial undertaking supplied
- Climate and climate change
- Losses due to leakage

The projection of an aging population is not considered as having a significant influence on demand for water.

Population is an obvious link to water demand as each individual requires water to satisfy their individual needs for drinking, personal washing and toilet flushing. The population in turn is related to the area served. If the area served is changed by either planning zone changes within the district or boundary changes to the district itself, then demand for water supply may alter.

Household numbers too will influence demand. For the same number of people, a number of households with a high occupancy rate will use less water than a higher number of households with a lower occupancy rate. This is because the shared uses, such for food preparation and outside activities, for a household with a high occupancy rate cannot be shared to the same degree as houses with a lower occupancy rate.

Consumer behaviour will be influenced by how the consumer is charged, e.g. a metered consumer will use less water than those unmetered.

Type of industry/commercial undertaking has a major influence on water usage. Those involved in primary 'wet industry' such as food processing, use very large amounts of water, whereas technical and manufacturing activities do not use much water at all.

Climate has a significant impact on demand. Dry conditions increase outside water use for irrigation, particularly for households. Climate change predicts an increase in mean annual and extreme temperatures.

Leakage losses are currently estimated at less than 10%. While leakage can be reduced it is not practical to assume its complete elimination.

The current COVID-19 pandemic and associated national lock down arrangements in early 2020 had no apparent change in the demand profile for water. Therefore, it has been assumed that there will be no future demand changes relating to the pandemic in this Plan.

4.1.2 Projected Growth or Decline in Demand for the Service

Of the above factors influencing water demand, the most significant are:

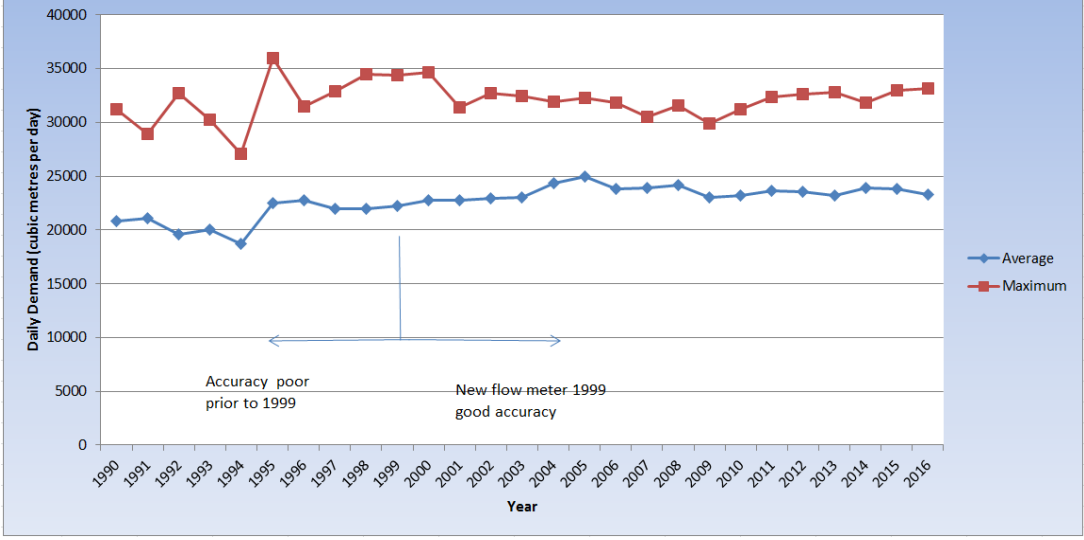
- Population served
- Industry served
- Weather

The other factors are considered to be less relevant in the context of this plan for the following reasons:

- Although the number of households served is expected to increase, its influence on demand is minor compared to that of ‘population served’. This is especially the case in the scenario of population increase. Ignoring it in the event of a population decrease may result in an under estimate of demand but not significantly.
- Water metering applied universally to all properties will doubtless influence a demand decrease but it is not provided for in this plan and so can have no influence on demand. (The current practice of metering large consumers or those with the potential to waste large amounts of water will continue).
- Climate change and the predicted increase in rainfall and temperature will counter each other in respect to water supply, i.e. while warmer temperatures will increase water use by promoting irrigation of gardens and lawns, increased rainfall will reduce the tendency for irrigation. No change in territorial boundaries or planning zones within the Invercargill district are planned and so no effect on demand has been determined.
- Because leakage losses have been estimated and not accurately determined, plus the practicality of not being able to eliminate leakage, no reduction in respect to its reduction has been made in determining future demand.

The historic demand for water is as shown in the figure below:

Figure 4.1 Historical Water Use Trend (Average Daily Demand)



The average daily demand has been fairly static since 2006, being just under 24,000 cubic metres per day. The daily maximum has been on the increase which would be more indicative of dryer summers – the weather effect. The ratio between daily

maximum to average is around 1.4, which is lower than the more usual 1.5 which has been attributed to Invercargill's wetter, cooler summer climate.

Looking towards what might happen in the future, the following scenarios in regard to population change have been applied:

- Statistics New Zealand population projections up until 2043 for –
 - Low
 - Medium
 - High

- The Southland Regional Development Strategy (SoRDS) aims for an increase in population of 10,000 by 2025. It has been assumed that half that increase (i.e. 5,000 people) will become resident in the Invercargill District. The SoRDS projection does not go beyond 2025.

Water consumption has been assumed to be directly proportional to population. Refer to Appendix 17.02 for population demand projections and Appendix 17.03 for consumption projections.

The resultant water demand projections are in the following figures:

Figure 4.2 Future Average Daily Demand Projection

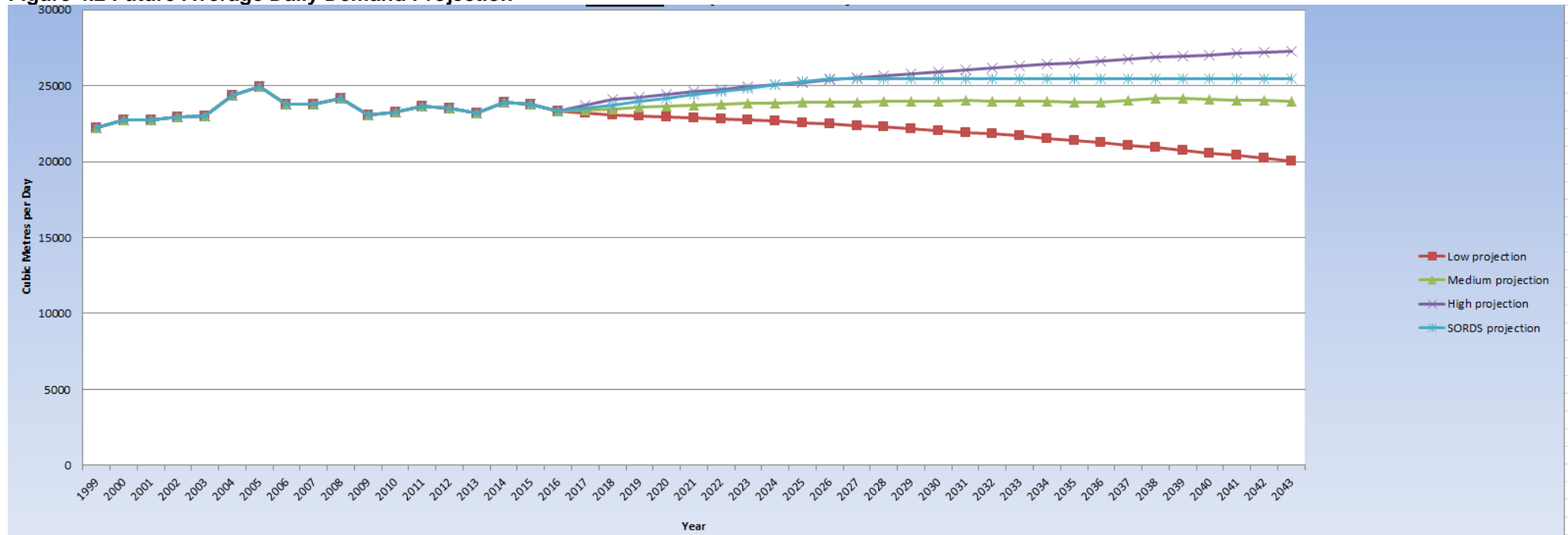
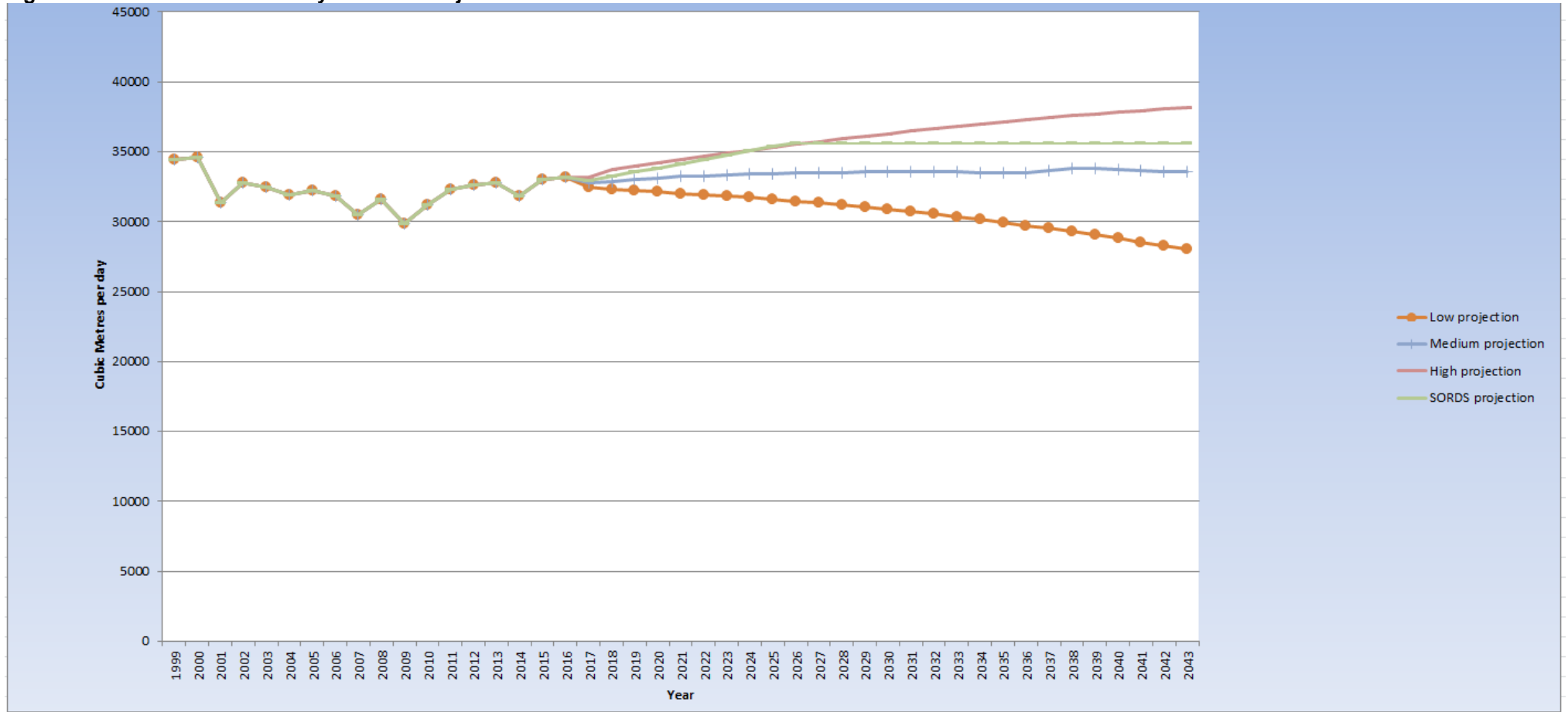


Figure 4.3 Future Maximum Daily Demand Projection



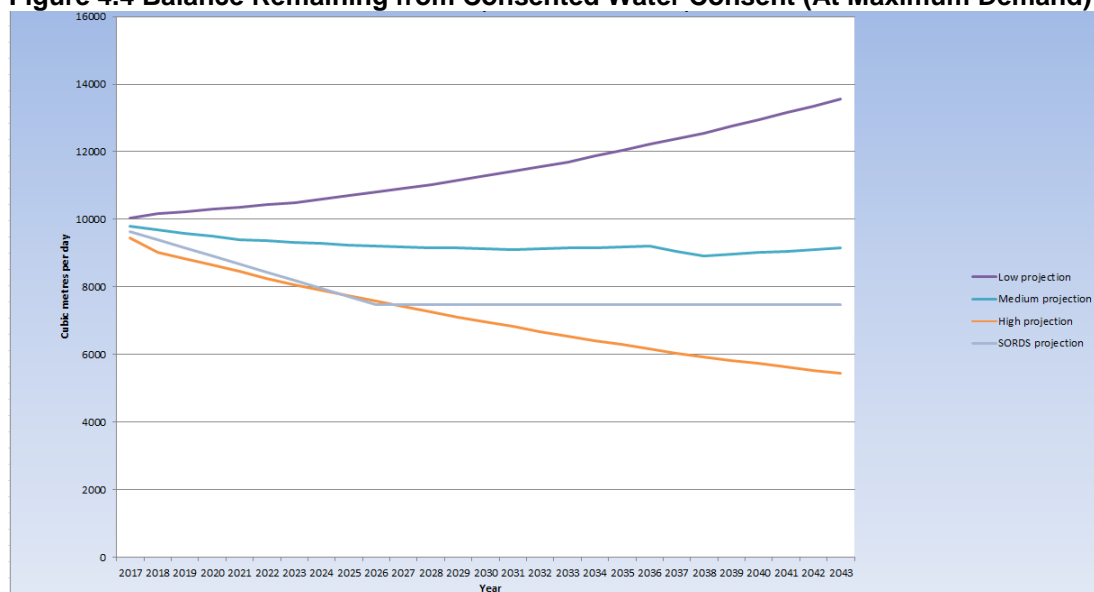
The graph for Future Average Daily Demand Projection shows that:

- The Low projection predicts that water consumption will drop below current levels – down by 4.6% in 2028, then down by 14% in 2043.
- For the Medium projection there will be a small increase of 2.7% above existing by 2028, with practically no further change by 2043. Effectively the Medium projection shows demand will ‘plateau’.
- The High projection closely approximates that for SoRDS, showing a steady increase. Namely, an increase of 10% in 2028, increasing to 17% above existing by 2043.

4.2 CHANGES IN SERVICE EXPECTATIONS (FUTURE LEVELS OF SERVICE)

The Water Activity can supply up to 45,000 cubic metres per day of treated water as permitted by its current resource consent for extraction from the Oreti River. In fact it is currently capable of supplying up to 48,800 cubic metres per day. From the projections made in the previous section which assumes change in demand is directly associated to population served, then even at the high population growth scenario the existing activity has excess capacity. The excess reduces over time for the high projection, remains fairly static for the medium projection and increases for the low projection.

Figure 4.4 Balance Remaining from Consented Water Consent (At Maximum Demand)



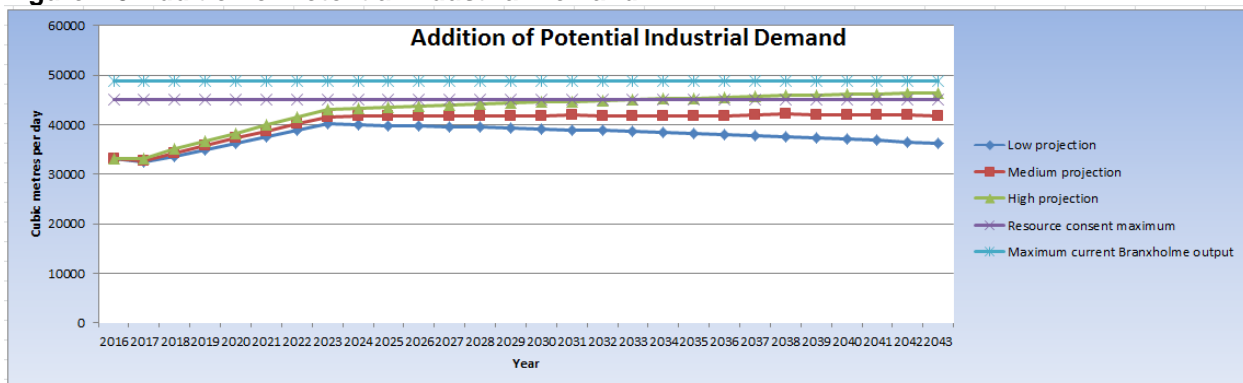
From a planning perspective an allowance to supply an average daily demand of 6,600 cubic metres per day in excess of current industry requirements has been made.

4.3 EXPECTED IMPLICATIONS FOR THE ACTIVITY

The Water Activity can meet the anticipated demand according to the change in population trend. The most significant influence in increasing demand is likely to be due to the successful attraction of industry. Even allowing for an increase in industrial demand of an average of 6,600 cubic metres per day suitably increased for daily maximum, it can be seen from the graph below that such a demand can be accommodated for the low and medium projections. However for the high demand the resource consent will just start to be exceeded in 2032, even though the activity itself has the capacity to continue to meet that demand.

In the event that the low projection will be the future, then the amount allocable to new industry is more than the 6,600 cubic metres per day and will increase as population and thus demand for water declines.

Figure 4.5 Addition of Potential Industrial Demand



4.4 FUTURE DEMAND ISSUES AND CHALLENGES (NEW)

The above predictions assume that the current area of supply will not be extended. This is particularly relevant in respect of the Otatara area which currently is not serviced but has a substantial population, which if included in the water supply area would increase water demand.

Warmer drier weather would tend to increase maximum daily demands and would push maximum demand higher than the currently experienced 40% more than average demand. This is not considered an issue in the event of the low and medium demand projections but may be significant in the event of the high projection.

The current consent for water extraction will need to be renewed by 2038. It is assumed that the renewed consent will reflect actual demand at that time which should not present a challenge. This is unless there is a requirement to demonstrate efficiency in water use, which will press the need to reduce Losses due to leakage possibly through to requiring universal water metering.

In the event that new industry is attracted to the Invercargill district, then new infrastructure may be required to convey and distribute supply if it is outside of the current reticulation area.

4.4.1 Possible Demand-related Responses

For the low projection consideration to the lowering of capacity when renewing assets will need to be made.

In the unlikely event that demand outstrips supply capacity, then increased effort into reducing water Loss due to leakage will be made. Additionally, the introduction of universal water metering will be considered to suppress demand.

In all it is considered that the existing water asset can handle demand projections for the 30-year duration of this plan.

4.4.2 Possible Non-Asset Solutions

Increasing the tariff for metered consumers would tend to suppress demand but is limited as not all consumers are metered. Should universal water metering come into being then the setting of tariff would directly influence a reduction in demand.

Education of environmental awareness and the linkage to water supply management will be promoted to protect the environment and to keep demand within reasonable bounds.

The setting of financial and development contributions to deal with the incremental development of subdivision by regulation is not considered to be needful throughout the term of this plan but may be reviewed if actual demand exceeds projections.

4.4.3 Managing Expectations

The projections of demand indicate that the current activity is well placed to meet future demand in its current state and so it is not anticipated that there will be a need to manage any reduction in demand with the exception of:

- When the supply system is under repair such that its capacity is reduced below demand.
- During drought conditions in the Oreti River when the provisions of the resource consent to extract water restrict abstraction to no more than 20% of the available flow.

During those situations a public awareness campaign with request to reduce demand will be made through the media.

Other than the above there are no planned improvements.

5. Asset Profile

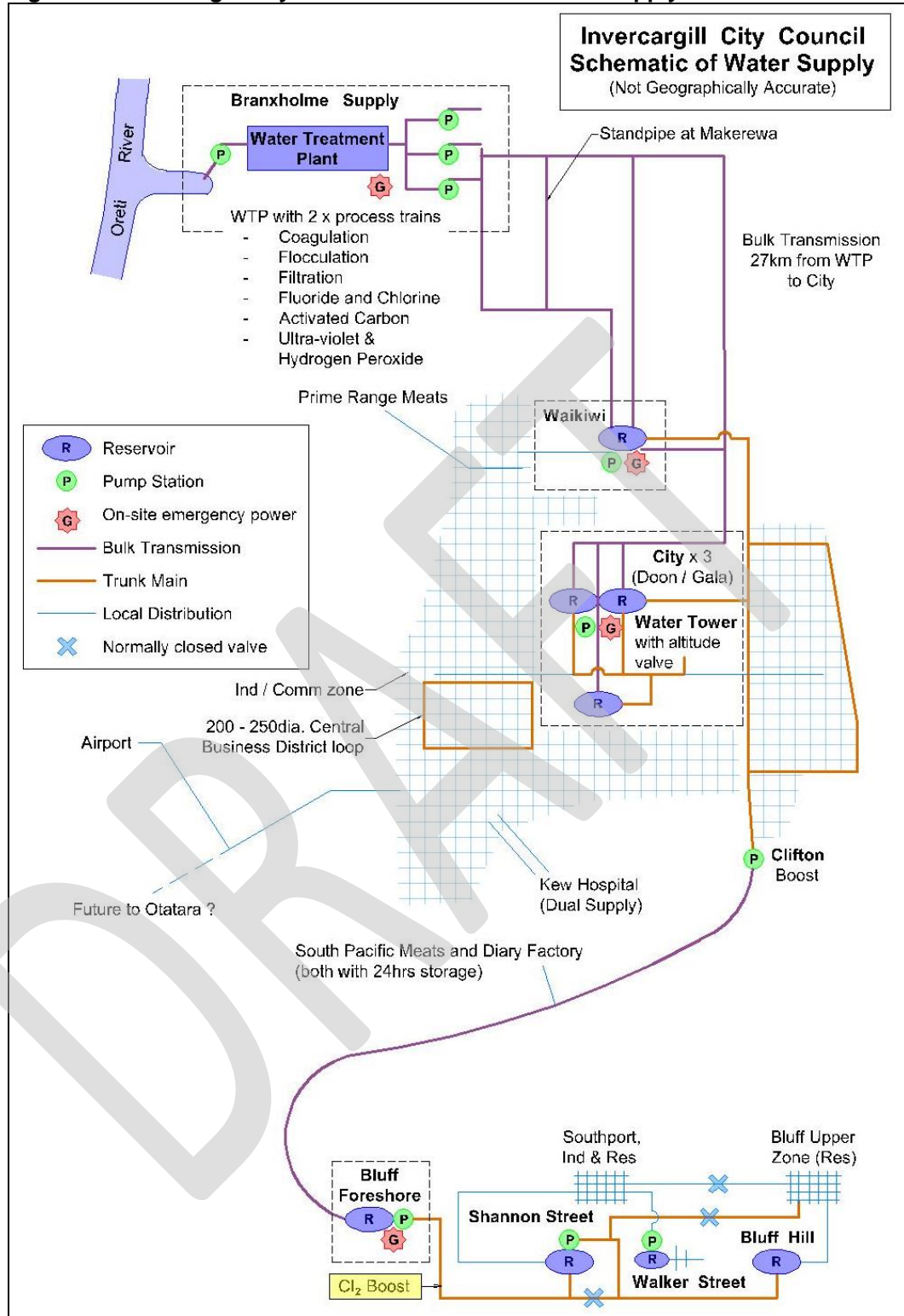
5.1 ASSET OVERVIEW

One supply source from the Oreti River, known as the Branxholme Water Supply scheme, serves the city of Invercargill and the port of Bluff. Established in the late 1950's the scheme has been progressively developed to meet growing demand and is capable of further capacity development. River water is treated at Branxholme, some 17 kilometres by road to the north of Invercargill, and is pumped into reservoir storage in Invercargill. From reservoir storage, water is pumped again, this time at higher pressure into the distribution pipe network (known as the reticulation system) to individual consumers. Invercargill's reticulation connects with the Bluff trunk main which supplies the consumers of Bluff plus industry enroute. Refer to schematic diagram on the following page – refer to Figure 5.1.

The reticulation system has an age profile from early 1900 to the present day. Both Invercargill and Bluff communities are of stable population, i.e. unaffected by holiday demand, with the biggest influence on demand being that experienced in dry summer conditions. The complete water supply and reticulation systems at Invercargill and Bluff plus interconnecting pipe lines are completely owned by the Invercargill City Council.

The following sections are intended as summaries, for detail refer to Appendix 17.04.

Figure 5.1 Invercargill City Council Schematic of Water Supply



5.2 ASSET DESCRIPTION

For the purpose of this Plan, assets are categorised into three categories:

- Headworks and treatment
- Pipe network
- Reservoirs and pump stations

5.2.1 Headworks and treatment

The Branxholme Water Treatment Plant has been upgraded to perform at a level consistent with the Drinking Water New Zealand Standards and to eliminate a persistent summertime earthy taste and odour problem. It is capable of processing up to 45,000 metres per day. It is a conventional coagulation / flocculation / filtration plant whose prime function is to provide a succession of barriers to organisms which are harmful to health, especially Giardia and Cryptosporidium, and to clarify or remove suspended particles from its raw water source; the Oreti River. The first barrier is the chemical process of coagulation / flocculation which removes the majority of suspensions and the bacterial load. The filters provide a second barrier to bacteria and harmful organisms, and further clarify the water.

Post filtration water is disinfected by passage through an ultraviolet reactor and chlorinated to provide a residual disinfectant, bringing the total number of barriers to harmful organisms to four. Fluoride is dosed for dental health, and lime for pH and alkalinity control.

During taste and odour episodes hydrogen peroxide is added prior to the ultraviolet reactor to provide a powerful oxidant to destroy the taste and odour substance of Geosmin and 2-Methylisoborneol. Water is then passed through Granular Activated Carbon Filters to remove oxidation by-products.

The Branxholme Water Treatment Plant is currently the sole source of water for Invercargill and Bluff residents. There is a small chlorination plant at Bluff to make up the decay in chlorine level which occurs in transit between Invercargill and Bluff.

5.2.2 Pipe Network

This is divided into two sub groups:

- *Bulk Supply Pipes*
These pipelines supply water from the Branxholme Water Treatment Plant into reservoir storage in Invercargill, then onto reservoir storage at Bluff.
- *Pipe Distribution Network* (also known as the reticulation network)
These pipes are laid within the streets of urban Invercargill and Bluff.

The pipe distribution network is comprised of the following:

- Trunk mains (of size 250mm to 600mm, laid to convey water in bulk within the distribution network with connection to specific reticulation mains).
- Reticulation mains (of size 50mm to 200mm diameter laid in roadways and interconnected at street intersections to distribute the water).
- Property connections (of size typically 20mm to 50mm diameter connecting individual properties to the reticulation street mains).

In Appendix 17.04, Section C, there are figures which describe the length and diameter of the total pipe network. Collectively they show that the pipe network is predominantly 100mm diameter, mostly composed of material types asbestos cement (42%) and cast or ductile iron (28%) accounting for 70%. Programmed renewal of asbestos cement pipes in PVC and polyethylene material has already commenced and so the proportion of asbestos cement pipe will further diminish in time with an increase in proportion of the replacement material type.

The Council has completed a programme of rehabilitating cast or ductile mains by cleaning out corrosion deposits, then relining the internal bore. In addition to the water main, all galvanised iron service connections have been replaced, bringing that section of the reticulation back to as new state. Effectively the rehabilitation work was necessary to improve performance by way of removing hydraulic obstruction, corrosion deposits, which were both a source of dirty water and limited flow and firefighting capability.

Appendix 17.04, Section C, describes property connections (service connections).

It shows practically a 45/55 split between galvanised iron and polyethylene material. Service connections were laid in galvanised iron until 1985 after which polyethylene has been used. The inclusion of service connection replacement as part of cast/ductile iron water main rehabilitation, asbestos cement main renewal and replacement by maintenance practices accounts significantly as to why polyethylene forms half the total service connection stock. Successive years will see further reduction in the proportion of galvanised connections.

Appendix 17.04, Section C, describes critical pipe assets. More than half (56%) is of asbestos cement material, with 33% being polyethylene collectively accounting for 89%. Cast/ductile and PVC make up the other significant material types. 600mm diameter pipe constitutes the longest length which is mainly the Braxholme supply mains.

5.2.3 Reservoirs and Pump Stations

At the Braxholme Water Treatment Plant, pumps transfer treated water into reservoir storage within the city via the Braxholme pipelines.

In Invercargill, there are two sites containing both reservoir storage and a pump station. Both are on Reserve sites being 'Waikiwi' on The Myers Reserve and 'City' on the reserve bounded by Gala Street and Queens Drive. Because of Invercargill's flat terrain it is necessary to pump water to obtain a reasonable pressure within the distribution system. Distribution pressure is typically 400Kpa with a range spanning 350 to 500Kpa.

At Clifton, on the Bluff pipeline, pressure and flow is boosted to meet industrial demand at Awarua and Bluff water requirement. This pump station normally operates over the period October to May, to coincide with the Awarua seasonal demand.

In Bluff, placement of reservoirs on Bluff Hill (on a site known as the Bluff Hill Reservoir site) and at Shannon Street, by virtue of their elevation, serve to pressurise two separate distribution zones. There is also a reservoir, known as the Bluff reservoir on the foreshore at Ocean Beach Road which receives the incoming supply from Invercargill via the Bluff trunk main. A pump station at the Bluff reservoir site pumps water to the Shannon Street reservoir which serves the low parts of Bluff. Similarly a pump station at Shannon Street lifts water to the Bluff Hill site which serves the high parts of Bluff. In all there are three reservoirs and two

pump stations in Bluff. Distribution pressure is typically 500Kpa with a range spanning 200 to 500Kpa.

All pump stations have redundancy in the form of having more than one pump so that, in the event of pump failure or withdrawal from service for maintenance, there is adequate coverage to maintain supply.

5.3 CRITICAL ASSETS

The criticality of an asset has been determined with consideration of what would be the consequence or outcome in the event of its failure on a range factors, which for water supply include:

- Health (sickness or injury)
- Loss of service (domestic and key customers)
- Environmental impact
- Damage (to property and disruption to other utilities)
- Financial impact on cost of repair
- Image/reputation

Criticality reflects the consequences of failure irrespective of whether the asset is new, or nearing the end of its useful working life. Typically, as an asset ages it moves from a low likelihood of failure to a higher likelihood.

Other risk factors, such as earthquake or flooding, are independent of asset age or condition.

Appendix 17.13 “Invercargill City Council: Defining Asset Criticality for Water Services” discusses in more detail criticality ratings have been determined. Summary information from that report follows below.

5.3.1 Asset Criticality Criteria

Asset criticality has been determined on a five-step ranking. The rankings have symmetry with the impact ratings used in risk analysis of Section 6.2 – see table below:

Table 5.1 Asset Criticality Ranking versus Risk Impact Rating

Asset Criticality Ranking	Risk Impact Rating (Consequence)
1 – Insignificant / minor	1 - Insignificant
	2 - Minor
2 - Low	3 - Low
3 - Moderate	4 - Moderate
4 - Major	5 - Major
5 - Extreme	6 - Extreme

The following considerations were identified as covering all reasonably conceivable consequences of failure:

Table 5.2 Asset Criticality Criteria

Rank	Consideration	Description
1 =	Health (sickness)	Causing sickness for individuals or groups within the community. Typically, this might be gastro-intestinal arising from contamination of drinking water or contact with polluted water.
1 =	Health (injury)	Causing injury or death due to circumstances associated with the asset failure. Usually occurring suddenly.
3 =	Loss of Service (domestic)	The water service is not available to the household. Initially this causes inconvenience but rapidly escalates into major health issues and disruption to normal life for the affected consumers.
3 =	Key Customers and Business Impacts	This is also related to water services not being available to business customers and reflects impact on their ability to trade and the longer term economic welfare of the City.
5	Environment	Impacts on the natural environment, particularly flora and fauna. Also intended to reflect disruption to water based recreation when pollution occurs.
6	Damage (property)	This is primarily associated with damage to private property, e.g. houses, vehicles, landscaping. Damage to business premises would typically be considered under Key Customers and Business Impacts as the key issue is the time to recover and any impacts on overall business viability.
7	Damage and disruption to other utilities	The failure of a water services asset might have relatively little impact on water services customers. However, if it takes out another major utility asset in the process, the impact might still be significant. This would include railways, arterial roads, bulk power transmission, key fibre-optic routes, etc.
8	Compliance	Most major compliance breaches will be accompanied by health or environmental consequences that would take priority at the time. This consideration is intended to capture multiple, lower level breaches that ultimately reflect adversely on the Council.
9	Financial (on Council)	If an asset needs to be replaced its cost will inevitably fall on Council and this is not an avoidable consequence. However, if the cost is significant and has not been predicted then this can be very disruptive to Council's programme. It can also apply to situations where a large repair cost is incurred that could have been avoided with a pro-active renewal prior to failure.
	Image / Legal / Reputation	These are often included in corporate risk strategies and can be relevant at the corporate level. However, they are unlikely to occur in relation to water services in the absence of consequences occurring in one of the above considerations. As they do not occur in isolation they are not included as 'stand-alone' considerations. However they will inevitably occur when high criticality failures occur and need to be planned for as part of the response.

The general definitions of Levels of Criticality are included in the following table:

Table 5.3 General Definitions of Levels of Criticality

Criticality Level	General Description
Insignificant / Minor 1 & 2	Insignificant is at a level of incidents affecting only a few customers and causing minor inconvenience. Failure of the asset is quite site-specific. Minor is similar but affecting groups of customers, but with the response completed within the target Levels of Service. Failure of these assets may be indicative of overall deterioration.
Low 3	This group includes several types of assets that justify management at a more intense level than 1 or 2. This would include situations where adverse effects justify an escalation of the provider's normal response. It also includes assets that receive regular (or event specific) inspections for security, graffiti, maintenance, cleaning, operational status, etc. Such inspections may be augmented by SCADA monitoring for status and operational purposes. Asset failures can occur but are expected to have relatively minor consequences.
Moderate 4	Assets in this group are likely arterial with significant impacts when failure occurs. Monitoring and pro-active management would be in place but not to the 'avoid at all costs' level of Major. Single failures might occur and this would trigger an urgent response to avoid recurrence.
Major 5	This is likely to be the highest Consequence of Failure that a provider would choose to adopt. The asset involved would be highly monitored and pro-actively renewed with a strong focus on avoidance of any failure occurring.
Extreme (Catastrophic) 6	This column is intended to indicate the most extreme outcomes that could conceivably occur. Ideally assets would be re-configured to avoid this possibility even if the Likelihood of Failure is considered to be very low.

5.3.2 Identification of Critical Assets

Those assets with a criticality rating Moderate, Major and Extreme are collectively considered as 'critical'.

Those with rank Low and Insignificant/Minor are collectively considered as 'non critical'.

The table below, extracted from Appendix 17.13, describes criticality levels for water supply assets:

Table 5.4 Defining Asset Criticality for Water Supply

Asset Type	Detailed Description	Criticality
Water source	Single source from Oreti River	Extreme
Reservoirs	Historic Water Tower – seismic stability	Extreme
System Management	Management of backflow prevention	Extreme
Water Treatment	Branxholme WTP and maintenance of compliance with Drinking Water Standards	Major
Bulk transmission	Single pipeline supplying City Reservoirs downstream of Waikiwi Reservoir Bluff Pipeline	Major
Reservoirs	Waikiwi Reservoir City Reservoirs	Major
Pump stations	Waikiwi Reservoir site City Reservoirs site	Major
SCADA	Control systems for WWTP, pump stations and reservoirs	Major
Bulk transmission	Duplicated bulk mains from WTP to Waikiwi Reservoir	Moderate
Reservoirs	Bluff Foreshore reservoir Shannon Street reservoir Bluff Hill reservoir	Moderate
Pump stations	Bluff Foreshore pump station Shannon Street pump station Clifton pump stations	Moderate
Pipes	Trunkmains (other than bulk transmission) > 200mm diameter Unducted pipe crossing under railways and within private properties 200mm CBD firemains	Moderate
Customers	The highest ranking key customers are the airport, Prime Range Meats (although they have some storage), Southport at Bluff Harbour and the Mobil tank-farm (for fire supply)	Moderate
Pipes	Pipe crossings under State Highways and ducted under railways	Low
Customers	The prison, the South Pacific Meats (SPM) and dairy factories	Low
All other assets	Not mentioned above	Insignificant / Minor

5.4 ASSET CONDITION

5.4.1 Summary of Current Asset Condition

Apart from recent surveys on asbestos cement pipework, there has been no systematic survey of the other assets to derive condition ratings. With respect to pump stations and headworks / treatment plants a degree of familiarity has developed through the operations and maintenance procedures of the various electro/mechanical components which make up these assets. This is considered sufficient to gauge whether or not there are any immediate problems in condition.

Surveys on samples of asbestos cement pipe have shown a wide variation in remaining life and thus condition with no apparent pattern. This is likely to be the case for all pipe network assets.

In the absence of any other method, condition assessment for the pipe network assets have been assigned according to the assessed remaining life – for detail and graphical representations refer to figures in Appendix 17.04. These show that the network condition as a whole is well over half of being in ‘moderate’ or better condition. Specifically, exclusive of property connections, the proportions that are ‘moderate’ or better are 70% for the whole network and 68% for the critical pipes. Property or service connections are 82% ‘moderate’ or better condition.

5.4.2 Condition Monitoring

The following strategies are used to monitor the condition and performance of water assets. These then feed into maintenance and renewal programmes:

➤ **Headworks and Treatment Plants**

- Operator Inspection - The plant is manned every day of the year with the operator attending to both operational duties and checking equipment performance. Any faults observed are instructed to Council’s maintenance contractors to action.
- SCADA and Telemetry - The plant has onsite SCADA which will generate an alarm upon equipment or process failure. Alarms are transmitted offsite by Telemetry to the City Control Room, manned 24/7, where upon Council’s maintenance contractor will be instructed to inspect, repair or replace as necessary. The maintenance contractor will advise of major equipment repair or replacement.

➤ **Reservoirs and Pump Stations**

These are inspected weekly by Council’s maintenance contractor who completes inspection sheets of electro/mechanical plant items to forward to Council. All sites are monitored and equipment alarmed by Telemetry back to the City Control Room.

➤ **Pipe Networks**

The Branxholme and Bluff pipelines are subject to annual inspection by Water Operations staff. Items in poor condition are arranged for repair or replacement through Council’s maintenance contractor. In the previous years’ samples have been cut from sections of the asbestos cement pipe network to

determine condition and remaining life. Unfortunately this method has shown a wide range in condition and remaining life for pipe of the same description and age, and so cannot be taken as the sole arbiter of asbestos cement pipe condition.

- Branxholme and Bluff pipeline pressures and flows are monitored by Telemetry. Monitoring of pressure and flows enables assessment of performance and deteriorating condition.
- Inspection sheets following pipe failure are completed by Council's maintenance contractor and forwarded to Council.
- Instances of failure are plotted on area wide maps to establish failure trends.

5.5 ASSET CAPACITY AND PERFORMANCE

5.5.1 Capacity and Utilisation

➤ Headworks and Treatment Plants

There is excess capacity in the Branxholme plant's capability to produce treated water above existing demand up to the maximum as permitted by Council's resource consent to draw water from the Oreti River.

There is a vulnerability though inasmuch that Branxholme is the sole water supply which if rendered inoperative means no water supply!

➤ Reservoirs and Pump Stations

Reservoir capacity is adequate for current demand being sufficient to cover two days summer demand but would need to be increased if demand were to increase by more than 10%.

Similarly Waikiwi pump station capacity for ringmain pumping would need to be increased if demand was to increase in the south east area of Invercargill or in the Awarua Industrial area. Pumping capacity at the other pump stations including reticulation pumping at Waikiwi is sufficient to meet increased industrial demand up to the capacity of the Branxholme water treatment station. If the industrial demand occurs outside the existing reticulated area then there would need to be both local reservoir storage and reticulation pumping set up at that site.

➤ Pipe Network

The network has sufficient capacity to meet current and anticipated industrial demand up to the current Branxholme treatments plant's capacity (as referenced above) but would need extension if the demand was geographically positioned outside the current distribution area.

5.5.2 Performance

The headworks and treatment plants as well as the pump stations are continuously monitored by telemetry which conveys operational status and alarm states back to the City Control Room which is manned 24 hours a day, 7 days a week.

Comments on specific asset groups are as follows:

➤ **Headworks and Treatment Plants**

The Branxholme Water Treatment Plant has been upgraded as of April 2017 and now attains full compliance with the Drinking Water Standard of New Zealand, as well as the elimination of the summertime earthy taste and odour.

➤ **Reservoir and Pump Stations**

These are considered to have performance adequate for function.

➤ **Pipe Network**

There is a need to engage in leakage and backflow protection. In regard to leakage there is an increasing need, both in terms of best practice in operating water supplies and in the allocation of water from source, to demonstrate efficient use of water. The determination of actual leakage needs to be accurately assessed using nationally accepted methodology given that the Invercargill and Bluff communities are not universally metered.

In regard to backflow protection, currently there is total reliance on the elimination of the threat at source via the Building Act provisions. Under the newly established Water Regulator and anticipated overhaul of the drinking water legislation, it is anticipated that Council will likely be required to demonstrate a more active approach towards protection against backflow.

Specific comment on the pipe network sub groups are as below:

- *Bulk Supply Pipes*
The original Branxholme pipeline is of asbestos cement 'Italit' manufacture which because of its historical operational history and failure rate is operated at lower than nominal capacity. The Bluff pipeline has recently been replaced in polyethylene pipe and can be operated at its nominal capacity.
- *Invercargill Distribution*
The progressive replacement of galvanised steel service connections done as part of the cast iron main rehabilitation programme has significantly decreased the incidence of poor flow to property boundaries. Also firefighting flows have been brought up to the New Zealand Fire Service code of practice performance levels as a consequence of the completion of the programme to clean and reline cast iron pipe water mains.
- *Bluff Distribution*
There has been a comprehensive upgrade of this distribution system over a period of years to improve firefighting flows and reduce pressure fluctuations. There remains only a small amount of work to be completed.

5.6 SUMMARY OF ASSET TRENDS, ISSUES AND CHALLENGES

- If the current Branxholme supply is rendered inoperative for some reason such as drought or disaster then the current complete reliance on the Oreti River source to singly serve the whole community makes for a vulnerable situation. Search for another source to act as an emergency supply needs investigation.
- Leakage and backflow protection programmes need commitment to demonstrate efficiency and safeguards in supply.
- Condition assessment remains a challenge, particularly in regard to underground pipe work. This leads onto the question of when to renew an asset. Renewal according solely to how far an asset is through its nominal life may be unduly conservative and is only one consideration to take into account when replacing an asset.
- Asset capacity may be an issue if demand for the service is markedly different from forecast. There may need to be an extension of the asset to reach new industrial customers if they locate outside the current service area.
- Asset performance in regard to water treatment standards should only be a challenge if a new threat to water supply is identified outside of the current Drinking Water Standard.

6. Sustainability, Risk and Resilience

6.1 SUSTAINABILITY AND NEGATIVE EFFECTS

The Local Government Act requires Council to take into account the social, economic and cultural interests of people and communities, the need to maintain and enhance the quality of the environment and the reasonably foreseeable needs of future generations by taking a sustainable development approach.

Sustainability can be defined as:

Development which meets the needs of the present generation without compromising the future generation from meeting their own needs
(Brundtland Report, 1987).

Infrastructure assets ability to influence sustainability outcomes are highest during the planning and design phase. Asset type, location and design can significantly impact sustainability outcomes, for example, accessibility, urban form, land-use, heritage, health and wellbeing. Good planning and design can lead to improved economic and social benefits.

The operation of infrastructure has ongoing impacts - particularly as they relate to energy use and emissions, runoff, noise, light, ecological impacts, safety, etc. Operation can provide ongoing employment and economic benefit.

The construction of infrastructure impacts on material use, energy, water, waste, etc. Construction can provide employment, with potential to target 'social' procurement.

The following aspects of 'sustainability' in relation to the Water Activity are discussed below:

- ***Planning and design phase***
Sizing of pipework and pump selection are undertaken to provide water supply capacity at the lowest cost. (Matching water demand to pipe diameter and pump size).
- ***Operations***
In regard to reduction in electricity and chemical consumption there is little potential for further reduction without changes in technology. Chemical selection has been on the basis of what works best rather than the holistic view of depletion of the world's resources while usage is limited to that necessary to provide compliance with the Drinking Water Standard. Electricity consumption will be reduced as advances in technology permit, e.g. replacement of older electric motors with higher efficiency units.
- ***Construction***
Construction methods to date follow the least cost option rather than the holistic total sustainability approach.

6.1.1 Social and Cultural Effects

There are concerns from the wider community over the continuance of fluoridation of the water supply. There are also concerns, although at a much lower level, over the practice of chlorination. This plan includes the continuation of chlorination and fluoridation but keeps within bounds as limited by the Drinking Water Standards.

No cultural effects, negative or positive have been identified.

6.1.2 Environmental Effects

The potential negative effects of the Water Supply Activity on the environment are:

- The effects on the environment of discharges of chlorinated water from maintenance activities or pipeline failures.
- The environmental effects of asbestos pipes on disposal.
- Disposal of water treatment by-products causing environmental degradation.
- Degradation of the Oreti watercourse due to rate of extraction of water for treatment.

Council mitigates against these potential negative effects by ensuring:

- Discharges of chlorinated water from the water supply system are of short duration. Chlorine levels in the water are low and any effects are likely to be localised and relatively minor.
- The disposal of asbestos pipes is done by the approved method.
- The disposal of water treatment by-products is taken to landfill.
- Extraction of water is regulated by resource consent conditions issued by Environment Southland.

6.1.3 Economic and Financial Effects

Asset Management's purpose is to provide the desired level of service in the most cost-effective manner through the management of assets for present and future customers. We do this by:

- Recognising the consumption of assets and appropriately funding.
- Categorising capital versus operational expenditure.
- Allocating costs and preparing forecasts over the long-term (30 years or more).
- Reporting on financial performance.

6.1.4 Summary of Sustainability Challenges and Issues

To date decisions in the selection and operation of assets that enable the Water Activity have been made on localised outcomes of cost moderated by limitations imposed on compliance with standards and resource consent conditions. The challenge will be to widen the scope of decision making beyond a local perspective to that of an overall global and intergenerational sustainability mindset.

6.2 RISK

The Council recognises that it is obliged to manage effectively and to review regularly its risks at a strategic, operational and project level. The Council has done this by developing a Risk Management Framework and a range of risk management processes that apply across the organisation. Risk assessment is a major consideration in planning and budgeting processes at all levels within the Council. Risks must be considered and documented as part of the justification for undertaking our activities. Risk assessment and monitoring must form part of the management of operational activities. The Chief Executive and the Council encourage the taking of controlled risks to better improve the effectiveness and efficiency of the services and functions that the Council provides on behalf of the community, provided the resultant exposures are acceptable.

6.2.1 Risk Framework / Standard

Council has previously adopted a risk management process that is consistent with Australia/New Zealand Standard AS/NZS ISO 31000:2009 which defines risk assessment and management. The key risk criteria adopted for assessing the consequences of identified risks are:

- Community Health and Safety
- Loss of Service – Extent / Duration
- Service Delivery – Customer Impact
- Invercargill City Council Financial Impact
- Financial Community
- Corporate Image and Reputation
- Legal Compliance

It should be noted that the current risk matrix has produced some outcomes that are not sensible, refer Section 6.2.5, therefore its review is necessary.

6.2.3 Critical Assets Decision-Making

Critical assets are “those which have a high consequence of failure, but not necessarily a high probability of failure”. This is important as it draws attention to those assets which are the most important, irrespective of the likelihood of failure of the asset.

Note that the likelihood of failure of an asset is often difficult to assess, however condition and age are parameters that provide an indication. The worse the condition of the asset, the more likely it is to fail.

Critical assets typically therefore require more proactive management to minimise or eliminate this risk. Assets that are both extremely critical and more likely to fail should have higher priority and be replaced or rehabilitated earlier in their lifecycle than others, and at lower levels ‘run to failure’ may be perfectly acceptable.

Critical assets were identified earlier in Section 5.3, which also references the 2017 report Defining Asset Criticality for Water Services. This report also described management approaches relating to the different asset criticality levels, with those relevant to prioritising life-cycle investment decisions reproduced below.

The application of asset criticality to asset management lifecycle decision-making and programme options is described further in:

- Section 7.2 Operations and Maintenance

➤ Section 7.3 Asset Renewal / Replacement

➤ Section 7.4 Capital Development Plan

Prioritisation of Maintenance, Investigations and Capital Works	
Insignificant / Minor	<p>If budget provisions are constrained these are the assets that would be given the lowest priority for investigations, preventative maintenance and renewals.</p> <p>If resources are constrained these are the projects that should be deferred.</p> <p>Care should however be exercised to ensure that any increasing maintenance costs arising do not exceed the cost associated with renewal.</p> <p>There is also the risk that Council will be perceived to be running its assets down by not progressing routine renewals in response to failures and it is therefore still desirable to be able to maintain an ongoing programme of renewals of assets that have obviously deteriorated to the point where this is required.</p>
Low	<p>In extreme prioritisation processes these assets could come under pressure and there would be concern about this. Further work may be required to prioritise within this group if budget cuts are required.</p>
Moderate	<p>These sit behind the Major Criticality projects (which should be relatively few in number) and would typically be included as 'must progress' in any prioritisation process.</p>
Major	<p>These are the highest priority projects to progress both in terms of funding the necessary works in the operational or CAPEX budgets but also in terms of ensuring that works actually progress during the intended planning period.</p> <p>In the event that any asset is identified as having High (Catastrophic) consequences of failure then a remedial plan to reduce that consequence would have the highest priority unless it is considered that the associated likelihood of occurrence does not justify such an investment.</p>

6.2.4 Risk Identification and Assessment

The highest ranked risk events are developed in accordance with the procedures in Section 6.2.1 and detailed in Section 6.2.5.

Causation of risk events result from the exposure of the various individual assets of the water system to various threats which have been categorised as below:

- Climate Change
 - Sea level rise
 - Increased rainfall intensities
 - Increased likelihood of drought

- Natural Disasters
 - Flood
 - Earthquake
 - Tsunami and coastal storm surge
 - Flooding
 - Wind
 - Lightning
 - Snow

- Asset Failure

- Condition
 - Performance (insufficient capacity, leakage, backflow)
- Events and Incidents
- Contamination
 - Vandalism / sabotage
 - Power failure
- Other
- Pandemic (e.g. COVID-19)
 - Legislative change
 - Poor practice – e.g. design, operations, etc.
 - Contractual breakdowns
 - Consenting / legislative risks

The level of risk is then composed as described in 6.2.1 to each asset sub group as listed in Appendix 17.06 – Water Asset Risk Analysis. An identified improvement action is to consider risks in terms of gross risk (pre-mitigation / treatment) and residual risk (post-current mitigation / treatment), and then to determine the effectiveness of the actions and whether further action is required.

There is a specific risk associated with the renewal strategy of non-critical asbestos cement water mains – refer Appendix 17.14 Asbestos Cement Water Mains: Renewal Strategy. Because of the uncertain life of asbestos cement mains, it is proposed to plan for the renewal of those that are non critical according to the longest life as indicated by the National Asbestos Cement Pressure Pipe Manual. Then, because the consequence of their failure has been assessed as inconsequential or minor, to withhold their renewal to when they either start to fail or when it is convenient to include their renewal as part of other works in a particular street. This strategy will create a financial risk identified in Section 8.

6.2.5 Summary of Key Risk Issues

The highest risk events are listed in the table below.

Table 6.1 Summary of Key Risk Issues

Asset Group (Reference Number from Appendix 17.06)	Failure Mode / Impact of Risk Event	Risk Exposure Rating
Intake (5)	Flood / Earthquake causes extensive damage resulting in non-operability	H
Branxholme pipe lines (102)	Earthquake / Condition causes significant pipe breaks resulting in the need to stop pumping water into the lines until they can be repaired or replaced	H
Reticulation (178)	Backflow causing contamination and public health impacts – e.g. sickness, fatality	H
Galvanised water connections (147,149)	Poor condition causing breaks and supply interruptions to individual consumers	H
All pipework (191,192)	Leakage resulting in extensive water losses and additional costs	H
Branxholme WTP pipe	Poor condition / Earthquake causing damage	M

Asset Group (Reference Number from Appendix 17.06)	Failure Mode / Impact of Risk Event	Risk Exposure Rating
work (17)	resulting in closure of the plant pending repair or replacement	
Bluff lagoons – East and West Hill reservoirs (187,188)	Environmental damage / Earthquake causing the reservoirs to lose water down the hill into the environment, with erosion and property damage also likely	M
Non critical asbestos cement pipe lines (124,132)	Earthquake / Condition causing breaks and supply interruptions to streets or close neighbourhoods	M

It should be noted that the awarding of ‘High’ risk for galvanised connection failure and pipework leakage would seem to be unnecessarily high. This is because the current risk matrix has been set to award an event of the lowest impact as “high” if it is almost certain to happen. Older galvanised service connections are failing and similarly older cast iron pipe work is bound to leak, hence it is the likelihood that has influenced the risk assessment.

An intuitive risk assessment for the above events would be ‘Moderate’.

This incongruence in the existing risk matrix has been recognised, promoting a future review.

A risk management approach alone is not sufficient and needs to be complemented by a resilience approach. This considers the low probability, high consequence events, such as major earthquakes, that have the potential to be very disruptive to the provision of a reliable water supply to Invercargill. Rare events may also be unpredictable in nature and result in inevitable failure of infrastructure. Resilience concepts and proposed actions to address this issue are discussed in the next section.

More specifically, there are several “Low” risks in Appendix 17.06 where the consequences of failure are significant, typically these are also reflected in higher asset criticality ratings. These risks have a low probability of occurrence, for example, an earthquake such as the anticipated Alpine Fault magnitude 8 event. However, the consequence scores of such events are similar in scale to other more frequent risk events affecting other assets where the risk rating is High.

Those risks with weighted consequence scores above 3 are listed below. In each case, a maximum possible consequence score of 6 has also been attributed to either or all of public health and safety, service delivery, and financial. Three risks meeting these criteria are included in the following table.

Table 6.2 Summary of High Consequence Risk Issues

Asset Group (Reference Number from Appendix 17.06)	Failure Mode / Impact of Risk Event	Consequence Score	Risk Exposure Rating
Water Tower (63)	Earthquake resulting in collapse of the water tower and loss of water, potential impacts on public safety and damage to public and private property	3.65	L
Bluff Pipeline (104)	Condition / Earthquake causing damage resulting in closure of the pipeline to Bluff pending repair or replacement	3.35	L
Waikiwi Bridge (107)	Condition / Earthquake causing damage to the bridge and severing the pipeline across it	3.1	L

6.2.6 Possible Approaches to Risk Mitigation

Controls that are planned to mitigate the above listed risks and mitigation options to be further evaluated are as listed below. Capital improvement projects are also listed to address the highest rated risks.

Table 6.2 Controls to Mitigate Risk

Asset Group (Reference Number from Appendix 17.06)	Failure Mode	Risk Exposure Rating	Current Controls	Action	Expenditure Type
Intake (5)	Flood / Earthquake	H	Apply restrictions	Establish emergency supply	LoS Capex
Water Tower (63)	Earthquake	L	Inspect / maintain	Seismic strengthening	LoS Capex
Branxholme Pipe lines (102)	Earthquake / Condition	H	Reactive repair	Programmed replacement	Renewal Capex
Bluff Pipeline (104)	Condition / Earthquake	L	Programmed replacement	As per current	Renewal Capex
Waikiwi Bridge (107)	Condition / Earthquake	L	Inspect / maintain	As per current	Opex
Reticulation (178)	Backflow	H	Reliance on protection at source by application of Building Act provisions	Backflow protection programme	Opex
Galvanised water connections (147,149)	Condition	H	Replacement	Replacement	Renewal Capex
All pipework (191,192)	Leakage	H	None	Leakage reduction programme	Opex
Branxholme WTP pipe work (17)	Condition / Earthquake	M	Reactive Repair	Condition assessment and renewal	Opex and Renewal Capex
Bluff lagoons – East and West Hill reservoirs (187,188)	Environmen tal damage	M	Inspect / maintain	Condition assessment	Opex (pending identification)

Asset Group (Reference Number from Appendix 17.06)	Failure Mode	Risk Exposure Rating	Current Controls	Action	Expenditure Type
Non critical asbestos cement pipe lines (124,132)	Earthquake / Condition	M	Repair	Condition assessment / replace	of works) Opex and Renewal Capex

6.3 RESILIENCE

The working definition of resilience to Invercargill City Council is the ability of both the organisation and community to survive a crisis and adapt to uncertainty. Resilience considers both the risks we face (Section 6.2) and adaptive capacity. In this latter context resilience relates to our capacity to adapt (rather than preparedness or recovery), which is the capacity of people, the community and systems to adapt in the face of predictable or unpredictable events or trends, including the ‘unknown unknowns’.

Such risks may include rare, infrequent natural hazards such as major earthquake or tsunami, whose timing or occurrence cannot be readily predicted, but which cause extreme damage, or predictable trends which occur slowly over time, such as climate change.

Resilience provides a different perspective to the “risk matrix”, putting less emphasis on likelihood and a focus on consequence to address “what if” questions.

100 Resilient Cities* provides a more structured view of what resilience means for a city such as Invercargill. Both Christchurch and Wellington have been through the 100 Resilient Cities process and identified goals and activities that will help improve their resilience over time.

100 Resilient Cities has four dimensions and three drivers within each dimension:

➤ ***Health and Well-being***

- Meet basic needs
- Support livelihoods and employment
- Ensure public health services

➤ ***Economy and Society***

- Foster economic prosperity
- Ensure social stability, security and justice
- Promote cohesive and engaged communities

➤ ***Infrastructure and Environment***

- Provide reliable communication and mobility
- Ensure continuity of critical services
- Provide and enhance natural and man-made assets

➤ ***Leadership and Strategy***

- Promote leadership and effective management
- Empower a broad range of stakeholders

- Foster long-term and integrated planning

* <http://www.100resilientcities.org/resilience>

Invercargill can learn from this knowledge and the experiences of other cities in improving the resilience of our city and its infrastructure.

6.3.1 Business Continuity and Emergency Response Arrangements

Catastrophic events such as extreme weather events, earthquakes, tsunamis, etc. are likely to damage water supply infrastructure and compromise its ability to continue to provide the service for which it is designed. Damage to other infrastructural services, particularly power and roading, can also compromise recovery strategies. Some of the strategies in the risk mitigation section will assist in the recovery of the service (e.g. availability of 24 hour response crews and standby gensets at pump stations), but resilience also means that the community is able to adapt to changing circumstances while services return to normal. For example, water may need to be supplied by remote water tankers and taps, and then only in limited volumes.

It is unlikely in these events that the water supply activity would be able to rely on its own resources, and the assistance of the wider community may be required

It is likely that resources will be rationed during a CDEM emergency declaration, and the CDEM Controller (whether City or Regional level declaration) may decide that recovery in other areas should take precedence over the water supply activity. The protection of human life, health and safety will however always be of paramount importance during such situations.

The CDEM function is delivered by Emergency Management Southland (EMS) as a shared service with other Southland Councils, delivering a structured approach to civil defence emergency management (CDEM) as required by legislation. It focuses on ensuring communities are prepared for emergencies and that they are able to respond to and recover from these when they do happen. Specific actions include public education and ensuring the availability of a pool of trained personnel. Having this combined organisation results in streamlined decision making, faster response times and cost savings

Each Council is responsible to provide trained staff into the team when requested and therefore providing a wider resource base when necessary. A specifically designed venue has been setup for the operation at Price Street for all the Councils that has three to four full time CDEM staff coordinating the response.

Basic continuity planning has been established at Invercargill City Council but further development is required to establish a robust and reliable set of response processes. Staff have a good understanding but the processes need to be documented. These are needed to be able to respond and manage Council assets in a sustainable manner in the event of a significant event where potentially all of Southland is affected. Staff have the knowledge and have participated in national training exercises and understand what is needed.

6.3.2 Lifeline Utility Obligations

The Council's water supply activity is defined as a "lifeline utility" in the Civil Defence and Emergency Management Act 2002. The Act contains specific requirements in relation to the duties of lifeline utilities, specifically it must:

- Ensure that it is able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency
- Make available to the Director in writing, on request, its plan for functioning during and after an emergency
- Participate in the development of the national civil defence emergency management strategy and civil defence emergency management plans
- Provide, free of charge, any technical advice to any Civil Defence Emergency Management Group or the Director that may be reasonably required by that Group or the Director
- Ensure that any information that is disclosed to the lifeline utility is used by the lifeline utility, or disclosed to another person, only for the purposes of this Act.

Invercargill has also had a lifelines plan in place for several years. This plan assessed the vulnerability of all lifeline utility infrastructure to natural hazards and identifies where asset strengthening or other reduction measures may be needed. The Council continues to work at a Regional level to advance its planning provisions. These plans recognise the isolation that Invercargill could experience in a major event such as the South Island Alpine Fault earthquake, an event that would affect and disrupt the whole South Island and parts of the North Island.

6.3.3 Current and Desired Resilience

Resilience is a topic that we are learning more about from events such as the Christchurch, Kaikoura and Wellington earthquakes. Invercargill City Council is seeking to make our organisation and infrastructure more resilient. Resilience will be part of the review of risk management being undertaken in the 2021/22 financial year.

Ideally, this will involve a structured approach to assessing the resilience of the water supply network and its interdependencies with other utilities (e.g. power, roads, telecommunications). This task will couple a review of the now dated lifelines plan referred to above with improved knowledge of the potential hazards that could affect the city (such as the Alpine Fault earthquake).

This study is expected to confirm key vulnerabilities, not only in our infrastructure but also in our ability to respond and recover from such events. It would define the “resilience gap” and identify initiatives to both strengthen the asset and improve our readiness capability.

At present, the most significant identified action to improve the resilience of the Water Activity is to move away from the current situation of having sole dependence on a single water source, as described in Section 6.2. Funding to carry out further investigations and preliminary work is included in this Plan.

6.3.4 Summary of Resilience Issues and Challenges

The challenge to improving resilience will be to find the resources to:

- Research how others have experienced disaster events, then developed better resilience.
- Carry out the investigations needed to assess our vulnerabilities and potential action plans.
- Develop contingency plans for various disaster scenarios.

7. Managing Our Activities

7.1 RESPONDING TO THE ISSUES AND CHALLENGES

Table 7.1 Potential Responses to Issues and Challenges

Topic	Issue or Challenge	Potential Responses
Level of Service (sec 3.4)	Service levels and their targets may not be representative of customer expectations.	Conduct water specific surveys with customers.
	Future change to Drinking Water Standards.	Upgrade Water Activity to comply.
	Future change to resource consent conditions.	Debate with consent authority, then upgrade Water Activity as necessary to comply.
Demand (sec 4.4)	Extension of supply area.	Apply for increase in abstraction of water resource consent.
	Increase in maximum daily demand because of climate change.	Apply for increase in abstraction of water resource consent.
	Prove efficiency of water use.	Improve assessment of amount of leakage and reduce as required.
Asset Profile (sec 5.6)	Total dependence on current sole source of supply.	Search and develop an emergency supply.
	Exposure to risk of backflow.	Engage in backflow prevention programme.
	Challenge to efficiency of water use.	Improve assessment of amount of leakage and reduce as required.
	Condition assessment improvement especially with respect to underground pipe work. When should an asset be renewed?	Search for and investigate new techniques for condition assessment.
Sustainability (sec 6.1.4)	To date decisions in the selection, operation and construction of assets have been limited with local effects in mind dominated by upfront cost.	Widen decision making to include consideration of global and inter-generational sustainability.
Risk (sec 6.2.5 and 6.2.6)	Decrease risk of total dependence on having only one water source.	Search and develop an emergency supply.
	Address potential asset damage risks posed by earthquakes	Asset replacement and strengthening programmes.
	Decrease risk of backflow.	Engage in backflow prevention programme.
	Address environmental risks Bluff lagoons – East and West Hill reservoirs	Investigation required.
Resilience (sec 6.3.3)	The sole dependence on one water source severely limits resilience.	Search and develop an emergency supply.
	Finding the resource to: Research and understand how others have experienced disaster, then developed resilience. Develop disaster scenarios.	Look for and engage a resource experienced in developing resilience in water supply.

7.1.1 Alternative Investment Approaches

Historically capital works involving asset renewals and service level improvements have tended to be committed to and undertaken purely on their own individual merits. Their funding similarly has been influenced by their individual cost with timing set by the expiry of their nominal service life.

An alternative is to collectively consider all projects together, then undertake various financial scenarios of funding to establish a uniform annual commitment rather than the historic up and down monetary requirement. Such an approach would be in accordance with the Asset Management Strategy which states:

“Take an organisational wide approach to prioritise renewal programmes to ensure coordination in the most efficient way possible”.

There is some flexibility in timing, even with renewals. Delaying renewals past a nominal service life does present a risk but the risk varies according to the criticality of the particular asset. The timing of commitment to capital works could vary with the benefit of providing flexibility to financial programming and the identification of an affordable annual commitment that addresses long term requirements.

There are less alternatives for operational and maintenance investments, as these tend to vary little from year to year and so could be considered as fixed costs. Their variance would impact very quickly on levels of service.

7.1.2 Do-Minimum Programmes

A do minimum programme would simply address legislative requirements, accepting higher rates of failure and potentially higher long term costs. A lower level of service would be offered – such as longer response times, reduced security of supply, and lower reliability. Drinking water standards would form the basis for a minimum programme.

Do minimum programmes may be acceptable if that’s what the end user and payer of the activity is prepared to tolerate. Their application is likely to lower the level of service and lead to increased costs in the future. If they were to be applied then the financial impact over time plus impact on service levels must be identified in order to enable a balanced decision to be reached.

7.1.3 Programmes Evaluation

Risk and asset criticality play a major role here, particularly in establishing a capital renewal programme. Consideration of operating non critical assets past their nominal service life, even to their eventual failure, would optimise the original investment and defer future investment.

On the other side the potential lowering of service levels and long term cost would need to be weighed against renewal deferral. If an asset can be run to failure without any impact on service levels or increased costs then it should be replaced only after it fails. In reality, the failure of most assets will have some impact on service levels and long term costs so their deferral should be risk assessment based.

Asset renewal timing is therefore not necessarily at its theoretical end of life.

Section 7.6 summarises options that have been considered in developing the recommended programme and how the above factors have been considered.

7.2 OPERATIONS AND MAINTENANCE

7.2.1 Operation / Maintenance Strategy

Refer to Appendix 17.08 for the detailed strategy.

A summary from the Strategy for each asset category is as follows:

➤ **Headworks and Treatment Plants**

Operations will continue to be undertaken by Council staff. Maintenance will be undertaken by contract with pre-programmed checks carried out on selected equipment items and reactive maintenance as required.

➤ **Reservoirs and Pump Stations**

As for Headworks and Treatment Plants detailed above.

➤ **Pipe Network**

Maintenance (reactive or planned) will be carried out under contract. Spare pipe and fittings for pipe diameter larger than 200mm will be kept in store by Council and supplied to the contractor when required. The maintenance contractor will keep spares for pipe diameter 200mm and smaller.

The approach to delivering operations and maintenance is also informed by the 2017 Defining Asset Criticality report, refer Appendix 17.13.

This report established management approaches for different levels of criticality, reproduced below for reactive maintenance, planned maintenance, fault and performance monitoring.

Management Approach for Various Levels of Criticality	
Reactive Maintenance Response	
Insignificant / Minor	Routine maintenance response typically within capacity and authorisation of maintenance contractor. Unless peculiar circumstances arise would only be reported in monthly report.
Low	Elevated response from contractor with additional crews and supervisors involved. ICC staff would be advised and may attend site. Likely that some customer interaction will occur to address issues arising.
Moderate	The response to the incident may require resources beyond the normal capacity of the contractor such as multiple tankers or sucker trucks, additional manpower or specialist skills, additional equipment such as generators, etc. brought in. Urgency with obtaining equipment not held in stock. Note that it is anticipated that the contractor would have contingency plans in place to undertake the lower end of this escalation as part of their 'normal' response and without the involvement, or approval, of council management.

Planned Maintenance and regular Operational Inspections	
Insignificant / Minor	<p>Maintenance of assets likely to be irregular and budget constrained. Generally, assets are inspected when an incident occurs and there is a need to undertake work on it.</p> <p>Low frequency maintenance may be undertaken on some assets as part of an overall intent to ensure they achieve their design life and to ensure that they are functional when required. This would include items such as checking the operability of hydrants and valves which might be undertaken as part of a 5 yr (?) rolling programme and other infrequent observations taken as part of a programme that is perceived to be 'good practice' but not specifically addressing any concerns about criticality.</p>
Low	<p>These are largely 'passive' assets that have a defined and elevated consequence of failure if this occurs. Failures would be primarily related to inconvenience and relatively low levels of damage and/or injury.</p> <p>This elevation warrants such assets having regular inspections if it is possible and practical to do so. Such inspections may be optimised by limiting them to certain seasons or events that increase the likelihood of failure. Such events could include forecast storms or large community events that will place additional load on the system</p>
Moderate	<p>These are likely to be specific assets such as pump stations, reservoirs, treatment plants and the like that have equipment that needs to operate from time to time and/or security and functionality need to be checked.</p> <p>In many cases these assets will also be linked to SCADA which will generate an alarm if the equipment fails to operate or if security breaches occur.</p> <p>Even if the consequences of failure are relatively low a cost/benefit analysis will typically illustrate that it is better to inspect the equipment periodically and undertake both scheduled and reactive maintenance than to wait until failure occurs.</p>
Major	<p>This is an extension of Moderate but particularly focussed on assets that could generate higher consequence outcomes in relation to health, injury and damage. This would include equipment that could lead directly to drinking water being unsafe, major failures in wastewater treatment and situations where the public could access unsafe areas that are normally protected.</p>

Fault and Status Monitoring (SCADA and Ad-hoc)	
Insignificant / Minor	<p>Unlikely to be any assets in this category.</p> <p>Monitoring by exception i.e. if issue/complaint arises an investigation is undertaken.</p> <p>May be SCADA connected even though low criticality due to all such equipment being on SCADA.</p>
Low	<p>Fault monitoring more likely to be by periodic inspection than SCADA.</p>
Moderate	<p>Monitoring will be concerned with ensuring that the assets are operational. Processes will be in place for transmitting of alarms.</p>
Major	<p>Largely as for Moderate but given elevated Criticality more attention given to ensuring that alarms cannot be missed and an escalation process in place.</p>

Performance monitoring (SCADA and ad hoc)	
Insignificant / Minor	Monitoring by exception i.e. if issue/complaint arises an investigation is undertaken. May be SCADA connected even though low criticality due to all such equipment being on SCADA.
Low	Periodic performance testing such as draw-down tests, comparison of production with pumps hours, etc.
Moderate	Some form of regular inspection / measurement should be in place to detect any decline in performance that would indicate imminent failure. This may require longer term analysis of data compared to routine Alarm and Status SCADA data. This may overlap with Alarm and Status SCADA if HACCP approach has been utilised and trigger points are able to be monitored e.g. turbidity levels. Likely to be SCADA connected.

7.2.2 Operation / Maintenance Standards and Specifications

The water system is operated and maintained according to the following documents. Generally they are New Zealand standards with their basis from international standards and codes of practice. They are also subject to updates as regulations and best practice change.

➤ Operations

- Drinking Water Standards for New Zealand
- Resource consents issued for Branxholme Treatment Plant for:
 - Abstraction of water from Oreti River
 - Discharge of filter wash water to Oreti River
- Internal instructions relating to the preservation of safe reservoir storage and pipeline operations

➤ Maintenance

- Specifications contained with the maintenance contract, namely:
 - AS/NZS 2566.2: 2002 Buried Flexible Pipelines Part 2 Installation
 - AS/NZS 2566.1:2002 Buried Flexible Pipelines Part 1
 - AS/NZS 1477 PVC Pipes and fittings for Pressure Application
 - AS/NZS 2638.2 Resilient Sealed Valves
 - NZS 3109:L1997 Specification for Concrete Construction
 - COPTTM NZTA Code of Practice for Temporary Traffic Management
 - NZS 7643 Installation of PVC Pipe Systems
 - NZS 4404:2004 Land Development Subdivision Engineering
 - Health and Safety At Work Act 2015 Excavation and Shafts for Foundation
 - Invercargill City Council Specification for Water Services

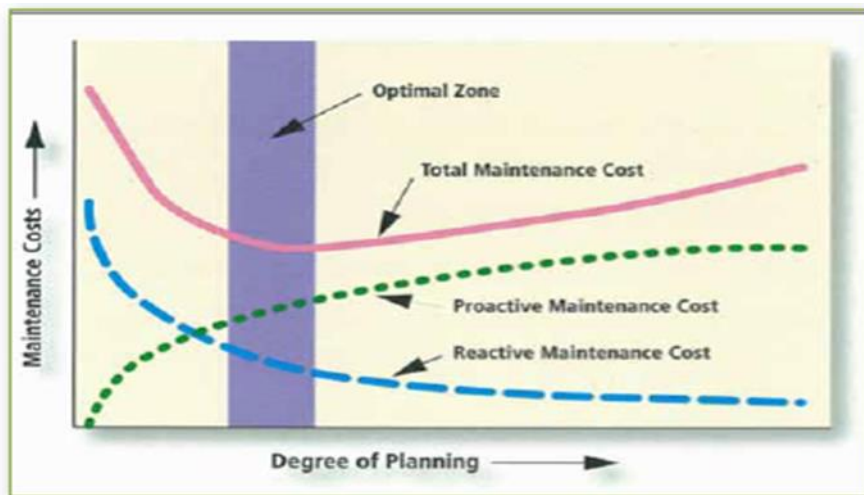
➤ General

- This Asset Management Plan
- The Health (Drinking Water) Amendment Act 2007
- New Zealand Fire Service Fire Fighting Water Supplies Code of Practice
- Health and Safety in Employment Act, 1992

- Invercargill City Council Water Supply Bylaw
- Invercargill City Council Code of Practice for Land Development and Sub Division Infrastructure

7.2.3 Operation / Maintenance Options and Alternatives

At a high level, the asset management objective is to maintain assets on a 'whole of life' basis to ensure that they have appropriate life-spans and continue to deliver the service expected of them. Each asset type has its own maintenance cycle and is maintained accordingly. The intention is that the most appropriate balance be found between planned and unplanned maintenance to help achieve the lowest lifecycle costs, the “optimal zone” as illustrated below.



In general terms the options available for this activity revolve around the level of planned / scheduled maintenance vs reactive maintenance, such as:

- High level of planned / scheduled maintenance – this keeps risk low, reactive needs low, and is better at maintaining service levels, but can be more costly. This option is to the right of the above graph.
- Low level of planned maintenance – this involves a higher level of risk with more failures and defects and a greater likelihood of service level disruption. Because of the relative cost inefficiencies of reactive maintenance, and the potential for earlier triggering of renewal, it can also prove more expensive. This option lies to the left of the diagram.
- The optimal zone – ideally, the right mix of planned and reactive maintenance that delivers an overall minimum “total cost of maintenance”. Note that in optimising lifecycle economics, decision-making should also consider the cost and timing of renewals.
- Applying criticality to the decision-making process – this approach places critical assets to the right hand side of the diagram and non-critical assets to the left. It adds consideration of the wider costs to the community should the asset fail prematurely due to poor maintenance to the economics of the optimal zone above – essentially adding risk-factored consequential costs to the diagram. As per the management approach described above, this sees more focus on the critical assets and less on the non-critical – they may be left to “run to failure”.

The preferred approach in this Plan is a blend of the latter two, aiming for the optimal zone but with consideration of asset criticality and the level of service expectations of our customers.

O&M Improvements

Two key improvements considered necessary in the O&M programme are:

- Leak detection – estimated cost \$100,000 pa over the duration of the programme
- Backflow protection – estimated cost \$100,000 pa over the duration of the programme

Programme Cost Reduction Opportunities

Potential options for reducing O&M costs are discussed below.

The most significant lifecycle option affecting O&M activity is the concept of delaying asset renewal until the asset fails. This would only apply to non critical assets. Maintenance costs could be expected to rise due to increased reactive needs, but would be offset by deferment of capital investment.

In water treatment operations a reduction in cost could be affected by removing certain treatment processes such as taste and odour removal and limiting plant performance for protozoal removal to the absolute minimum. Neither are recommended. Taste and odour removal are high on the list of what the consumer wants, while operating at the bare minimum health requirements gives unwanted exposure to unsafe drinking water.

Scheduled plant maintenance tasks at treatment plant and pumping stations could be spread out further, however with an increased risk of plant breakdowns and more extensive and costly repair needs.

Water pipe network maintenance cost reduction options include:

- Repairing galvanised service connections instead of complete renewal at initial failure
- Increasing response times in responding to asset failure – effectively, this reduces the reactive component with more work being programmed in planned repair lists

Neither represent large savings and would threaten service levels disproportionately to any cost saving made.

7.3 ASSET RENEWAL / REPLACEMENT

7.3.1 Renewal Strategy

As set down in Council's Asset Management Strategy:

“Assets are renewed in a financially prudent manner”

There are several generic approaches that the Council could take in planning for renewals, including:

- Simply renew all assets at the expiry of their nominated useful life or earlier should they fail. This approach does not recognise asset criticality and is inefficient as some assets will be replaced while still providing service in a reliable manner.
- Only renew once the asset has failed and/or no longer delivers the level of service required of it. This is essentially a “just in time” approach but does not recognise the wider consequences of failure of critical assets.
- Renew critical assets before they become “likely to fail”. This approach needs to be supported by technical and risk-based economic analysis to optimise renewal investment spend. It also allows non-critical assets to “run to failure” as per the above option.
- Coordinate the renewal programme with other programmes in the road corridor to ensure the most optimal overall spend across infrastructure sectors (in particular major road work such as resurfacing or rehabilitation).

For the Water Activity there are two distinct approaches proposed depending on the criticality of the asset:

- For critical assets – programme their replacement before expiry of their nominal service life.
- For non critical assets – financially plan for their replacement at the expiry of their most optimistic service life but physically undertake the replacement upon complete failure or when economic analysis confirms that ongoing repair costs outweigh the cost of renewal.

The strategy incorporates the 2017 Defining Asset Criticality report, refer Appendix 17.13. This report established management approaches for different levels of criticality, reproduced below for renewals. These include condition monitoring processes, as these are important in determining whether the asset poses a significant risk of failure.

Management Approach for Various Levels of Criticality	
Condition monitoring (Pro-active and Reactive)	
Insignificant / Minor	<p>Assets are inspected as the opportunity arises either from asset modification (e.g. adding a connection) or repair following asset failure. Generally, asset failures are recorded but no site-specific analysis undertaken unless unusual circumstances exist.</p> <p>In addition to opportunist condition assessment there should ideally be a managed condition assessment programme to ensure that there is sufficient information available to construct renewal forecasts with an acceptable level of confidence. This would likely use random testing.</p>
Low	<p>Periodic inspections are undertaken on the asset, or very similar assets, to determine if deterioration is occurring. Industry knowledge about the likely decline of similar assets may be utilised if it can be established they are in comparable situations.</p>
Moderate	<p>Periodic inspections are undertaken on the asset, or very similar assets, to determine if deterioration is occurring. Industry knowledge about the likely decline of similar assets may be utilised if it can be established they are in comparable situations.</p> <p>Any asset failure is carefully investigated to determine if asset deterioration was the primary driver. If this is the case consideration will be given to renewal of the asset within the near future to try and avoid further failures.</p> <p>For defined facilities e.g. reservoirs, pump stations consideration is given to regular Asset Inspections that are more comprehensive than routine regular inspections. This would include structural assessment, thermographic inspection of switchboards, flow testing of pumps, etc.</p>
Major	<p>Techniques are identified that allow the condition of the specific asset to be monitored in relation to likely failure modes. Inspections are scheduled and likely to become more frequent as the asset ages or as deterioration is noted. Analysis is undertaken using the measured deterioration to predict likely asset life with the intent to undertake pro-active renewal of the asset prior to failure.</p> <p>As for Moderate in relation to defined facilities but this would be obligatory and with frequency increasing as Likelihood of Failure is perceived to be increasing to unacceptable levels.</p>

Renewal Planning and Project Justification	
Insignificant / Minor	<p>These assets are operated on a 'Fix When Fail' basis. Renewal is only considered when there is clear evidence that the failure was generated by the deterioration of the condition of the asset and that this is likely to extend beyond the point of failure to the extent that renewal of the entire asset can be justified rather than a localised repair/renewal.</p> <p>Renewal would also require consideration of the cost benefit of repair Vs renewal and whether acceptable Levels of Service have been breached.</p> <p>Multiple failures over several years may be an acceptable outcome albeit this would result in the pipe being closely monitored and included in potential renewals within the near term.</p>
Low	<p>These assets will have more information available about their condition and rate of deterioration. Renewal may follow several failures and likely driven by LOS targets or cost/benefit. They would have higher priority for renewal than Insignificant/Minor</p>
Moderate	<p>The key characteristic of this group is that the impacts of asset failure are considered to be tolerable but not on a regular or re-occurring basis. A single asset failure, considered to be directly attributable to condition deterioration, and considered to be indicative of overall asset condition, would trigger a response to minimise the likelihood of a repeat occurrence within the short to medium term.</p>
Major	<p>These are assets for which failure is considered to be unacceptable and to be avoided if it is practical and possible to do so.</p> <p>In the likely absence of actual failure records for the specific asset it will be necessary to assemble as much information as is relevant to the renewal decision. This will include information on failure of other assets considered to be similar, general industry knowledge, specific testing undertaken on the asset and a rigorous review of the consequences and likelihood of failure.</p> <p>It is unlikely that age by itself will be sufficient unless this is all that is available and there is consensus that failure is not an option.</p>

7.3.2 Renewal Criteria / Intervention Standards

Asset renewal is required when “failure” is justified by:

- **Asset Performance** – when it fails to meet the required level of service. Non-performing assets are identified by the monitoring of asset reliability, capacity and efficiency during maintenance and operational activity. Indicators of non-performing assets include:
 - Repeated asset failure.
 - Ineffective and / or uneconomic operations.
 - Inefficient energy consumption.
- **Economics** (value for money and at the right time) – when it can no longer be economically repaired (i.e. the annual cost of repairs exceeds the annualised cost of its renewal).
- **Criticality / Risk / Condition** – when the risk of physical failure has increased to the point that the environmental, public health, financial and social impacts are no longer acceptable to the community. Critical assets are replaced before physical failure becomes imminent.

Asset renewal / rehabilitation programmes are developed by the application of the following processes:

Table 7.2 Processes for Asset Renewal / Rehabilitation Programmes

Process	Objective/Description
Critical Asset Management	<p>Identify critical assets and manage these pro-actively. Manage non critical assets reactively.</p> <p>Critical assets identified in Section 5 are replaced prior to failure.</p>
Identification of Renewal Needs	<p>Cyclic renewal needs are identified by analysing:</p> <ul style="list-style-type: none"> • Performance – is the asset compromising service levels? • Age and material type data • Condition reports • Maintenance records (asset failure and expenditure history) • Request for service records • Observations of staff and contractors • Remaining lives for discrete assets have been estimated from inspections, maintenance history and customer issues
Prioritisation of Renewal Projects	<p>Renewal projects are justified and prioritised using a risk based process.</p> <p>The renewal programme is based on a prioritised assessment of whether the asset is critical or non critical, failure history and its condition and performance. The renewal programme for non critical pipe assets is heavily influenced by the timing of roading asset renewal or major maintenance so as to avoid damage to new roading works.</p>
Project Design	<p>All asset renewal works will be designed and constructed in accordance with current adopted industry standards (or known future standards).</p> <p>System performance and rationalisation options are investigated as part of project design. The standardisation of designs and specifications will be considered in the interest of facilitating replacement and operational simplicity. New pipes are constructed from materials chosen considering earthquake tolerance and cost. Pipes are always constructed with flexible joints.</p>

7.3.4 Renewal Options and Alternatives

Programme Options

Two possible programmes have been developed and details are provided in Section 7.6. The first uses the proposed approach described above to allow non-critical assets to fail before they are renewed, and uses the assumed asset age profiles described in Appendix 17.07 to establish the renewal profile. Note that this does not necessarily mean these works will be carried out in the year proposed, due to the uncertainty associated with predicting actual failure dates for non-critical assets.

If renewals are needed before the theoretical financial date in the forecast, funding will have to be found ahead of time. If renewals are not needed at the time of the financial programme then the funds collected will need to be managed to protect their availability when renewal is actually undertaken.

It is to be noted too that there is a risk of depleting the local construction resource to a level below that which will be needed in the future, should failure of non-critical assets take longer to occur than forecast, reducing actual programme levels before

the quantum of works starts to increase again. There is merit in programme smoothing in ensuring a stable supplier market.

The second programme proposes “smoothing” to both allow for coordination with roading programmes and help facilitate market stability.

Asset Lives

Asset lives are as listed in Appendix 17.07. These lives are consistent with the 2019 valuation.

For reticulation, a significant amount of work has been carried out since 2014 in determining an appropriate range of lives for AC pipes based on both failure rate evidence and national research. Appendix 17.14 Asbestos Cement Water Mains Renewal Strategy provides further detail, categorising lives by pipe size and highlighting the renewal approach – i.e. “run to failure” for pipe sizes ranging from 100mm to 200mm (expected life range 54-72 years), or “Renewal at expiry of nominal life or earlier if ‘onset of failure’ is observed” for larger size pipes (expected life range 60-100 years).

These nominal lives are based on criticality so pipes can be expected to be replaced before the potential for failure increases to unacceptable levels.

Headworks, treatment, reservoirs and pumping stations plant and structures have a range of assumed useful lives depending on the asset component. These range from 7 years up to 120 years.

These lives inform the long-term renewal programmes proposed in this AMP.

Financial Risk Exposure

The renewal of non-critical assets as described in Section 7.3.1 (i.e. upon actual failure occurring, whether due to condition, economics, or performance) does increase financial risk exposure, a concept illustrated in the figure and description given below. This uses both condition and criticality in a matrix that maps to asset replacement cost.

The worse the condition of the asset, the more likely it is to physically fail. The distribution of asset replacement cost against both criticality (or importance) and condition provides a “financial risk exposure” view.

Assets which are both very important and more likely to fail (the red and dark orange areas) have the highest financial risk exposure levels, and have a higher priority to be replaced or rehabilitated earlier in their lifecycle than others. This might mean intervening when condition reaches grade 4 for example, while a lower priority asset will be left to deteriorate to grade 5 the failure zone.

The intent in optimising financial risk exposure is therefore to avoid having significant replacement cost value in the red area to the upper right of this figure (the “critical” assets), while allowing “non-critical” assets to move across into the yellow or orange zones.

Importance Level (or Criticality)	Replacement Cost linked to Failure Likelihood				
	1	2	3	4	5
	As New	Good	Average	Poor	Very Poor
	Very Rare	Rare	Seldom	Common	Frequent
Extreme					
Major					
Moderate					
Low					
Insignificant					

7.4 CAPITAL DEVELOPMENT PLAN

Development works have been divided into two categories, namely:

➤ ***Increase in Level of Service***

Upgrade existing assets where they do not provide an appropriate level of service (close gap in performance to meet target service level) or install new assets to improve existing levels of service. Additionally, consideration has been given to risk, or more particularly in creating a level of redundancy, to secure continual operation of those assets critical to maintaining the essential service of water supply.

The only project included in this plan is as described below. Costs are discussed in Section 7.6.

Table 7.3 Emergency Water Supply Project

Project	Development Category	Reason
Emergency Water Supply	Increase in Level of Service	To mitigate against the risks described in Section 6, specifically to guard against the vulnerability of being completely dependent on a single source of water by providing redundancy in the form of a second emergency water supply source.

➤ ***Growth***

Assets constructed to meet growing demand, for example larger population, larger reticulation area to be serviced, etc.

Asset development work plans will be set to meet the objectives outlined in Council's Asset Management Strategy which states:

"... only expanding the network in accordance with the District Plan..."

The District Plan does not signal any expansion for growth of the network, thus this plan does not include any growth related projects.

7.4.1 Asset Development Strategy

Asset development needs are identified from analysis of:

- System performance monitoring (flows)
- Flow monitoring and network modelling
- Demand forecasts
- Risk and resilience assessments (including Risk Management Plan)
- Customer service requests

A provisional forward capital works development programme is maintained and updated at least annually.

7.4.2 Capital Development Selection Criteria

Development projects are justified and prioritised using a risk based process.

In determining the requirement for capital or development works, the short and long term effects on the operating and life of the system are considered, together with any forecast increase in loading upon the system.

All feasible options, including non-asset demand management options and the use of second-hand plant, are considered. Development works are designed and undertaken in accordance with industry standards (or known future standards) and system design loadings.

The management approach incorporates the 2017 Defining Asset Criticality report, refer Appendix 17.13. The extract below refers to criticality considerations in developing new capital investment projects.

Development of Capital Investment Programme	
Insignificant / Minor	Largely focussed on renewal programme (above) as new assets likely to be installed by Developers.
Low	As above but with some larger infrastructure being installed by council to provide for growth
Moderate	Development of projects having local significant local impacts but not across entire zone. Completion of project likely to impact on maintenance and operating requirements.
Major	These are likely to be major projects impacting on capacity for future growth, to accommodate a major change in Level of Service targets or to undertake a major renewal – which will inevitably include elements of growth and LOS upgrade. Will be subject to significant design and consultation input and requiring significant decision to be confirmed by the Council.

7.4.3 Capital Development Options and Alternatives

There is unlikely to be any expansion of the network given Council’s asset management strategy statement. But if there was, it would be funded exclusively by those parties undertaking the development.

The development of an emergency water supply would be funded by loan.

7.5 DISPOSAL PLAN

7.5.1 Forecast Future Disposal of Assets

➤ *Headworks and Treatment Plants*

There are no disposal plans as disposal of the complete entity is not envisaged. If significant civil assets within that category need disposal, they will be demolished and if need be, rebuilt in a form appropriate to the then current requirement. Various pieces of plant and equipment (as they come to be renewed) that have a market value will be sold to the highest bidder or disposed of as scrap.

➤ *Reservoirs and Pump Stations*

As for Headworks and Treatment Plants detailed above.

➤ *Pipe Network*

This is an emerging issue which has not yet been fully resolved. Historically disused pipe has been left in the ground on the vague premise that it may be used as a duct for other utilities. While the pipe can retain its structural integrity there will be no risk of ground slump above it, should it collapse then there is a risk of ground subsidence. This is particularly relevant for abandoned asbestos cement pipes. The current practice is to stabilise by filling the pipe with a low strength medium or removing it completely and taking it to approved landfill.

7.5.2 Forecast of Income / Expenditure from Asset Disposal

Income from disposal of assets is considered to be insignificant. However, there is potential (yet to be quantified) for significant expenditure in the disposal or treatment of assets abandoned from the pipe network.

7.6 RECOMMENDED PROGRAMME

7.6.1 Evaluation of Options / Alternative Programmes

Earlier sections of the AMP have considered a range of options for O&M and renewal, seeking to optimise lifecycle costs while maintaining levels of service at acceptable risk levels.

In general, the consequences of adopting alternative programmes are summarised in the following table.

Programme Alternative	Service Level Impacts	Cost Impacts
AMP Optimised	Maintains levels of service and an acceptable risk profile with a focus on critical assets.	Considered to provide an optimal lifecycle cost outcome across O&M and renewal programmes.
AMP Smoothed	As for AMP Optimised, but also provides for coordination within the road corridor and more stable programme levels.	Mostly delivers an optimal lifecycle outcome as above. Potential for some renewal projects to be brought forward or delayed slightly
Reduced Investment O&M –	Increased asset failures, compromised levels of service, more reactive work.	Could escalate in the short term, potential need to bring more major works such as renewals forward in

Programme Alternative	Service Level Impacts	Cost Impacts
		the programme.
Reduced Investment – Renewals	Slow reduction in levels of service as asset failure rates increase, countered by increased reactive maintenance effort.	Short term renewal cost reductions, but the potential for increased longer term costs. Increased maintenance costs likely.

The following cost items have been listed but (with the exception of deferment of asbestos cement water mains) are not recommended, as they would seriously compromise service levels. Consequently the costs below are still in the financial plan for this activity.

Table 7.4 Evaluation of Options and Associated Costs

Area	Option	Annual Cost
Operations and Maintenance		
Water Treatment	Taste and odour removal	\$100,000
Water Treatment	No disinfection by ultraviolet light	\$20,000
Pipe Network		
Pipe Network	Repair galvanised connections rather than replace	\$32,000
Pipe Network	Remove response time target requirement	\$45,000
Capital Renewals		
Asbestos cement main renewals	Defer renewal to onset of failure	Not identified

An increased level of investment in renewals can also be considered, by reducing assumed expected lives.

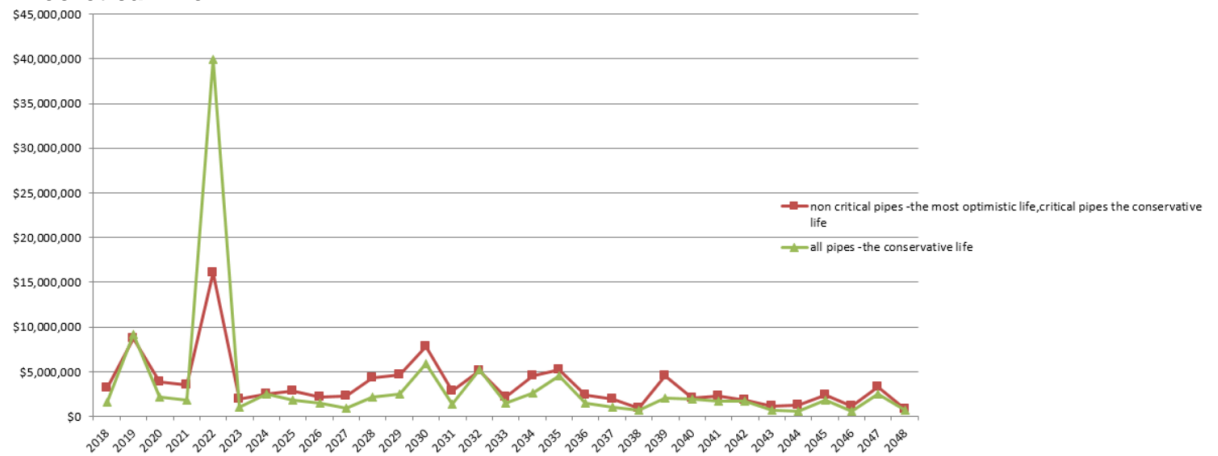
The financial effect of renewing non critical mains at their longest expected life as proposed in this Plan can be compared to their expected shortest life, as shown below.

Unfortunately, the expected advantage of using longer lives over shorter lives is overshadowed by the fact that much of the existing non critical pipework has already exceeded its theoretical life, be it the nominal shortest or longest. This would suggest that further review of assumed pipe lives should be undertaken prior to the next valuation update in 2022.

The practice for asset valuation has been to add five years to the expiry date where the asset has passed this date. As the valuation was last completed in 2019, the addition of five years has reflected into 2024. This does not necessarily mean that renewal should take place in that year. Depending on condition and serviceability, replacement may be required sooner or the pipe may last several years after that date.

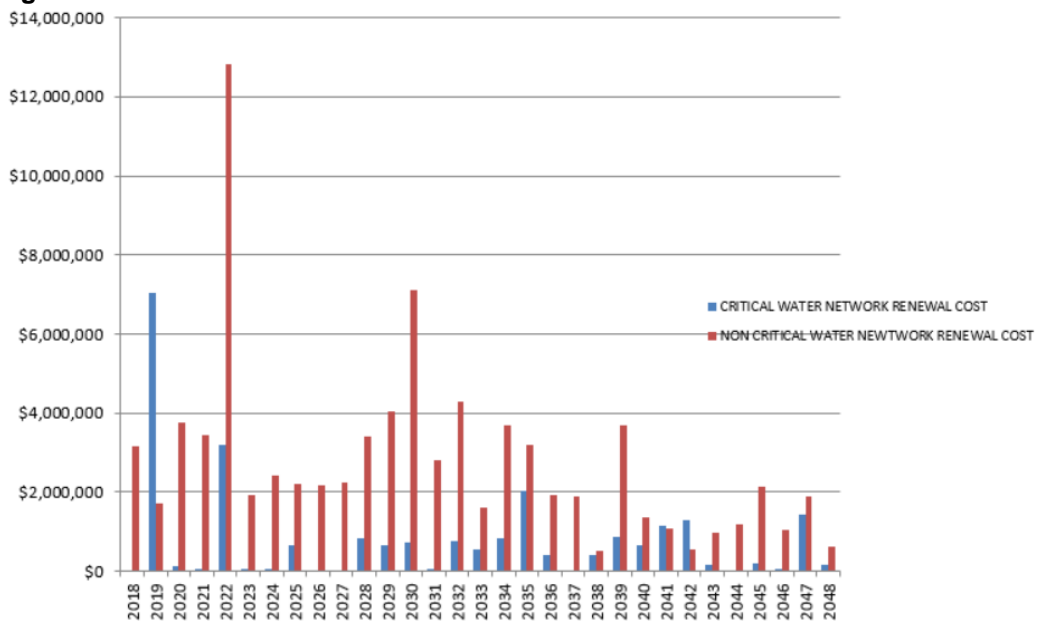
The main difference between the two approaches above is the quantum of renewals that according to the valuation assumption should be done by 2024. This finding also confirms the need to review the assumed lives for the next valuation.

Figure 7.1 Asbestos Cement Pipe Renewal Programme According to Expiry of Theoretical Life



Using the red line programme above (“AMP Optimal”), the graph below demonstrates that most of the cost relating to a/c pipe renewals is for non critical pipe. These cost profiles are taken forward to Section 7.6.3, the recommended programme.

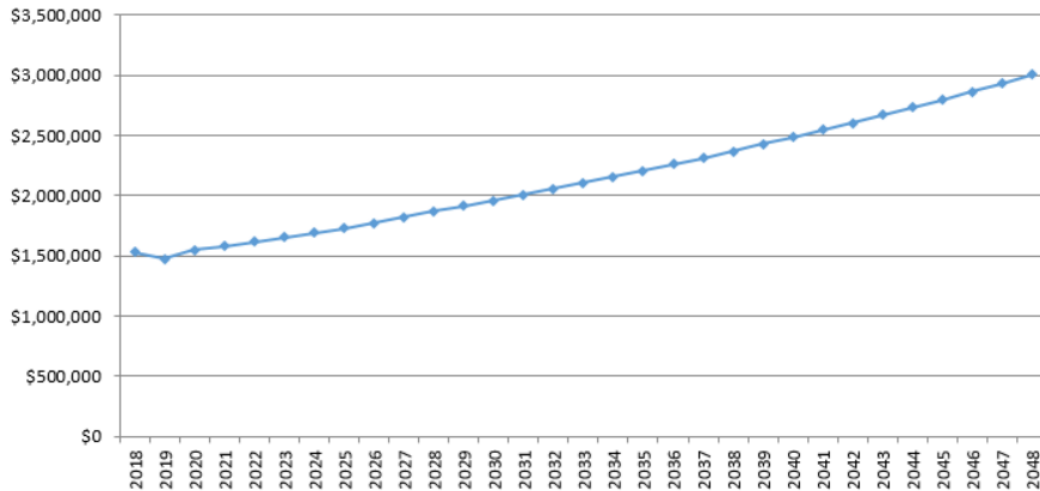
Figure 7.2 Critical vs Non Critical Water Network Renewal Cost Profiles



7.6.2 Recommended Operation / Maintenance Programmes

The following figure provides an inflation-adjusted summary of forecast maintenance costs for the 30-year period. This is built up from cost estimates for planned and reactive maintenance for reticulation, headworks, treatment, reservoirs and pumping stations.

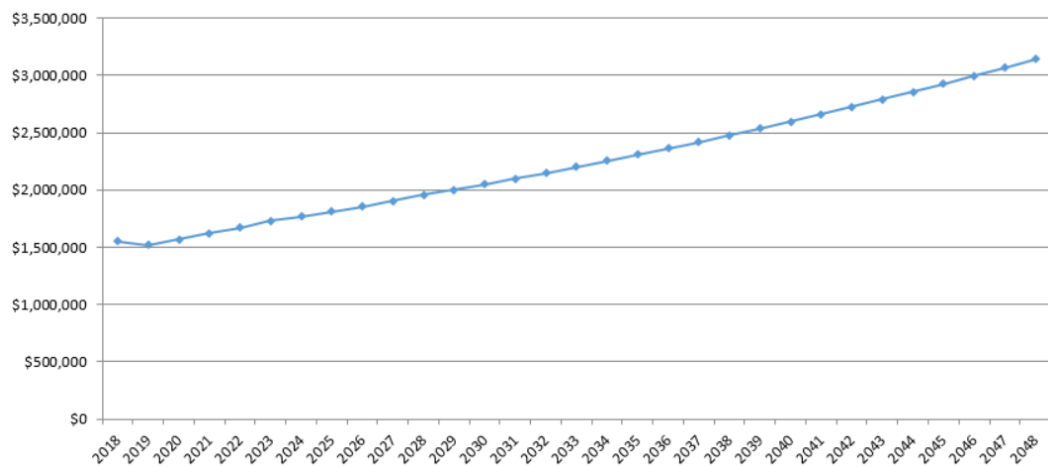
Figure 7.3 Repairs & Maintenance Costs



Included in the above is a leak detection programme at \$100,000 pa, thereafter adjusted by inflation for each successive year of this plan.

The next figure provides an inflation-adjusted summary of forecast operational expenditure. This is built up from cost estimates for operational activity for headworks, treatment plant, reservoirs and pumping stations, including the costs of electricity, chemicals, operator time, etc.

Figure 7.4 Operational Costs



Included in the above is a backflow protection programme commencing at \$100,000 pa, thereafter adjusted by inflation for each successive year of this plan.

As can be seen, both operational, and repairs and maintenance costs are practically the same. Both show a small dip in 2019 which reflects an adjustment of budget to reflect historical actual costs. Apart from that and the inclusion of the backflow prevention programme, cost increases correspond to inflation only, there being no other significant change from year to year.

7.6.3 Recommended Renewal Programmes

Section 8 provides an inflation-adjusted summary of forecast renewal costs for the 30-year period. This is built up from cost estimates for reticulation, headworks, treatment, reservoirs and pumping stations.

The above figure summarises the two programmes considered for recommendation, firstly the programme based on the asset reaching the end of its assumed nominal useful life (AMP Optimised), and the second the proposed “smoothed” programme (AMP Smoothed).

Renewal costs are dominated by the programme of asbestos cement pipe replacement. Other significant renewal projects are the replacement of the Doon Street reservoir in 2031 and the Waikiwi reservoir in 2046.

Appendix 17.12 lists a five year plant and equipment renewal programme for headworks and treatment plants, and reservoirs / pump stations.

As can be seen, the proposed renewal programme lags that due to expiry of assigned life. The proposed programme has been set to smooth commitment to renewals but critical pipes will be renewed upon expiry of their assigned life. The early stages of the programme also includes renewal of non critical pipes that have already reached their expired life.

To date the number of main failures is less than could be anticipated from the assigned life indicating a conservative assessment. In the previous plan the intention was to renew non critical mains only when it became necessary to do so. For example, upon an increasing incidence of failure or just before major works in the roadway when the main was close to or past its nominal service life so as to avoid damage to the new road surface. Also, in years when those circumstances did not occur, to put renewal monies into reserve to be drawn on when they did apply, the aim being to get the longest life possible for these assets.

The increase over the period 2020 through to 2022 relates to the planned renewal of part of the original 600mm diameter Braxholme supply main.

The large increase in renewals according to expiry of assigned life for 2024 is resultant from the valuation practice of adding five additional years to an asset with an expired life.

Impact of Covid-19 on Work Programmes

There has been an identified need to support the contracting industry and avoid the potential stop / go of renewal activity that might result from the practice described above. Consequently, actual renewals will be undertaken according to the smoothed financial programme.

7.6.4 Recommended Capital Development Programme

There is no programme for growth as the current asset capacity is considered adequate for anticipated increase in demand.

The only potential candidate for the service level improvement programme relates to the emergency water supply to decrease the current risk of being solely dependent on the Oreti River supply. However, the proposed programme makes no provision

for the capital costs of this work, with only investigations into feasibility and likely cost provided for.

7.7 HOW THE ACTIVITY WILL BE RESOURCED

Although under the 2002 Local Government Act, Councils are not expressly required to establish water supplies; they are required to assess the provision of water supply within their district and are required under section 17A to review the cost effectiveness of current arrangements for meeting the community's needs. Section 17A allows Council to not undertake the review if the expected costs of the review are greater than the benefits. Council has resolved to defer a review under that provision.

The activity is therefore managed and operated by Council staff with all physical works put out to contract.

7.7.1 Internal Resourcing

- The Water Department consists of a staff of 11 full time equivalent (fe) positions
- The Water Manager has complete oversight of the Water Activity
- The Three Waters Operations Manager (½fe) who directly supervises:
 - Three water treatment operators at Branxholme
 - Five operators who maintain the 24 hours a day, 7 days a week City Control Room
 - A Water Operations Team Leader
 - A Three Waters Technologist (½fe)

7.7.2 Procurement Strategy

Contracts are let on a competitive tender basis for:

- Asset maintenance (term up to seven years subject to contractor performance)
- Asset renewal of value greater than \$50,000
- Chemical supply for water treatment

The successful tender is generally selected by the lowest cost conforming method. For specialised or long term contracts the price value method is used.

Supply of electrical power has been sought on a competitive basis through the bulk purchase provisions of the "Territorial and Local Authority Electricity Buying Group #5".

8. Financial Management

8.1. OVERVIEW

The Local Government Act 2002 requires local authorities to manage their finances “*prudently and in a manner that promotes the current and future interests of the community*”. This implies compliance with Generally Accepted Accounting Practice (GAAP). Of particular relevance is PBE IPSAS 17.

In determining how activities will be funded local authorities are required to take the following into consideration:

- The contribution to the achievement of Community Outcomes (strategic alignment).
- Beneficiaries of each activity (beneficiary / user pays principles).
- The period over which benefits from the activity will occur (intergenerational equity issues).
- The costs and benefits of funding the activity compared to other activities (cost / benefit, prioritisation principles).
- The impact of funding the activity on the wellbeing of the community (ability to pay principles).

Asset Management Plans provide the basis for meeting these requirements for infrastructure based activities.

8.2 FINANCIAL SUMMARY – WHAT THE ACTIVITY COSTS

The annual charge for water supply to residential properties in 2019/20 is \$385.74. The following diagram shows a comparison of average household water supply costs with other typical household costs. As can be seen, the annual charge for water is the second lowest.

8.2.1 Council Funded Programmes

Under section 101B of the Local Government Act 2002 Council is required to prepare and adopt an Infrastructure Strategy for a period of at least thirty consecutive years. The purpose being to:

- Identify significant issues over the period
- Identify the principal options for managing those issues and the implications of those options

This Asset Management Plan has included in the following financial programmes the Council’s preferred options, as identified in the Infrastructure Strategy, to address the issues of:

- Water – Emergency Water Source. The vulnerability and associated high risk of the existing situation of being solely dependent on single water supply source. As noted earlier, financial provision has only been included to allow for investigation of the options and assessment of feasibility and likely cost.
- Water – Renewal Pipe Network. How to commit responsibly to the renewal of asbestos cement pipework which is reaching the end of useful life.

The graphs and tables below portray total costs inclusive of inflation¹⁵ for the activity. For detail per asset group refer to Appendix 17.09 Financial Summary.

They illustrate:

- The most significant cost item over both the 10 and 30 year period is that for asset replacement.
- The main funding source is from rate revenue.
- The rate requirement will rise over the planning period but will not exceed the limits as set by the Financial Strategy. The main influence for the rise is due to a switch in policy to fund depreciation.

For specific comment on each programme refer Section 7.6, i.e.

- Repairs & Maintenance Costs – Figure 7.3
- Operational Costs – Figure 7.4
- Capital Renewal Programme – Figure 7.5
- Recommended Capital Development Programme – Section 7.6.4
- Capital Service Level Improvement – Figure 7.6

¹⁵ The inflation rate assumed is as advised by Finance

Ten Year Plan

Figure 8.2 Operating Expenditure (10 years) (inflated)

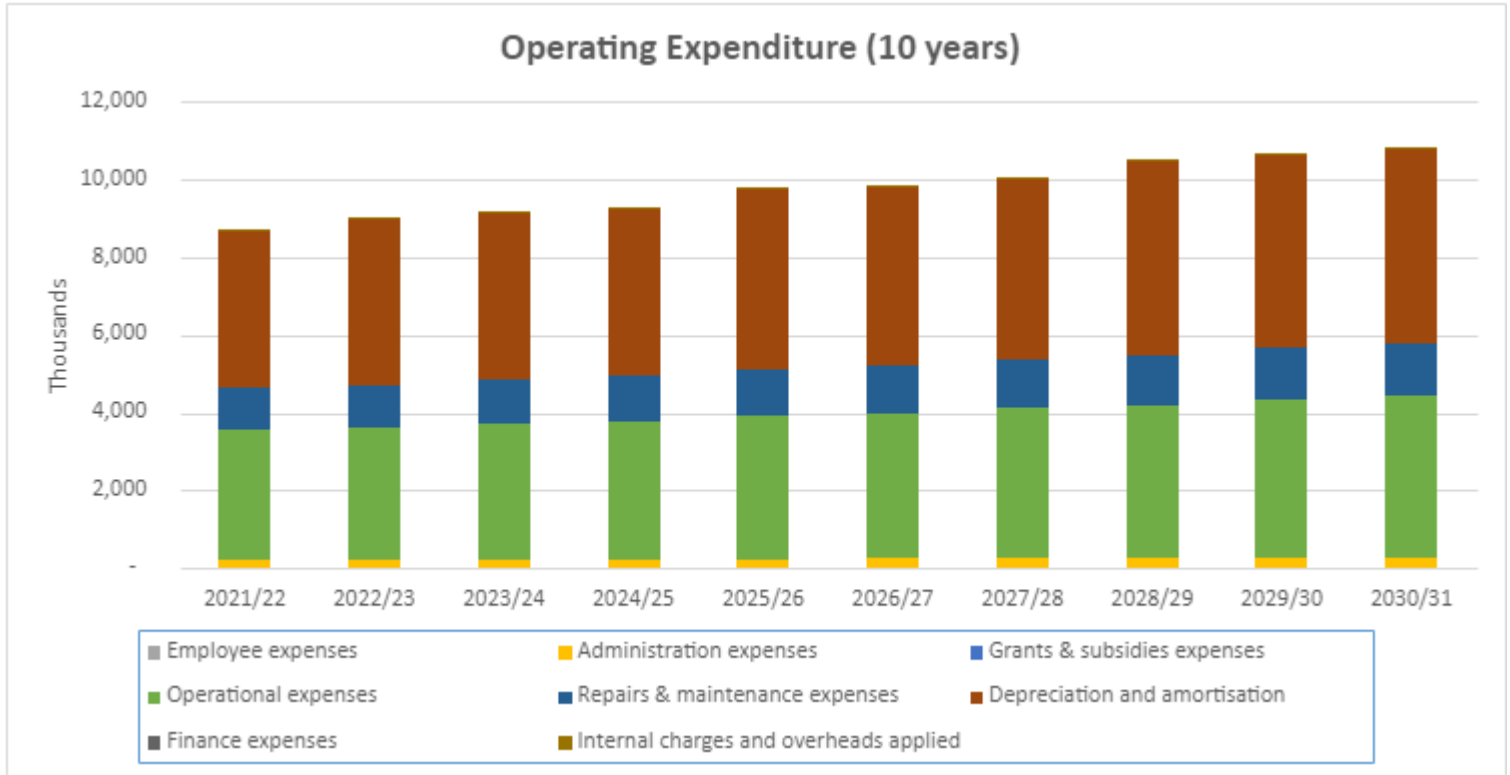
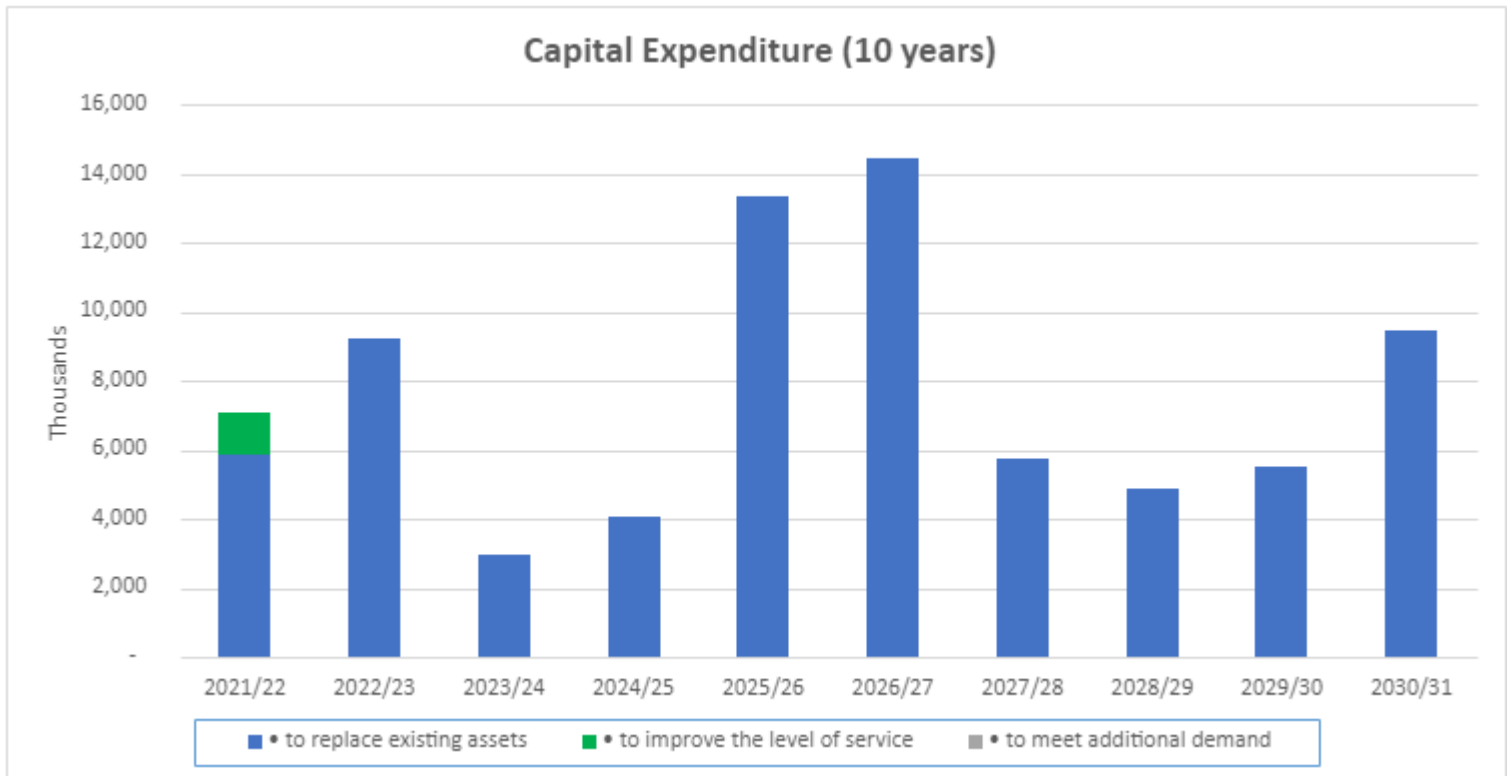


Figure 8.3 Capital Expenditure (10 years) (inflated)



These figures include:

- A gradual increase in O&M costs generally in line with inflation expectations
- Steady provision for annual depreciation (no allowance for inflation)
- A small amount of LoS capex, largely to provide for investigation of the Emergency Water Supply source
- Lumpy asset replacement capex as forecast in Section 7.6.3, also inflated

These costs and associated revenue forecasts are detailed in the following tables. Note that Section 8.4 provides further information around how the allocation of revenue shown in these tables, by funding source, is determined.

Table 8.1 10-Year Plan (with inflation)

	2020/21	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
	Annual Plan	Forecast	LTP	LTP	LTP	LTP	LTP	LTP	LTP	LTP	LTP	LTP
	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)
OPERATING												
Rates revenue	8,201	8,201	8,611	9,009	9,426	9,862	10,318	10,795	11,185	11,590	12,009	12,444
Subsidies and grants (Capital)	-	-	300	-	-	-	-	-	-	-	-	-
Subsidies and grants (Operational)	-	-	710	3,710	-	-	-	-	-	-	-	-
Direct charges revenue	1,481	1,519	1,595	1,659	1,725	1,794	1,866	1,940	1,999	2,058	2,120	2,185
Rental revenue	-	-	-	-	-	-	-	-	-	-	-	-
Finance revenue	16	-	-	-	-	-	-	-	-	-	-	-
Dividends	-	-	-	-	-	-	-	-	-	-	-	-
Fines	-	-	-	-	-	-	-	-	-	-	-	-
Other revenue	-	-	-	-	-	-	-	-	-	-	-	-
Internal charges and overheads recovered	-	-	-	-	-	-	-	-	-	-	-	-
Total revenue	9,698	9,720	11,216	14,378	11,151	11,656	12,184	12,735	13,184	13,648	14,129	14,629
Employee expenses	-	-	-	-	-	-	-	-	-	-	-	-
Administration expenses	102	219	219	224	230	237	243	250	255	262	270	277
Grants & subsidies expenses	-	-	-	-	-	-	-	-	-	-	-	-
Operational expenses	2,673	3,194	3,333	3,392	3,517	3,562	3,697	3,748	3,885	3,949	4,096	4,166
Repairs & maintenance expenses	1,169	1,075	1,075	1,106	1,134	1,161	1,192	1,222	1,256	1,287	1,322	1,357
Depreciation and amortisation	4,038	4,038	4,041	4,258	4,258	4,258	4,604	4,604	4,604	4,967	4,967	4,967
Finance expenses	316	-	-	-	-	-	-	-	-	-	-	-
Internal charges and overheads applied	738	3	3	3	3	3	3	3	3	4	4	4
Total expenses	9,036	8,529	8,671	8,983	9,142	9,221	9,739	9,827	10,003	10,469	10,659	10,771
OPERATING SURPLUS / (DEFICIT)	662	1,191	2,545	5,395	2,009	2,435	2,445	2,908	3,181	3,179	3,470	3,858
CAPITAL EXPENDITURE												
• to meet additional demand	-	-	-	-	-	-	-	-	-	-	-	-
• to improve the level of service	200	1,171	-	-	-	-	-	-	-	-	-	-
• to replace existing assets	7,193	5,899	9,247	2,987	4,087	13,370	14,470	5,771	4,897	5,498	9,478	9,478
TOTAL CAPITAL EXPENDITURE	7,393	7,070	9,247	2,987	4,087	13,370	14,470	5,771	4,897	5,498	9,478	9,478
Gross proceeds from sale of assets	-	-	-	-	-	-	-	-	-	-	-	-

30 Year Plan

Figure 8.4 Operating Expenditure (30 years) (inflated)

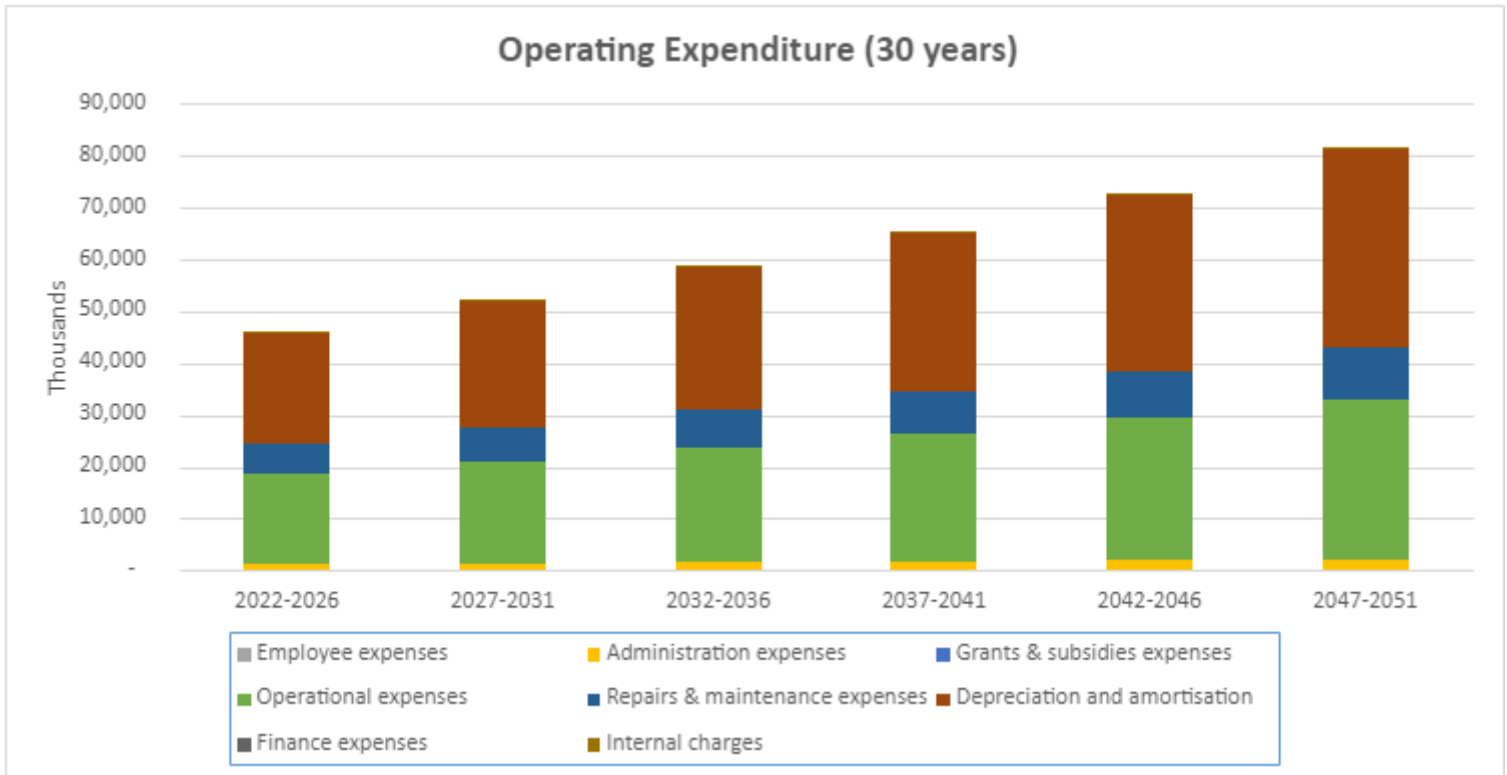
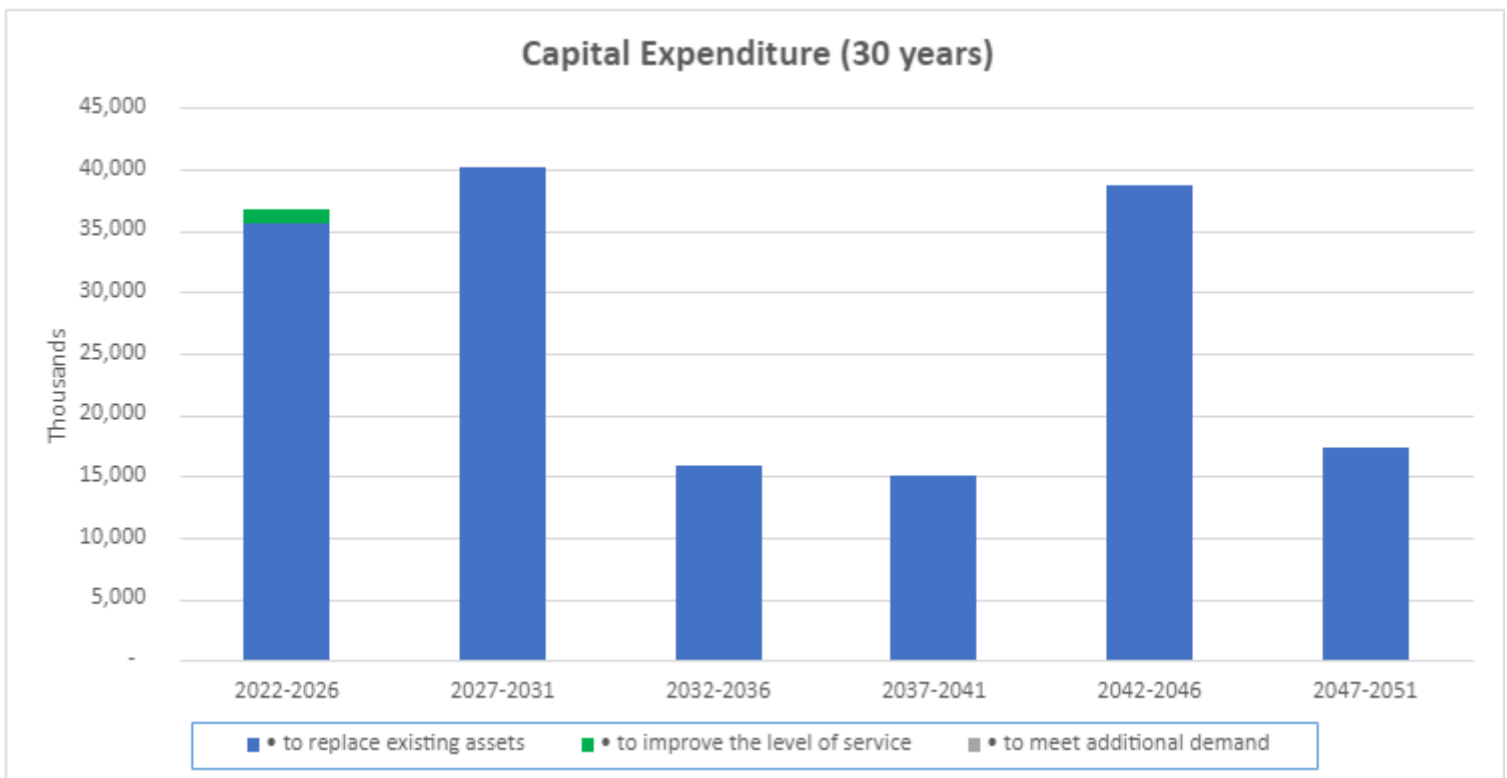


Figure 8.5 Capital Expenditure (30 years) (inflated)



The 30-year view is shown in the graphs above and tables below, showing:

- Continuation of the gradual increase in O&M costs generally in line with inflation expectations.
- Steady provision for annual depreciation (no allowance for inflation).
- A small amount of LoS capex within the first 5 years only, largely to provide for investigation of the Emergency Water Supply source. No other Capex has been provided for in this AMP.
- Ongoing asset replacement capex as forecast in Section 7.6.3, also inflated.
- A comparison of proposed Capex and “required” Capex needs along with a brief commentary.

Table 8.2 30-Year Plan (with inflation)

	2022-2026 LTP (\$000)	2027-2031 LTP (\$000)	2032-2036 LTP (\$000)	2037-2041 LTP (\$000)	2042-2046 LTP (\$000)	2047-2051 LTP (\$000)
OPERATING						
Rates revenue	47,226	58,023	69,307	82,784	98,885	118,114
Subsidies and grants (Capital)	300	-	-	-	-	-
Subsidies and grants (Operational)	4,420	-	-	-	-	-
Direct charges revenue	8,639	10,302	11,944	13,845	16,050	18,606
Rental revenue	-	-	-	-	-	-
Finance revenue	-	-	-	-	-	-
Dividends	-	-	-	-	-	-
Fines	-	-	-	-	-	-
Other revenue	-	-	-	-	-	-
Internal Charges	-	-	-	-	-	-
Total revenue	60,585	68,325	81,251	96,629	114,935	136,720
Employee expenses	-	-	-	-	-	-
Administration expenses	1,153	1,314	1,476	1,647	1,835	2,048
Grants & subsidies expenses	-	-	-	-	-	-
Operational expenses	17,501	19,844	22,237	24,789	27,622	30,815
Repairs & maintenance expenses	5,668	6,444	7,247	8,078	9,010	10,042
Depreciation and amortisation	21,419	24,109	27,604	30,652	34,018	38,259
Finance expenses	-	-	-	-	-	-
Internal charges	15	18	20	23	25	28
Total expenses	45,756	51,729	58,584	65,189	72,510	81,192
OPERATING SURPLUS / (DEFICIT)	14,829	16,596	22,667	31,440	42,425	55,528
CAPITAL EXPENDITURE						
• to meet additional demand	-	-	-	-	-	-
• to improve the level of service	1,171	-	-	-	-	-
• to replace existing assets	35,590	40,114	15,832	15,115	38,742	17,298
TOTAL CAPITAL EXPENDITURE	36,761	40,114	15,832	15,115	38,742	17,298
Gross proceeds from sale of assets	-	-	-	-	-	-

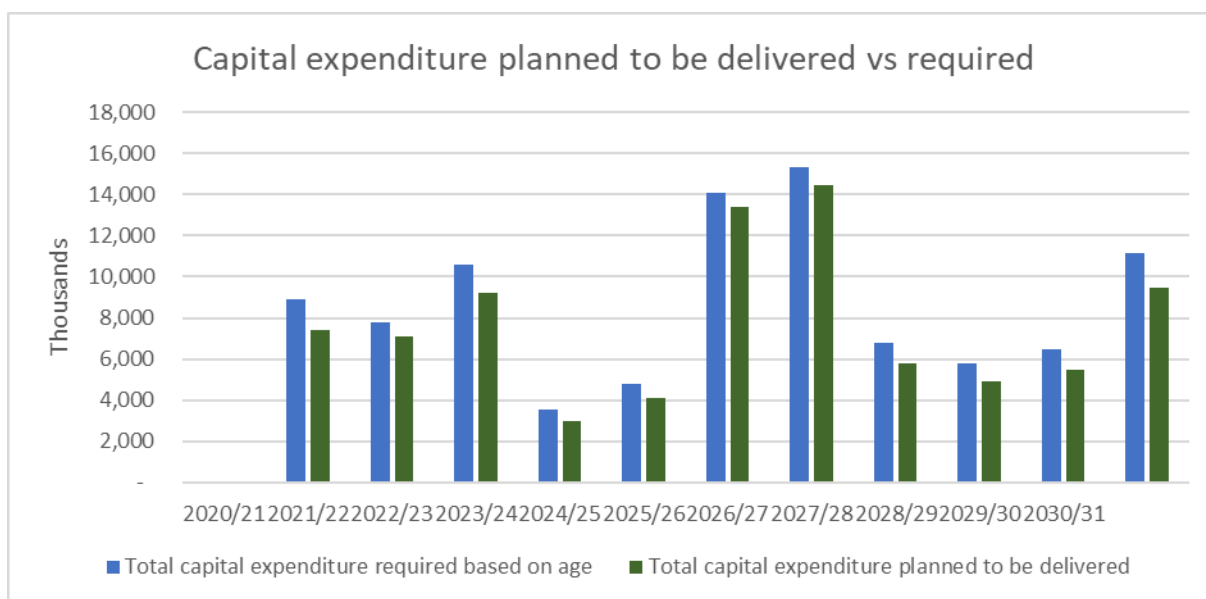
Table 8.3 10 Year Capital expenditure planned to be delivered vs required (with inflation)

	2020/21	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
	Annual Plan	Forecast	LTP	LTP	LTP	LTP	LTP	LTP	LTP	LTP	LTP	LTP
	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)
Capital expenditure required based on age												
• to meet additional demand	-	-	-	-	-	-	-	-	-	-	-	-
• to improve the level of service	200	1,171	-	-	-	-	-	-	-	-	-	-
• to replace existing assets	8,702	6,641	10,614	3,513	4,808	14,066	15,318	6,789	5,761	6,468	11,151	
Total capital expenditure required based on age	8,902	7,812	10,614	3,513	4,808	14,066	15,318	6,789	5,761	6,468	11,151	
Capital expenditure planned to be delivered												
• to meet additional demand	-	-	-	-	-	-	-	-	-	-	-	-
• to improve the level of service	200	1,171	-	-	-	-	-	-	-	-	-	-
• to replace existing assets	7,193	5,899	9,247	2,987	4,087	13,370	14,470	5,771	4,897	5,498	9,478	
Total capital expenditure planned to be delivered	7,393	7,070	9,247	2,987	4,087	13,370	14,470	5,771	4,897	5,498	9,478	

This table and the graph below highlight the differences between the planned level of Capex with that “required” as assessed in the AMP:

- LoS Capex – no difference between the two scenarios
- Replacement Capex – the planned scenario totalling \$83m over the 10-year period is around 12% lower than the AMP assessment.

Figure 8.6 Capital Expenditure planned to be delivered vs required



8.2.2 Financial implications of Capital Expenditure planned to be delivered vs required

If asset replacement investment is less than the optimal renewal strategy developed in the AMP, then the following consequences could emerge over time:

- Higher levels of asset deterioration and increased rates of failure of assets.
- More reactive maintenance to address increased fault and defect rates.
- Reduced levels of service in terms of the reliability, and possibly quality, of the water supply.

No analysis has been conducted on the escalation of reactive O&M costs, response costs or the wider economic costs associated with future potential supply disruption.

Asset condition and performance along with O&M costs will be closely monitored however, with life-cycle economic analysis conducted to assess the optimal timing of future replacement linked to asset criticality. Further work will be carried out and reported on in the next update of the AMP.

8.3 FINANCIAL POLICIES

The Local Government Act 2002 requires Council to manage its finances prudently and in a manner which promotes the current and future needs of the community. Council must ensure that each year’s projected operating revenues are set at a level sufficient to meet the years projected operating expenses.

The Revenue and Financing Policy states Council’s policy on the funding of its operating and capital expenditure, and the sources of those funds.

For each activity Council must give consideration to who benefits from the activity and the appropriate level of private versus public benefit when funding the activity. Public benefit is gained from having access to activities provided by Council. Private benefit is gained from receiving goods or services provided by Council, e.g. a water connection installed for an individual property.

8.4 HOW WE PAY FOR THE ACTIVITY

The following sources of funding are used by Council:

- General Rate
- Targeted Rate
- Fees and Charges
- Other sources of funding
- Loans and Reserves

Ratepayers receiving a water supply within the reticulation system are charged a targeted rate (i.e. 'the water rate') on the property rate assessment. Additionally, large commercial users are metered and some small businesses. Those that are metered are invoiced for consumption in excess of 249 cubic metres per year, in addition to their property rate assessment. The 249 cubic metre amount being that considered typical of an annual domestic property consumption.

- ***Residential Property Water Rate***

A uniform charge payable annually for each property representing 84% of the total water rate revenue.

- ***Non Residential Property Water Rate***

A rate varied according to property capital value representing 16% of the total water rate revenue.

Those properties outside the reticulated area that are connected to the Branxholme and Bluff trunk supply mains are metered and pay for all water passing through the meter. No property rate is applied.

- ***Metered Water Charges***

Volume based charges payable by industries, businesses and other organisations where the water usage significantly exceeds normal domestic usage.

- ***Fees***

Charged for requested services such as service connection installation or disconnection.

Property rates are considered as a public benefit as they include not only water for consumption but also that required for firefighting and flushing of waste.

Metered water charges and other fees are considered as private goods, e.g. fee for installation of a water connection or for water in excess of the 249 cubic metre annual entitlement.

The proportions of funding from the different sources are indicated in the following diagram. Dollar amounts shown are for the 2019/20 year budget.

8.5 ASSET VALUATION FORECASTS

8.5.1 30-Year Valuation and Depreciation Forecast

➤ **Valuation**

Council water supply assets were revalued as at 30 June 2019 in accordance with the:

- Public Benefit Entity International Public Sector Accounting Standard 17 Property, Plant and Equipment (PBE IPSAS 17), issued by the External Reporting Board.
- New Zealand Infrastructure Valuation and Depreciation Guidelines issued by the National Asset Management Group (NAMS) of IPWEA.

The pipe network asset was valued by Council staff and audited by AECOM NZ Limited. Headworks and Treatment, and Reservoirs and Pump Station assets were valued by AECOM NZ Limited and reviewed by Council staff. The unit costs applied to pipe network assets were derived from Council analysis of previous contracts with comparison to those experienced in other councils plus comparison with those stated in the New Zealand Infrastructure Valuation Guidelines. Asset lives are generally in accordance with those stated in the New Zealand Infrastructure Valuation Guidelines with some modification by Council asset management staff. The valuation is as below:

Table 8.3 Asset Valuation

Asset Group	Optimised Replacement Cost	Optimised Depreciated Replacement Cost	Annual Depreciation
Water Supply			
Fittings	\$2,232,605	\$1,046,292	\$35,396
Fittings – Non-critical	\$17,339,527	\$4,843,914	\$267,217
Pipes	\$65,299,134	\$40,747,534	\$695,067
Pipes - Non-critical	\$103,402,989	\$57,430,476	\$1,307,415
Connections	\$26,941,611	\$12,879,647	\$449,014
Water Meters	\$1,368,426	\$256,872	\$82,349
Reservoir Storage	\$30,111,904	\$10,183,164	\$378,459
Pumping Stations	\$4,598,584	\$1,581,136	\$117,653
Treatment plants	\$28,614,468	\$18,546,380	\$673,211
Miscellaneous	\$399,446	\$187,034	\$15,931
Total Water Supply	\$280,308,694	\$147,702,449	\$4,021,712

➤ **Depreciation**

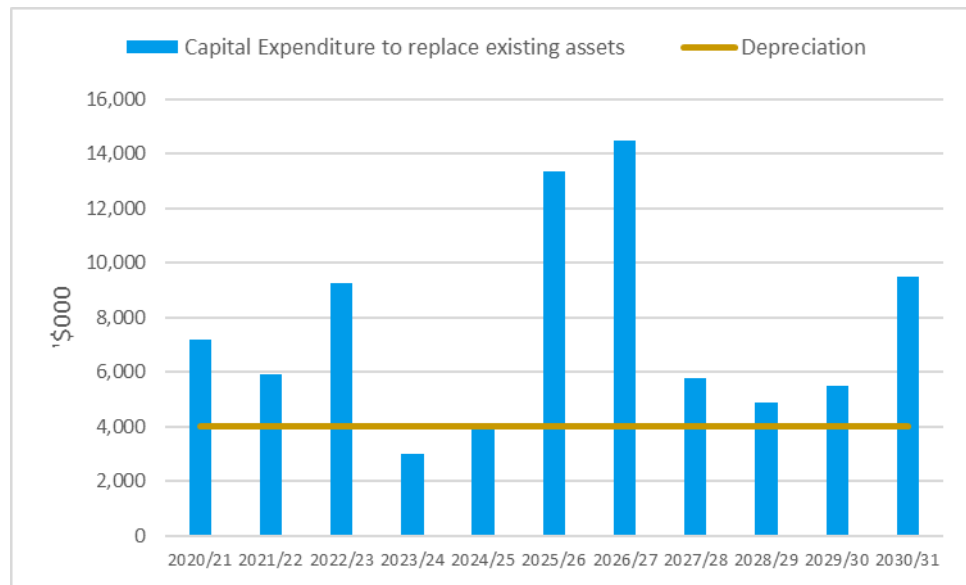
Depreciation has been set as determined by the June 2019 valuation, then adjusted by the standard inflationary movement for subsequent years.

The graphs below demonstrate that capital renewal costs do not match depreciation exactly. This is explained by the fact that renewals are influenced by the cost and timing of significant individual assets and so can be irregular. Whereas depreciation is an average taken over all water assets.

For the 10 year period, planned renewal costs total \$82.9 million whereas total depreciation is \$44.4 million. For the 30 year period, renewal costs total \$163 million whereas depreciation totals \$121 million.

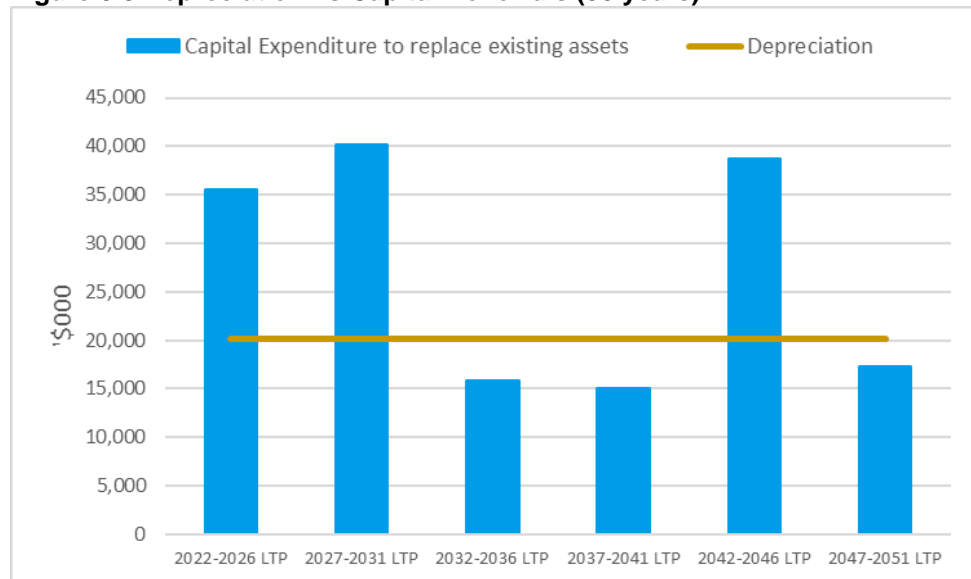
Ten Year Period

Figure 8.7 Depreciation vs Capital Renewals (10 years)



Thirty Year Period

Figure 8.8 Depreciation vs Capital Renewals (30 years)



8.6 CONFIDENCE LEVELS IN PROGRAMMES

Confidence in the programmes in this Asset Management Plan has been assessed in terms of the data on which the programmes are based and in terms of the programmes themselves.

The data confidence assessment structure is as recommended in the IIMM2015 and was assessed across the three waters as “B” in an exercise conducted by AECOM in 2017 – refer ICC Report on Asset Data Confidence.

IIMM 2015 confidence definitions as below.

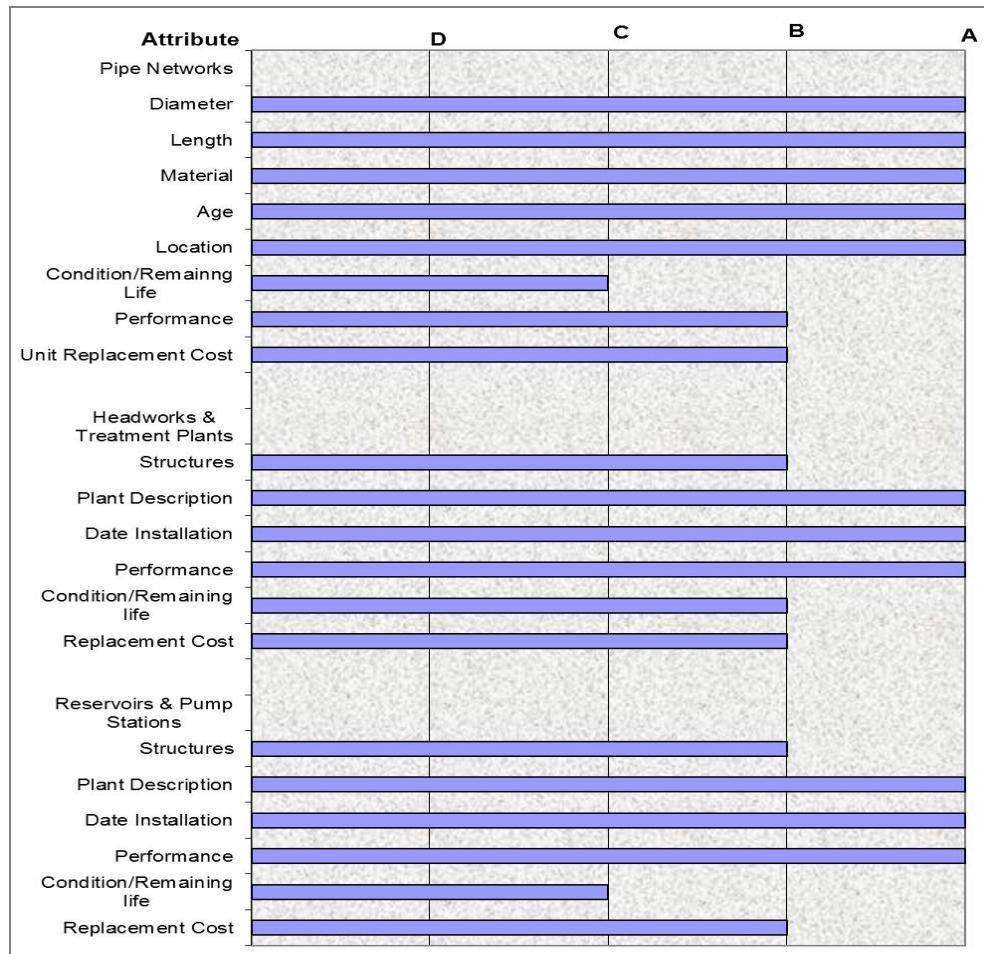
Specific assessment on the Water Activity is as below:

Table 8.4 Specific Assessment on the Water Activity

A	Highly reliable	Data based on sound records, procedure, investigations and analysis, documented properly and recognised as the best method of assessment. Dataset is complete and estimated to be accurate $\pm 2\%$.
B	Reliable	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example some data is old, some documentation is missing and/or reliance is placed on unconfirmed reports or some extrapolation. Dataset is complete and estimated to be accurate $\pm 10\%$.
C	Uncertain	Data based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data are available. Dataset is substantially complete but up to 50% is extrapolated data and accuracy estimated $\pm 25\%$.
D	Very uncertain	Data based on unconfirmed verbal reports and/or cursory inspection and analysis. Dataset may not be fully complete and most data is estimated or extrapolated. Accuracy $\pm 40\%$
E	Unknown	None or very little data held.

➤ Key Inputs

Figure 8.9 Key Inputs – Confidence Levels



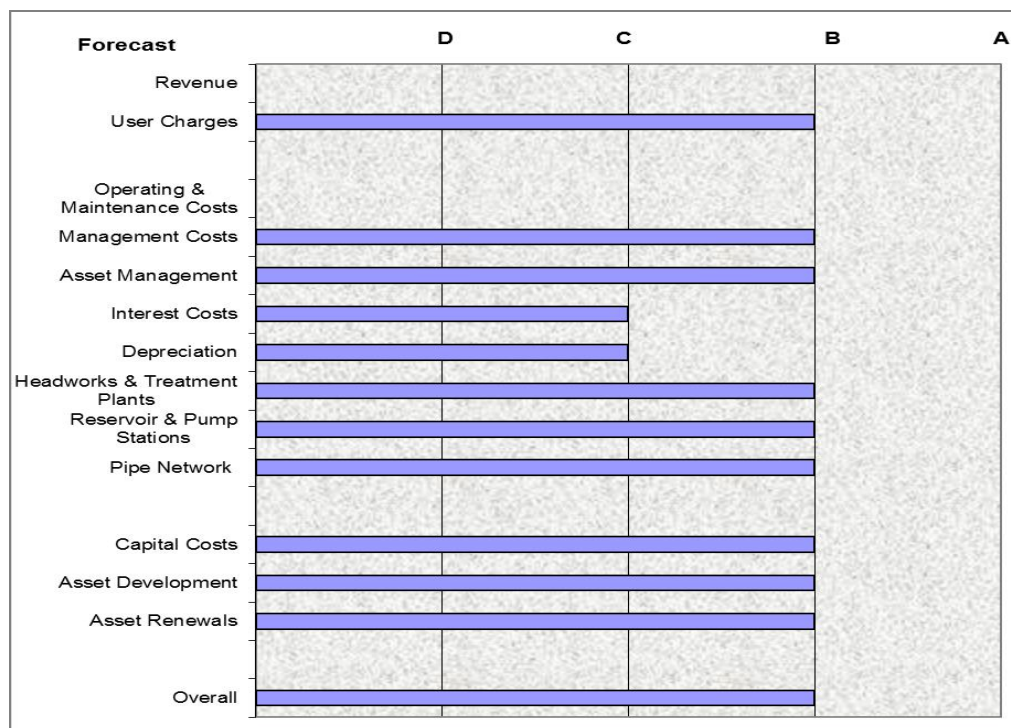
Key weaknesses were identified as Condition and Remaining Life across all asset types. All other attributes rated B or better.

The AMP makes assumptions about asset condition, particularly where it cannot be directly measured such as for underground pipes, and how it will change over time. Remaining lives are also assumed in determining renewal profiles, creating a level of uncertainty for associated programmes.

The data confidence findings are still considered relevant in 2020, although ongoing improvements will see a higher level of confidence over time. It is planned to review the above assessment prior to the development of the next AMP – an improvement plan action. This will specifically also consider the level of confidence for critical vs non-critical assets. For higher criticality in particular, the priority is to improve data confidence to increase the reliability of predicted intervention times.

➤ Financial Programmes

Figure 8.10 Financial Programmes – Confidence Levels



The above figure shows a generally “Reliable” (B) level of confidence in forward programme forecasts. Projections of depreciation and interest costs however are “Uncertain” (C), the latter reflecting uncertainties in the economy particularly post-COVID.

More specific information around a number of specific uncertainties is provided in the following section, in particular:

- The assumed development of the Awarua Industrial area – this particularly affects revenue and to a lesser degree the O&M programme.
- A scenario where non-critical pipe assets fail before the end of their assumed useful lives – this affects both O&M and renewal programmes.

8.7 RELIABILITY OF FINANCIAL FORECASTS

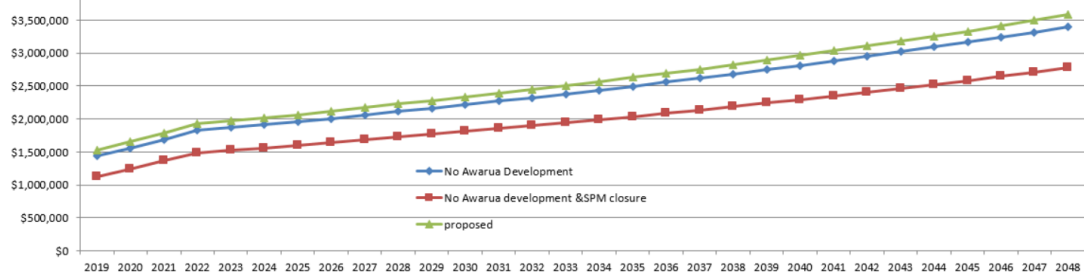
8.7.1 Revenue Forecasts

The graph below shows the sensitivity of revenue due to sale of water to industrial users. This plan assumes that the development of the Awarua Industrial will proceed but if it doesn't, over the next 10 years revenue will be in the order of \$100,000 less than that proposed. More significantly, should Awarua not develop and the current largest consumers, South Pacific Meats / Dairy Trust (SPM), close then over the next 10 years revenue will be in the order of \$450,000 less than budget. Obviously SPM are a significant contributor to the revenue stream.

The green trace represents the greatest likely revenue, the blue is a continuation of existing, and the red is the lowest likely revenue.

If Awarua does not develop then there will be a decrease in operational costs, and consumption of water treatment chemicals and electricity. But not sufficiently to balance the loss in revenue – see next section.

Figure 8.11 Revenue Scenarios: Sensitivity Analysis

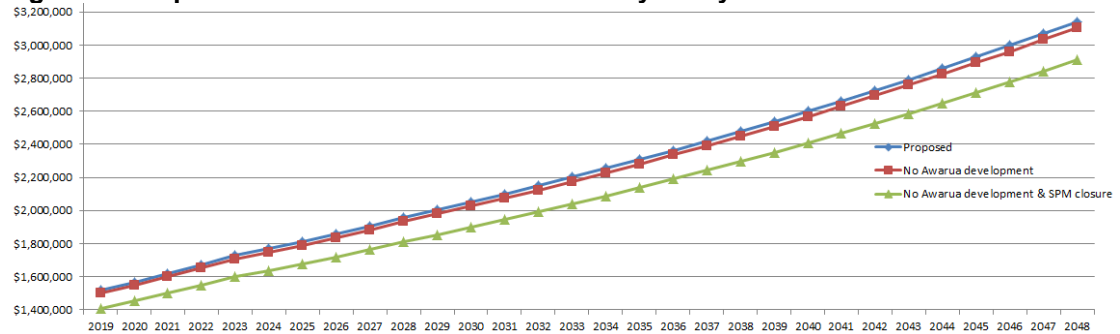


8.7.2 Operational Forecasts

The graph below shows the sensitivity to operational costs discussed in the previous section. The blue trace (being that proposed) is the highest cost, red is if the Awarua Development does not proceed and green is should SPM close and the Awarua not proceed. As can be seen:

- There is very little difference in operational costs between that proposed and should Awarua not proceed (less than \$25,000 for the first 10 years).
- Should Awarua not proceed and SPM close, then costs will reduce by \$145,000 to that proposed by 2028.

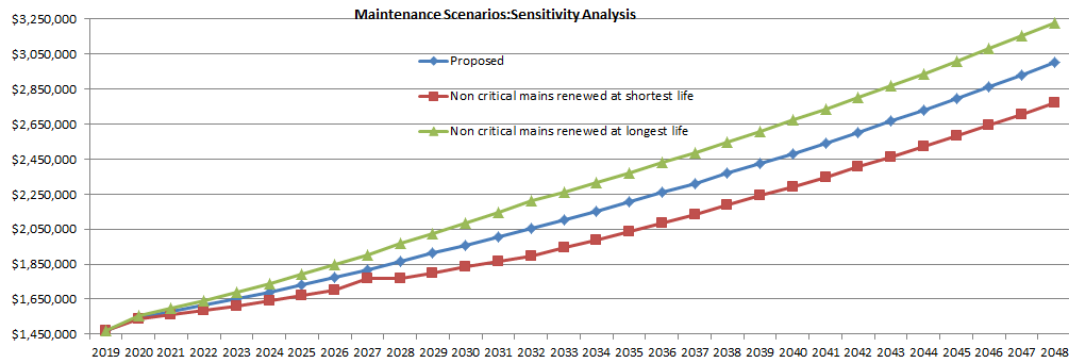
Figure 8.12 Operational Costs Scenario: Sensitivity Analysis



8.7.3 Maintenance and Renewal Forecasts

As mentioned in Section 7, non critical asbestos cement mains have revalued on the basis of the longest likely life. The graph below shows the likely envelope of maintenance costs should failures occur before expiry of the assigned life. The green trace shows maximum likely cost, the red trace is the minimum cost if mains were all renewed according to the shortest life likely, and the blue trace is the programme submitted. By 2028 costs could vary from that proposed by 5% being \$98,000.

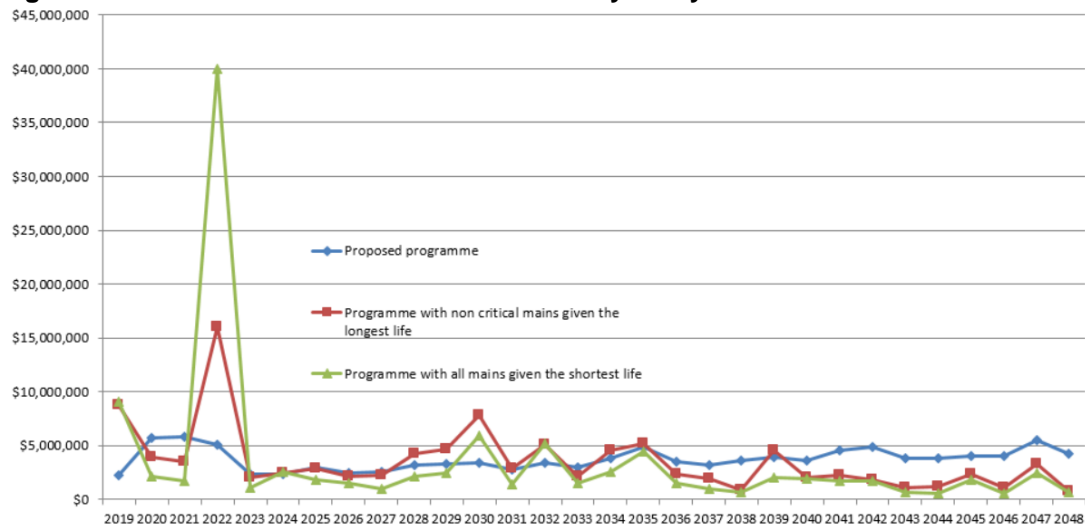
Figure 8.13 Maintenance Scenarios: Sensitivity Analysis



The graph below shows the effect on timing of renewals. It applies to asbestos cement main renewals as those are the only mains subject to renewal within the period of this plan.

The red trace reflects non critical mains being renewed at the longest life likely with the critical mains being renewed at the shortest life likely. The green trace is if all mains were renewed according to their shortest life likely. The blue trace is the proposed programme which has been put forward to smooth the early peak in 2022. The peaks in 2022 reflect the valuation practice of assigning an extra five years to those assets whose life is theoretically expired. Observations to date have not indicated any significant increase in main failures. That, plus the fact that there is not the contracting resource available to undertake a renewal programme at such short notice, support the concept of undertaking renewals over a longer period but it must be stated that renewal of asbestos cement water mains must continue.

Figure 8.14 Mains Renewal Scenarios: Sensitivity Analysis

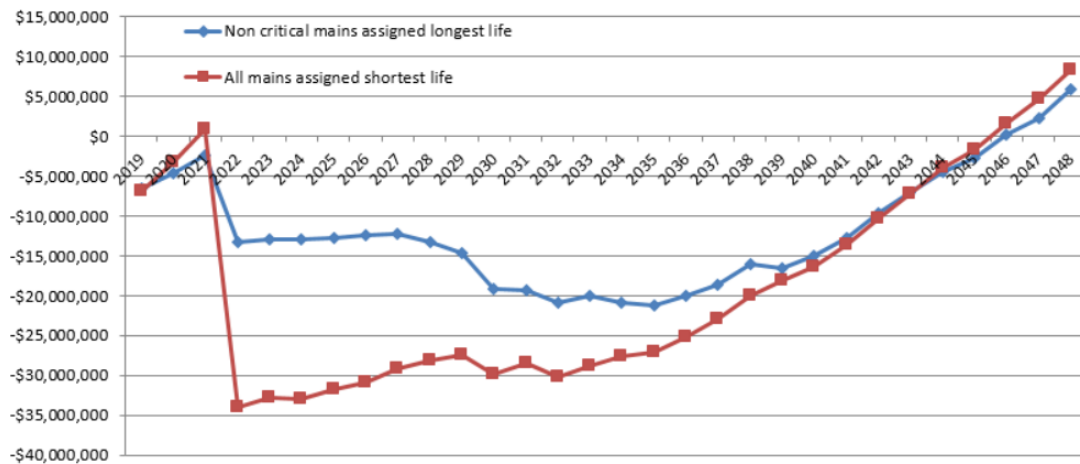


The graph below demonstrates the risk in undertaking renewals as per the proposed programme which is later than the theoretical expired life. It shows the risk if replacement of mains:

- Are required sooner than the expiry of non critical mains longest life, i.e. the blue trace.
- Are required sooner than the expiry of non critical mains shortest life, i.e. the red trace.

As can be seen, there is a risk for most of this plan period but by 2044 approximately, a reserve will begin to accumulate to fund the next wave of pipe renewals.

Figure 8.15 Mains Renewals Cumulative Risk: Sensitivity Analysis



8.7.4 Development Forecasts

The only new capital investment scheduled in this plan is to investigate the development of an emergency water supply. This does not include any physical works costs, nor has timing of implementation been established at this point. No sensitivity analysis has been carried out.

8.8 SUMMARY OF PROGRAMME ASSUMPTIONS

Programmes have been proposed in this plan based on the following assumptions.

Growth

- Population change will follow the Statistics New Zealand medium growth projection.
- There will be no significant change in per capita water consumption.
- Water demand is directly influenced by population numbers.
- The majority of infrastructure required to service new developments will be funded by developers.
- The resource consent to take water will have no adverse reviews or reduction on permitted water abstraction.
- The water reticulation area will not increase.

Levels of Service

- Continuation of the existing service levels and their targets will be acceptable.
- There will be no significant changes to Drinking Water Standards or water grading criteria.
- The reticulation water pressure regime will remain the same.
- The water quality of the Oreti River will not deteriorate from the present condition.
- There is no change to the pipework infrastructure as a result of urban development.
- Asset condition assessments do not indicate additional remedial / replacement works.

- The resource consent to discharge filter wash water at the Branxholme Water Treatment Plant will have no more conditions added.

Asset Renewal

Non critical asbestos cement will have a life expectancy in accordance with at least the longest prediction as indicated in the National Asbestos Cement Pressure Pipe Manual (2017).

Natural Disasters

No provision has been made in programmes for the cost of repairing damage or other additional costs consequent upon a natural disaster such as a major flood or substantial earthquake, apart from the costs of participation in the LAPP scheme (Local Authority Protection Programme Disaster Fund) and insurance of assets excluded from coverage by the LAPP scheme. It should be noted that the LAPP scheme is intended to cover major disasters and that the potential exists for substantial unbudgeted costs following a moderate disaster which is below the threshold for the LAPP scheme to come into effect.

Assessment of Assumptions with a High Level of Uncertainty

Those where there is considered to be a high level of uncertainty are further assessed below. These include relevant assumptions from Section 2.4.

Table 8.5 Impacts of Uncertainty on Financial Programmes

Assumption	Level of uncertainty	Impact of uncertainty on Financial Programmes
ENVIRONMENTAL		
Resource consent to take water will have no adverse reviews or reduction on permitted water abstraction.	High	Could increase Capex costs if more investment needed at Branxholme. In a worst-case scenario, additional source(s) of water may be required – very significant potential Capex costs both for extraction, treatment and new trunk distribution to the network.
Resource consent to discharge filter wash water at the Branxholme Water Treatment Plant will have no more conditions added	High	Could increase Capex costs if more investment needed at Branxholme.
Climate change – the effects of higher temperatures and drought increases water demand	High	Increased volume of water supplied, with consequential higher O&M costs. Potential for increased capacity demand – to be monitored, may require water restrictions if effects are significant.
Climate change – the effects of increased rainfall and flood levels in the Oreti River create turbidity and increase the cost to treat water for consumption	High	Increased O&M costs to treat turbidity – expect to be modest in scale.
Climate change – sea level rise	High	No impact expected in relation to water supply headworks, reservoirs. Low-lying areas of the city and associated reticulation may be affected in the long term (beyond 30 years). Cost impacts unknown

Assumption	Level of uncertainty	Impact of uncertainty on Financial Programmes
		at this time.
NATURAL DISASTERS		
No major disasters occur during the life of the Plan	High	Financial programmes could be very significantly affected, both Opex and Capex, in the event of major damage due to earthquake, flood or tsunami type events
COUNCIL OPERATIONS		
Water Reform and associated organisational changes	High	These could change the scale of financial programmes, although this will occur outside current organisational arrangements, with a new relationship likely to be formed between customers and the new entity.
GROWTH AND DEMAND		
Ageing population – over 65 cohort	High	Minor influence on water demand and therefore O&M costs
Water reticulation area will not increase	High	Water reticulation associated with an increase in area typically installed by developers within the development area. Significant increases could need capacity expansion in reticulation or pumping, potentially requiring major new capex in addition to O&M cost.
LEVELS OF SERVICE		
Oreti River water quality will not materially deteriorate over time	High	Asa above, climate change could affect turbidity. Changes in land-use within the catchment could increase the need for additional treatment. Significant changes in river water quality could have a major effect on both O&M and Capex costs.
ASSETS		
Assets will remain useful until the end of their average useful life, assuming asset average life expectancy assumptions are correct	High	Potential for later or earlier renewal required – this could have a modest to significant impact on asset replacement capex.
Asset condition and remaining life are as predicted in the AMP	High	Faster rates of deterioration would increase O&M costs, probably modest in effect. Also creates potential for later or earlier renewal as above.

9. Delivering and Monitoring the Programme

9.1 Programme Governance and Reporting

Council operates on a monthly cycle with committees meeting before a full Council meeting. These committees accept and receive reports from their relevant Group, and Management Staff are at these meetings to answer any questions that arise.

This reporting process ensures accountability to Councillors and allows for transparency to the public.

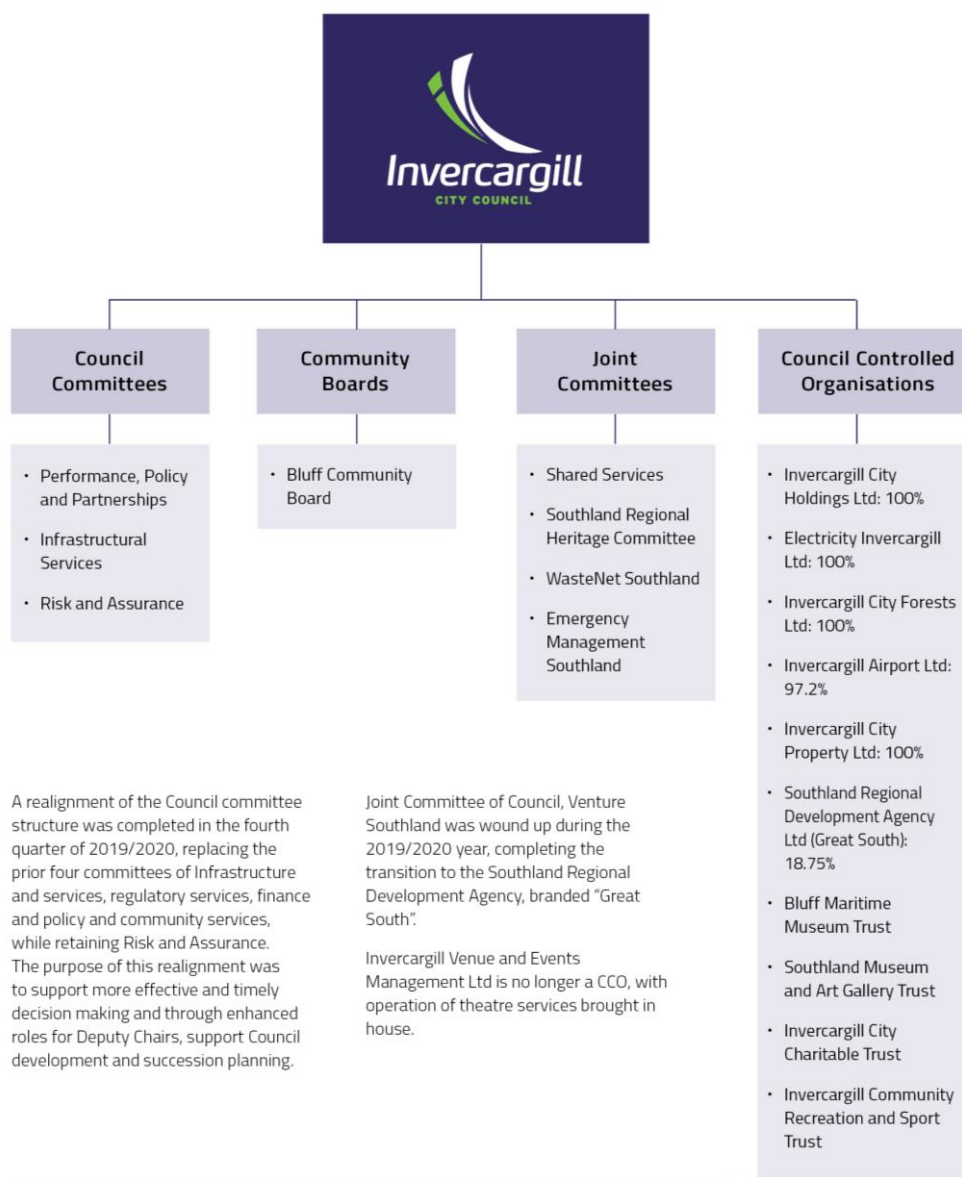
The Bluff Community Board is established as a committee who reports to Council on behalf of the Bluff area and deals with any issues relating to their area. Council provides direction to this committee and has a representative sitting on this Board.

Councillors are elected on a triennial basis through local government elections with the community voting for 12 Councillors and a Mayor. The Chief Executive role is reviewed every five years. In addition to this, Council undertakes a Representation Review every six years to ensure that the community is aware and accepting of the current Council structure.

Council develops their Long Term Plan every three years in line with their obligations under the Local Government Act 2002. Every year following this, Council will adopt an Annual Plan which will make any amendments to the existing Long Term Plan and allows for members of the community to submit on this process.

Further, Council will provide an Annual Report, which is a full year financial snapshot of Council's activities for that financial year. This is also compared to the financial projections in Council's Long Term Plan.

Figure 9.1 Programme Governance and Reporting Council Structure



9.2 Stakeholder Engagement and Communications

Council currently utilises a myriad of methods to engage in consultation with members of the community. The Local Government Act 2002 states specific methods of consultation to be utilised by Council for certain processes, Council adds to this through innovative and community-tailored engagement techniques.

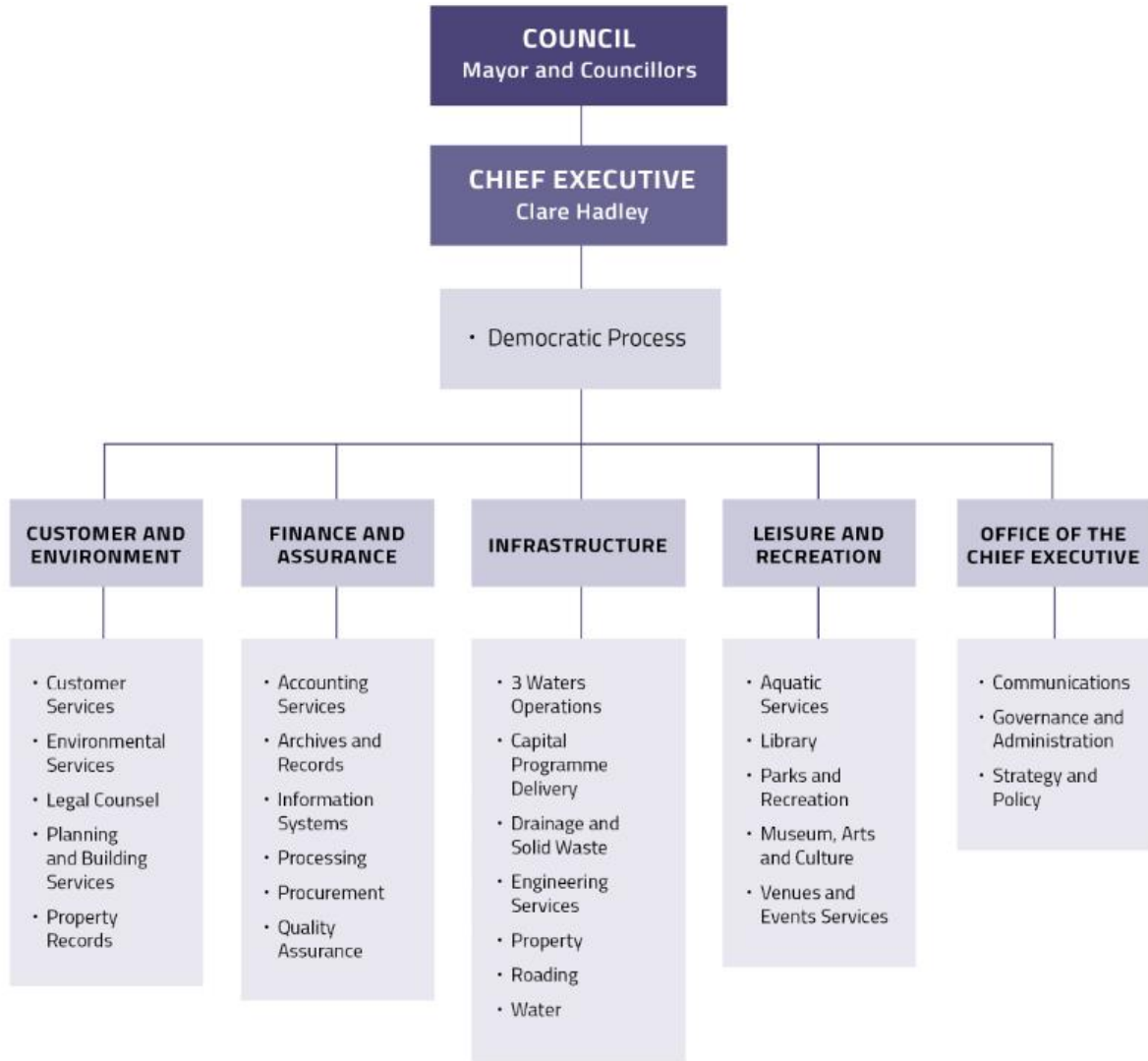
9.3 Business Processes

Council staff operate under a Delegations Register that is adopted by Council. This Register lists every department with specific delegations that are required under legislation or Council policies so that staff members are able to carry out their specific job requirements.

The management structure of the Invercargill City Council is as follows:

Figure 9.2 Management Structure of Invercargill City Council

Management Structure



9.4 Information Systems and Data

Geographical Information Systems (GIS)

Provides mapping and spatial analysis tools for Council to graphically determine and understand where Council facilities or assets are located. This includes geocoding data, putting it on a map, and symbolizing it in ways that can help visualize and understand the data. The software displays how places are related which helps

make more informed decisions about the best locations and paths for infrastructure and planning. Utilising these attributes we can use the software to help make predictions and better understand our environment.

Infor Pathway

Delivers a comprehensive offering of fully integrated functionality for managing council related business processes including:

- *Customer Service and People Management* – central name / address register and customer request management.
- *Land and Property Management* – administration tools to assist with land and property management.
- *Revenue Management* – capabilities such as rates accounting, property valuations, debtors and water billing.
- *Regulatory Management* – a comprehensive range of workflow-driven modules to ensure that local and national regulatory legislation for consents processing, parking and animals, and health and liquor licensing are complied with.
- *Internet-enabled customer self-service* – ePathway enables Council customers to conduct local government e-commerce online.

Infor Public Sector (IPS)

IPS is a centralised Asset Management Information System (AMIS) that allows for the effective management of infrastructure assets. IPS provides tools to improve asset efficiency, conduct planned and unplanned maintenance, manage work costs, provide asset inspection scheduling, and assists in optimising assets life cycles. Asset needs analysis in IPS can be used to determine and recommend which maintenance and renewal programmes are likely to be needed, to assist with long term maintenance and budgeting plans.

Objective

Delivers an Electronic Document and Records Management (EDRMS) service across all of Council providing information management processes and business process automation with robust security, version control and audit management to ensure Council complies with recordkeeping standards; this reduces the risk associated with managing information in multiple locations.

SCADA / InTouch

SCADA (Supervisory Control and Data Acquisition) is a control system installed at the Clifton Wastewater Treatment Plant and the City Control Room. It includes electronic devices networked to a computer to allow remote control and record keeping of all actions, faults and alarms.

InTouch is the computer programme which allows human interfacing with SCADA to facilitate the exercising of control and access of data (a form of human / machine interface referred to as HMI).

Telemetry

Telemetry is the communication system that allows communication between the Clifton Wastewater Treatment Plant and City Control Room to all remote sites

including the Bluff Wastewater Treatment Plant and pump stations. Communication technology currently in service is a combination of several direct point to point radio links and micro wave / fibre optic network links. The telemetry system reports alarms from remote sites to the Treatment Plant SCADA system which can then be actioned by operators, or by Council's 24 hour Water Control Centre.

9.5 Programme Performance Monitoring and Review

9.5.1 Monitoring Approach

Council operates on a monthly cycle with meetings for the committees of Council that look into each department at Council and are provided with extensive monitoring and reporting of levels of services for activities and assets that come out of that department, alongside monthly financial accounts for each department. The Committee will question these reports with managers present to answer any questions that arise from the reports.

The information for these reports is entered into various software systems as detailed in Section 9.4. This monitors the performance (which is both fiscal and service based) against targets and budgets from Council's Long Term Plan. Targets can be key performance indicators, internally driven targets or provided from a Ministry that oversees that area, e.g. Department of Internal Affairs. At a full Council meeting these reports are then received.

9.5.2 Frequency of Review

Every financial year Council prepares an Annual Report that is the key document in ensuring the expenditure for the year was efficient and is pertinent in ensuring accountability to the community and ratepayers.

The Annual Report does not just show the current financial status, but also shows the levels of service for all Council activities and assets measured against the yearly targets set in the Long Term Plan. As noted in Section 9.1, these are measured and reported six weekly in the Council meetings. The Annual Report is a holistic overview of their performance.

10. Continuous Improvement

10.1 CURRENT ACTIVITY MANAGEMENT PRACTICE

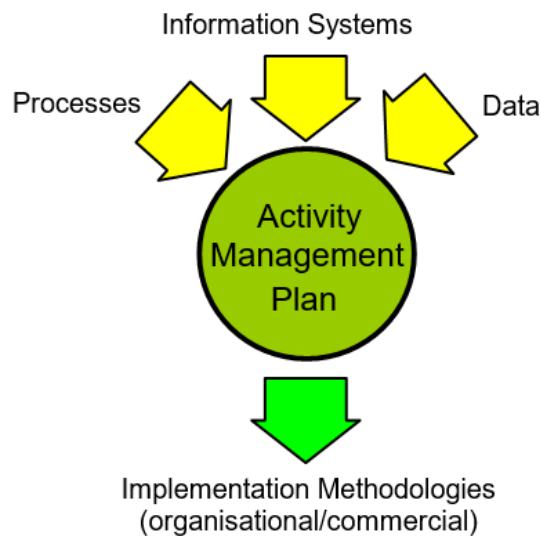
10.1.1 Key Asset Management Inputs

The key Asset Management inputs required to support good Asset Management planning are:

- **Processes:** The necessary processes, analysis and evaluation techniques needed for life cycle asset management.
- **Information systems:** The information support systems, which support the above processes and which store and manipulate asset data.
- **Data:** Data available for manipulation by information systems to support Asset management decision-making.

The relationship between the Asset (or Activity) Management Plan, its supporting practices (processes, data and information systems) and implementation tactics (commercial tactics and organisational / people issues) is illustrated below.

Figure 10.1 Key Asset Management Inputs



When producing an Asset Management Plan, it is important to maintain contact both with the end users of the service (i.e. the customers and the asset providers) and those who represent the owners (i.e. the elected Councillors of the Invercargill City Council). In this regard customers' satisfaction surveys as referenced in Section 3 and workshops between Councillors and Council Asset Managers were held. It is also important that an Asset Management Plan is consistent in its format and methodology with best practice.

This Plan has been peer reviewed to ensure it is consistent with best practice before being presented to Council for formal adoption.

10.1.2 Maturity of Asset Management Practices

Asset management practices were assessed in 2017 using the Treasury Asset Management Maturity Assessment Tool (AMMAT), which considers practice against criteria derived from the 2015 IIMM Section 2.1.1 Table 2.1.2.

The Council's target level of maturity for asset management generally for the Water Supply activity is "Intermediate". At that time, the following improvement actions were identified to achieve this level of maturity. In some areas, such as 2.1, 2.3, 3.4, 3.5, no further improvement was considered necessary.

Note that the maturity of the AM Plan itself is only one of 17 elements of the overall maturity assessment.

Table 10.1 Improvements arising from the 2017 AMMAT Assessment

IIMM Reference	Question	Improvement Activity	Improvement Planned to Reach "Intermediate" Level
Understanding and Defining Requirements			
2.1	1	AM Policy and Strategy	<ul style="list-style-type: none"> None required – addressed by 2017 Activity Management Policy and Strategy documents.
2.2	2	Levels of Service and Performance Management	<ul style="list-style-type: none"> Identify alternative levels of service options together with benefits and costs. Determine consumer preference by consultation with consumer groups.
2.3	3	Demand forecasting	<ul style="list-style-type: none"> None required – addressed in this plan's analysis of demand trends.
2.4	4	Asset Register Data	<ul style="list-style-type: none"> Check all asset data on above ground assets. Develop system for registration of data on all new assets. Develop Infor Public Sector (IPS) asset management system to provide reports on asset: condition, performance and maintenance costs. Apply criticality assessment as per Appendix 17.3 "Invercargill City Council: Defining Asset Criticality for Water Services" to assets within the water treatment plants and pump stations / reservoirs.
2.5	5	Asset Condition Assessment	<ul style="list-style-type: none"> Apply alternative condition assessment to pipe other than random section sampling. Examine for correlation between the two methods.
2.6	6	Risk Management	<ul style="list-style-type: none"> Review Corporate risk matrix. Review risk register annually.
Life Cycle Decision Making			
3.1	7	Decision Making	<ul style="list-style-type: none"> Develop and apply formal decision making and work priority techniques to all expenditure programmes. Carry out sensitivity analysis on estimates by testing critical assumptions and their influence on the result.
3.2	8	Operational Planning and Reporting	<ul style="list-style-type: none"> Develop and test emergency response and business continuity plans.
3.3	9	Maintenance Planning	<ul style="list-style-type: none"> Develop contingency plans for all maintenance activities.
3.4	10	Capital Investment Strategies	<ul style="list-style-type: none"> None – achieved in this plan.
3.5	11	Financial and Planning Strategies	<ul style="list-style-type: none"> None – achieved in this plan.
Asset Management Enablers			

4.1	12	Asset Management Teams	<ul style="list-style-type: none"> • Redefine job descriptions to reflect asset management responsibilities. • Seek relative training for those in asset management roles.
4.2	13	Asset Management Plans	<ul style="list-style-type: none"> • Develop effective customer engagement in setting levels of service (refer question 2 above).
4.3	14	Information Systems	<ul style="list-style-type: none"> • As for question 4, third bullet point.
4.4	15	Service Delivery Models	<ul style="list-style-type: none"> • Develop internal service agreements with all internal service providers.
4.5	16	Quality Management	<ul style="list-style-type: none"> • Develop a clear policy and quality management system. • Document all activity management activity processes to show compliance with the quality management system.
4.6	17	Improvement Planning	<p>All key improvement actions have a:</p> <ul style="list-style-type: none"> • Project brief. • Allocation of resources. • Formal reporting programme to the Executive team.

In addition, a number of other initiatives were identified for the Improvement Plan, as follows:

Table 10.2 Other Improvements identified in the 2017 AMP

Reference in this plan	Item	Description
Section 3	Recording: <ul style="list-style-type: none"> • Notifications of planned water shutdowns. • Complaints of water clarity. 	<ul style="list-style-type: none"> • Improve accuracy.
Section 4	Losses due to leakage	<ul style="list-style-type: none"> • Improve assessment of leakage losses.
Section 5 and 6	Vulnerability due to single water source	<ul style="list-style-type: none"> • Commit to development of an emergency water supply.
Section 5	Leakage and backflow	<ul style="list-style-type: none"> • Engage in leakage and backflow programmes – to be checked
Section 6	Sustainability	<ul style="list-style-type: none"> • Develop strategy.
Section 6	Resilience	<ul style="list-style-type: none"> • Assess current level.

10.1.3 Maturity of the AM Plan

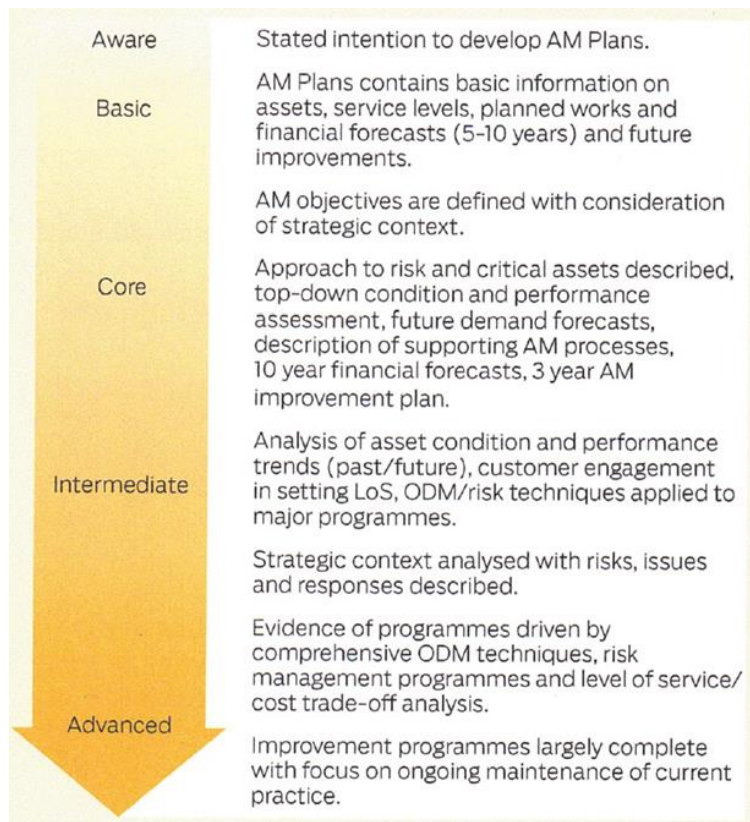
As per Council’s Asset Management Policy, the proposed maturity level for the Water Asset Management Plan is ‘Intermediate’ as defined by the International Infrastructure Management Manual (IIMM) 2015 Section 4.2.

The independent review of the draft 2020 AMP (before this version was finalised) assessed the AMP as “*generally at the Intermediate level but with some gaps. For example, there is good use of condition and life data evident in renewal planning for AC pipes and significant enhancements, such as determining asset criticality. One particular area that needs further development is the Improvement Plan*”.

This version of the AMP has recognised many of the suggestions and recommendations within that report, with remaining matters consolidated in the Improvement Plan in Section 10.3.

The diagram below provides a summary of AMP maturity level descriptions from the IIMM.

Figure 10.2 IIMM 2015 AMP Maturity Levels



10.2 STATUS OF IMPROVEMENTS IDENTIFIED IN THE PREVIOUS ASSET MANAGEMENT PLAN

A wide range of improvement actions were proposed in the 2017 AMP, including those suggested in the peer review report for that Plan. The improvement programme was determined in the main by utilisation of the IIMM Section 2 Asset Management Maturity Assessment Tool (AMMAT) – refer Appendix 17.10.

Progress in implementing this programme is summarised below.

Table 10.2 Status of Improvement Plan Actions from Previous (2017) Asset Management Plan

IIMM Ref	Q'n No.	Item	Improvement Activity	2017 Time Frame	Progress towards Achievement
Understanding and Defining Requirements					
2.1	1	AM Policy and Strategy	<ul style="list-style-type: none"> None required – addressed by 2017 Activity Management Policy and Strategy documents. 	NA	Completed and can be removed from Improvement Plan
2.2	2	Levels of Service and Performance Management	<ul style="list-style-type: none"> Identify alternative levels of service options together with cost. Determine consumer preference by consultation with consumer groups. 	2019	To be progressed
2.3	3	Demand forecasting	<ul style="list-style-type: none"> None required – addressed in the 2017 plan's analysis of demand trends. 	NA	Completed and can be removed from Improvement Plan
2.4	4	Asset Register Data	<ul style="list-style-type: none"> Check all asset data on above ground assets. Develop system for registration of data on all new assets. Develop Infor Public Sector (IPS) asset management system to provide reports on asset: condition, performance and maintenance costs. Apply criticality assessment as per Appendix 17.3 "Invercargill City Council: Defining Asset Criticality for Water Services" to assets within the water treatment plants and pump stations / reservoirs. 	2019	To be progressed
2.5	5	Asset Condition Assessment	<ul style="list-style-type: none"> Apply alternative condition assessment to pipe other than random section sampling. Examine for correlation between the two methods. 	2018	To be progressed
2.6	6	Risk Management	<ul style="list-style-type: none"> Review Corporate risk matrix. Review risk register annually. 	2018	To be progressed
Life Cycle Decision Making					
3.1	7	Decision Making	<ul style="list-style-type: none"> Develop and apply formal decision making and work priority techniques to all expenditure programmes. 	2018/19	To be progressed

IIMM Ref	Q'n No.	Item	Improvement Activity	2017 Time Frame	Progress towards Achievement
			<ul style="list-style-type: none"> Carry out sensitivity analysis on estimates by testing critical assumptions and their influence on the result. 		
3.2	8	Operational Planning and Reporting	<ul style="list-style-type: none"> Develop and test emergency response and business continuity plans. 	2019/20	Content added to 2020 AMP, plans yet to be fully developed and tested
3.3	9	Maintenance Planning	<ul style="list-style-type: none"> Develop contingency plans for all maintenance activities. 	2019/20	
3.4	10	Capital Investment Strategies	<ul style="list-style-type: none"> None – achieved in the 2017 AMP. 	NA	Completed and can be removed from Improvement Plan
3.5	11	Financial and Planning Strategies	<ul style="list-style-type: none"> None – achieved in the 2017 AMP. 	NA	Completed and can be removed from Improvement Plan
Asset Management Enablers					
4.1	12	Asset Management Teams	<ul style="list-style-type: none"> Redefine job descriptions to reflect asset management responsibilities. Seek relative training for those in asset management roles. 	2020/21	To be progressed
4.2	13	Asset Management Plans	<ul style="list-style-type: none"> Develop effective customer engagement in setting levels of service (refer question 2 above). 	2019	To be progressed
4.3	14	Information Systems	<ul style="list-style-type: none"> Develop Infor Public Sector (IPS) asset management system to provide reports on asset: condition, performance and maintenance costs. 	2019	To be progressed
4.4	15	Service Delivery Models	<ul style="list-style-type: none"> Develop internal service agreements with all internal service providers. 	2019	To be progressed
4.5	16	Quality Management	<ul style="list-style-type: none"> Develop a clear policy and quality management system. Document all asset management activity processes to show compliance with the quality management system. 	2019/20	To be progressed
4.6	17	Improvement Planning	<ul style="list-style-type: none"> Ensure all key improvement actions have: <ul style="list-style-type: none"> Project brief. Allocation of resources. Formal reporting programme to the Executive team. 	2018/19	To be progressed
Items contained in the 2017 Plan not specifically addressed above					
Plan Ref (2017)	Item	Improvement planned to reach “Intermediate” level			
Section 3	Customer related information	<ul style="list-style-type: none"> Recording – improve accuracy of: <ul style="list-style-type: none"> Notifications of planned water shutdowns. Complaints of water clarity 			To be progressed

IIMM Ref	Q'n No.	Item	Improvement Activity	2017 Time Frame	Progress towards Achievement
Section 4		Losses due to leakage	<ul style="list-style-type: none"> Improve assessment of leakage losses. 	2018	Included in 2020 AMP
Section 5 & 6		Vulnerability due to single water source	<ul style="list-style-type: none"> Commit to development of an emergency water supply. 	2025	Investigations included in 2020 AMP
Section 5		Leakage and Backflow	<ul style="list-style-type: none"> Engage in leakage and backflow programmes. 	2018	Included in 2020 AMP
Section 6		Sustainability	<ul style="list-style-type: none"> Develop strategy. 	2019	To be progressed
Section 6		Resilience	<ul style="list-style-type: none"> Assess current level and target improvements. 	2019	To be progressed

10.3 2020 AMP IMPROVEMENT PROGRAMME

The proposed Improvement Plan picks up on the previous actions highlighted above, where progress is still to be made. The actions may be modified below to better suit current priorities and needs. Additionally, items not covered but mentioned elsewhere in this Plan are also included, as are outstanding items from the 2020 AMP review report.

Table 10.3 Improvement Plan Monitoring and Review

Item	Improvement Activity	Time Frame	Budget	Responsibility
Understanding and Defining Requirements				
Levels of Service and Performance Management	<ul style="list-style-type: none"> Investigate potential alternative level of service options and assess the relative costs and benefits. This would include the emergency water supply as well as water quality and reliability aspects. Using the above, determine consumer preferences by consultation with customer groups, including ratepayers and stakeholders such as MoH and FENZ. Review customer satisfaction measures and determine whether measures last reported in 2013 should be resurveyed or removed from the AMP as they are now outdated. 	30 June 2023	Internal	<ul style="list-style-type: none"> Water Supply Manager in consultation with Corporate Planner / Communications
Asset Register Data	<ul style="list-style-type: none"> Check all asset data on above ground assets. Develop system for registration of data on all new assets. Develop Infor Public Sector (IPS) asset management system to provide reports on asset: condition, performance and maintenance costs. Apply criticality assessment as per Appendix 17.3 "Invercargill City Council: Defining Asset Criticality for Water Services" to assets within the water treatment plants and pump stations / reservoirs. Data confidence update, including data improvement plan based on a functional assessment of data needs for asset management. 	30 June 2023	Internal with some external budget where required (allow say \$20k)	<ul style="list-style-type: none"> Water Supply Manager
Asset Condition Assessment	<ul style="list-style-type: none"> Apply alternative condition assessment to pipe other than random section sampling. Examine for correlation between the two methods. This is to include aspects such as fault rates of critical 	30 June 2023	Internal	<ul style="list-style-type: none"> Water Supply Manager

Item	Improvement Activity	Time Frame	Budget	Responsibility
	structures, plant, and equipment at the treatment plant and pump stations.			
Risk Management	<ul style="list-style-type: none"> Review and update Corporate risk matrix and definitions Review risk register annually and consider risks in terms of gross risk (pre-mitigation / treatment) and residual risk (post-current mitigation / treatment), and then to determine the effectiveness of the actions and whether further action is required. Make explicit the impact of risks on activity objectives – this could be done in the risk register and/or summary tables. Confirm the current status of the Water Tower in relation to earthquake strengthening. 	Ongoing	Internal with some external budget where required (allow say \$5k pa)	<ul style="list-style-type: none"> Corporate Water Supply Manager
Life Cycle Decision Making				
Decision Making	<ul style="list-style-type: none"> Develop and apply formal decision making and work priority techniques to all expenditure programmes. Carry out sensitivity analysis on estimates by testing critical assumptions and their influence on the result. 	30 June 2023	Internal	<ul style="list-style-type: none"> Corporate
Operational Planning and Reporting	<ul style="list-style-type: none"> Develop and test emergency response and business continuity plans. 	30 June 2023	Internal	<ul style="list-style-type: none"> Water Supply Manager
Maintenance Planning	<ul style="list-style-type: none"> Develop contingency plans for all maintenance activities. Rationalise the O&M strategy and actions bringing together Appendix 17.08 and Appendix 17.13. 	30 June 2023	Internal	<ul style="list-style-type: none"> Water Supply Manager
Asset Disposals	<ul style="list-style-type: none"> Quantify and determine whether significant expenditure is required for the disposal or treatment of assets abandoned from the pipe network. 	30 June 2023	Internal	<ul style="list-style-type: none"> Water Supply Manager
Asset Management Enablers				
Asset Management Teams	<ul style="list-style-type: none"> Redefine job descriptions to reflect asset management responsibilities. Identify and provide for relevant training for those in asset management roles. 	Ongoing	Internal with external budget for training where necessary	<ul style="list-style-type: none"> Water Supply Manager in consultation with HR Manager
Asset Management Plans	<ul style="list-style-type: none"> Continue to enhance the AMP to achieve a minimum maturity level of Intermediate in accordance with IIMM levels. This is to include more graphical information relating to the assets and clearly demonstrate the build-up of the financial case for investment at a more detailed level of granularity than at present. 	30 June 2023	Internal with some external budget where required (allow say \$10k pa)	<ul style="list-style-type: none"> Water Supply Manager

Item	Improvement Activity	Time Frame	Budget	Responsibility
Information Systems	<ul style="list-style-type: none"> Develop Infor Public Sector (IPS) asset management system to provide reports on asset: condition, performance and maintenance costs. 	30 June 2023	Internal	•
Service Delivery Models	<ul style="list-style-type: none"> Develop internal service agreements with all internal service providers. 	30 June 2023	Internal	•
Quality Management	<ul style="list-style-type: none"> Develop a clear policy and quality management system. Document all asset management activity processes to show compliance with the quality management system. 	30 June 2023	Internal	•
Improvement Planning	<ul style="list-style-type: none"> Update (or use a different tool) the 2017 AMMAT self-assessment to provide an up-to-date view of AM maturity against the IIMM across the Water Supply activity, identifying any additional AM improvements that may be needed. Develop for all key improvement actions: <ul style="list-style-type: none"> Project brief. Allocation of resources. Formal reporting programme to the Executive team. 	30 June 2023	Internal with some external budget for review (allow say \$10k)	• Water Supply Manager
Other Items contained in this plan not specifically addressed above				
Vulnerability due to single water source	<ul style="list-style-type: none"> Assess the feasibility and options relating to the development of an emergency water supply. 	For 2023 AMP	Investigations only	• Water Supply Manager
Losses due to water leakage	<ul style="list-style-type: none"> Improve assessment of leakage losses – leak detection programme feeding into Renewals programme 	Ongoing	\$100,000 pa	• Water Supply Manager
Backflow contamination	<ul style="list-style-type: none"> Engage in backflow prevention programme 	Ongoing	\$100,000 pa	• Water Supply Manager
Sustainability	<ul style="list-style-type: none"> Develop Sustainability Strategy at Council level. Quantify sustainability issues where possible to enable assessment of costs and benefits and widen the scope of decision making beyond a local perspective to that of an overall global and intergenerational sustainability mindset. 	Ongoing	Internal process. External where physical works investment is involved.	• Corporate • Water Supply Manager
Resilience	<ul style="list-style-type: none"> Assess the current level of resilience of the water supply network to natural hazard events and determine whether the level of risk is acceptable. If improvement in resilience is considered necessary, scope and develop a programme of improvements for consideration in the 2023/24 AMP. 	For 2023 AMP	Internal with some external budget (allow say \$20k)	• Water Supply Manager in association with other infrastructure managers and CDEM staff (ICC and ES)

10.4 MONITORING AND REVIEW

Monitoring and review of the Asset Management Plan is required to:

- Ensure compliance with the proposed AM improvement programme and milestones in Section 10.3 above.
- Ensure compliance with adopted standards and procedures for condition and performance

It is envisaged that reviews of the ICC Asset Management Strategy and Policy and Asset Management Plans will be undertaken on a three year basis to improve the quality of information provided, and to update as necessary changes which have occurred during the period. This will link to any Section 17A review of the activity.

To ensure the AM Plan remains useful and relevant, the following ongoing process of plan monitoring and activity review will be undertaken:

- Revisions of the Asset Management Plan following consultation and adoption of the Long Term Plan.
- Annually review and report on the progress of the Plan and associated Improvement Programme.
- Internal Audits of asset management information to ensure the integrity and cost-effectiveness of data collected.
- Periodic audits undertaken by external auditors to measure asset management performance against “best practice”.

The **annual review** includes:

- Update of appropriate financial and valuation information when required.
- Update of funding implications and any asset condition generated from asset management information systems.
- Update of status of the Improvement Programme.
- Set forward programmes for development of the Asset Management Plan.
- Consider if customer service surveys are required.

The **three yearly reviews** include:

- Undertake a review of the delivery structure.
- Review of alignment of Asset Management Plan to organisational management plan objectives, and required service levels.
- Review of structure and content of Asset Management Plan to incorporate development of improved asset management philosophy and techniques.
- Update of valuation information on a three yearly basis.
- Review of the organisational arrangement to align with advances in the Better Business Case approach.

11. Glossary

The following terms and acronyms (in brackets) are used in this Asset Management Plan.

Table 11.1 Glossary

Activity	An activity is the work undertaken on an asset or group of assets to achieve a desired outcome.
Advanced Asset Management	Asset management which employs predictive modelling, risk management and optimised renewal decision-making techniques to establish asset lifecycle treatment options and related long-term cash flow predictions (see Basic Asset management).
Annual Plan	The Annual Plan provides a statement of the direction of Council and ensures consistency and co-ordination in both making policies and decisions concerning the use of Council resources. It is a reference document for monitoring and measuring performance for the community, as well as the Council itself.
Asset	A physical component of a facility that has value, enables services to be provided and has an economic life of greater than 12 months.
Asset Management	The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost-effective manner.
Asset Management System	A system (usually computerised) for collecting, analysing and reporting data on the utilisation, performance, lifecycle management and funding of existing assets.
Asset Management Plan	A plan developed for the management of one or more infrastructure assets that combines multi-disciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost-effective manner to provide a specified level of service. A significant component of the plan is a long-term cash flow projection for the activities.
Asset Management Strategy	A strategy for asset management covering, the development and implementation of plans and programmes for asset creation, operation, maintenance, renewal, disposal and performance monitoring to ensure that the desired levels of service and other operational objectives are achieved at optimum cost.
Asset Management Team	The team appointed by an organisation to review and monitor the corporate asset management improvement programme and ensure the development of integrated asset management systems and plans consistent with organisational goals and objectives.
Asset Register	A record of asset information considered worthy of separate identification including inventory, historical, financial, condition, construction, technical and financial information about each.
Basic Asset Management	Asset management which relies primarily on the use of an asset register, maintenance management systems, job / resource management, inventory control, condition assessment and defined levels of service, in order to establish alternative treatment options and long-term cash flow predictions. Priorities are usually established on the basis of financial return gained by carrying out the work (rather than risk analysis and optimised renewal decision making).

Benefit Cost Ratio (B/C)	The sum of the present values of all benefits (including residual value, if any) over a specified period, or the lifecycle of the asset or facility, divided by the sum of the present value of all costs.
Business Plan	A plan produced by an organisation (or business units within it) which translates the objectives contained in an Annual Plan into detailed work plans for a particular, or range of, business activities. Activities may include marketing, development, operations, management, personnel, technology and financial planning.
Business Case Approach (BCA)	A robust, principles based approach for developing business cases for investment.
Capital Expenditure (CAPEX)	Expenditure used to create new assets or to increase the capacity of existing assets beyond their original design capacity or service potential. CAPEX increases the value of an asset.
Cash flow	The stream of costs and / or benefits over time resulting from a project investment or ownership of an asset.
Components	Specific parts of an asset having independent physical or functional identity and having specific attributes such as different life expectancy, maintenance regimes, risk or criticality.
Condition Monitoring	Continuous or periodic inspection, assessment, measurement and interpretation of resulting data, to indicate the condition of a specific component so as to determine the need for some preventive or remedial action.
Critical Assets	Assets for which the financial, business or service level consequences of failure are sufficiently severe to justify pro-active inspection and rehabilitation. Critical assets have a lower threshold for action than non-critical assets.
Current Replacement Cost	The cost of replacing the service potential of an existing asset, by reference to some measure of capacity, with an appropriate modern equivalent asset.
Deferred Maintenance	The shortfall in rehabilitation work required to maintain the service potential of an asset.
Demand Management	The active intervention in the market to influence demand for services and assets with forecast consequences, usually to avoid or defer CAPEX expenditure. Demand management is based on the notion that as needs are satisfied, expectations rise automatically and almost every action taken to satisfy demand will stimulate further demand.
Depreciated Replacement Cost (DRC)	The replacement cost of an existing asset after deducting an allowance for wear or consumption to reflect the remaining economic life of the existing asset.
Depreciation	The wearing out, consumption or other loss of value of an asset whether arising from use, passing of time or obsolescence through technological and market changes. It is accounted for by the allocation of the historical cost (or revalued amount) of the asset less its residual value over its useful life.
Disposal	Activities necessary to dispose of decommissioned assets.
Economic Life	The period from the acquisition of the asset to the time when the asset, while physically able to provide a service, ceases to be the lowest cost alternative to satisfy a particular level of service. The economic life is at the maximum when equal to the physical life, however, obsolescence will often ensure that the economic life is less than the physical life.

Facility	A complex comprising many assets (e.g. a hospital, water treatment plant, recreation complex, etc) which represents a single management unit for financial, operational, maintenance or other purposes.
Geographic Information System (GIS)	Software which provides a means of spatially viewing, searching, manipulating, and analysing an electronic database.
Infrastructure Assets	Stationary systems forming a network and serving whole communities, where the system as a whole is intended to be maintained indefinitely at a particular level of service potential by the continuing replacement and refurbishment of its components.
Life	A measure of the anticipated life of an asset or component, such as time, number of cycles, distance intervals, etc.
Level of Service	The defined service quality for a particular activity (i.e. sewerage) or service area (i.e. sewage disposal) against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.
Life Cycle	Life cycle has two meanings: <ul style="list-style-type: none"> (a) The cycle of activities that an asset (or facility) goes through while it retains an identity as a particular asset, i.e. from planning and design to decommissioning or disposal. (b) The period of time between a selected date and the last year over which the criteria (e.g. costs) relating to a decision or alternative understudy will be assessed.
Life Cycle Cost	The total cost of an asset throughout its life, including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.
Maintenance	All actions necessary for retaining an asset as near as practicable to its original condition but excluding rehabilitation or renewal.
Maintenance Plan	Collated information, policies and procedures for the optimum maintenance of an asset, or group of assets.
Maintenance Standards	The standards set for the maintenance service, usually contained in preventative maintenance schedules, operation and maintenance manuals, codes of practice, estimating criteria, statutory regulations and mandatory requirements, in accordance with maintenance quality objectives.
Objective	An objective is a general statement of intention relating to a specific output or activity. They are generally longer-term aims and are not necessarily outcomes that managers can control.
Operation	The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials. Operation costs are part of the lifecycle costs of an asset.
Optimised Renewal Decision Making (ORDM)	An optimisation process for considering and prioritising all options to rectify performance failures of assets. The process encompasses NPV analysis and risk assessment.
Performance Measure	A qualitative or quantitative measure of a service or activity used to compare actual performance against a standard or other target. Performance indicators commonly relate to statutory limits, safety, responsiveness, cost, comfort, asset performance, reliability, efficiency, environmental protection and customer satisfaction.

Performance Monitoring	Continuous or periodic quantitative and qualitative assessments of the actual performance compared with specific objectives, targets or standards.
Pipeline Asset Management System (PAMS)	The computerised utilities asset management software system [Infor Public Sector (IPS)]
Planned Maintenance	Planned maintenance activities fall into three categories: <ul style="list-style-type: none"> (a) Periodic - necessary to ensure the reliability or sustain the design life of an asset. (b) Predictive - condition monitoring activities used to predict failure. (c) Preventive - maintenance that can be initiated without routine or continuous checking (e.g. using information contained in maintenance manuals or manufacturer's recommendations) and is not condition-based.
Rehabilitation	Works to rebuild or replace parts or components of an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification. Generally involves repairing the asset using available techniques and standards to deliver its original level of service (i.e. heavy patching of roads, slip-lining of sewer mains, etc.) without resorting to significant upgrading or replacement.
Renewal	Works to upgrade, refurbish, rehabilitate or replace existing facilities with facilities of equivalent capacity or performance capability.
Renewal Accounting	A method of infrastructure asset accounting which recognises that infrastructure assets are maintained at an agreed service level through regular planned maintenance, rehabilitation and renewal programmes contained in an asset management plan. The system as a whole is maintained in perpetuity and, therefore, does not need to be depreciated. The relevant rehabilitation and renewal costs are treated as operational rather than capital expenditure and any loss in service potential is recognised as deferred maintenance.
Repair	Action to restore an item to its previous condition after failure or damage.
Replacement	The complete replacement of an asset that has reached the end of its life, so as to provide a similar, or agreed alternative, level of service.
Risk Management	The application of a formal process to the range of possible values relating to key factors associated with a risk in order to determine the resultant ranges of outcomes and their probability of occurrence.
Routine Maintenance	Day-to-day operational activities to keep the asset operating (replacement of light bulbs, cleaning of drains, repairing leaks, etc.) and which form part of the annual operating budget, including preventative maintenance.
Service Potential	The total future service capacity of an asset. It is normally determined by reference to the operating capacity and economic life of an asset.
Strategic Plan	Strategic planning involves making decisions about the long-term goals and strategies of an organisation. Strategic plans have a strong external focus, cover major portions of the organisation and identify major targets, actions and resource allocations relating to the long-term survival, value and growth of the organisation.

<i>Unplanned Maintenance</i>	Corrective work required in the short-term to restore an asset to working condition so it can continue to deliver the required service or to maintain its level of security and integrity.
<i>Upgrading</i>	The replacement of an asset or addition / replacement of an asset component which materially improves the original service potential of the asset.
<i>Valuation</i>	Estimated asset value which may depend on the purpose for which the valuation is required, i.e. replacement value for determining maintenance levels or market value for lifecycle costing.

12. Appendices

The Appendices for all of Council's Asset Management Plans are kept separate. The list below highlights the appendices that relate to this Asset Management Plan and where to find them in the Corporate Appendices Register.”

Table 12.1 Appendices

	Type	Title
17.01	Water Supply	Climate Change for the Southern Region
17.02	Water Supply	Population Projection
17.03	Water Supply	Consumption Projection
17.04	Water Supply	Detailed Listing of Water Assets
17.05	Water Supply	Current Levels of Service
17.06	Water Supply	Water Asset Risk Analysis
17.07	Water Supply	Asset Lives
17.08	Water Supply	Operation and Maintenance Strategy
17.09	Water Supply	Financial Summary
17.10	Water Supply	IIMM Section 2 Asset Management Maturity Assessment Tool
17.11	Water Supply	Asset Images
17.12	Water Supply	Plant and Equipment Renewal Schedule
17.13	Water Supply	Invercargill City Council: Defining Asset Criticality for Water Services
17.14	Water Supply	Asbestos Cement Water Mains: Renewal Strategy