WAIMAKARIRI
DISTRICT COUNCIL

Activity Management Plan 2021

Water Supply District Overview

3 Waters | July 2021

Prepared by

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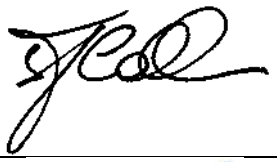
Document Acceptance

Action	Name		Signed	Date
Prepared by	Simon Collin	Infrastructure Strategy Manager		17/02/2021
	Colin Roxburgh	Water Asset Manager		17/02/2021
Reviewed by	Kalley Simpson	3 Waters Manager		17/02/2021
Approved by	Gerard Cleary	Manager Utilities and Roading		17/02/2021
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1 EXECUTIVE SUMMARY

What Assets do we have?

Waimakariri District Council owns and operates 12 separate water supplies, which provide water to approximately 80% of the population, or about 50,000 people. There are a total of about 20,000 connections. Of these 12 supplies, there are two sets of supplies with are physically joined but financially separate. This means that while physically there are 12 supplies, financially there are 14 supplies.

Schemes are either "on demand" (unrestricted), "restricted" (a specific amount of water per day is made available to the customer), or "semi restricted" (connections are allocated 19 m^3 per day which is close to an on demand supply).

The Ashley Rural Water Supply, which supplies water to about 1,530 properties within the WDC boundaries, is owned managed and operated by the Hurunui District Council. This water supply services the Ashley, Sefton and Loburn residential village areas and a number of rural residential lifestyle blocks north of the Ashley River.

Levels of Service

A review of the 2018-2021 AMP Levels of Service (LoS) has been carried out, with modifications made as detailed below:

- 3 minor modifications have been made to the targets for the mandatory performance measures for water supply. These changes have been to improve reporting, and add clarity to the targets.
- 7 elective performance measures have been modified, generally for ease or clarify of reporting.
- 2 new elective performance measures were introduced.

These changes were presented to the Council's Utilities and Roading Committee in July 2020, who recommended that the Council include them within the Draft 2021-31 Long Term Plan (refer to report 200406043184).

Historically, the primary LoS driver has been an ongoing programme of upgrades to achieve compliance with the Drinking-water Standards for New Zealand (DWSNZ). There are measures relating to the bacterial, protozoal, chemical, and radiological compliance of all the Council's public supplies. These projects are now largely complete, with the Garrymere upgrade being completed in 2020, and the Poyntzs Road upgrade due for completion within 2021.

Another key level of service area that will be a focus for Council is to reduce leakage, to achieve its target level of less than 22%.

Uncertainties about future LoS arise from potential legislative changes from the Havelock North Drinking Water Inquiry, The Department of Internal Affairs "Three Waters Review", and other requirements that may result from the new Drinking-water Regulator that is due to come into force from 2021. To prepare for these potentially changes financially, budget provision has been made to install UV treatment on all deep bore water supplies, and chlorination equipment for all supplies not currently chlorinated. The nature of which upgrades are required however is subject to confirmation once new standards and the new regulator is in place.

Asset Condition

Asset condition for the pipework assets has been determined based on detailed analysis of pipe burst data to inform expected lives of all assets, which in turn informs pipe condition rating. In 2020, work was completed by the Council's Network Planning Team to assess burst data collected on Council water mains to determine expected useful life by asset category. This useful life was then converted to a condition rating, based on criteria provided in the IPWEA International Infrastructure Management Manual (IIMM) to assign a condition score to all pipeline assets. This gives a more informed remaining useful life, and proxy condition score, as this is now derived from actual pipe performance data across the district. To verify the assigned asset life and condition score, some individual pipe condition assessments are done on specific samples of AC pipe.

Risk

A range of different types of risk assessments have been carried out for the District's water supply schemes, some of which have been updated for this AMP review. The operational risk assessment has previously generated a programme of work focussed primarily on improving security of supply and meeting the Drinking Water Standards. This work is now largely complete, with the final upgrade due for completion within 2021 (Poyntzs Road).

The vulnerability assessment and criticality assessments provide input data to the renewals programme. The effect of the vulnerability assessment, which only applies to underground pipes, is to accelerate the renewal of old brittle pipework, in areas of high risk of liquefaction.

The Disaster Resilience Assessment considers the risk to above ground assets from a broad range of potential natural disasters.

Growth and Demand

Growth projections have been updated in line with the Statistics New Zealand data. Subsequent modelling has been carried out to identify new works or upgrades that will be required in the future to service this growth while continuing to meet the agreed levels of service. The necessary works have been incorporated into the capital project budgets. It is proposed to manage the inherent uncertainty in rate of growth, by carrying out an annual growth review in conjunction with the Development Planning Unit to enable short term capital planning adjustments to be made that respond to changing market requirements. This will avoid unnecessary expenditure on growth works before they are actually needed, or potentially ensure growth related projects are accelerated as necessary if growth occurs faster than anticipated.

Water source supply for the coastal towns of Kaiapoi, Woodend and Pegasus is from ample and secure artesian aquifers for Kaiapoi, and deep secure sources for Woodend and Pegasus. Kaiapoi source wells are also used to supply Rangiora, via a pressure main from Kaiapoi. Finding additional water to cater for growth for these communities is therefore not seen as a significant issue, although there will be ongoing projects to extend existing well fields.

The regulatory authority to protect both the availability of water and its quality lies with Environment Canterbury (ECan). Council works closely with ECan in protecting the quality of the aquifers that supply water to the majority of the district's inhabitants.

Operation and Maintenance

Council is currently in a transitional phase, moving from predominantly reactive works, to a system in which individual asset performance can be better understood and future costs more accurately forecast.

With improvements to the ability to capture data in the field, and the implementation of a works management system associated with the Asset Management Information System (AMIS), a start is being made towards more robust operation and maintenance planning, including both planned and unplanned works.

Renewals

Prior to the previous (2018-28) Long Term Plan, improvements were made to the Council's risk based renewals model, so that different levels of acceptable risk can be applied to the various categories of criticality. This included the proposal that highly critical assets are renewed before 85% of their expected life, while the lowest criticality assets may not be replaced until 120% of their assigned base life. Based on these risk profiles the model provides a prioritised list of pipe renewals needed across the district, identified by scheme. The model also provides an annual expenditure profile for the next 150 years, and identifies the annual revenue required that will enable this renewals expenditure to be made without the renewals fund falling into debt.

The system described above relies upon an accurate understanding of expected useful life of each asset. As the understanding of useful life has improved through the burst history analysis (described under Asset Condition), the renewals model is now able to better forecast which assets are required to be renewed within a certain time period. This helps ensure the optimum balance is achieved between assets being left in service longer than they should be, leading to unacceptable failure rates, versus assets being replaced prematurely meaning the full value of assets is not realised.

Financial Forecasts

Financial forecasts included within the individual scheme AMPs show projected capital expenditure for growth, level of service, and renewals, together with operational and maintenance expenditure. Any funds carried forward from previous years because capital projects have been delayed (carry-overs) are not included.

Periods shown in the graphs and tables vary, from 30 years for operations and maintenance, through to the full life cycle of long lived assets such as pipelines – 150 years. Forecasts are aggregated up and shown graphically within this overview document. See Section 18.

Future Challenges

The following are the key upcoming challenges relating to water supply that require managing:

- **Changes to Regulation:** In 2021 an updated version of the Drinking-water Standards are expected to be released, and the new drinking-water regulator (Taumata Arowai) is to commence their responsibility taking over from the current Drinking-water Assessors which come under the Ministry of Health. With these changes to standards and regulation, comes some uncertainty. While financial provision has been made for changes to treatment requirements in anticipation of changes, the transition to the new environment is still likely to provide some challenges.

- **Three Waters Reform:** The Government is currently carrying out the Three Waters Review, which was initiated following the Havelock North Drinking-water contamination event and subsequent inquiry. As part of this, reforms to the way water and wastewater are delivered are being proposed. While this brings some opportunities in terms of funding that has been made available to participate in the first stage of the reforms, it also brings some challenges and uncertainty about the future provision of these services, and where this responsibility will ultimately lie.
- **Climate Change:** The potential impacts of climate change and sea level rise to water supplies requires consideration. This is being considered both in terms of potential impacts of sea level rise to coastal assets and infrastructure, but also in terms of the availability of groundwater which may be affected by changing rainfall patterns. There are some key reports regarding that have been produced anticipating the impact of climate change to coastal areas which can be referenced to anticipate the impact on assets, and the Council will continue to work closely with Environment Canterbury regarding the allocation of groundwater to ensure there is adequate resource available going forward.

2 INTRODUCTION

The purpose of the Water Supply Activity Management Plan (AMP) is to provide a summary of the Council's water supply assets, outline the issues associated with these assets and show how the Council proposes to manage them in the future, so as to continue to supply agreed levels of service, or to demonstrate how levels of service that are not currently met with be achieved going forward.

The overview also describes the processes and asset management practices common to all of the water supply schemes. There is an introductory chapter that provides an overview of the activities and asset management practices and processes, which should be read in conjunction with the other documents.

The Water Supply AMPs consists of 12 scheme specific plans, while this Overview document provides a district wide view of the water supply activity. It is noted that some schemes which were historically separate schemes have been joined physically, but are still rated separately. This means there are 12 physical schemes but 14 financial schemes.

The 12 Council operated public water supply schemes service a total of approximately 20,000 connections. This equates to around 50,000 people, which is about 80% of the population of the Waimakariri District. The remaining 20% of the population are supplied by either the Hurunui District Council as part of the Ashley Rural Water Supply (approximately 3,800 people) or private schemes and wells in the district.

Schemes are either "on demand" (unrestricted), "restricted" (a specific amount of water per day is made available to the customer), or a small number of properties within certain schemes are "semi restricted" (connections are allocated a flow equivalent to 19 m^3 per day which is similar to an on demand supply)

The Ashley Rural Water Supply is owned, managed and operated by the Hurunui District Council. This water supply services the Ashley, Sefton and Loburn residential village areas and a number of rural residential lifestyle blocks north of the Ashley River. As this supply is managed by the Hurunui District Council, it is not covered by this document.

Document Structure and Improvement Plan

The assessments carried out as part of the asset management review process are intended to identify issues that need to be addressed. Resolution may include new capital works, or adjusted management or process practices. A summary is provided within this document, but generally capital projects to improve levels of service deficiencies are identified in the individual AMPs. Most asset management process improvements and many investigations will be district wide, and are therefore identified in this document. All of these improvements are collated in Table 23: 2021 AMP Improvement Plan.

Document Review Process

Review of the AMPs has been carried out by a project team comprising the 3 Waters Manager, the Infrastructure Strategy Manager, the relevant Asset Managers (Water, Wastewater), and the Network Planning Team Leader, with additional technical input from the Network Planning Team. Project Management has been led by the Water Supply Asset Manager.

The project team met fortnightly, and progress was tracked against a detailed programme that set out the review actions necessary for each section of the document

Internal advice was sought from the Council's Development Planning Team for growth projections, and liaison with the Asset Information Management team occurred during the update of the valuations. Asset Managers worked closely with the Finance department during development of the budgets.

Information regarding progress and requirements for the LTP development was provided via the LTP Project Manager.

Draft versions of the documents were presented to the Utilities and Roading Committee at the end of 2020, with an updated version presented to Council in late January for adoption. Any changes in the AMPs resulting from modifications to the LTP, are incorporated in the final version published on the Council's webpages after adoption of the 2021-2031 LTP.

Financial Forecasts

Financial forecasts and future budgets are included within each individual AMP. The financial forecasts shown in the AMPs exclude inflation and any carry-forwards between the 2020/21 and 2021/22 financial years.

District Overview – Key Projects

Over the last 10 years, the key focus for water supply schemes has been upgrading schemes to comply with the Drinking-water Standards for New Zealand (DWSNZ). These projects have now been completed, with the final upgrade (Poyntzs Road) programmed to be completed approximately at the time this document is published (programmed completion date June 2021).

With projects completed to achieve compliance with the current DWSNZ, the focus in the coming years is on the following key areas:

- Projects to achieve compliance with anticipated future standards which are expected to be released once the new drinking-water regulator (Taumata Arowai) comes into effect. It is anticipated that under the new standards, the secure classification section will be removed, and therefore that all water will require treatment for both bacteria and protozoa. In anticipation of this projects to install ultra-violet (UV) disinfection have been programmed on all schemes that do not currently have treatment for protozoa.
- Projects to improve the resilience and allow for growth, where there is not adequate redundancy in terms of source capacity or storage, or where growth is anticipated.
- Renewals projects to continue to renew assets as they deteriorate.

There are annual budgets for the renewal projects to keep up with requirements, which are relatively consistent from year to year. Key projects that fall into one of the first two categories include:

Table 1: District Overview – Key Projects

Scheme/s	Project	Reason	Timeframe
Rangiora	UV Treatment Installation	Provide treatment to currently untreated water supplies, in anticipation of changes to requirements in the DWSNZ	2022/23
Kaiapoi			
Oxford Urban – Rural No.2			
Cust			
Woodend-Pegasus			
Waikuku Beach Campground		Provide treatment to backup source to improve resilience of scheme, and reduce the risk of outages.	2021/22
Ohoka		Provide treatment to supplies which are chlorinated only (no protozoal treatment), in anticipation of changes to requirements in the DWSNZ	2023/24 – 2024/25
West Eyreton			
Oxford Rural No.1			
Oxford Urban – Rural No.2	New Reservoirs	To renew aging infrastructure, and accommodate future growth	2025/26
Oxford Urban – Rural No.2	New Well	To provide sufficient levels of redundancy, and allow for growth	2022/23 – 2023/24
Mandeville - Fernside	New Well	To provide sufficient levels of redundancy, and allow for growth	2023/24 – 2024/25
Oxford Rural No.1	New Well	To provide sufficient levels of redundancy	2024/25 - 2025/26
Mandeville - Fernside	New Reservoir	To provide sufficient levels of redundancy, and allow for growth	2021/22
Kaiapoi	New Well	To provide sufficient levels of redundancy, and allow for growth	2022/23 – 2023/24
Rangiora	New Reservoir	To allow for growth	2026/27
Rangiora	New Source	To provide sufficient levels of redundancy, and allow for growth	2022/23 – 2023/24

As noted previously, the UV projects are in anticipation of changes to Drinking-water Standards. There is therefore the potential for these projects to either be modified in scope, or in timing, once new standards are released.

All projects driven by growth are subject to growth occurring at the expected frequencies determined by population forecasts. The timing of these projects may be adjusted through future Annual Plans or Long Term Plans as actual growth rates are compared to current forecasts.

3 SCHEME DESCRIPTION (WHAT DO WE HAVE?)

Table 2 outlines, for each Council managed water supply scheme, total connection numbers as of June 2020, scheme type (on-demand, restricted or semi-restricted), security of the source, and primary treatment methods.

In the cases where two schemes have been joined, but they are still treated as separate schemes financially, these have been split into a main scheme and a sub-scheme.

Table 2: District Overview – Scheme Summary Information

Main Scheme	Sub-Scheme	Level of Service	Connections	Security of Source / Treatment
Rangiora	NA	On-Demand	7,796	Secure groundwater
Kaiapoi	NA	On-Demand	5,487	Secure groundwater
Woodend-Pegasus	NA	On-Demand	3,186	Secure groundwater, chlorine disinfection for Pegasus only.
Oxford Urban – Rural No.2	Oxford Urban	On-Demand	938	Secure groundwater
	Rural No.2	Restricted	343	Secure groundwater with chlorine treatment
Waikuku Beach	NA	On-Demand	467	Non-secure groundwater with UV disinfection
Cust	NA	On-Demand	143	Secure groundwater
Mandeville - Fernside	NA	Restricted	968	Non-secure groundwater with UV disinfection, chlorine disinfection and pH correction.
Oxford Rural No. 1	NA	Restricted	346	Secure groundwater with chlorine treatment
West Eyreton - Summerhill	West Eyreton	Restricted	74	Secure groundwater with chlorine treatment
	Summerhill		186	
Poyntzs Road	NA	Restricted with some Semi- Restricted	88	Previously shallow source with chlorine disinfection, but expected to have been connected to West Eyreton / Summerhill by June 2021
Ohoka	NA	Semi-Restricted with some Restricted	121	Secure groundwater with chlorine treatment
Garrymere	NA	Restricted with some Semi- Restricted	43	Non-secure groundwater with filtration, UV disinfection, chlorine treatment and pH correction.
Total			**20,187**	

Table 3 Water Supply Pipe Data Summary

Water Supply pipe length (m) by diameter and pipe material											
Pipe Material	**Pipe Diameter (mm)**										
	< 50	**50**	**100**	**150**	**200**	**250**	**300**	**375**	**450**	**> 500**	**Total**
Asbestos Cement	11m	4,565m	37,729m	24,328m	10,896m	1,682m	477m	871m	2,835m	0m	83,393m
PE	19,013m	316,581m	18,799m	6,728m	101m	9,974m	5,788m	1,784m	1,143m	0m	379,911m
PVC	66,394m	123,169m	139,317m	86,981m	26,127m	5,755m	8,766m	4,856m	7m	8,613m	469,986m
Steel	29m	142m	33m	57m	53m	0m	0m	0m	22m	123m	461m
Other	17m	691m	0m	26m	686m	2m	4m	0m	0m	0m	1,426m
Total	**85,465m**	**445,148m**	**195,878m**	**118,120m**	**37,863m**	**17,412m**	**15,035m**	**7,510m**	**4,008m**	**8,736m**	**935,176m**

Table 4 Water Supply Valve Data Summary

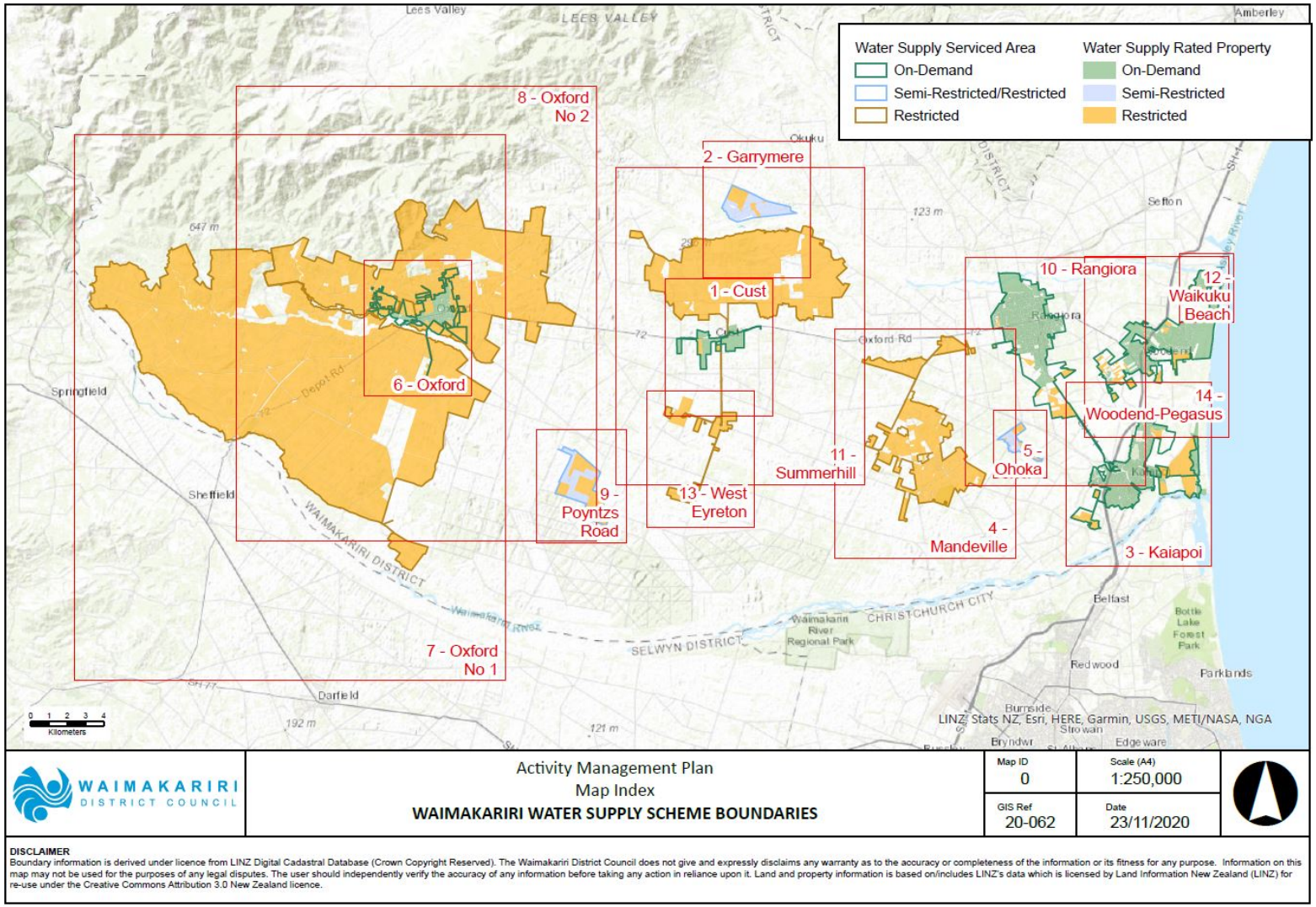
Water Valves	
Diameter (mm)	**Count**
< 50	547
50	2,865
100	1,250
150	730
200	254
250	73
300	77
350	2
375	26
400	3
450	3
500	4
Total Valves	**5,834**
Fire Hydrants	**2,130**

Scheme Statistics

The scheme description section of each scheme AMP includes a Scheme Statistics table current for the end of 2019/20 financial year, which provides a summary of the scheme statistics. It includes a Data Source column outlining the source of information for each reported item. A Data Reference table has also been included which lists the technical reports and file reference numbers outlining the data sources used to compile each AMP document.

More comprehensive flow data records for each water supply AMP are attached to each scheme appendix. More up to date scheme statistics are available on document TRIM 121108078783 which is updated approximately quarterly. For the purposes of detailed design, scheme statistics are interpreted in consultation with the Council Network Planning Team.

Figure 1: District Map of Water Supply



4 LEVELS OF SERVICE

Levels of Service (LoS) are a measure of the standard of service being provided. The target levels of service are a significant factor in determining the size, capacity and cost of operating each scheme.

There is a hierarchy to the water supply LoS. Some are measured at district wide level, some at scheme level, and some differ depending on the type of water supply. The way that LoS measures are assigned, measured, and reported is summarised below, and explained in more detail in the following paragraphs.

Table 5: Summary of Performance Measure Types, and Reporting

	Mandatory Performance Measures	Elective Performance Measures
Set By:	These measures are set by the Department of Internal Affairs (DIA), but the targets set by individual local authorities.	These measures are set by individual local authorities.
Reporting:	Long Term Plan and Annual Report	Individual scheme Activity Management Plans Annual report to Council (future improvement). Some measures are also included within the Long Term Plan and Annual Report.

Mandatory Performance Measures

In 2010, the Local Government Act 2002 was amended to include new rules specifying non-financial performance measures for local authorities. The measures are intended to help members of the public compare the level of service provided by different councils at District or City level. The Council is required to incorporate the performance measures into their long-term plans and report against them in their annual reports. These measures, prescribed in accordance with Section 261B of the Local Government Act 2002, are now included within the Council's Long Term Plan and outlined in Table 6 of this overview document, for reference.

Mandatory performance measures are measured at the district wide level and therefore are not included in the individual water supply scheme AMPs, but rather are reported in the Council's Long Term Plan, and Annual Report.

Table 6 shows the Council's performance measures for the water supply activity that are published in the 2021-31 Long Term Plan. These include the mandatory performance measures prescribed under Section 261B of the Local Government Act 2002, for water supplies, shown in italics. Reporting of these measures was required for the first time for the 2015/16 year, and they are reported to Council on a quarterly basis.

Elective Levels of Service

The mandatory measures do not replace the scheme specific elective LoS reported in the AMPs and used by the Council to monitor and manage the performance of individual water supply schemes.

The LoS detailed in each scheme AMP are motivated by either legislative requirements (for example, compliance with resource consent conditions) or by established best practice (for example, provide a minimum water pressure of 250kPa at the boundary for urban supplies). These are categorised as technical levels of service, and they are to be reported to Council on an annual basis. They have been developed over time, and are guided by a number of factors, including:

- Customer Expectations
- Affordability
- Council Community Outcomes (strategic goals and objectives)
- Legislative Requirements

Primary customers are households or businesses that are connected to Council water supply schemes, with key stakeholders being Community Boards and Councillors, and the Regional Council.

Community Engagement

The level of service component of the Activity Management Plans were consulted upon comprehensively as part of the 2005 review. While a comprehensive public review has not been carried out since then, levels of service are tested with the public in a number of ways:

- For general feedback the principle method of communicating proposed LoS to customers is via the LTP process. As noted, mandatory performance measures form part of the LTP documentation that goes out for public consultation, during preparation for the LTP.
- The Council's water supply AMPs, which are updated concurrently with preparation for the LTP, are made available on Council's website, which allows a channel for feedback from customers who may be interested.
- More specific consultation is carried out when significant changes in the LoS are proposed. For example upgrades have recently been undertaken for a number of water supplies, driven primarily by the need to meet the Drinking Water Standards for New Zealand. Where there have been options available to meet this requirement, with different costs and risks associated with each option, a specific detailed engagement programme is carried out to seek the views of those affected. Recent examples of these consultative exercises include the Garrymere, Poyntzs Road, and Cust upgrade projects.
- The general satisfaction of customers with the level of service being received is gauged through tracking of complaints through the service request system, as well as through the Council's customer satisfaction survey. Changes to this survey have been made so that information is now available on a per scheme basis. Trends in complaints are available through the Council's BI reporting system, allowing easy analysis for trends both at a district level and a scheme level. Where upgrades to schemes have been completed, the positive impacts can be seen to flow through to complaint levels, which provides a useful measure of success of projects (for example discolouration complaints reduced following upgrades on the Oxford Rural No.1 and Woodend schemes).

Changes to LoS for 2020

A review of levels of service was carried out in 2017 to check that the scheme specific performance measure definitions were still relevant. In 2020 a subsequent review was completed, to further refine these measures.

As a result of the 2020 review, the following changes were made to the elective performance measures:

- 7 measures were either clarified or modified, generally for ease or clarity of reporting;
- 2 new measures were introduced;
- No measure was removed.

Table 6 summarises the adopted set of performance measures, including changes between the 2018 and 2021 AMPs, and provides an explanation for the changes. Refer to Council report 200406043184 for background to these changes.

The LoS section in each scheme specific AMP contains a table that summarises the improvements required to ensure that all performance measure targets can be achieved in the future. The table lists the response type and improvement project details for tracking.

Table 6: Elective Performance Measures for Water Supply for 2021 relative to 2018

Level of Service	Performance Measure (2018)	Performance Measure (2021)	Target	Type of Change / Reason	Community Outcome that this LoS Contributes to
Consent Breach – Action Required	Number breaches of consent conditions that result in an Ecan report that identifies compliance issues.	Percentage of the total number of WS consent conditions that have breaches that result in an Ecan report identifying compliance issues that require action.	~~Nil~~ 0%	Change Type: Clarification Reason: Clarified that this is measuring only breaches that require actions, and also modified the measure to give more context to the level of breaches.	***There is a healthy and sustainable environment for all***
Customers % Satisfied	Percentage of respondents to a three-yearly community survey that have an opinion, that rates the service as "Satisfactory" or "Very Satisfactory"	Percentage of respondents to a three-yearly community survey that have an opinion, that rates the service as "Satisfactory" or "Very Satisfactory"	> 90%	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
DWSNZ - Aesthetic Compliance	Water supply delivers water that complies to a standard suitable for compliance with the aesthetic requirements of DWSNZ	Water is supplied that is within the guideline range in the DWSNZ for aesthetic parameters, with the exception of pH.	~~Complies~~ 95% of samples comply	Change Type: Modification Reason: These measures are aesthetic only, and not required for health reasons. On some schemes, it is not cost effective to comply all the time for an aesthetic parameter, hence exceptions were introduced.	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
DWSNZ – E. Coli Presence	Number of instances where the presence of E coli was detected at the headworks	Number of instances where the presence of E coli was detected at the headworks or within the reticulation	Nil / year	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***

Level of Service	Performance Measure (2018)	Performance Measure (2021)	Target	Type of Change / Reason	Community Outcome that this LoS Contributes to
	or within the reticulation				
DWSNZ - Protozoa Compliance	Water supply delivers water that achieves a standard suitable for compliance with the health requirements of DWSNZ	Water supply delivers water that achieves a standard suitable for compliance with the protozoal requirements of DWSNZ	Complies	Change Type: Clarification Reason: Clarified measure to refer to protozoal compliance (for clarity).	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
DWSNZ - Radiological Compliance	NA (new measure, did not exist in 2018).	Water supply delivers water that achieves a standard suitable for compliance with the radiological requirements of DWSNZ	Complies	Change Type: New Measure Reason: Radiological compliance is required under the DWSNZ, in the same way protozoal compliance is, so this should be measured in the same way.	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
DWSNZ - Chemical Compliance	NA (new measure, did not exist in 2018).	Water supply delivers water that achieves a standard suitable for compliance with the chemical requirements of DWSNZ	Complies	Change Type: New Measure Reason: Chemical compliance is required under the DWSNZ, in the same way protozoal compliance is, so this should be measured in the same way.	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
~~DWSNZ - Sampling Non-compliance~~ DWSNZ - Bacterial Compliance	Number of instances where sampling programme did not comply with DWSNZ, as demonstrated by Water Information NZ (WINZ) database	Water supply delivers water that achieves a standard suitable for compliance with the bacterial requirements of DWSNZ	Complies	Change Type: Clarification Reason: Removed reference to obsolete WINZ database. Clarified measure as samples are taken in order to achieve bacterial compliance, so simpler just to report on overall bacterial compliance.	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Fire CoP – System Flow - Urban	Percentage of properties within a Fire District serviced by a reticulated system that complies with the Fire Service	Percentage of properties within a Fire District serviced by a reticulated system that complies with the Fire Service Code of Practice for flow from system	95%	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***

Level of Service	Performance Measure (2018)	Performance Measure (2021)	Target	Type of Change / Reason	Community Outcome that this LoS Contributes to
	Code of Practice for flow from system				
Fire CoP - Hydrant Placement - Urban	Percentage of properties within a Fire District serviced by a reticulated system that complies with the Fire Service Code of Practice for placement of hydrants	Percentage of properties within a Fire District serviced by a reticulated system that complies with the Fire Service Code of Practice for placement of hydrants	100%	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Flow - Allocated Units	Water flow at the point of supply in Restricted or Semi Restricted schemes, excluding outages, as demonstrated by programmed restrictor audits, that tests restrictors at not less than 5 yearly intervals.	Percentage of properties where flow received is consistent with allocated units at the point of supply in Restricted or Semi Restricted schemes, (excluding outages) as demonstrated by restrictor checks completed at not more than 5 yearly intervals	100% of restrictors tested at no more than 5 yearly intervals	Change Type: Clarification Reason: Clarified what is meant to be achieved with the restrictor checks at property boundaries, and what can be reported on.	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
~~Losses – Restricted / Losses On Demand~~ Losses	Water losses as determined by flow monitoring for Restricted water supply schemes / Water losses as determined by measured or calculated minimum flow for On Demand schemes	Water losses as determined by the Infrastructure Leakage Index (ILI) based on an annual assessment	~~< 240L/conn/day~~ Scheme shall either: a) achieve an ILI of "A" or "B", OR; b) For schemes with an ILI of "C" or "D" , an economic assessment shall be carried out to determine the value in further leak detection work	Change Type: Modification (two measures combined) Reason: Used to be separated into measures for restricted and on-demand, but measure is the same, so no reason to have separate categories. Changed to ILI as the performance measure, as per report to Council 190130010451.	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Outages - Events >8 hours	Number of events that cause water not to be available	Number of events that cause water not to be available to any	Nil / year	No change	***Core utility services are sustainable, resilient, affordable,***

Level of Service	Performance Measure (2018)	Performance Measure (2021)	Target	Type of Change / Reason	Community Outcome that this LoS Contributes to
	to any connection for >8 hours	connection for >8 hours			***and provided in a timely manner***
Scheme Capacity - On Demand	Actual peak capacity of the scheme for domestic use - On Demand	Actual peak capacity of the scheme for domestic use - On Demand	>2500 litres/connection/day	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Scheme Capacity - Restricted	Actual peak capacity of the scheme for domestic use - Restricted	Actual peak capacity of the scheme for domestic use - Restricted	>1150 litres/allocated unit/ day	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Pressure - Boundary - Restricted	Water pressure at the point of supply of Restricted connections, excluding outages, as demonstrated by a reticulation model or reactive audits.	Water pressure at the point of supply of Restricted connections, excluding outages, as demonstrated by a reticulation model or reactive audits.	>150kPa for all connections ~~100% of the time~~ at peak demand	Change Type: Modification Reason: Changed performance measure to be 'at peak demand' as this is the critical time. 100% of the time is not an appropriate measure if there are outages from time to time.	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Pressure - Point of Supply - On Demand	Water pressure at the point of supply in On Demand and Semi-Restricted schemes, excluding outages, as demonstrated by a reticulation model or audits.	Water pressure at the point of supply in On Demand and Semi-Restricted schemes, excluding outages, as demonstrated by a reticulation model or audits.	>250kPa for all connections at peak demand >300kPa for 99% of connections at peak demand	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Storage - On Demand	Volume of available and usable storage for On Demand and Semi-Restricted schemes meets the calculated scheme specific value	Volume of available and usable storage for On Demand and Semi-Restricted schemes meets the calculated scheme specific value	Target calculated on scheme by scheme basis, depending on resiliency and redundancy of source infrastructure	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***
Usage - Average Day	Actual usage on average day	Actual usage on average day	Maintain the average daily water use below 100% of the	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***

Level of Service	Performance Measure (2018)	Performance Measure (2021)	Target	Type of Change / Reason	Community Outcome that this LoS Contributes to
			assessed reasonable water use		
Usage - Peak Day	Actual usage on Peak Day	Actual usage on Peak Day	Reduce the peak daily usage to below 110% of the assessed reasonable water use	No change	***Core utility services are sustainable, resilient, affordable, and provided in a timely manner***

Mandatory Performance Measures

For the mandatory performance measures, the element that is measured cannot be changed (as this is mandatory), however the targets can be changed. The following table summarises the full set of mandatory performance measures, and notes the changes that were made to the targets as part of the 2020 review. As for the elective measures these changes were approved by the Council's Utilities and Roading Committee for inclusion in the Draft Long Term Plan (report 200406043184), before ultimately being approved by Council.

Table 7: Water Supply Mandatory Performance Measures for 2021 relative to 2018

Level of Service	Performance Measure	2018 Target	2021 Target	Reason for Change
Safety of Drinking Water All public water supplies comply with the Drinking Water Standards of New Zealand	The extent to which drinking water complies with the drinking water standards for : a) Bacterial compliance b) Protozoal compliance	a) Fully compliant b) Fully compliant	a) 100% compliant b) 100% compliant (Measured across all supplies combined)	**Improving Reporting:** Percentage compliant allows progress to be tracked, while a fully compliant / not compliant measure does not reflect where progress is being made towards becoming fully compliant
Maintenance of the Reticulation Network All public supplies are actively maintained to minimise the loss of water leakage	The percentage of real water loss from the networked reticulation system	Less than 22% (based on 240 l/connection /day)	Less than 22%	**Providing Clarity:** The reference to 240 L/connection/day was an outdated assumption, so removed.
Fault Response Times All public water supplies are actively maintained to minimise the outage of water	The median response times to attend a call-out in response to a fault or unplanned interruption to the network reticulation system:			No change
	a) Attendance for urgent call-outs: from the time that the local authority receives notification to	less than 60 minutes	less than 60 minutes	

Level of Service	Performance Measure	2018 Target	2021 Target	Reason for Change
	the time that the service personnel reach the site, and			
	b) Resolution of urgent call outs : from the time that the local authority receives notification to the time that the service personnel confirm resolution of the fault or interruption, and	less than 480 minutes	less than 480 minutes	
	c) Attendance for non-urgent call-outs: from the time that the local authority receives notification to the time that the service personnel reach the site, and	Less than 2160 minutes (36 hours)	Less than 2160 minutes (36 hours)	
	d) Resolution of non-urgent call outs : from the time that the local authority receives notification to the time that the service personnel confirm resolution of the fault or interruption.	Less than 2880 minutes (48 hours)	Less than 2880 minutes (48 hours)	
Customer satisfaction All public water supplies are managed to an appropriate quality of service	The total number of complaints received by the local authority about any of the following : (a) drinking water clarity (b) drinking water taste (c) drinking water odour (d) drinking water pressure or flow (e) continuity of supply, and (f)Council's response to any of these issues Expressed per 1000 connections to the networked reticulation system	Less than 5 complaints	Aggregate of a) to f) to be < 5 per 1000 connections	**Providing Clarity:** There was a lack of clarity previously, with individual measures given a target of <5, but also the aggregate being less than 5. These individual measures will still be reported separately, however only the aggregate will be assessed as the target.
All public water supplies are managed to ensure demand does not outstrip capacity	The average consumption of drinking water per day per resident within the district.	Less than 450 L/person/day	Less than 450 L/person/day	No change

District Overview: 2019/2020 Levels of Service Performance

Table 8 shows the recent levels of service achievement for those measures that are assessed at the district level. Measures shown are all the mandatory ones, and two non-mandatory. Scheme AMPs can be referred to for the elective LoS and performance results for the individual schemes. The target shown is the target from the AMP's associated with the 2018-28 LTP. Community outcomes shown are also from the 2018-28 LTP.

Table 8: District Overview - Levels of Service Performance Measured at District Level for 2019/20

Performance Measure	Target	Target met 2019/20	Commentary	Action to Address	Community Outcome that this LOS contributes to
The extent to which drinking water complies with the drinking water standards for: a) Bacterial compliance b) Protozoal compliance	a) Fully compliant b) Fully compliant	a) No b) No	All schemes achieved bacterial compliance, with the exception of Mandeville where a programmed sample was not taken, leading to a non-compliance. Protozoal complaince achieved on all schemes except Garrymere, Mandeville and Poyntzs Road.	Upgrade has been completed at Garrymere, so will be compliant from 20/21 onwards. Poyntzs Road has an upgrade project underway, for completion in 21/22. Mandeville was required to use backup source for one day, which did not have protozoal treatment. Second primary well will mean this is not required in future.	***There is a safe environment for all***
The percentage of real water loss from the networked reticulation system	Less than 22% (based on 240 l/connection /day)	No	District wide leakage levels were assessed at 25% of total water used.	Investigation into pressure management in Rangiora proposed. Better understanding of leakage on restricted schemes being investigated, as these results are thought to be over-estimated using night flow method.	***Core utility services are provided in a timely and sustainable manner***

Performance Measure	Target	Target met 2019/20	Commentary	Action to Address	Community Outcome that this LOS contributes to
The median response times to attend a call-out in response to a fault or unplanned interruption to the network reticulation system:					
a) Attendance for urgent call-outs: from the time that the local authority receives notification to the time that the service personnel reach the site, and	less than 60 minutes	Yes	For 2019/20 there was a median attendance time for urgent water call-outs of 14 minutes	NA	
b) Resolution of urgent call outs : from the time that the local authority receives notification to the time that the service personnel confirm resolution of the fault or interruption, and	less than 480 minutes	Yes	For 2019/20 there was a median resolution time for urgent water call-outs of 106 minutes	NA	
c) Attendance for non-urgent call-outs: from the time that the local authority receives notification to the time that the service personnel reach the site, and	Less than 2160 minutes (36 hours)	Yes	For 2019/20 there was a median response time for non-urgent water call-outs of 22 hours.	NA	
d) Resolution of non-urgent call outs : from the time that the local authority receives notification to the time that the service personnel confirm resolution of the fault or interruption.	Less than 2880 minutes (48 hours)	Yes	For 2019/20 there was a median resolution time for non-urgent water call-outs of 26 hours.	NA	
The total number of complaints received by the local authority about any of the following: *a) drinking water clarity* *b) drinking water taste* *c) drinking water odour* *d) drinking water pressure or flow* *e) continuity of supply, and* *f) Council's response to any of these issues* *Expressed per 1000 connections to the networked reticulation system*	Less than 5 complaints	Yes	Actual results per 1000 connections were: a) 0.50 b) 0.55 c) 0.2 d) 1.2 e) 0.35 f) 0 Aggregate = 2.8	NA	***There is a healthy and sustainable environment for all***

Performance Measure	Target	Target met 2019/20	Commentary	Action to Address	Community Outcome that this LOS contributes to
The average consumption of drinking water based on litres per day per person within the District.	Less than 450 L/person/day	Yes	434	NA	
Percentage of respondents to a three-yearly community survey that have an opinion, that rates the service as "Satisfactory" or "Very Satisfactory"	>90%	Yes	90% of respondants from the 2019 survey indicated that they were either Very Satisfied (43.8%), or Satisfied (46.2%).	NA	***Core utility services are provided in a timely and sustainable manner***
Number of events that cause water not to be available to any connection for >8 hours	Nil / yr	No	There was one event in Rangiora where there was a large main burst, which caused water to not be available to a single business for more than 8 hours. As the event was overnight, the business had no need for this water for the majority of time that the water wasn't available.	Review of processes for repairing larger diameter and more complex mains at night to speed up repair process.	

Benchmarking

A number of the performance measures above are collated and reported nationally, and therefore can be benchmarked against other service providers to compare performance. At the time this document was being prepared, data for the 2019/20 version of the National Performance Review was still being collated, however comparisons can be undertaken against the 2018/19 report (https://12240-console.memberconnex.com/Attachment?Action=Download&Attachment_id=4271).

An example of one performance measure where comparisons are made is the number of complaints per 1000 properties served.

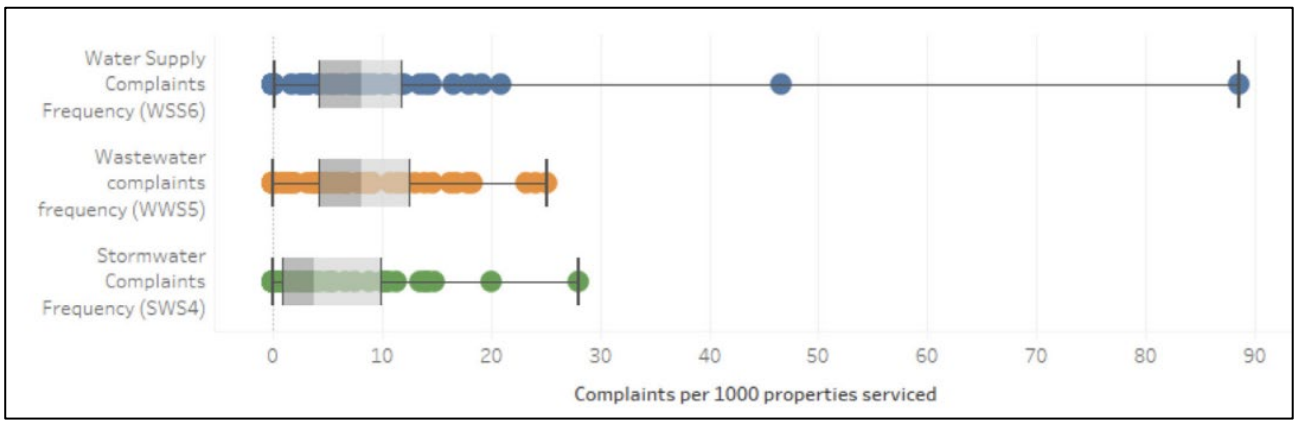


Figure 2: Water NZ National Performance Review 2018-19 Number of Complaints per 1000 properties Serviced

In this particular measure, Council's complaint rate for water supply of 2.8 per 1000 properties serviced compares favourably with the national median value of 8.0.

Another measure to compare against national benchmarks is around water losses. In terms of percentage of water loss, it can be seen in the 2018/19 National Performance Review that total losses reported by participants represented 18% of total water supplied.

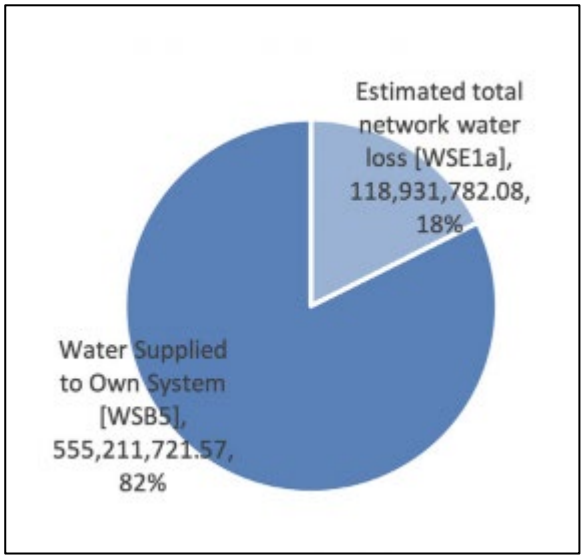


Figure 3: Extract from 2018-19 National Performance Review representing Total Water Loss as a Percent of Water Supplied

By comparison, Council achieved 25% for this measure. As noted above, actions are identified through Council's Water Conservation Strategy to improve performance against this measure.

In order to provide a comprehensive comparison against national data, as well as participating in the 2019/20 National Performance Review, Council has signed up to receive a customised report. This report will outline how Council's performance compares against other service providers.

Scheme differences

As well as assessing the performance measures included within the Overview AMP at a district level, there are a number of related measures assessed at scheme level. This allows for a comparison between schemes to highlight areas where improvements are required. For example, in terms of the leakage performance measure, while this is not met at a district level, there are also related perforamnce measures at scheme level (i..e leakage in terms of litres per connection per day is a performance measure at scheme level). By addressing the relevant schemes where the scheme specific performance measures are not met, improvements will flow up into the district measure.

Another example where scheme specific improvements flow up to district level measures is around DWSNZ compliance. At each scheme, performance is assessed in terms of bacterial and protozoal compliance with the DWSNZ. There is then a district wide performance measure that all schemes achieve compliance. So, in this case, by addressing non-performances at scheme level, district wide performance measures will also be achieved.

5 ASSET CONDITION

The asset condition for the reticulation has been determined based on criteria set out in the International Infrastructure Management Manual (IIMM), published by the Institute of Public Works Engineering Australasia (IPWEA), combined with updated calculations of base lives for the pipeline asset types.

The IIMM sets out criteria for converting remaining useful life as a percentage to a Condition Grade from 1 (Very Poor) to 5 (Very Good). This is a relatively simple conversion. However the determination of the base lives, which in turn gives remaining useful life, is a more complex process.

Base Life Calculation for Pressure Pipe Assets

A significant body of work has been completed in 2020 by the Council's Network Planning Team to better understand expected reticulation asset lives, to inform the asset condition calculation. This work has provided a more complete understanding of the performance of various asset types, and also sets up a correlation between failure rates and expected lives. This will ensure that decisions on pipework replacements are optimised, with assets not left in service longer than intended, or not replaced prematurely when they still have a large degree of remaining useful life.

The work undertaken to achieve the outputs described above, is detailed below:

- Review of failure rates (pipe bursts) by asset type across all WDC water supply pipe assets. Pipe failure data has been analysed from 2007 to 2019.
- Incorporation of mechanism of failure, but excluding failures not related to asset condition (i.e. third party damage).
- Introduction of a greater number of bands of asset type, based not only on material type, but allowing for differing performance within a particular material. For example asbestos cement pipes differentiated by diameter, and plastic pipes differentiated by the generation of plastic used.
- Each asset type category was then analysed for accumulated failures over a period of time, and matched to an exponential curve to plot past performance and expected future performance for each of the asset categories selected.
- A rate of 7 failures of pipe per km of main accumulated over the asset life was deemed to represent the end of life of an asset. A sensitivity analysis was carried out on adjusting this failure rate, and 7 failures of pipe per km of main was found to achieve a practical balance between cost and level of service.
- Verification of the model results was completed by comparing the asset lives generated by the model with typical asset lives provided from a combination of sources, including:
    - Previous valuation data;
    - Water New Zealand National Asbestos Cement Pressure Pipe Manual (the AC Pipe Manual)
- The benefits of the new process are that it provides a more accurate estimate of pipe performance by taking into account actual performance of each asset group across the district, as well as referencing a more broad range of reference material (including the AC Pipe Manual). This is more accurate compared to the previous asset base lives which were based off more broadly defined 'text book' values, which had not been calibrated against the performance of assets within the district.

This process generated the following expected asset lives, for the asset types analysed:

Table 9: Adopted Reticulation Asset Base Lives for Pressure Pipes

Pipe Category and Definition	Calculated Asset Life (years)
PVC Modern (PVC pipe installed post 1997)	100
PVC Old (PVC pipe installed prior to 1997)	60
PE Modern (PE pipe installed post 1990)	100
PE Old (PE pipe installed prior to 1990).	35
AC Small (AC pipe with diameter < 100mm)	55
AC Medium (AC pipe with diameter 100mm to 150mm)	60
AC Large (AC pipe with diameter >= 200mm)	90

Asset Condition Calculation

With the asset base lives calculated as per the process described above, and the condition defined as a function of remaining useful life, the remaining data required to calculate the condition of each asset is the year of installation of the asset. This information is held for each asset within the Council's TechOne asset database. Thus, through a combination of expected asset life, year of installation, remaining useful life of asset, the condition grade for each asset is able to be assigned.

The results of this analysis are presented in Figure 3 and Table 9 below. It is noted that "Headworks" is inclusive of all above ground assets associated with the water supply scheme (e.g. reservoirs, buildings, pump sets). "Reticulation" covers the remainder of the assets, which are typically below ground pipework related assets.

Figure 4: Asset Condition Summary

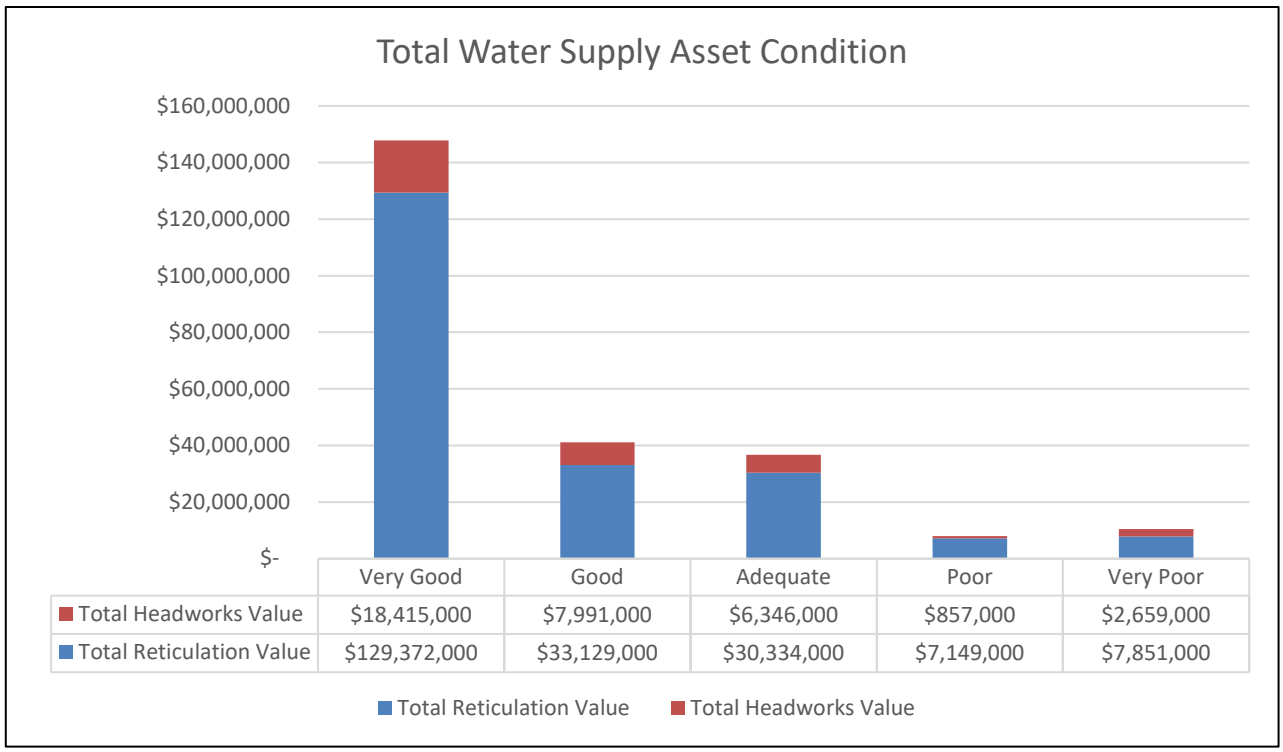


Table 10: Pipe Condition Summary

Condition Grade	Definition	Pipeline Quantity	Total Reticulation Value	Total Headworks Value	Total Value
1	Very Good *More than 80% of life remaining*	553.3 km *58%*	$ 129,372,000 *62%*	$ 18,415,000 *51%*	$ 147,787,000 *61%*
2	Good *Between 50% and 80% of life remaining*	143.4 km *15%*	$ 33,129,000 *16%*	$ 7,991,000 *22%*	$ 41,120,000 *17%*
3	Adequate *Between 20% and 50% of life remaining*	191.6 km *20%*	$ 30,334,000 *15%*	$ 6,346,000 *17%*	$ 36,680,000 *15%*
4	Poor *Between 10% and 20% of life remaining*	22.9 km *2%*	$ 7,149,000 *3%*	$ 857,000 *2%*	$ 8,006,000 *3%*
5	Very Poor *Less than 10% of life remaining*	35.5 km *4%*	$ 7,851,000 *4%*	$ 2,659,000 *7%*	$ 10,510,000 *4%*
Total		**946.7 km**	**$ 207,835,000**	**$ 36,268,000**	**$ 244,103,000**

Asset Condition on GIS

Each scheme AMP contains a GIS plan that spatially illustrates the reticulation asset condition within the network. Included on the plan are the location of any mains repair activity recorded since 2007. This provides a useful picture of the relative asset age and performance.

6 CRITICALITY

Criticality is a measure of the importance of a given asset to the overall scheme and is determined by the consequence of failure. Assets for which the financial, business, or service level consequences of failure are sufficiently severe to justify proactive inspection and rehabilitation are considered more highly critical. Critical assets have a lower threshold for action than non-critical assets. Criticality is used as a means to:

- Identify the most important assets in the overall network;
- Prioritise assets that warrant specific condition assessment;
- Prioritise assets for repair following multiple failures, e.g. following an earthquake;
- Quantify the relative consequence of failure, which can then be used to assess the risk of failure and prioritise renewals. Specifically this means that assets with higher criticality rating are renewed before their end of life, while renewal of low criticality assets will be delayed beyond theoretical end of life.

The criticality assessment carried out on the reticulation uses an automated GIS model using both GIS and modelling data to determine the criticality of pipes. The previous critically assessment model for water headworks and pump stations has been updated and used again in this document. It is expected that a new model for assessing the criticality of pump stations and treatment plants will be completed in time for the next AMP document, but is subject to a comprehensive asset stocktake at facilities being undertaken first.

WDC have chosen to use a component failure and public-impact based approach to identify and rank critical assets.

For water assets “Failure” is defined as any single component malfunctioning causing a loss of service or significant impact to others under normal operating circumstances. The criticality assessment was undertaken assuming an average peak daily demand. “Impact” is defined as:

- Public health impact – the failure of the asset creates an unacceptable impact on public health.
- Socio-economic impact – the failure of the asset creates an unacceptable social and/or economic loss to the community. This includes disruption to essential services, significant economic activities and important roads.
- Financial loss – The failure of the asset, or the repair of a failed asset, creates an unacceptable financial loss to the community, including the Council.
- Environmental impact – the failure of the asset creates an unacceptable environmental effect.

The criticality of water mains is assessed using seven key criteria:

Table 11: Criticality Assessment Criteria

Criteria	Assessment Notes
Loss of Service	The number of customers to lose water supply in the event of a single pipe failure. This was determined by modelling data assuming average peak daily flow.
Crossings	The disruption caused by a pipe failure on a major crossing point. Railways, Motorways, State Highways and Major Waterways were all considered under this item and identified using GIS queries. The disruption under this item relates to both the other service and the difficulty and time to make repairs to the water main.
Private Land	Pipes on private land were given a higher criticality rating based on the difficulties associating with making repairs to the pipe and the impact on the private landowner of a pipe failure. These pipes were identified using GIS queries.
Diameter	Large diameter water mains were given a higher criticality rating to reflect the difficulty and time required to repair these mains and to reflect the intrinsic importance of these mains in the network.
CBD	Pipes within CBD or retail shopping areas were given a higher criticality rating to reflect the financial impact of water shutdown in these areas and the likely effect of a pipe repair on pedestrian traffic. These pipes were identified using GIS queries.
Roads	The location of the pipe in the road corridor and the nature of the road was considered here. A pipe within the road carriageway and pipes on high volume strategic roads were given a higher rating to reflect the greater impact on road users. These pipes will also likely be more expensive and time consuming to repair.
Material	Where a pipe was identified as a large diameter spiral steel pipe this was given a higher criticality rating to reflect the difficulties associated with repairing these pipes.

Table 12: Criticality Score Categories

Criticality Rank		Criticality Rank Code
High Criticality	Extreme Criticality	AA
	High Criticality	A
Moderate Criticality		B
Low Criticality		C

Because the pipe criticality assessment is undertaken using GIS data the assessment can now be repeated and updated on a more regular basis. Annual updates are therefore planned that will inform each year's detailed renewals programme.

Operations

Criticality is used to determine if a "stand over" is necessary by our in-house operations contractor, when external contractors are working on or near WDC assets. This effectively means that there is a greater level of oversight for works near critical assets relative to non-critical.

District Overview – Criticality

Table 12 summarises the percentage of mains in each of the criticality classes:

Table 13: District Overview – Mains Criticality % by Category (% shown by length).

Scheme	AA	A	B	C
Cust Water	0%	35%	22%	42%
Garrymere Water	0%	0%	42%	58%
Kaiapoi Water	5%	4%	23%	68%
Mandeville Water	5%	7%	25%	63%
Ohoka Water	2%	14%	44%	39%
Oxford No 1 Water	1%	5%	24%	70%
Oxford No 2 Water	11%	10%	32%	47%
Oxford Water	5%	5%	30%	60%
Poyntzs Road Water	0%	0%	50%	50%
Rangiora Water	6%	12%	15%	67%
Summerhill Water	2%	8%	43%	47%
Waikuku Beach Water	4%	0%	16%	80%
West Eyreton Water	0%	0%	36%	64%
Woodend Pegasus Water	1%	9%	14%	76%
All Schemes	***4%***	***8%***	***23%***	***65%***

7 RISK ASSESSMENT - OVERVIEW

The purpose of carrying out risk assessments on water supply schemes is to identify any risks to the scheme, which need to be mitigated and to prioritise implementation of any mitigation plans.

A number of different risk assessments have been carried out, each one with a specific focus, although there is some overlap. A description, and the purpose of each assessment is provided below

i. *Operational Risk Assessment*: This is the broadest scope assessment. Possible causes of failure of the water supply system are examined, together with the consequences of that failure. Failure includes contamination, or treatment failures as well as failure caused by natural disasters. This assessment, was last carried out for the 2015 AMP review, but has not been updated for this review, as little has changed.

   When next reviewed the methodology will also be reviewed, to align with ISO 31000.

ii. *Health Risk Assessment*: Developed very recently following the Havelock North water supply issues, its purpose is to provide a comparison across the district of the relative risk between the Council's 12 water supply schemes that will enable better prioritisation of scheme upgrades. This also fed into a Canterbury wide comparative risk assessment, via the Canterbury Drinking-water Reference Group (CDWRG). Refer TRIM record 171030117078.

iii. *Disaster Resilience Assessment (DRA):* Assesses the risk to above ground assets from a broad range of potential natural disasters. See Section 9.

iv. *Vulnerability Assessment*: Focuses solely on underground assets, assessing the vulnerability of pipes to damage from natural hazards, and uses an automated approach. One of the principal inputs to the risk based methodology for determining the renewals programme. See Renewals section.

v. *Corporate Risk*: High level risk assessment carried out corporately in association with the development of the LTP and Infrastructure Strategy. Covers Environmental, Economic, and Social risks. This risk assessment is appended at the end of this document. Council adopted a Risk Management Framework in April 2018 that demonstrates how the Council considers and responds to risk (TRIM 180316028262). This has been used to guide the appended Corporate Risk Assessment.

vi. All water supply schemes have Water Safety Plans, or Public Health Risk Management Plans (PHRMP), which include detailed scheme specific risk assessments. These are referenced in the individual scheme AMPs.

8 OPERATIONAL AND HEALTH RISK ASSESSMENTS

Operational Risk

A total of 58 possible causes of failure have been assessed for each of the water supply schemes as part of the 2015 assessment.

Table 13 details the 17 separate events considered under each process area.

Table 14: Risk Events Considered

Process	Event
Source	Contamination
	Insufficient Water
	Natural disaster and Other
Treatment	Protozoa contamination
	Inadequate chlorination
	Insufficient pH correction
	Too much pH correction
	Filtration ineffective
	Elevated turbidity
	Natural disaster
Distribution	Inadequate supply
	Pipeline breakages causing contamination or loss of supply
	Contamination from back flow
	Insufficient firefighting supply
	Natural Disaster
General	Operation/Management failures

Risk Matrix

Each of the 58 possible causes are rated for consequence (1 to 5) and likelihood (A to E) and then combined to give a risk score using the matrix shown below. The three cells highlighted by a black frame show where the WDC matrix differs from the standard AS/NZ 4360 risk matrix. These changes were made as they better reflect the level of risk accepted by WDC on their 3 Waters assets.

Risk Matrix		Consequences				
		Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	A Almost certain	M	H	H	E	E
	B Likely	M	H	H	E	E
	C Possible	L	M	H	H	E
	D Unlikely	L	L	M	H	E
	E Rare	L	L	M	H	H

For each scheme AMP, where the assessment shows unresolved extreme or high risks, a table is provided that shows more details of the nature and response to those risks. Improvement projects have been assigned to each risk event. In some cases multiple projects are required to address a wide ranging risk. Improvement projects take the form of either capital works (ref AMP) or process improvement (ref IP) projects.

2017 Health Risk Assessment Tool

This risk assessment tool focuses on the delivery of safe drinking water. Its purpose is to provide a comparison across the district of the relative risk between the Council's water supply schemes that existed in 2017 when the tool was developed, in order to enable better prioritisation of scheme upgrades. This tool was used as a consistent assessment of risk across Canterbury water supply schemes via the Canterbury Drinking Water Reference Group, in response to the Havelock North Drinking Water Inquiry.

It is also assists with determining the relative risk to consumers of drinking water from schemes with secure sources, and whether adding UV disinfection versus chlorination would materially reduce that risk. The results have been tabulated in Table 15, but they should be regarded as interim.

Table 14 shows the risk criteria assessed and the weightings used against the source, treatment, and reticulation components of the supply.

Table 15: Risk criteria considered

Process	Criteria
Source	Surface Influence
	History of E Coli Absence
	Well Head Protection
	Stock Exclusion
	Catchment
	Source Depth
	Risk of Source Inundation
Treatment	Protozoa Compliance
	Bacteriological Compliance
	History of E Coli Compliance
	Priority 2 Compliance
	Monitoring
	Management & Operation
	Maintenance
Distribution	Residual Disinfection
	History of E Coli Compliance
	Monitoring
	Backflow Prevention
	Reticulation Condition
	Measures to Prevent Damage
	Contamination Entry Points

District Overview – Operational and Health Risk

Table 15 summarises for the operational risk assessment the number of high and extreme risks identified across the water supply schemes that existed in 2017 when the Health Risk assessment was completed.

The right hand column in Table 15 outlines the progress that has been made since the 2017 Health Risk assessment. Of the six schemes assessed as 'medium' health risk, upgrades have been completed on five of these schemes. The final scheme where the risk score of medium is still applicable (Poyntzs Road), has an upgrade project underway at the time of this document being prepared.

Table 16: District Overview – Extreme and High Risks (Operational) plus Health Risk Assessment Score and Subsequent Upgrades

Scheme	Operational Risk Assessment (as of 2015)		Health Risk (as of 2017)	Significant Improvements Since 2017 Health Risk Assessment
	Extreme	High		
Cust	0	3	Very Low	-
Fernside	0	3	Medium	Joined to Mandeville scheme, which has a Low Health Risk.
Garrymere	0	5	Medium	Treatment upgrade completed to add two further treatment barriers.
Kaiapoi	0	0	Low	-
Mandeville	0	0	Low	-
Ohoka	0	3	Very Low	-
Oxford Rural 1	0	9	Medium	Secure source added to scheme, non-compliant source now relegated to an emergency backup.
Oxford Rural 2	0	5	Medium	Joined to Oxford Urban scheme which has a Low rating.
Oxford Urban	0	0	Low	-
Pegasus	0	0	Very Low	Joined with Woodend, but no material change to risk.
Poyntzs Road	0	3	Medium	Upgrade project underway in 2020-21.
Rangiora	0	0	Low	-
Summerhill	0	0	Very Low	-
Waikuku Beach	0	1	Medium	UV treatment installed.
West Eyreton	0	0	Very Low	-
Woodend	0	0	Low	Joined with Pegasus, but no material change to risk.
District	0	32	-	

The 9 previously assessed high risks for Oxford Rural No 1, relate to potential contamination and inadequate supply, however these have been resolved with the commissioning of the new source in 2018. Contamination issues provide the 5 high risks for Oxford Rural No 2 supply, and were also resolved with the source upgrade for this scheme.

9 DISASTER RESILIENCE ASSESSMENT

The 2009 Disaster Resilience Assessment (DRA) was a desktop assessment of the risk from natural hazard events for all Council operated water supply, wastewater and drainage schemes including above ground and reticulation assets.

In calculating risk the following factors were considered:

- The likelihood of the hazard event occurring, determined from return period
- The resilience or vulnerability of the asset to each hazard (desktop based)
- The consequence of asset failure to the community

The DRA was updated in 2011 to take into account new hazard assessments, in particular the increased seismic risk to the water supply assets throughout the District including further work on areas susceptible to liquefaction. The outputs of new tsunami modelling, a rapid flood hazard assessment and, an updated wildfire threat assessment were also included. This update focused on above ground assets, as the assessment of risk to below ground assets became incorporated from this time on, into the renewals model. See the Renewals section. Accordingly, each scheme DRA section only shows risks associated with above ground assets.

A comprehensive review of the DRA Action Plan was carried out in 2014 to update progress made on tasks and prioritise future initiatives. As a result of the review, related tasks were consolidated into one of three improvement projects to be actioned over the following three years. Refer to planned improvements at the end of this section. Limited progress has been made on these improvements since the 2015 AMP revision, due to resourcing constraints.

The DRA, together with the risk based renewals assessment, are the Council's 3 Waters department's primary tools in meeting the obligations of the CDEM Act which requires that all lifeline utilities operate to the fullest possible extent before, during and after an emergency. The results from the DRA inform expenditure decisions for physical works, further assessments and other actions to increase readiness, but these are prioritised, as resources to action implementation plans are limited.

Hazard Scenarios

All above ground facilities were assessed for risk of failure against 13 natural and 2 manmade hazard events. Table details the hazard scenarios and approximate return periods considered for the DRA.

Table 17: Disaster Hazard Scenarios Considered

Natural Hazard Scenarios
100 yr Local Flooding
475 yr Earthquake Induced Slope Hazard
Ashley Flood (100 yr)
Ashley Flood (500 yr)
Waimakariri Flood (3,300 yr)
Earthquake (50 yr)
Earthquake (150 yr)
Earthquake (475 yr)
Tsunami (200 yr)
Wildfire (threat based)
Snow (150 yr)
Wind (150 yr)
Lightning (100 yr)
Pandemic (50 yr)
Terrorism (100 yr)

District Overview – Disaster Resilience

Table 17 summarises the number of high and extreme natural hazard risks identified across the 16 water supply schemes that existed when this assessment took place. Details of the risks are provided in the individual scheme AMPs.

Table 18: District Overview - Extreme and High Risks (Natural Hazards)

Scheme	Extreme	High	Facilities
Cust	0	2	2
Fernside	0	0	1
Garrymere	0	0	1
Kaiapoi	0	6	4
Mandeville	0	0	2
Ohoka	0	1	1
Oxford Rural 1	0	2	3
Oxford Rural 2	0	2	1
Oxford Urban	0	3	4
Pegasus	2	3	3
Poyntzs Road	0	1	1
Rangiora	0	8	4
Summerhill	0	2	2
Waikuku Beach	0	1	2
West Eyreton	0	4	2
Woodend	0	1	1
District	**2**	**36**	**34**

10 CORPORATE RISK AND ASSUMPTIONS

An assessment of key risks and assumptions was prepared by the Council in preparation for the Infrastructure Strategy and 2021-31 LTP. The assessment outlines all of the Key Assumptions and Risks that could potentially impact Council service delivery for the 3 Waters activities. Mitigation measures are explained in response to each identified risk.

The Key Risks and Assumptions table has been reproduced as Appendix 3: Assumptions and Risks.

The definitions of likelihood and consequence and the overall risk priority used in the Corporate Risk Assessment are included in the Council's Risk Framework Document (TRIM 180316028262), and are also reproduced at the end of Appendix 3: Assumptions and Risks.

A number of the financial risks and assumptions identified in Appendix 3: Assumptions and Risks imply future uncertainty, with future changes potentially affecting the individual scheme financial projections. Changes to corporate assumptions are picked up during annual budget reviews and projections are revised accordingly for the subsequent AMPs and LTP.

11 CLIMATE CHANGE

Waimakariri District Council intends to base its response to climate change on scenario outlined in the NIWA report commissioned by ECan in Feb 2020 entitled 'Climate Change projections for the Canterbury Region'. NIWA's projections draw heavily from climate model simulations from the Intergovernmental Panel on Climate change (IPCC) Fifth Assessment Report.

Climate projections in this report are presented as a 20 year average for two future periods: 2031-2050 (referred to as 2040) and 2081-2100 (referred to as 2090). All changes shown on the maps are relative to the baseline climate of 1986-2005 (referred to as 1995). NIWA acknowledges there are limitations on the results and use of the data but also state the projections are currently the best available for New Zealand.

WDC intends to use the RCP8.5 scenario (representative concentration pathways), which is the current worst case projection.

The key findings of the NIWA report for Canterbury as a whole are as follows:

- The projected Canterbury temperature changes increase with time and increasing greenhouse gas concentrations. Future annual average warming spans a wide range: 0.5-1.5°C by 2040, and 0.5-3.5°C by 2090. Diurnal temperature range (i.e., difference between minimum and maximum temperature of a given day) is expected to increase with time and increasing greenhouse gas concentrations.
- The average number of hot days (days ≥25°C) is expected to increase with time, in some areas quite significantly. The number of frost days (days <0°C) is expected to decrease throughout the region. Largest decreases are expected in inland areas; 10-30 fewer frost days per year by 2040, and 20-50 fewer frost days per year by 2090.
- Projected changes in rainfall show variability across the Canterbury region. Small changes to annual rainfall of ±5% are projected for most of the region by 2040 and 2090. Seasonally the largest increases are projected during winter, with 15-40% more rainfall projected in many eastern, western and southern parts by 2090 under RCP8.5.
- The future amount of accumulated PED (Potential Evapotranspiration Deficit) is projected to increase across most of Canterbury, therefore drought potential is projected to increase.
- Mean annual low flow in rivers generally decreases by late century, with decreases exceeding 20% in many areas of the region.
- Floods (characterised by the Mean Annual Flood; MAF) are expected to become larger for many parts of Canterbury, with some increases exceeding 100%. However, there are some pockets of little change or decreasing Mean Annual Flood.
- Sea-level rise will continually lift the base mean sea level on which the tide rides, which means there will be an increasing percentage of normal high tides which exceed a given present-day elevation e.g., street level, berm or stopbank crest.

Consideration is being given to engaging NIWA to carry out more detailed work specifically for the district as this would provide more detail than is currently available through interpolating the Canterbury wide data.

WDC's own studies carried out to date on the effects of climate change have focused on the coastal fringe. An investigation into groundwater levels, (TRIM 191202168785) concluded that rising groundwater levels will subject underground assets to more frequent inundation, and exacerbate surface flooding. Existing drainage systems are likely to become less effective. However a study of

coastal erosion (TRIM 191202168789) found that dune erosion is not likely to follow from sea level rise, as the Waikamariri River delivers enough additional material along the coast to the north of the river, to compensate for any increased rate of erosion. This study also considered coastal inundation, but a further more comprehensive study (TRIM 200312034365) concluded that various combinations of storm tide, fluvial events and a rising mean sea level will cause overtopping of existing stop banks and natural river banks.

Design and modelling work carried out by WDC for its 3 Waters infrastructure allow for both increased rainfall intensity and sea level rise, and water level in public supply wells is monitored. RCP8.5 has been adopted for all WDC modelling.

Overall the effects of climate change are expected to increase pressure on water supplies, with potential effects near the coast from sea level rise, and away from the coast from potentially lower levels of groundwater recharge. Discussions have been held with ECan regarding the impact this may have on groundwater resources, and how this will be managed. The following key points can be made:

- Although predications are for the Canterbury Plains groundwater recharge to decrease, the large alpine rivers are predicted to increase flows so that the steady recharge the aquifers receive from them is expected to be the same. This means that shallower groundwater may become more vulnerable, but the deeper sources (which supply the vast majority of Council's public water supplies) will be less vulnerable to increased frequency of low recharge. Refer 201029145198.
- The intention in terms of allocation of the groundwater resource going forward is to have an adjustable allocation accounting for climate change, which also acknowledges the priority the drinking-water has in the Resource Management Act (RMA). Refer 201029145198.

Specific actions in the 3 Waters area that the WDC is carrying out with respect to reduction of carbon emissions are as follows:

- Investigate technology and improvements which help reduce greenhouse gas emissions from treatment plants and other 3 Waters infrastructure via energy efficiency improvements.
- Record nitrogen, BOD and other parameters influent and effluent to enable accurate calculation of greenhouse gas emissions from large wastewater treatment plants. Provide an updated greenhouse gas emission profile to Management Team as result of the assessment.
- Report progress quarterly on preparation and process for installation and initial operation of solar power array project (Rangiora WWTP)
- Identify appropriate targets for reduction of greenhouse gas emissions from Council's corporate and infrastructure facilities.

12 DEMAND

Growth projections were updated in 2019 to determine the expected growth on each water scheme in order to understand what upgrade works are required to meet the agreed levels of service. There are a number of factors that influence future demand on water in the District:

- Population trends or increases in population
- Changes in water use practices
- Changes in legislation
- Advancements in technology
- Implementation of water conservation measures (such as water metering)

To date only growth has been considered in establishing the district's future demand for water. A more complex approach is planned for the future with consideration of the effects of the factors noted above. Refer Planned Improvements at the end of the section. The overall district population growth scenario used for the 2021 AMP update was supplied by Council's Development Planning Unit, broken into towns and rural areas. 3 waters growth projections were calculated using the New Projections for LTP 2021-2031 (TRIM200908117997), which was the basis for infrastructure planning.

Due to issues that have occurred with the Census 2018, the population projections that would normally be used as a basis for updating the work previously developed by the Council's Development Planning Unit have not been released by Stats NZ in sufficient time for the development of this assessment.

However, based on the historical growth patterns of new dwelling Building Consents over the last three years (636 in 2017/18, 661 in 2018/19 and 615 in 2019/20), the projections used for the previous Long Term Plan and Infrastructure Strategy remain valid to be used for infrastructure planning. As the timeframe for this infrastructure planning is for the thirty years between 2021 to 2051, the previous population projections have been extended out a further three years, as documented in New Projections for LTP 2021-2031 (TRIM 200908117997).

To calculate the growth for the water supply schemes, population increases were applied to planned growth areas at agreed densities. Account was also taken of the capacity for infill to absorb the necessary increases. In cases where the required increase in population could not be fitted inside growth areas, further discussions were held with the Development Planning Unit to agree on locations where the additional growth should be applied. Water supply scheme growth in connections was then calculated based on the growth areas.

The following growth projection horizons were used;

1	1 – 3 years	(2021/22 to 2023/24)
2	4 – 10 years	(2024/25 to 2030/31)
3	11 – 20 years	(2031/32 to 2040/41)
4	21 – 30 years	(2041-42 to 2050/51)
5	31 – 50 years	(2051/52 to 2070/71)

The growth projections report can be found in TRIM 200224024348.

Improvement project IP028 follows on from Council's Water Conservation Strategy (TRIM 200501050668). The project aims to investigate current water usage and then review and refine the reasonable water use targets used in the Water Conservation Strategy, which act as a benchmark against which future water conservation programmes will be measured. This will allow for future changes in water demand for new connections, which may be different from historical demand, to be factored into future demand assessments.

It is important to provide a brief comment on COVID-19 and the impact it could have on population projections. At the time of writing this paragraph (August 2020), there were Level 3 restrictions in place in Auckland and Level 2 restrictions in the remainder of the country. While international migration is currently low arising from the COVID-19 travel restrictions, a significant number of New Zealanders are returning home due to the impact of COVID-19 on overseas countries. This has contributed to a high level of population growth nationally over the last six months, which has had a flow on effect to growth in the Greater Christchurch and Waimakariri Districts. How long this might continue for and when international migration (from other countries) might return to pre-COVID levels is still to be determined. However, the existing population projections remained the most appropriate to use for infrastructure planning at this time.

Managing Uncertainty

The corporate growth model developed by the Council for assessing growth related works is by its nature uncertain as it relies on population projections that are highly dependent on changing economic and social factors. Generally however, there is a greater degree of certainty in initial years, and greater levels of uncertainty when looking forward to the future. This means that over time, there is the ability for growth projections to be updated and refined over time as contributing factors evolve. There are also a number of other strategies employed to manage this uncertainty, which are outlined below.

A key means of managing this uncertainly has been to use the best available data and consult widely with Council staff in the policy and planning fields for the best information.

As part of the 2021 AMPs, a sensibility analysis was also undertaken by comparing the past 5 years of actual scheme connection growth with the future growth projections. The projections are seen to align well with the recent flattening of growth that has occurred, following the rapid rise in growth that occurred post-earthquake, which informed the 2021 AMP growth projections.

Long term, the 2021 projections are very similar to the 2017 AMP projections, and thus as a whole there are not significant changes to the overall capital work programme, however some changes have been recommended for particular projects.

To further reduce the uncertainties from the model in terms of the timing of when a growth project may actually be required, when a project is recommended by the Network Planning Team, a catalyst for the project is always included (for example, when a certain parcel of land begins to develop, when connection numbers exceed a certain value). This means that as a project comes up in an Annual Plan to be constructed, the documented catalyst is reviewed and discussions held with the Network Planning Team to verify that the project is genuinely required to be constructed at that time, or whether it be pushed out further in the budget.

District Overview – Growth Forecasts

The district water connections are predicted to grow by approximately 90% over the 50 year projection period. This is less than the the 2017 projections, in which there was a projected 107% increase over the 50 year time period.

It is predicted that in the first 10 year projection (up to 2030/31) the Waimakariri District is to grow on average by 513 new water connections annually. However in the long term (2031/32 to 2070/71), the rate of growth is expected to be approximately 302 new connections annually.

Table 19 presents the growth forecast for the Waimakariri District's water supply schemes.

Table 19 Summary of the Growth Forecast for the Waimakariri Districts Water Schemes

Scheme	Rates Strike July 2019	Years 1 - 3	Years 4 - 10	Years 11 - 20	Years 21 - 30	Years 31 - 50
	2019/20	2021/22 to 2023/24	2024/25 to 2030/31	2031/32 to 2040/41	2041-42 to 2050/51	2051/52 to 2070/71
Cust	141	149	160	171	179	195
Garrymere	42	46	52	59	66	78
Kaiapoi Water	5,394	5,778	6,241	6,857	7,397	8,355
Mandeville-Fernside	952	1,019	1,113	1,241	1,352	1,552
Ohoka	118	130	147	171	193	225
Oxford 1	338	371	416	478	532	628
Oxford 2	335	367	413	474	528	622
Oxford Urban	914	1,014	1,153	1,339	1,502	1,792
Poyntzs Road	86	94	106	122	135	160
Rangiora	7,574	8,503	9,847	11,589	12,969	15,399
Summerhill	182	200	224	257	287	338
Waikuku Beach	464	476	493	517	539	571
West Eyreton	72	79	89	102	113	134
Woodend-Pegasus	3,025	3,723	4,832	5,522	6,113	7,322
Total District Connections	19,637	21,949	25,286	28,898	31,906	37,371
Projected Annual Connection Growth Rate		2.8%	2.0%	1.3%	1.0%	0.8%

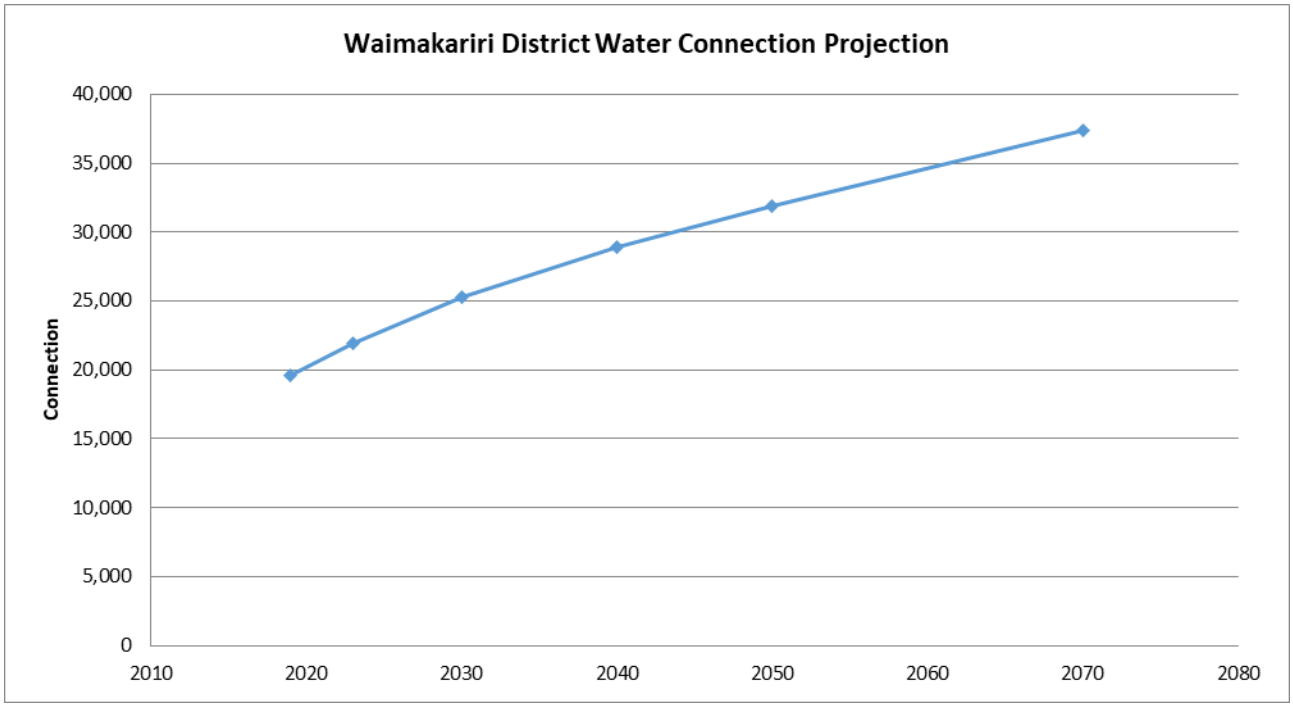
Note that the above growth forecasts will not necessarily directly match the number of growth connections shown in the LTP or financial sections of the Infrastructure Strategy. The above figures were generated based on growth forecasts provided by the Development Planning Unit, in January

2020, which allows sufficient time to carry out the work necessary reticulation modelling to plan the infrastructure upgrades required to accommodate the growth. Capital budgets are then developed from this planning work, which feed into the recommended capital projects within the AMPs and LTP.

Late in 2020 the Finance department carry out a separate process, using the same base growth data, to estimate the number of connections for rate income forecasts. Not only do Finance have more recent data to base their forecasts on (for example whether a particular subdivision is / is not going ahead) but they also have a different perspective. To be conservative they will tend to minimise the connection numbers (to be conservative in terms of expected rating income), whereas for infrastructure planning, being conservative will tend to maximise the potential numbers to ensure that growth can be accommodated without compromising levels of service.

Figure 4 presents the projected growth for the Waimakariri District's Water Supply connections.

Figure 5: Water Connection Projection



13 CAPACITY & PERFORMANCE

The existing capacity and performance of the water schemes throughout the district are monitored using hydraulic water models developed and maintained by the Council for each scheme. The demand profiles in the models are based on flow records collected from the Council's SCADA system and analysed by the Project Delivery Unit to obtain peak daily diurnal flow profiles. The total demand in the models is linked to the Council's rates system through the rating charges on each property.

The Council models, along with the AMIS and flow data that supports the models, are updated approximately quarterly and the capacity assessments undertaken for this AMP represent the latest available information.

The Council's Project Delivery Unit has reviewed source, treatment, storage, headworks and reticulation requirements to determine any additional upgrades required for both existing LoS deficiencies and growth related demand. The report which details the 50 year growth modelling and upgrades can be viewed on TRIM, reference number 201102146327. The projected future demands from the Growth Projections Model have been used to assess the performance of each scheme for 5 development horizons:

- 0 Years (existing)
- 10 Years
- 20 Years
- 30 Years
- 50 years

Where a scheme was identified as performing below the required Levels of Service, upgrades have been subsequently modelled and recommended. These upgrades have then been costed and added to the list of AMP capital projects for inclusion in the Council's Long Term Plan.

The two major towns (Rangiora and Kaiapoi) in the District are well supplied with artesian water of high quality. Finding and supplying additional water to cater for growth is not foreseen as a significant issue for these towns. Further information is provided in the Capacity and Performance sections of the scheme AMPs. For these towns, major work that is required other than connecting new subdivisions, will be providing additional storage reservoirs to hold sufficient capacity to meet peak demand, or adding wells to existing well fields.

The outcome from the Havelock North Drinking-water Inquiry and subsequent Drinking-water standards review is also creating a degree of uncertainty that could significantly affect the water supply AMPs, with the possibility of treatment being required for all water supplied being a likely outcome. Financial provision has been made to install UV treatment on all water supplies that currently rely on the secure groundwater classification for compliance, as well as future budgetary allowance for the implementation of chlorination on all supplies. In the interim Council has installed emergency chlorination equipment capability in all supplies that did not previously have it so that it is available for an emergency event.

Consents

Information about relevant water source consents is contained within each AMP, in the Capacity and Performance section.

A consent is required for the water abstraction at each source within the District. The effect on the water source is considered as part of the assessment of environmental effects. This includes an assessment of impact on other users. The conditions of consent also require that the Council has in place measures to conserve water. The consent process, which is the responsibility of the Regional Council (ECan), is intended to ensure that the long term abstraction and water use by multiple users from water sources is sustainable.

14 OPERATION AND MAINTENANCE

Operation and maintenance (O&M) expenditure incorporates the day to day running of the water supply network and allows the system to carry on functioning to deliver the agreed levels of service.

The O&M programme includes a combination of reactive and planned tasks. Examples of the differing nature of these tasks is summarised below:

Table 20: Overview of Planned and Reactive Maintenance Tasks

Task	Planned	Reactive
Headworks Maintenance	Frequent inspections (typically weekly) and basic maintenance	If required for particular headworks items in response to alarms, or defects noted as part of inspections.
Water Quality Sampling	Planned samples are taken in accordance with DWSNZ requirements	If required in response to an event, triggered by planned sampling
Generator Checks	Planned monthly, quarterly and annual checks	If required in response to alarms
Chemical Monitoring	Monitoring and top-ups are part of planned headworks inspections	If required in response to alarms
Restrictor Checks	Planned periodic checks are undertaken to ensure correct flow received.	If required in response to customer complaints
Backflow Preventer Tests	Annual testing is completed in accordance with Health Act requirements.	If required in response to a suspected backflow event.
Pipe repairs	No planned repairs	Repairs undertaken in response to service requests / leaks.
Valve repairs	No planned repairs	Repairs undertaken in response to service requests / leaks.

Council has recently implemented additional asset management functionality to its asset register, via the Asset Management Information System (AMIS) project.

Water supply pipe burst costs are now automatically linked to pipe asset ID's and mapped , to help better understand the performance of the network and in particular the performance of the different pipe materials being used throughout the district. The mobility devices field workers use to record these costs, are also configured so as to enable the field recording of asset data. This automatically updates the asset register, and will allow faulty asset data to be readily corrected directly from the field. It is expected that in time, this new functionality will enable Council to better understand it's maintenance costs, and move towards more informed asset management decision making. Identifying burst history, critical assets, assessing the risks and replacing mains prior to failure will ultimately reduce operational repair work.

3 Waters has also recently concluded negotiating a Service Level Agreement with its in house operations arm, The Water Unit, and which includes a fully priced schedule of works. This is expected to significantly increase the transparency of the maintenance costs for our networked assets. Scheduled prices have been incorporated into the works order system associated with the Asset Management Information System.

The SLA also includes comprehensive KPI's to be monitored, which are expected to improve accountability and quality assurance.

District Overview – Operation & Maintenance Expenditure

The operation and maintenance (O&M) budgets are currently set up to automatically account for inflation and growth. Inflation is accounted for with a factor set by the Council's Finance Unit, but this is not used in the development of the graphs and tables in the AMPs so as to provide a clearer comparative picture of asset O&M costs year to year.

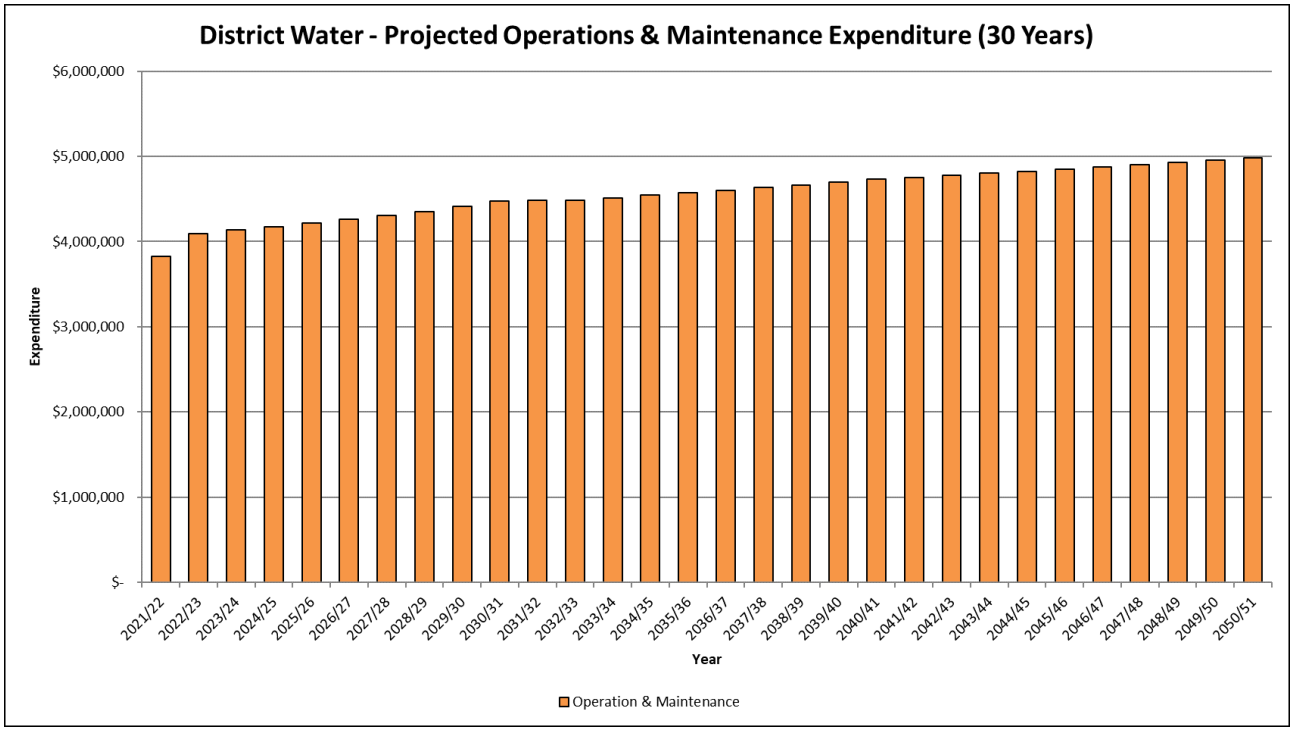
The implication of growth on O&M budgets is accounted for with the inclusion of a formula that increases the O&M costs on a pro rata basis proportionally with the population (as new developments come online). However, depending on asset class the increase in O&M costs may be reduced from being directly proportional. This is adjusted using a 'Demand Factor'. So for example costs for a particular scheme to maintain the network pipes and valves is expected to increase directly in proportion to increasing numbers of connections, but maintenance of pump maintenance costs are only expected to increase at 50% of the rate of the increasing number of connections.

In addition to the automated increases, part of the consideration when setting the O&M budgets across the district's schemes is the potential impact of any new capital projects. These increases are accounted for in two ways:

- Direct O&M Increases: Through Asset Managers calculating what areas of the budget may increase, and manually adjusting the appropriate parts of the budgets from the year following when the capital project will be completed. An example of this would be a new headworks being constructed. This would require power costs to be reviewed (as the new headworks would consume power), as well as items related to headworks inspections and maintenance.
- Depreciation Increases: Changes in depreciation as a result of new capital projects are accounted for by the Council's Finance team. As a new capital budget is introduced to a scheme, there is a formula to increase the depreciation amount for that scheme based on the size of the capital budget being assumed to represent the value of the assets being added, and the asset life being assigned a representative figure for that scheme (depreciation rates are typically in the order of 1.5% to 2.5% of the value of assets added for example). Every three years a comprehensive valuation is carried out, which then assigns accurate valuation rates and base lives to any new assets created in the last years, to refine the accuracy of the depreciation rates further.

Figure 5 presents the forecast Operations and Maintenance Expenditure across all the Council's water schemes for the following 30 year period.

Figure 6: District Overview - Projected Operation & Maintenance Expenditure



15 CAPITAL WORKS

Until recently Waimakariri District Council has not applied significant constraints to applications through the Long Term Plan process for capital expenditure, where this has been required to address levels of service, renewals or growth. However with the Council's debt having risen following the 2010/11 Canterbury earthquakes, more rigour is being applied through the development of an approval process for capital works. All new capital projects of value greater than $250,000 are now required have a "Project Justification" document filled in for them, which is essentially a mini business case. The following information is required to be supplied:

- Project description and scope;
- Strategic case – LOS, growth or renewal. Contribution to Community Outcomes, national programmes and public value benefits;
- Risks and assumptions;
- Economic case – Preferred option and alternatives considered;
- Financial case – Requested budget, (components –LOS, growth, renewal), expensed component, funding sources (DC's if relevant), effect on rates and budget confidence;
- Management Case – ability to deliver and how.

Through each Annual Plan and Long Term Plan process, Project Justification forms are prepared for projects that meet the criteria for requiring them. These are then reviewed by an internal panel including the Project Delivery Manager and Finance Manager, prior to being approved. Subsequently, if they gain approval following the initial round they require the relevant Department Manager's approval before being presented to the Council's Management Team as part of submitting the overall budget proposal from each service area. Ultimately what is approved by the Management Team is presented to Council to review as the Draft Long Term Plan or Annual Plan budget.

16 RENEWALS

Renewal expenditure is work that does not increase the capacity of the existing asset, rather it is work to replace existing assets and maintain the original capacity of the system. Renewal work is funded from a budget generated by the depreciation component of the rates.

Previously the Council has undertaken a renewals programme based on replacing assets nearing or at the end of their remaining useful life, and mains in known poor condition. From 2011 onwards the Council made a change to a risk based renewals programme for pipework which incorporates the following criteria:

- Burst History – the number of bursts in the previous three years collected as part of the new maintenance data collection programme.
- Remaining Useful Life – based on the design life, as used previously.
- Vulnerability – a function of location, material and joint type calculated as part of the DRA review.
- Criticality – the criticality score calculated for each main

The process has been evolving and development of the programme now uses a GIS model that incorporates the latest criticality and vulnerability assessments and utilises existing AMIS data in the GIS to produce a prioritised grouping of pipes for renewal. A schematic of the process is shown below in Figure 8 . Criticality, which is an input to this model incorporates factors such as pipe material type, groundwater and soil types.

The framework used for the renewals model has remained relatively consistent in the last 3 years since the 2018 revision of the AMPs, however the outputs have changed in the latest revision. The reason for the change in outputs is the improved understanding of expected asset base life, based on the pipe burst analysis work, which is explained under Asset Condition. This accurate understanding of typical asset lives is critical to the confidence that can be put in the outputs of the renewals model.

The model also enables an assessment to be made of the depreciation required to fund future replacement costs, for different levels of risk. This allows risk and affordability to be balanced. Key outputs from the model are a prioritised list of pipe renewals needed across the district, identified by scheme, and an annual expenditure profile for the next 150 years.

The model developed for headworks uses the same methodology as the pipe renewals model, and has been used for the first time in this AMP review. Since knowledge of the headworks condition is not to as higher standard as the reticulation, standard industry lives for the relevant asset classes have been used as inputs to the headworks renewals model. As the headworks criticality model is still under development, a simplified renewals assessment methodology has been used in the interim, which does not factor in criticality.

The final decision about pipe renewals to be carried out in a particular year is made by the Asset Manager, taking into account opportunities for coordination of works (i.e Roading projects and other utilities renewals that may be planned) and any other operational requirements.

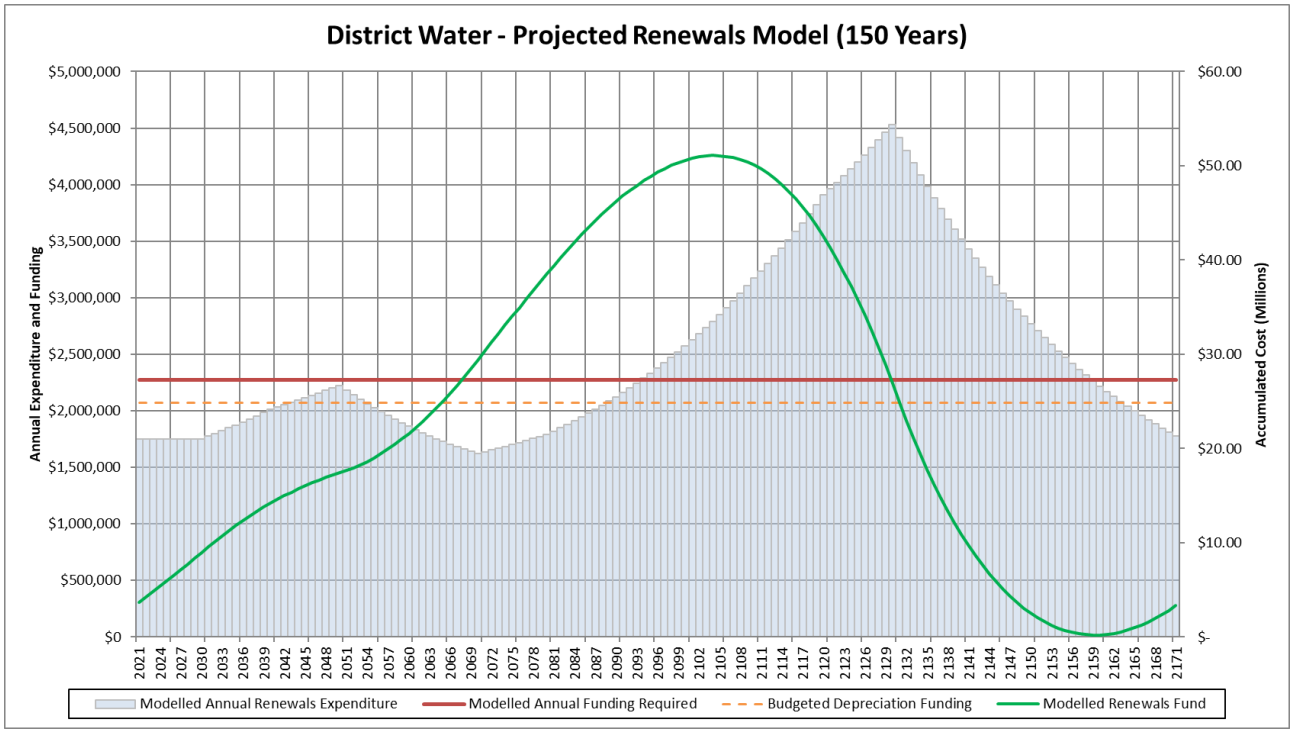
A cost risk factor identified, is the potential need to remove all AC pipe in private property, when a renewal project is planned on a route different to the existing pipe, on the basis of health risks. The quantum and potential cost implications of the issue have not yet been fully worked through, and nor has a definitive policy of how this will be approached been established. However the potential exists to significantly increase renewal costs above those currently used.

District Overview – Renewals Expenditure

Figure 6 presents the forecast Renewals Expenditure across all the Council's water schemes for the following 150 year period. The horizontal line is the required level of funding to ensure that the renewals fund does not go into debt, and current levels of service are maintained.

The figure only shows the output from the model, so expenditure shown in the graph for the first ten years may be different from the expenditure shown in the LTP, as adjustments may have been made by the Asset Manager from the direct renewals model outputs. Individual scheme AMPs detail the actual planned renewals budgets for the first ten years.

Figure 7: District Overview - Projected Renewals Expenditure



The key parameters in the figure above are explained below:

- **Modelled Annual Renewals Expenditure:** This is the direct output from the renewals model, recommending the annual investment to be made in renewals each year.
- **Modelled Annual Funding Required:** This is the amount of annual renewals funding required, to ensure there are sufficient funds available to carry out the recommended annual renewals each year.
- **Budgeted Depreciation Funding:** This is the actual amount of depreciation being collected, which is extracted from the Council's budgets.
- **Modelled Renewals Fund:** This is the modelled balance in the renewals account, assuming the annual funding and annual expenditure is completed as per the recommendations from the renewals model. As can be seen, this account is maintained as a surplus, peaking at approximately $50 million in the year 2105, before being drawn down over the following 50 years.

The key point to note is that the Budgeted Depreciation Funding is less than the Modelled Annual Funding Required. The reason for this discrepancy is twofold:

- **Depreciation Discount Factor:** Council's financing of future renewals incorporates the expectation that depreciation funding can be invested at a higher rate of return over the life of the assets than the rate of inflation. Further information regarding this approach is provided in the Finance Policy. This concept is embodied in the scheme budgets in the form of a discount rate (referred to in the budgets as the 'Depreciation Discount Factor'). This reduces the annual depreciation funding required from rates, while still ensuring that there will be sufficient funding available to renew assets at the end of their useful life. The renewals model takes a simpler and more conservative approach to the way this effect is calculated, which accounts for some of the difference shown in Figure 6.

- **Improvement in Asset Base Lives:** The second, and more significant, factor explaining this difference particular to this LTP, is a consequence of recent analysis work carried out on the base lives of all water pressure pipe (refer 200508053285 for a record of this analysis, or refer to the Asset Condition section). A significant difference from the previous base lives, to the updated ones is that concluded that the previous 100 year life for old PVC (defined as pre-1997 installation) pipe, should be reduced to 60 years. This reduced life for this particular pipe class increases the depreciation rate, and therefore increases the annual renewals funding required for schemes with a high proportion of old PVC mains. The analysis was undertaken after asset lives were finalised for the three yearly valuation update, so the updated depreciation rates from the pipe burst analysis work were not able to be incorporated into the 2020 valuation work. However they have been incorporated into the renewals model, which is the primary cause of the difference shown in Figure 5. This will be self-correcting at the next LTP, as a common life for old PVC pipes will be used for both the valuation and the renewals modelling work. Going forward this improved understanding of the expected base lives of pressure pipes will ensure that the required amount of depreciation funding is allowed for.

It is noted also that there are a wide number of factors influencing specific planning for renewals projects, which mean that the outputs from the renewals model are not strictly followed. In general, district wide final renewals budgets have been set at a lower level than that recommended by the renewals model (84% overall). The difference is shown in the table below.

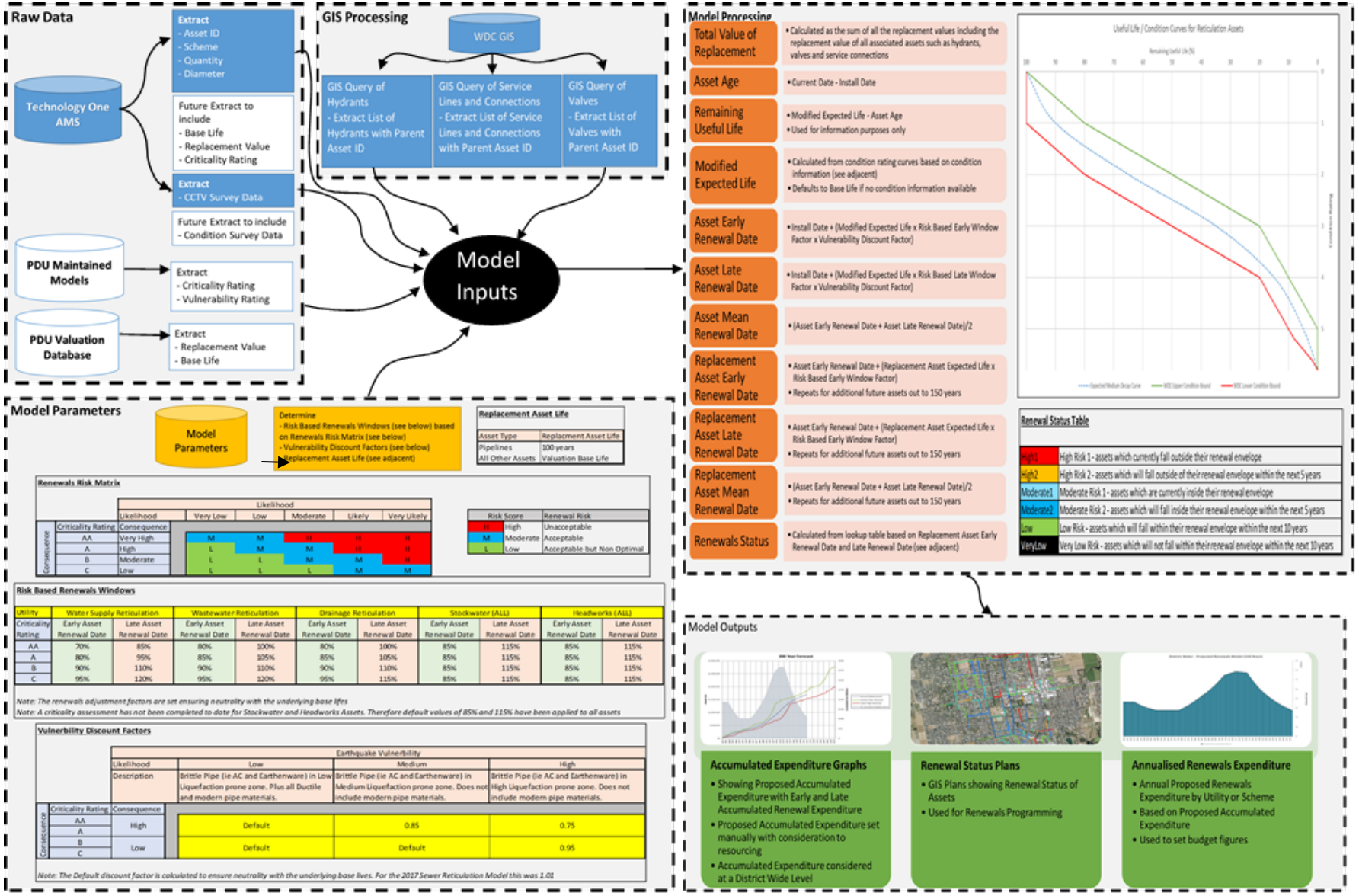
Table 21: Planned Budget versus Renewals Model Recommendation 2021-31

	Renewals model recommendation	Planned Budget	Budget as a percentage of model recommendation
Reticulation	$10,687,316	$11,651,242	109%
Headworks	$5,500,000	$2,005,864	36%
Total	$16,187,316	$13,657,106	84%

One key reason for the difference is that headworks assets are not requiring renewal at the frequency that is assumed to be required by the renewals model, hence headworks renewals budgets are currently set at 36% of those recommended by the renewals model for the first 10 years of the LTP. An improved understanding of asset base lives will improve this process going forward. It is noted that beyond the first 10 year window, the outputs from the renewals model have largely been followed to inform the renewals budgets for each scheme.

The mechanics of the renewals model are outlined further in Figure 7

Figure 8: Renewals Expenditure Models



17 NEW WORKS

There are six main sources of new works in the District that come together to produce the new works programme. These are:

1. The capacity assessments provide details on any shortfall on the schemes and new works are prioritised to address these, the primary influence being growth.
2. The Levels of Service highlight any deficiencies in the quality of service provided to customers, which can then trigger new projects to address any highlighted deficiencies.
3. The Operational Risk Assessments provide information on the highest risk areas on each water supply scheme, with any extreme or high risks requiring works to mitigate against those risks.
4. The Disaster Resilience Assessment action plan provides a prioritised list of actions to improve resilience against a number of potential natural disasters. Some of these relate directly to individual sites, and where necessary, have been included in the new works programme.
5. Operational works are identified through the operation of the schemes rather than being identified through the assessment of level of service, capacity, risk or resilience. These works are normally identified by an operator or Asset Manager and include such works as health and safety improvements.
6. The Water Safety Plan risk assessment process can generate new works to address any deficiencies or improvements for water supplies.

These six sources all provide new works projects that provide a budget for the next 50 years.

As well as the processes above identifying works on a scheme by scheme, or by service type, further consideration is required to coordinate work programmes between a combination of service types. Utilities Providers Coordination meetings are held quarterly between 3 Waters, Roading, power and telecommunication providers. This enables opportunities for collaboration to be identified. In addition, Council is working on a GIS tool where future planned works can be overlaid to optimise the coordination process further.

The table below shows the projected budgets for new works for the next 50 years for all 14 water supply schemes, including renewals. It is noted that the two rows at the bottom of the table below (District Water and Stimulus Water) which are not physical schemes. These are additional cost centres set up to fund projects that fit certain criteria.

The District Water account was established to fund UV related upgrades equally across the district. The purpose being to manage affordability concerns particularly for small schemes with already high rates, if they were required to fund UV upgrades in addition to existing infrastructure. The Stimulus cost centre was established following the allocation of stimulus funding to Council to invest in three waters projects, as part of the Government's COVID-19 economic response.

Table 22: New Works across Water Schemes Over 50 Years

Scheme	2021 - 2030	2031 - 2040	2041 - 2050	2051 - 2070	Total
Rangiora Water	$12,955,728	$9,820,280	$6,644,327	$16,649,111	$46,069,446
Summerhill Water	$707,000	$655,944	$989,593	$650,142	$3,002,680
Cust Water	$1,776,850	$1,767,061	$778,076	$1,094,878	$5,416,865
Oxford No 1 Water	$1,816,836	$4,590,344	$1,985,073	$2,017,879	$10,410,132
Woodend Pegasus Water	$3,232,000	$8,204,788	$4,512,520	$5,516,309	$21,465,617
Kaiapoi Water	$4,978,529	$2,721,528	$5,394,800	$10,387,170	$23,482,026
Garrymere Water	$228,000	$210,458	$130,831	$437,817	$1,007,105
Oxford Urban Water	$4,665,004	$5,049,410	$1,479,125	$2,248,254	$13,441,793
Ohoka Water	$160,258	$927,127	$558,811	$443,001	$2,089,197
Mandeville Fernside Water	$1,548,000	$1,171,221	$931,596	$2,088,458	$5,739,276
Waikuku Beach Water	$410,000	$840,132	$1,370,133	$1,861,958	$4,482,223
Oxford No 2 Water	$1,633,000	$2,467,766	$2,145,153	$1,665,948	$7,911,867
West Eyreton Water	$139,000	$70,787	$105,816	$410,214	$725,817
Poyntzs Road Water	$15,000	$33,940	$219,488	$213,619	$482,047
District Water UV	$6,445,000	$0	$0	$0	$6,445,000
Stimulus Water	$742,500	$0	$0	$0	$742,500
Total	**$41,452,705**	**$38,530,786**	**$27,245,341**	**$45,684,757**	**$152,913,590**

The figures in the table are based on the assumption that LOS requirements do not change significantly into the future, and that growth forecasts are accurate. Growth projects may be accelerated or delayed to fit actual growth patterns.

All projects are included in a central database of capital works projects. Projects are required to ensure the levels of service targets are met, assets are maintained in an acceptable condition, risks are reduced to an acceptable level, growth is accommodated for in the District, and to improve resilience operational efficiencies. The data base also includes renewals expenditure.

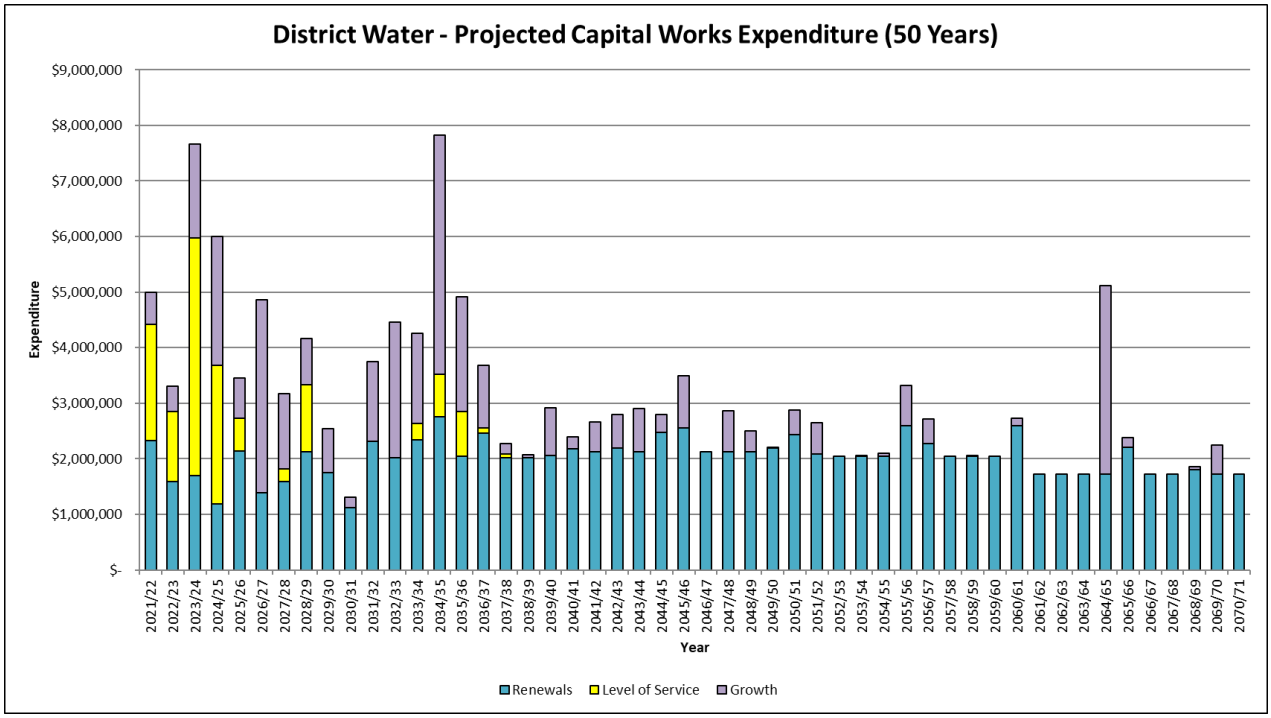
The front end of the data base has recently been updated to ensure that relevant data to the projects is captured in one place as a "single source of truth". This data will also be used to populate the "WDC Capital Works Project Justification" template that is required to be filled in for any new project of a higher capital value than $250,000.

When a scheme upgrade is undertaken, the supporting investigations include assessment of the costs and benefits of all practicable options leading to a decision to undertake capital works. These investigative reports are referenced within the scheme AMP's in the Data Reference table in Section 2, Scheme Description.

District Overview – Capital works

The following graph shows the 50 year budget for all capital works, including projects driven by growth and levels of service, including carry forwards but excluding stimulus grant funded projects.

Figure 9: District Overview - Projected Capital Works Expenditure



It can be seen that in initial years (predominantly the first 10) include a number of level of service projects (LoS), with later years dominated by renewals works with some growth. The reason being that LoS works are required to address existing or expected deficiencies, and once all measures are being met, future projects should either be purely to accommodate growth, or renew existing assets. Also evident in the timing of growth projects is that growth is expected to occur at a faster rate in initial years before (with more growth related works in the first 10 years), then slow in out years. This is driven by the profile of expected population changes over time.

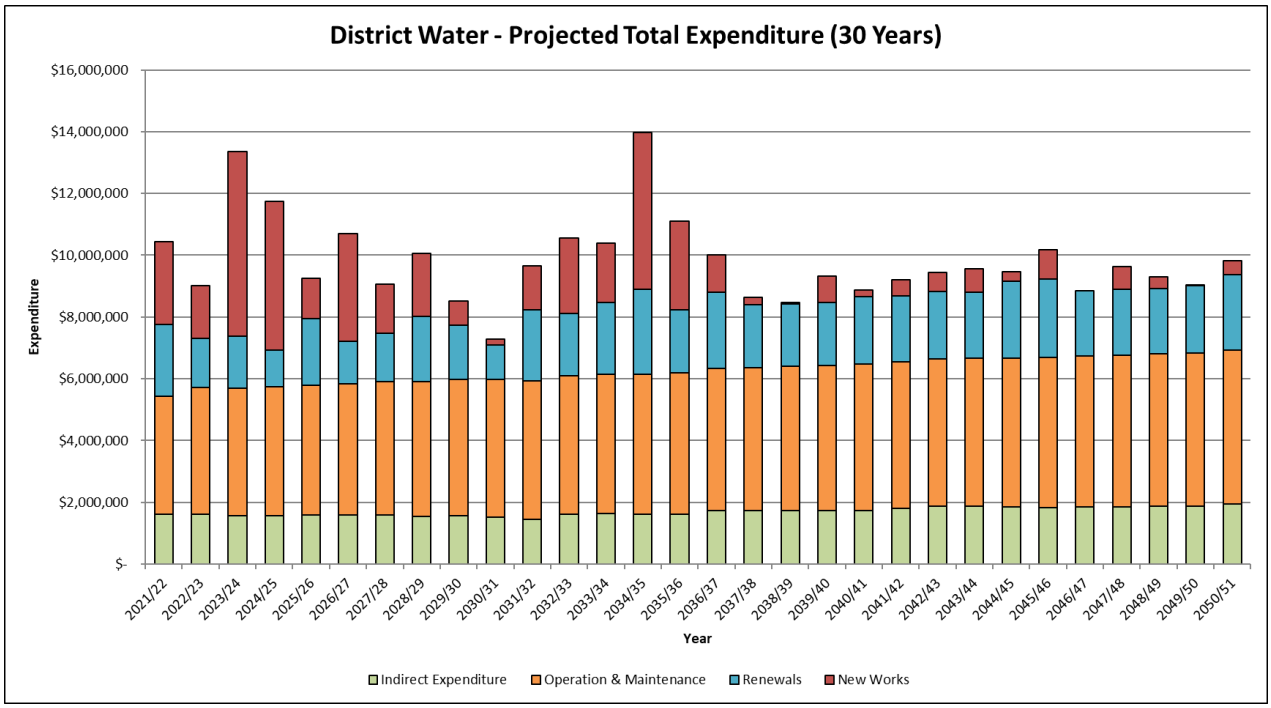
18 OVERALL FINANCIAL FORECASTS

The following graph summarises the breakdown of projected total expenditure over a 30 year time horizon. It includes both operational and capital expenditure.

Operational costs include operations and maintenance, and indirect expenditure. Indirect expenditure includes interest rating collection costs, costs associated with maintaining the Asset Register, interest and internal overhead costs.

Capital costs include expenditure for growth, levels of service and renewals, (including carry forwards) but excludes stimulus grant funded projects.

Figure 10: District Overview - Total Projected Expenditure



Financial Forecast Key Assumptions

The following key assumptions have been made in preparing the financial forecasts.

1. Asset data in the asset register is fit for purpose.
2. Asset lives based on nominal material life, are reasonably accurate.
3. LOS will not change, for example required by legislation.
4. WDC does not suffer any major natural disaster during the period of the financial forecasts.
5. Effects of climate change are not felt during the term of this LTP
6. Growth matches the projected profiles.
7. Maintaining Operational and Maintenance costs at current levels is cost effective

Funding

An explanation of the sources of funding for the activity is fully detailed in the Council's Revenue and Financing Policy, published within the 2021-2031 LTP. This includes the rationale for each source of funding for each scheme, and an explanation of how the different funding methods are applied to each scheme in relation to the service delivered.

Primary sources of funding for all water supply schemes are targeted rates and development contributions for works required to accommodate growth.

All capital works budgets are split into three components, Level of Service, Renewal and Growth. The division may be seen for scheme projects in the Capital Works section (section 4.3) of the scheme AMPs. The growth component is recovered through development contributions (DC's). An assessment has been made for the 2018-2028 LTP of the value of the DC required per future connection to the scheme, to fully recover the growth component of the capital works associated with the particular scheme. These assessments are updated as part of the Annual Plan process, and are published on the Council's website at the following link http://www.waimakariri.govt.nz/__data/assets/pdf_file/0023/16358/Copy-of-DRAFT-2016-17-Development-contributions-calculations-schedules-Comments.pdf

Summary calculation sheets for individual schemes can be viewed by clicking on links within the main document.

Valuation

A full peer reviewed valuation of assets is carried out on a three yearly cycle, using the asset data in our asset management information system. Table 21 below provides a summary of the replacement cost, depreciated replacement cost and annual depreciation for the district.

Table 23: Asset Valuation

Asset Type	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Valve	No.	5,835	$16,970,106	$13,658,879	$184,617
Main	m	935,227	$165,421,867	$124,742,597	$1,845,023
Hydrant	No.	2,161	$5,931,036	$4,314,960	$68,144
Service Line	Properties	18,628	$16,260,383	$11,938,891	$183,753
Facilities			**$36,313,963**	**$25,176,517**	**$792,436**
Total			**$240,897,355**	**$179,831,843**	**$3,073,973**

Revenue Sources

Targeted rates provide the majority of the revenue for the district. The only other revenue source, Development Contributions, provides a budgeted revenue only over a three year period, FY 22/23 to 24/25. Development contributions are calculated in accordance with Councils Development Contributions Policy (TRIM 191129168016)

For the 2021 LTP, Council has been able to take advantage of the Covid-19 Stimulus package, which has provided an additional short term but significant revenue source

19 DATA CONFIDENCE

Data confidence has been assessed for the first time as part of this AMP review, across a range of asset data and processes. The confidence grading used has been taken from the IIMM as follows:

Confidence Grade	Description
A Highly Reliable	Data based on sound records, procedures, investigations and analysis, documented properly and recognised as the best method of assessment. Dataset accuracy ± 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. Data set accuracy ± 10%
C Uncertain	Data based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample. Up to 50% data is extrapolated and accuracy estimated at ± 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 estimated at ± 40%
E Unknown	None or very little data held

Confidence grades have been assessed as:

Table 24: Data Confidence Levels

Element		Grade
Asset Inventory	Reticulation	B
	Headworks	C
Performance and service gap interpretation		B
Asset condition	Reticulation	B
	Headworks	C
Asset remaining lives	Reticulation	B
	Headworks	C
Demand forecasts		B
Valuation and depreciation		B
Financial forecasts		B

Confidence in headworks assets can be seen to be consistently lower than reticulation assets. This is a reflection of more focus being placed historically on network assets rather than facilities, as that is where the majority of the maintenance effort is expended. While we have a good understanding of our pipe materials and ages, a full inventory of all facility assets has not yet been undertaken, from which it follows that asset condition and remaining life are uncertain.

Council has been aware of this gap in its asset inventory for some time, and a portion of the funding available from the Covid-19 Response and Recovery Fund is to be directed to carry out a facilities asset inventory survey. If the funding allows, asset attributes and condition will also be recorded at the same time. This work will be carried out in FY 21/22

In the interim, it is worth noting that because headworks assets are above ground, any assets in poor condition can be readily identified and the risk associated with asset failure mitigated through regular visual inspections that can be carried out when operations staff are carrying out routine maintenance operations.

Note that Demand forecasts and financial forecasts sections have been assessed on the basis of the confidence in our infrastructure planning given a particular growth scenario. Growth predictions themselves are always inherently uncertain, and elastic. If actual growth is faster or slower than the growth scenario selected, projects to cope with the demand, provided they have been well scoped, can be readily brought forward or delayed as necessary.

20 ASSET MANAGEMENT SYSTEM

A register of water supply assets is held within the Council's Financial Management System and referred to as the Asset Management Information System (AMIS). The register is maintained by the Asset Information Management (AIM) Team on behalf of the 3 Waters Team. The platform is the Council's Finance Management System, Technology One.

The AMIS provides the base data used for the asset criticality model, the water network models and RAMM Roading data, so it is essential that every effort is made to ensure the dataset in the AMIS is accurate. This need is driving a number of planned data improvements, set out below.

For new assets, built as part of development or as stand-alone capital projects, the AIM team collates as-built data from as-built engineering plans and incorporates this data into the GIS system and asset database. This data then feeds through into the Council's asset valuation process.

The asset management system has been recently enhanced with the introduction of a works order system. Maintenance activity, for example in the form of a pipe fault to by the Council Water Unit under instruction from a work order is now entered digitally via mobile devices in the field. The field devices record job costs, asset location and any changes to assets, and the information is direct uploaded into asset register. Costs are recorded against the repaired assets.

Service requests are generated out of Council's Property and Rates System and for certain job types automatically raise a work order to be sent to the Water Unit via email. Other service request types are forwarded to 3 Waters team members for triage.

Implementation of these asset management modules has been one of the major focuses for asset management improvement since the 2018 AMP reviews were carried out. The system now in place will allow a maintenance history record against assets to be built up over time.

21 NEGATIVE EFFECTS

At the District level the activity of providing a water supply to the various communities has the following negative effects:

- Demand for continuity of community supplies may have an adverse effect on groundwater resources over time.
- Major industrial or commercial users that use large quantities of water may have their economic potential curtailed by a restriction in the amount of water available

22 SERVICE DELIVERY

Delivery of most capital works is via competitive tendering practice in accordance with the Council's procurement policy (link). Design is usually carried out in house, or where resources are insufficient, via external consultants, again engaged in accordance with the procurement policy.

Routine maintenance is carried out by Council's in house Water Unit. A Service Level Agreement has recently been signed to better define the relationship between Asset Managers and the Water Unit. Some specific challenges faced by the Water Unit relate to carrying out maintenance in rural areas over a widely dispersed geographical area. With the District having a particularly high number of lifestyle and rural residential properties there is a considerable network of small bore pipes providing the water service, and the GIS location of assets in some instances is less than desirable. Locating breaks in the field, when service has been lost, can be a time consuming and inefficient process.

23 IMPROVEMENT PLAN

Table 25 below summarises the planned AMP improvements applicable district wide, identified as each section has been reviewed. Some of these have been carried forward from the 2018 AMPs, where they have not yet been completed. These projects will be managed under the 2021-24 AMP Improvement Programme full details of which are provided in S:\3Waters\AMP\2021 AMPS and IS\Improvement programme\2021 Improvement Programme.xlsx. The summary table below shows which section the AMP that the improvement project was derived from, and includes projects that have been completed since the 2018 AMP.

Projects have been given a priority in Table 18, but only high and medium priority projects have been included. High priority projects are where budgets have been allowed for, and it is expected that the work will be completed within the first three years of the 2021/31 LTP. The medium priority category indicates that the project is programmed for the years 4 to 10 of the 2021/31 LTP.

Improvements only relevant for individual schemes are identified in the individual scheme AMPS, and these tend to be capital improvements, rather than AMP process or development projects.

2021 Improvement Plan

Table 25: 2021 AMP Improvement Plan

Project Ref	AMP Section	Project Description	Priority	Status	Estimated Cost
IP001	Renewals	Stage 1 - Maintain and analyse pipe bursts data to inform new base lives	Medium	Complete	N/A
IP002	Asset Management System	Carry out asset inventory check at all facility sites. Record key attributes and condition, and functional descriptions	High	Planned for 2021	$250,000
IP011	Disaster Resilience	Confirm natural hazard information at facilities sites.	Medium	Planned for 2024/25 onwards	$48,000
IP012	Asset Management System	Define asset data and spatial accuracy requirements for all 3 Waters assets	High	Complete	N/A
IP022	Asset Management System	Develop system to store and manage consent information	High	Planned for 2022	$9,600
IP026	Levels of Service	Investigate and report leakage rates. Formulate leak reduction programme if benchmarked standards are not being met	High	Complete	N/A
IP027	Asset Management System	Establish documentation that specifies asset data that must be included in As Built information supplied to AIM team	High	Planned for 2021	$48,000
IP028	Demand	Review and define appropriate average and peak water use targets for urban schemes to support LoS & WCS reporting, and future water take applications	Medium	Planned for 2024/25 onwards	$9,600
IP029	Overview	Collect usage information from existing domestic meters. (Water Conservation Strategy)	High	Complete	N/A

Project Ref	AMP Section	Project Description	Priority	Status	Estimated Cost
IP032	New Works	Develop Capital Programme Management Tool, scope expanded to include project justification and cost estimate guidelines.	Medium	Complete	N/A
IP039	Risk Assessment	Advocate for the development of a corporate Risk Management framework, via corporate AMP Steering Group.	High	Complete	N/A
IP045	Risk Assessment	Update DRA in parallel with Risk Assessment Update using common risk approach. Develop high level framework, seek update of hazard information.	High	Planned for 2022-23	$24,000
IP048	Operations and Maintenance	Standardise operational and maintenance items used in the budget to enable better expenditure monitoring	Medium	Planned for 2024/25 onwards	$9,600
IP049	Overview	Review costs and benefits of universal water metering and charging for water	High	Planned for 2021	$28,000
IP054	Overview	Carry out an assessment of the likely operational and asset management risks associated with rising GW levels in affected areas.	High	Planned for 2021-2023	$50,000

As an adjunct to this section the 10 key questions that Audit NZ have advised should be responded to, as a high level check on the adequacy of Asset Management Plans, has been reproduced below with responses. Additional improvement projects are included in Table 18 that fill gaps identified through this process.

Table 26: Audit NZ Questions and Responses

Audit NZ Question	**Response**
1. Have you got a strategy for the long-term sustainability of your assets?	Council has Activity Management Plans that are reviewed in house, at three yearly intervals, that contain a well developed renewals assessment and funding model that ensures the long term sustainability of its 3 waters assets. Maintenance programmes do need improving, and this has been recognised with the planned stage 2 of the Asset Management Information System project that will provide a more robust and trackable maintenance programme
2. Have you set an asset management policy?	Yes. TRIM link to policy
3. Do you have good quality up-to-date asset management plans for achieving your strategy?	Yes. These are comprehensively reviewed every three years and submitted for peer review.
4. Does your organisation have appropriate asset management skills and experience?	Yes. For 3 waters each of the activity areas – water supply, wastewater and drainage, has a dedicated asset manager responsible for the management of the relevant assets
5. Do you know the reliability of your asset information?	Reasonably well. Asset data for our reticulation network is reliable and being improved through analysis of maintenance data. Facility asset data is less reliable, and the need for a comprehensive assessment of all facility assets has been recognised and planned for in the improvement programme
6. Do you have a structured approach to assessing the condition and performance of your assets?	Yes. Noting that the average age of its network assets is relatively young, the condition of water supply assets has been the subject of recent analysis through examination of pipe performance. This has enabled condition to be inferred in more detail than has previously been the case. For gravity pipes, Council has recognised that the way it previously managed it's CCTV data was inadequate and will be using InfoAssets software in the future to improve this situation
7. Have you defined a clear and comprehensive set of service levels to be delivered or supported by the assets?	Yes. These are reviewed and approved by Council in conjunction with the three yearly AMP review
8. How well do you forecast future demand for the services that are delivered or supported by your assets?	Demand forecast is largely based on growth projections. Improvements could be made by considering other factors such as for example demographic changes, and changing technologies

9. Do you report, and get reports, on achievement of your asset management plan(s)?	Key Levels of Service are reported quarterly to Council, and other LOS are reported annually to Council Asset Management Plans themselves are peer reviewed.
10. Do you have a backlog of repairs, maintenance, and asset renewals? And what are you doing about it?	No. The Asset Management Plan process delivers approved budgets that to date have been sufficient to ensure that there is no appreciable maintenance backlog, and that fully funds future renewals

24 CHANGES TO AMP AS A RESULT OF LONG TERM PLAN CONSULTATION

This section outlines any significant changes to the AMP as a result of the 2021-31 Long Term Plan consultation period.

Some changes to budgets have arisen as a consequence of a staff submission report to Council during LTP hearings 25-26 May (TRIM 210420063358). Projects themselves have not changed, but budgets have been modified as a consequence of detailed designs progressing. The table below provides a summary of the changes to capital budgets across the various district schemes

Budget Name	Draft 2021-31 LTP (2021/22)	Proposed Revised Budget (2021/22)	Difference	Notes
Cust UV Treatment Implementation	$ 110,000	$ 10,000	-$100,000	Stimulus funding reduced District Water funded portion
Cust Headworks Renewal	$ 200,000	$ 100,000	-$100,000	Stimulus funding reduced Cust scheme funded portion.
Mandeville Water Renewals	$ 70,000	$ 90,000	$20,000	Design completed and cost estimate revised
Oxford Rural No.2 Water Renewals	$ 50,000	$ 70,000	$20,000	Design completed and cost estimate revised
Mandeville Pump Upgrade – Renewal	$ 10,000	$ 20,000	$10,000	Concept design completed and cost estimate revised
Mandeville Pump Upgrade – Growth	$ 40,000	$ 60,000	$20,000	
Mandeville Storage Upgrade (Partially Growth)	$ 280,000	$ 500,000	$220,000	Early concept design completed and cost estimate revised.
Waikuku Beach Campground UV	$ 220,000	$ 295,000	$75,000	Concept design completed and cost estimate revised
Total	$ 980,000	$ 1,145,000	$165,000	

In addition the Pipeline Cleaning and Flushing budget for the Woodend water supply was brought forward to enable earlier air scouring of pipes than previously planned, (increased in 2021/22 from $20,670 to $60,670, and reduced in 2022/23 from $62,250 to $22,250)

Appendix 1: Asset Management Maturity Assessment

Asset Management Maturity Assessment Water Supply

Reference	Question	Section	Questions	Why	Maturity Levels					Current Score	Appropriate Target
					Aware	Minimum	Core	Intermediate	Advanced		
					0-20	25-40	45-60	65-80	85-100		
Understanding and Defining Requirements											
IIMM 2.1	**1**	**AM Policy and Strategy**	To what extent has your organisation's AM Policy and AM Strategy been articulated, approved, communicated and acted on? How consistent is this policy and strategy with current government policies?	The AM Policy supports an organisation's strategic objectives. It articulates the principles, requirements and responsibilities for asset management (AM). It articulates the objectives, practices and action plans for AM improvement, audit and review processes. The AM Policy and Strategy may be incorporated into the AM Plan.	The Organisation is aware of the need to develop an AM Policy, but hasn't yet completed this work.	Corporate expectations are expressed informally and simply, e.g. "all departments must update AMPs every three years".	There are defined policy statements for all significant business activities. There is a clear linkage to corporate goals. AM Policy is supported by high level action plans with defined responsibilities for delivery.	Expectations of each business activity are supported by detailed action plans, resources, responsibilities and timeframes. AM Policy and Strategy is reviewed and adopted by Executive Team each year.	AM Policy and Strategy is fully integrated into the organisation's business processes and subject to defined audit, review and updating procedures.	55	70
IIMM 2.2	**2**	**Levels of Service and Performance Management**	How does your organisation determine what is the appropriate level of service for its customers and then ensure that asset performance is appropriate to those service levels?	Levels of service are the cornerstone of asset management and provide the platform for all lifecycle decision making. Levels of service are the outputs a customer receives from the organisation, and are supported by performance measures. One of the first steps in developing asset management plans or processes is to find out what levels of service customers are prepared to pay for, then understand asset performance and capability to deliver those requirements.	The organisation recognises the benefits of defining levels of service but has yet to implement guidelines for development of these.	Basic levels of service have been defined and agreed, along with the contribution of asset performance to the organisation's objectives.	Customer Groups have been defined and requirements understood. Levels of service and performance measures are in place covering a range of service attributes. There is annual reporting against targets.	Customer Group needs have been analysed and costs of delivering alternate levels of service have been assessed. Customers are consulted on significant service levels and options.	There is formal consultation over levels of service. Customer levels of service and technical (ie asset performance) levels of service are an integral part of to decision making and business planning.	65	75
IIMM 2.3	**3**	**Demand Forecasting**	How robust is the approach your organisation uses to forecast demand for its services and the possible impact on its asset portfolios?	This AM activity involves estimating demand for the service over the life of the AM plan or the life of the asset. Demand is a measure of how much customers consume the services provided by the assets. The ability to predict demand enables an organisation to plan ahead and meet that demand, or manage risks of not meeting demand.	The organisation recognises the benefits of demand forecasting but has yet to implement processes to forecast demand.	Demand forecasts are derived by experienced staff (rather than data models), taking account of past demand trends and likely future growth patterns.	Demand Forecasts are based on robust projections of a single primary demand factor (e.g. population growth) and extrapolation of historic trends. Risk associated with changes in demand is broadly understood and documented.	Demand forecasts are based on mathematical analysis of past trends and primary demand factors. A range of demand scenarios is developed (e.g.: high/medium/ low).	As for intermediate, plus there is an assessment of risks associated with different demand scenarios, and mitigation actions are identified.	75	85
IIMM 2.4	**4**	**Asset Register Data**	What sort of asset-related information does the organisation collect, and how does it ensure the information has the requisite quality (accuracy, consistency, reliability)?	Asset data is the foundation for enabling most AM functions. Planning for asset renewal and maintenance activities cannot proceed until organisations know exactly what assets they own or operate and where they are located	The organisation recognises the benefits of capturing asset data but has yet to implement systems to capture the data.	Basic physical information recorded in a spread sheet or similar (e.g. location, size, type), but may be based on broad assumptions or not complete.	Sufficient information to complete asset valuation – as above plus replacement cost and asset age/ life. Asset hierarchy, asset identification and asset attribute systems documented.	A reliable register of physical and financial attributes recorded in an information system with data analysis and reporting functionality. Systematic and documented data collection process in place. High level of confidence in critical asset data.	Information on work history type and cost, condition, performance, etc. recorded at asset component level. Systematic and fully optimised data collection programme. Complete data-base for critical assets; minimal assumptions for noncritical assets.	55	85

IIMM 2.5	**5**	**Asset Condition Assessment**	How does the organisation measure and manage the condition of its assets?	Timely and complete condition information supports risk management, lifecycle decision-making and financial / performance reporting.	The organisation recognises the need for monitoring asset condition but has not developed a coherent approach. Measures are incomplete, predominantly reactive. There is no linkage to asset management objectives.	Condition assessment at asset group level ('top-down). Supports minimum requirements for managing critical assets and statutory requirements (e.g. safety).	Condition assessment programme in place for major asset types, prioritised based on asset risk. Data supports asset life assessment. Data management standards and processes documented. Programme for data improvement developed.	Condition assessment programme derived from benefit- cost analysis of options. A good range of condition data for all asset types (may be sampling-based). Data management processes fully integrated into business processes. Data validation process in place.	The quality and completeness of condition information supports risk management, lifecycle decision-making and financial / performance reporting. The organisation conducts periodic reviews of the suitability of its condition assessment programme.	**40**	**75**
Lifecycle Decision Making											
IIMM 3.1	**7**	**Decision Making**	How does your organisation go about making decisions on the replacement or refurbishment of existing assets or investment in new ones?	Decision techniques provide the best value for money form an organisation's expenditure programmes. These techniques reveal strategic choices, and balance the trade off between levels of service, cost and risk. ODM is a formal process to identify and prioritise all potential asset and non-asset solutions with consideration of financial viability, social and environmental responsibility and cultural outcomes.	The organisation recognises the benefits of optimised decision making but has yet to implement processes.	AM decisions are based largely on staff judgement and agreed corporate priorities.	Formal decision making techniques (eg using BCA) are applied to major projects and programmes.	Formal decision making and prioritisation techniques are applied to all operational and capital asset programmes within each main budget category/business unit. Formal decision making techniques (eg BCA) are applied to major projects and programmes. Critical assumptions and estimates are tested for sensitivity to results.	As for Intermediate, plus the decision making framework enables projects and programmes to be optimised across the whole business. Formal risk-based sensitivity analysis is carried out.	**60**	**80**
IIMM 3.2	**8**	**Operational Planning and Reporting**	How does your organisation manage the cost effective performance of its key business assets over time (e.g. in terms of utilisation, availability, fitness for purpose)?	Effective operational strategies can mitigate risk, defer the need for asset renewals and minimise service downtime following asset failures. Planning for business continuity and full utilisation of assets are key factors in good asset management processes.	The organisation recognises the benefits of operational planning and asset performance reporting but has yet to implement processes to implement these.	Operational responses are understood by key staff, but plans aren't well-documented, or are mainly reactive in nature. Asset performance is measured for some key assets but is not routinely analysed.	Emergency response plan is developed. Demand management is considered in major asset planning. Asset performance is measured for critical asset groups and is routinely analysed.	Emergency response plans and business continuity plans are routinely developed and tested. Demand management is a component of all operational decision making. Asset performance is measured and analysed for most asset groups.	Operational plans are routinely analysed, tested and improved. Formal debriefs occur after incidents. Asset performance is measured in real-time and cost-effectiveness is analysed across all asset groups. Operational programmes are optimised using benefit-cost and risk analysis.	**40**	**70**
IIMM 3.3	**9**	**Maintenance Planning**	How does the organisation plan and manage its maintenance activity?	Maintenance is "all actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal". Maintenance slows deterioration: it is mechanism to ensure assets continue to deliver performance associated with the required level of service. A major challenge for the asset manager is striking the appropriate balance between planned maintenance (inspections and scheduled maintenance etc.) and unplanned maintenance (arising from unexpected failures)	The organisation recognises the benefits of maintenance planning but has yet to implement such processes.	Managers and operators understand how asset functions support organisational objectives. Processes comply with legislation and regulations. Maintenance records are maintained. Critical assets have been identified.	Asset criticality considered in response, fault tracking and closure processes. There is a strategy for prescriptive vs. performance-based maintenance. Key maintenance objectives have been established, measured and reported on.	Contingency plans exist for all maintenance activities. Asset failure modes are understood. Timing and frequency of major preventative maintenance is optimised using benefit-cost analysis. Maintenance management software is being applied appropriately.	Forensic root cause analysis is conducted for major faults. All reactive and planned programmes are optimised with respect to renewal planning. Different procurement models have been fully explored. Maintenance operations represent value for money.	**35**	**65**

IIMM 3.4	**10**	**Capital Investment Strategies**	What processes and practices does the organisation have in place to plan and prioritise capital expenditure?	Capital investment include the upgrade, creation or purchase of new assets, typically to address growth or changes in levels of service requirements, or for the periodic renewal of existing assets, to maintain service levels. Agencies need to plan for the long term asset requirements relative to future levels of service. The decision on whether to create a new asset is typically the time when there is the most opportunity to impact on the potential cost and level of service. Cabinet expects all capital-intensive agencies to disclose 10 year capital intentions and make appropriate use of the better business cases methodology for programmes and individual investment proposals.	The organisation recognises the benefits of capital planning, but has yet to implement such processes.	There is a schedule of proposed capital projects and associated costs, based on staff judgement of future requirements.	Projects have been collated from a wide range of sources such as business unit planning processes and corporate risk processes. Capital projects for the next three years are fully scoped and estimated.	As for core, plus formal options analysis has been completed for major projects that need to be bought into service within the next 5 years. Capital intentions reports identify all major capital projects for the next 10 or more years with broad estimates of the costs and benefits of those projects or programmes.	Long -term capital investment programmes are developed using advanced decision techniques, such as predictive renewal modelling. The organisation has a reliable and approved 10 year view of its future capital requirements and the strategic choices available to meet changing fiscal or level of service requirements.	**65**	**90**
IIMM 3.5	**11**	**Financial and Funding Strategies**	How does your organisation plan for the funding of its future capital expenditure and asset-related costs?	Poor financial management can lead to higher long run life cycle costs, inequitable fees and charges, and financial "shocks". Good collaboration between financial and asset managers is important, especially in relation to long term financial forecasts and asset revaluations. Asset valuation is required by International Accounting Standards, and can be used in lifecycle decision making. Robust financial budgets are a key output of any asset management planning process.	The organisation recognises the benefits of developing medium to long term financial and funding strategies, but does yet have any in place. The organisational focus is on the operating statement rather than the balance sheet.	Financial forecasts are based on extrapolation of past trends and broad assumptions about the future. Assets are re-valued in accordance with NZ International Accounting Standards (NZ IFRS).	Ten year+ financial forecasts based on current AMP outputs. The quality of forecasts meets NZ IFRS requirements. Significant assumptions are specific and well reasoned. Expenditure captured at a level useful for AM analysis.	Ten year+ financial forecasts are based on current and comprehensive AMP's with detailed supporting assumptions / reliability factors. Asset expenditure information is linked with asset performance information.	The organisation publishes reliable ten year+ financial forecasts based on comprehensive, advanced AMPs with detailed underlying assumptions and high confidence in accuracy. Advanced financial modelling provides sensitivity analysis, evidence-based whole of life costs and cost analysis for level of service options.	**65**	**85**
Asset Management Enablers											
IIMM 4.1	**12**	**Asset Management Teams**	What is the level of organisational commitment to asset management? How is this reflected in existing organisation structure, responsibilities and resourcing of AM competencies?	Effective asset management requires a committed and co-ordinated effort across all sections of an organisation.	The organisation recognises the benefits of an asset management function within the organisation, but has yet to implement a structure to support it.	Asset Management functions are performed by a small number of people with AM experience.	An organisation-wide Steering Group or Committee coordinates all capital asset management activity. There is relevant training for key AM staff. The Executive Team have considered options for AM functions and structures.	All staff in the organisation understand their role in relation to AM, it is defined in their job descriptions, and they receive training aligned to their roles. A person on the Executive Team has responsibility for delivering the AM policy and strategy.	There is strong leadership of the AM functions across the organisation. There is a formal AM capability management programme. The cost effectiveness of the AM structure has been formally reviewed.	**45**	**75**
IIMM 4.2	**13**	**AM Plans**	How does your organisation develop, communicate, resource and action its asset management plans?	An asset management plan is a written representation of intended capital and operational programmes for it's new and existing infrastructure, based on the organisations understanding of demand, customer requirements and it's own network of assets.	The organisation recognises the benefits of asset management plan(s), but has not yet developed any.	The AM Plan contains basic information on assets, service levels, planned works and financial forecasts up to 5 years, and future AM improvement actions.	As for minimum plus a description of services and key / critical assets, future demand forecasts, description of supporting AM processes, 10 year financial forecasts, 3 year AM improvement plan.	As for core, plus analysis of asset condition and performance trends (past / future), effective customer engagement in setting LoS, ODM / risk techniques applied to major programmes.	As for intermediate plus evidence of programmes driven by comprehensive ODM techniques, risk management programmes and level of service / cost trade-off analysis. Improvement programmes are largely complete. There is a focus on maintaining appropriate practices.	**70**	**85**

IIMM 4.3	**14**	**Information Systems**	How does your organisation meet the information needs of those responsible for various aspects of asset management?	AM systems have become an essential tool for the management of assets in order to effectively deal with the extent of analysis required.	The organisation recognises the benefits of using an asset management system, but does not have one in place.	Asset register records core asset attributes - size, location, age, etc. Asset information reports can be manually generated for AMP input.	Asset register enables hierarchal reporting (from component level to whole-of-facility level). There are systems for tracking customer service requests and for planning maintenance activity. System enables manual reports to be generated for valuation, renewal forecasting.	More automated asset performance reporting on a wider range of information. Key operations, unplanned maintenance and condition information held.	Financial, asset and customer service systems are integrated and enable advanced AM functions. There is optimised forecasting of renewal expenditure.	**50**	**85**
IIMM 4.4	**15**	**Service Delivery Models**	How does your organisation procure asset-related services like maintenance and consumables for different classes of assets? How does the organisation exercise control over any outsourced asset management services?	The effectiveness of asset management planning is proven in the efficient and effective delivery of services at an operational level.	The organisation recognises the benefits of defining services delivery mechanisms and functions, but has yet to define these.	Service delivery roles are clear. Allocation of roles (internal and external) generally follows past procurement preferences.	Core functions defined. Contracts in place for external service providers. Tendering / contracting policy in place. Competitive tendering practices applied.	As for core, plus internal service level agreements in place with internal service providers. Contracting approaches have been reviewed to identify best value delivery mechanism.	All potential service delivery mechanisms have been reviewed and formal analysis carried out. Risks, benefits and costs of various outsourcing options have been considered and the best value arrangement has been or is being implemented.	**65**	**85**
IIMM 4.5	**16**	**Quality Management**	How does your organisation ensure that it's asset management processes and practices are appropriate and effective?	When AM processes are part of a Quality Management system the organisation is able to operate consistent and reliable processes,, provide evidence that what was planned was delivered, and ensure that knowledge is shared. In short, that processes are appropriate and consistently applied and understood.	The organisation recognises the benefits of quality assurance processes, but has yet to implement processes for these.	Simple process documentation in place for service-critical activities.	There is a clear quality policy and basic quality management system. All critical AM activity processes are documented.	Process documentation has been implemented in accordance with the Quality Management System plan. All processes documented to appropriate level detail.	Quality certification has been achieved. Surveillance audits demonstrate the quality management system is operating satisfactorily.	**35**	**65**
IIMM 4.6	**17**	**Improvement Planning**	How does your organisation ensure that it continues to develop its asset management capability towards an appropriate level of maturity?	Well performing agencies give careful consideration of the value that can be obtained from improving AM information, processes, systems and capability. The focus is on ensuring AM practices are "appropriate" to the business objectives and government requirements.	The organisation recognises the benefits of improving asset management processes and practises, but has yet to develop an improvement plan.	Improvement actions have been identified and allocated to appropriate staff.	Current and future AM performance has been assessed and improvement actions identified to close the gaps. Improvement plans identify objectives, timeframes, deliverables, resource requirements and responsibilities.	There is formal monitoring and reporting on the improvement programme to the Executive Team. Project briefs have been developed for all key improvement actions. Resources have been allocated to the improvement actions.	There is evidence that agreed improvement plans have delivered the expected business benefits.	**65**	**80**

Appendix 2: Glossary Of Terms

The following terms and acronyms (in brackets) are used in this Activity Management Plan (either in this overview document or the scheme specific documents).

Activity	As defined in the Local Government Act 2002: 'Goods or services provided by, or on behalf of a local authority or council-controlled organisation and includes: a) The provision of facilities and amenities; b) The making of grants; and The performance of regulatory and other governmental functions.
Activity Management Plan (AM Plan)	Activity Management Plans are key strategic documents that describe all aspects of the management of assets and services for an activity (including technical and financial) over the lifecycle of the asset in the most cost-effective manner to provide a specified level of service. The documents are an information source for the Council's LTP and IS, and place an emphasis on long term financial planning, community consultation, and a clear definition of service levels and performance standards.
Asset Management (AM)	The combination of management, financial, economic, engineering and other practices applied systematically to physical assets with the objective of providing the required level of service in the most cost-effective and sustainable manner.
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.
Asset Management System (AMS) (also known as asset register)	A system (usually computerised) for collecting analysing and reporting data on the utilisation, performance, lifecycle management and funding of existing assets.
Asset Management Planning	A set of interrelated or interacting elements of an organisation, including the AM policy, AM objectives, AM Strategy, AM Plans, and the processes to achieve these objectives.
Asset Management Plan (AMP)	In the Waimakariri District Council's context, this is referred to as an activity management plan.
Aesthetic Determinant	A constituent or property of the water that can adversely affect the taste, odour, colour, clarity or general appearance of the water. These include substances such as manganese and iron compounds that can stain washing and utensils.
Aggressiveness	A measure of the tendency of water to corrode pipes and fittings, which can cause heavy metal concentrations to rise above 50% of their MAV.
Alkalinity	Alkalinity is a measure of the buffering capacity. A buffer limits the change in pH that occurs when water comes into contact with acidic or alkaline substances.
Annual Plan	The Annual Plan has the meaning given to it in the Local Government Act 2002.
Asset	A physical item that enables provision of services and has an economic life of greater than 12 months, has value of at least $250 and is recorded in the asset register.

Asset condition	This describes an asset's structural integrity or ability to deliver the service required from it. The condition can deteriorate slowly over the life of an asset or rapidly if it is damaged.
Asset Register	A record of asset information considered worthy of separate identification including inventory, historical, financial, condition, construction, technical and financial information about each.
Average Daily Flow (ADF)	The recorded flow over a year divided by the number of days in a year and generally expressed as volume/day or litres/second.
Brownfields	Previously developed land with potential for new development.
Chlorination	Part of a water treatment process that involves the injection of chlorine into the water supply to kill potentially harmful micro-organisms.
Capital Expenditure (CAPEX)	Expenditure used to create new assets, renew assets, expand or upgrade assets or to increase the capacity of existing assets beyond their original design capacity or service potential. CAPEX increases the value of an asset.
Community Drinking Water Supply	A publicly or privately owned drinking water supply which serves more than 25 people for at least 60 days of the year.
Compliance	A drinking water is said to be in compliance with the standards when the results of monitoring of bacteriological and chemical determinants show that the water supply satisfies the requirements of the Drinking Water Standards for New Zealand 2005 (revised 2008) (DWSNZ).
Condition Monitoring	The inspection, assessment, measurement and interpretation of the resultant data, to indicate the condition of a specific component so as to determine the need for some preventive or remedial action
Connection	From the point of view of the utility provider this relates to the physical connection of a particular customer to the service.
Consumer	The owner or resident of a property who has a connection to a water supply and is provided with potable water at an agreed level of service
Contaminant	A substance or organism in the water which can cause undesirable public health or aesthetic effects.
CPH	Community and Public Health. An organisation working for the Ministry of Health. Health Protection Officers are engaged by CPH.
Critical Assets	Assets for which the financial, business or service level consequences of failure are sufficiently severe to justify prioritisation for inspection, rehabilitation or replacement ahead of other assets.
Customer	A customer is an individual or business that creates the demand for and is the recipient of goods or services. Customers can be internal or external.
Current Replacement Cost	The cost of replacing an existing asset with an appropriate modern equivalent asset to deliver the same level of service.
Deferred Maintenance	The shortfall in maintenance or rehabilitation work required to maintain the service potential of an asset.

Demand Management	The active intervention to influence demand for services and assets with forecast consequences, usually to avoid or defer CAPEX expenditure. Demand management may be 'SUPPLY-SIDE' demand management (for example minimising wastage through pipe leak detection) or customer DEMAND-SIDE management, to reduce demand for over-utilised assets or vice versa (for example, through pricing, regulation, education and incentives).
Depreciation	The annual sum budgeted to enable the assets to be replaced at the end of their economic life. It is generally based on the value of the asset divided by its remaining life at that point in time.
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.
Disaster Resilience Assessment (DRA)	An assessment first carried out in 2007 and updated in 2011/12 to determine the risk to assets from natural hazards.
Disinfection	The process used to inactivate micro-organisms in a drinking water supply. The only disinfection method used in Waimakariri Council water supplies is chlorination, but only on some supplies.
Disinfection Residual	The amount of disinfection that is still present in the water at any time. After disinfection is added to drinking water it is used up by the disinfection process and other chemical reactions. More disinfection is usually added than is initially needed so that enough disinfectant remains to guard against post treatment contamination.
Disposal	Activities necessary to decommission and dispose of assets that are no longer required.
Distribution system	All the trunk main, storage, and distribution system components which follow a treatment facility at the treatment station.
Diurnal Pattern	The variation in daily flow pattern generated within the system related to varying demands throughout the day.
Drinking-water	Potable water intended to be used for human consumption, food preparation, utensil washing, oral hygiene or personal hygiene.
DWS or DWSNZ	The Drinking Water Standards for New Zealand 2005 (revised 2008). The yardstick to assess the quality of drinking water. The Standards define the MAVs of health significance and specify methods for determining whether a drinking water supply complies with the standards.
E coli	A bacterium used as an indicator that faecal Coliform contamination of the water may have occurred and that, therefore there is a possibility that pathogens are present. The ratio of E.coli to harmful bacteria is on the order of 10,000 to 1 and its concentration in liquids is easily determined. Therefore E.coli is the principle indicator for the presence of harmful bacteria.
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 physical life, however obsolescence will often ensure that the economic life is less than the physical life.
Facility	A complex comprising many assets (eg. swimming pool complex, sewage treatment plant etc.) which represents a single management unit for financial, operational, maintenance or other purposes.

Faecal coliforms	A subgroup of total coliforms, which will grow on a specific selective medium. The presence of faecal coliforms indicates that faecal contamination may have occurred and that steps need to be taken to ensure pathogens are not present.
Free Available Chlorine (FAC)	The residual chlorine left in the water at any point in time.
Fully Chlorinated Water Supply	Water in which the FAC concentration exceeds the equivalent of 0.2 mg /L free available chlorine at pH 8.0
Geographic Information System (GIS)	Software which provides a means of spatially viewing, searching, manipulating, and analysing an electronic data-base.
Greenfield Development Area	Existing undeveloped land with potential for development or newly rezoned land that has yet to be developed with the appropriate infrastructure to support a residential or commercial land use.
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.
Key Performance Indicator (KPI)	A qualitative or quantitative measure of a service or activity used to compare actual performance against a standard or other target. Key performance indicators commonly relate to statutory limits, safety, responsiveness, cost, comfort, asset performance, reliability, efficiency, environmental protection and customer satisfaction. Some of these may be mandatory performance measures as prescribed by central government. Also referred to as performance indicators (PI) or performance measures (PM).
Guideline value	The value for an aesthetic determinant specified in the DWSNZ, which if exceeded will render the water unattractive to consumers.
Headworks	Headworks are the heart of a water supply system and fall into two categories. They may be combined on one site or at two separate locations. The first category contains all the pumps, treatment processes, electrical controls and switchboards and is normally housed in a pump station building. Any flow control/storage reservoirs are commonly at the sites. The second category contains the well(s), their associated pump(s), electrical controls and switchboards and if at a separate location deliver the water to the first category headworks.
Health Drinking Water Amendment Act 2007 (HDWAA)	This Act is aimed at ensuring communities have safe water to drink. A key requirement of the HDWAA will be that all water suppliers must take all practicable steps to comply with the DWSNZ.
Iron (Fe)	This is a metal (often associated with manganese) that can be found dissolved in water sourced from underground. It can cause aesthetic problems in reticulated water supplies, but it can be removed with appropriate treatment.
Level of service (LoS)	A measure of the standard of service that the Council intends to provide. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.
LGA	Local Government Act 2002.
Life	A measure of the anticipated life of an asset or component; such as time, number of cycles, distance intervals etc.

Life Cycle Cost	The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.
Life Cycle Maintenance	All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal.
Life Cycle Maintenance	All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal.
Long Term Plan (LTP)	The Long Term Plan (LTP) has the meaning given to it in the Local Government Act 2002.
Maintenance Plan	Details the specific planned or reactive maintenance actions for the optimum maintenance of an asset, or group of assets.
Manganese (Mn)	This is a metal (often associated with iron) that can be found dissolved in water sourced from underground. It can cause odour, taste and aesthetic problems in reticulated water supplies, but it can be removed with appropriate treatment.
Maximum Acceptable Value (MAV)	The concentration of a determinant (specified in the DWSNZ), below which the presence of the determinant does not result in any significant risk to the consumer over a lifetime of consumption. For carcinogenic chemicals, the MAVs set in the New Zealand Drinking Water Standards generally represent a risk of one additional incidence of cancer per 100,000 people ingesting the water at the concentration of the MAV for 70 years.
Maintenance Plan	Details the specific planned or reactive maintenance actions for the optimum maintenance of an asset, or group of assets.
Medical Officer of Health (MOH)	The Medical Officer of Health appointed for a health district under the Health Act 1956, and includes any Deputy Medical Officer of Health; and, for the purposes of Part IV of the act, includes any medical Practitioner acting under the direction of the Medical Officer of Health.
Micro-organism	A very small (microscopic) organism, including viruses, bacteria, protozoa, algae and helminthes.
Ministry of Health (MoH)	The government agency responsible for implementing the Health Act 1956.
Network Utility Operator	A person or in many cases a local authority that provides a reticulated water supply.
NTU	See turbidity.
NZ Treasury Asset Management Maturity Assessment Tool (AMMA)	A tool (in spreadsheet format) that allows organisations to assess the maturity of their current Asset Management Plans, and to define a target maturity to which future Asset management Plans can aspire to, that is appropriate to the activity under consideration.
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.
Peak Daily Flow	The highest recorded daily flow in a year generally expressed as volume/day or litres/second or litres/connection/day.
Performance Monitoring	Quantitative and qualitative assessments of the actual performance compared with specific objectives, measures, targets or standards.

pH	A measure of the concentration of hydrogen ions in water. It is the negative logarithm to base of 10 of the concentration H+1 in the water. A low pH indicates an acidic water, a high pH shows the water is alkaline. A pH of 7 is neutral. The pH of the water is particularly important in water treatment processes such as disinfection.
pH Correction	Potable water has a narrow acceptable range on the acidity/alkalinity scale. Too high alkalinity can cause scale build-up in the reticulation and digestion problems and too high acidity can erode parts of the reticulation system. pH correction is a treatment process that shifts a water supply into the correct range if necessary.
Potable water	Drinking water that does not contain contaminants, which exceed the Maximum Acceptable Values (MAVs) given in the DWSNZ.
Planned Maintenance	Day to day operational activities to keep the asset operating (fixing potholes, clearing drains, greasing pumps and motors, mowing etc.) and which form part of the annual operating budget. These may be cyclic, e.g. on specific timeframe, or needs-based, i.e. where a fault is monitored until it reaches a point at which some action must be taken to ensure continued performance/life of asset.
Presumptive Coliforms	Bacteria whose identification in the early stages of bacteriological examination highlight the need for further identification of coliform organisms.
Protozoa	One of several types of micro-organism found in water, some of which can be harmful if ingested. Protozoa are larger than bacteria and include species like Giardia and Cryptosporidium.
Rating Charges	The annual amount charged to a customer for the provision of a reticulated water supply. In the Waimakariri District a fixed amount is charged on each rating unit or separately used or inhabited parts of a rating unit in the Rangiora, Kaiapoi, Woodend (including Tuahiwi), Waikuku Beach, Pines-Kairaki, Cust, Oxford township, Ohoka, Garrymere, Fernside, Mandeville, Pegasus and West Eyreton supplies. A fixed amount per unit of water allocated to the property is charged on the Oxford Rural No 1 and Oxford Rural No 2 supplies. A combination of a fixed amount per rating unit (to collect 75% of costs) plus a fixed amount per unit of water (to collect 25% of costs) allocated to the property is charged on the Summerhill Rural Water Supply and the Poyntzs Road Water Supply.
Raw water	Water, which has not received any treatment to make it suitable for drinking.
Renewal	Works to upgrade, refurbish, rehabilitate or replace existing assets with ones of equivalent capacity or performance capability.
Renewal Programme	This is the programmed replacement of like asset with like asset (as opposed to an upgrade), when it reaches the end of its useful life due to deterioration of its condition.
Remaining Economic Life	The time remaining until an asset ceases to provide the required level of service or economic usefulness.
Repair	Action to restore an item to its previous condition after failure or damage.
Replacement	The complete replacement or renewal of an asset that has reached the end of its life, so as to provide a similar, or agreed alternative, level of service.
Reservoir	A storage facility present in the network reticulation for the purpose balancing peak demands, maintaining a constant pressure, and providing storage for emergency and fire-fighting purposes.

Risk Cost	The assessed annual cost or benefit relating to the consequence of an event. Risk cost equals the costs relating to the event multiplied by the probability of the event occurring.
Risk Assessment	The process of looking at all possible events that might cause the failure of a given asset or component. The risk assessment considers both the probability and consequences of an event occurring. Risks are assessed and prioritised, and appropriate reduction or mitigation measures are implemented.
Risk Management	Risk management is the identification, assessment, and prioritisation of risks (defined in ISO 31000 as the effect of uncertainty on objectives) followed by coordinated and economical application of resources to minimise, monitor, and control the probability and/or impact of unfortunate events.
Restrictor	A flow control device fitted to the service pipe to limit the flow rate of water to a customer's premises. This device is owned and maintained by the Council. The device maintains a constant flow over the normal operating pressure of the scheme, allowing a fixed volume of water to be delivered over a 24 hour period. Restrictors are designed to deliver differing volumes of water to suit differing allocations (units of water) to customers.
Reticulation	The network of pipes that delivers drinking water from the treatment plant to the customer's point of supply. It includes pumps, pipes, and reservoirs.
Routine Maintenance (can be planned or unplanned)	Day to day operational activities to keep the asset operating such as replacement of minor equipment, oil and greasing pumps and motors, cleaning of equipment, repairing leaks, etc. It forms part of the annual operating budget, including preventative maintenance.
Semi-Restricted Supply	A rural water supply that has restrictors to limit the peak flow of water at each connection. Each connection receives normal urban pressures and is not required to have an individual tank. Each connection is restricted to 13 litres per minute (this is a supply of up to 19 units per day per property, where 1 unit is equivalent to 1,000 litres per 24 hours).
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.
Restricted Supply / Rural Restricted Supply	A rural or rural-residential water supply that has restrictors at each connection to limit the total volume of water supplied over a 24 hour period. Each connection is required to have its own tank. Residential properties are normally restricted to two cubic metres per day. On some Rural Schemes customers are able to purchase additional units for stock use.
Rural Water Supply (RWS)	Rural water supplies are designed to deliver potable water to rural areas. Each consumer is provided with a restricted connection and required to provide onsite storage for peak flows.
Secure Groundwater	Water contained beneath the land surface which is abstracted via a secure well head or similarly proven structure. It must not be under the direct influence of surface water or demonstrate any significant and rapid shift in characteristics such as turbidity, temperature, conductivity or pH which closely correlate to any climatological conditions, surface water conditions or land use practices, as demonstrated by : Less than 0.005 percent of the water having been present in the aquifer for less than one year as demonstrated by the tritium and CFC methods. Variations in the groundwater characteristics not exceeding a coefficient of variation of more than:

	3.0 percent in conductivity 4.0 percent in chloride concentration 2.5 percent in nitrate concentration (standardised variance) There must also be no insects, other macro-organisms such as algae/ organic debris, large diameter pathogens, or E-coli in 12 successive monthly samples.
Surface Water	The water on the land surface. Surface water is produced by rainfall runoff and by groundwater seeping through the top layers of soil. Surface water can also be defined as all water open to the atmosphere.
Secure Well Head	A well head that incorporates appropriate measures to prevent or minimise risk of groundwater contamination. Measures include: 1) Sealed pumping and piping system including backflow prevention. 2) Seals between the well casing, pipework and surrounding ground. 3) Restrictions on any potentially contaminating land use in the vicinity of the well head.
Surrogate	A determinant used to assess the likely presence or concentrations of another determinant which is difficult to determine directly. For example, E-coli is used to assess the likely presence of specific pathogen organisms, as they are good indicator organisms and are easier to test for than pathogens themselves.
Total Coliforms	Genera in the family enterobacteriaceae, the total coliforms are bacteria which will grow on a specific selective medium when incubated at 35 degrees centigrade + or – 0.2 degrees centigrade. They are used to indicate the probable contamination of water by organic material, and that the possibility of faecal contamination needs to be checked. Total coliforms include the genera; Erwinia, Klebsiella, Escherichia, Citrobacta and Enterobacta.
Transgression	A drinking-water sample is said to transgress the Standards when a determinant of any priority class that is present in the sample exceeds the Maximum Acceptable Value (MAV) or the compliance criteria requirements.
Turbidity (NTU)	A measure of the clarity of water. High turbidity means low clarity (poor aesthetics) and is generally caused by very fine suspended particles in the water (as opposed anything dissolved in the water). It is not harmful. Suitable treatment processes can reduce turbidity. NTU is the measure of turbidity, higher values mean the water is more cloudy or has lower clarity.
Unit of Water	One cubic metre (1,000 litres) of water per day delivered over a 24 hour period. The normal minimum is two units for domestic consumption but additional water units can be purchased on some restricted water schemes to supplement a properties water demand.
Unplanned Maintenance (or repair)	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.
Upgrade	The addition or replacement of an asset, or component of that asset, that materially improves its original service potential.
Urban Supply	An on-demand supply that has no flow restriction. Connections receive normal urban pressures and are not required to have their own tank. Fire Fighting capacity is normally also provided.

Valuation	The process of determining the worth of an asset or liability. Assessed asset value, which may depend on the purpose for which the valuation is required, i.e. replacement value for determining maintenance levels, market value for life cycle costing or replacement plus a percentage for insurance purposes.
Water Conservation Strategy (WCS)	A strategy adopted by Waimakariri District Council in 2010 to adopt appropriate water conservation measures throughout the district.
Water Information New Zealand (WINZ)	A computer database that assesses compliance of monitoring results of water supplies with the DWSNZ 2000.
Water Safety Plan (WSP)	A document written by the Water Supply Authority to assess all potential risks in the process of abstracting, treating and distributing water to the consumers in a particular water supply. The plans identify events, their cause/s, preventative measures and the corrective action to be undertaken. The preparation of a WSP is a requirement of the HDWAA. Water Safety Plans were previously described as Public Health Risk Management Plans in earlier versions of the Council's AMP's.
Water Supply Authority	Any person or entity that owns, or is responsible for operating, a drinking-water supply. For example, the Waimakariri District Council is the principal Water Supply Authority in the Waimakariri district.
Water Treatment Plant	The point where raw water is treated to make it potable. Note that not all raw waters require treatment (for example, secure groundwater often requires no treatment).
Well Head	The physical structure, facility or device at the land surface from which groundwater is abstracted.
WHO	World Health Organisation
Wholesome Drinking Water	Potable water which does not contain any determinants which exceed the Guideline Values for Aesthetic Determinants given in the DWSNZ 2000.

The following acronyms may also appear in Council activity management plans.

AM	Asset management
AMMA	NZ Treasury asset management maturity assessment
CAPEX	Capital expenditure
CE	Chief Executive
GIS	Geographic Information System
IIMM	International Infrastructure Management Manual
KPI	Key performance indicator
LGA	*Local Government Act*

Appendix 3: Assumptions and Risks

The following table is extracted from the 2021 to 2051 Waimakariri District Council Infrastructure Strategy. At a corporate level it outlines all of the key assumptions and risks that could potentially impact Council service delivery. Mitigation measures are explained in response to each identified risk.

Key Assumptions and Risks

The Council has identified a number of risks and assumptions when preparing this Long Term Plan (LTP) to ensure that all estimates and forecasts, contained throughout this document, are made on the same basis throughout the 10 year period, and in the case of the Infrastructure Strategy (IS) throughout the 30 year period.

LIKELIHOOD RATINGS	
Descriptor	*Description*
Likely - Almost Certain	The event is expected or likely to occur in most circumstances. A very low level of confidence/information
Medium	The event should occur at some time. A moderate level of confidence/information
Unlikely - Rare	The event may occur at some time or only in exceptional circumstances. A very high level of confidence/information

CONSEQUENCES					
Descriptor	*Health and Safety*	*$*	*Project Delays*	*Design robustness*	*Environment*
Major - Show stopper	Risk of multiple fatalities	Millions to tens of millions of dollars	More than 6 Months - Years delay	Significant performance deficiencies	Widespread ecological damage, costly restoration
Medium	Risk of serious injuries	Hundreds of thousands to millions of dollars	Weeks to months	Unable to meet some design criteria	Significant but recoverable damage
Routine to Minor	Risk of minor injuries	Tens of thousands to hundreds of thousands dollars or less	Days - Weeks	Meets design criteria most of the time	Minor short term effects

COMBINED FACTOR RATINGS
High significance
Medium significance
Low significance

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
ENVIRONMENTAL				
Earthquakes Significant earthquakes that cause major damage to Council's assets.	Medium likelihood (refer to Alpine Fault Magnitude 8 Study, 2016). This confirms a 30% probability of a magnitude 8.0 or above event within the next 50 years.	The community is significantly disrupted and displaced; Infrastructure and facilities are significantly damaged by more earthquakes; As well as a large amount of additional funding being required for service restoration affecting Council's debt and rate levels, provision for infrastructure renewals would also be affected.	Continuing to maintain CDEM readiness for response and recovery; Adopting resilient infrastructure standards through asset management plans and practises; All Council existing and above ground facilities upgraded to or otherwise at least 67% of current building code requirements; All new facilities meeting or exceeding current code requirements; Making appropriate District Plan provisions in relation to known active faults; Providing for borrowing 'headroom' in the Financial Strategy (FS).	CDEM emergency readiness and infrastructure and buildings seismic resiliency are all reflected in relevant budgets; Borrowing 'headroom' of $69M to fund the Council's share of rebuild in relation to a 'maximum probable loss scenario is provided for within the Council's FS.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
ENVIRONMENTAL				
Other Hazards/Significant Unplanned Adverse Events Fire, floods, windstorms, snowstorms, tsunamis outside of expected risk assessments;	Possible for tsunami, likely for flooding and snowstorms, possible for high winds (refer to Table 3.4 on page 31 of Canterbury CDEM Group Plan June 2014);	Some community disruption and displacement; Localised Infrastructure and facilities damage; Lesser scale affects than 1. above on the Council's financial position;	Ongoing mitigation measures as for a very large earthquake are more or less relevant depending on the event; Making provisions in the Reviewed District Plan informed by updated flood hazard mapping to guide development location and floor heights in relation to localised as well as major flooding scenarios; Continue to maintain CDEM readiness for response and recovery; Continue to support FENZ and their urban and rural Fire Forces.	The borrowing 'headroom' assumption in 1. above applies and is considered sufficient to account for reasonably foreseeable costs;
A Pandemic or Similar Event That would affect the District's population to an extent that has a significant effect on community wellbeing.	NZ is geographically isolated and border protection and preventative health programmes are well developed and in place. However, biosecurity risks are of increasing concern.	In the case of wide-spread epidemic, District health and welfare services cannot keep up with demand; Low direct impact, but if it were to occur, some adverse indirect impact on Council's financial position could be expected.	Continue to maintain CDEM readiness for response and recovery; Continue to support relevant agencies border protection, monitoring and response programmes capacity and readiness;	COVID-19 is contained. There will not be another significant health event across the entire community in the next ten years.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
Impacts of Climate Change Hazards planning has not adequately accounted for climate change impacts.	Hazards planning allows for projected sea level rise and flood mitigation measures account for anticipated changes to weather patterns. There is an increasing likelihood of sea surge, coastal inundation and groundwater rise affecting coastal settlements. IF average mean temperatures rise in the District, THEN the risks of wild fire, drought and windstorms is likely to increase.	Sea level rise progressively impacts low lying coastal areas affecting ecology and beach settlements; More significant rainfall events, (incl. higher rainfall intensity) may cause more localised flooding and alter major river flow patterns. Loss of essential services and damage to infrastructure and natural systems habitat.	Updating flood hazard mapping as in 2. above allows for 1 metre of sea level rise by 2100. This will be reflected in Reviewed District Plan provisions; Allowing for implications of slow sea level (sea surge and coastal inundation) and groundwater rise and changing weather patterns in infrastructural asset management planning and the forthcoming Reviewed District Plan.	Consequences of climate change for asset management are or are soon to be accounted for in relevant plans and policies.
ENVIRONMENTAL				
Water Quality Rising regulatory requirements and community expectations in relation to freshwater quality and in the face of deteriorating groundwater and lowland stream water quality; Previously secure deep source drinking water supplies are impacted with contaminants.	Ongoing adjustments to national and regional policy requirements are highly likely and this poses uncertainty to the adequacy of capital works programmes; Regular testing and proactive approach to treatment as necessary will ensure deep source supplies are protected from contamination.	Increasing standards for water quality management impact the Council's regulatory, monitoring and infrastructure requirements; Community drinking water supplies pose a health risk to the public in the event of deep-well water quality deterioration.	Provisions of asset management plans are updated and this is reflected in capital works programmes; New and revised consenting requirements set by Regional Plans are responded to; Regular testing and proactive safety plan implementation to ensure compliance with NZDWS.	Planned expenditure, monitoring and regulatory initiatives are effective in responding to rising regulatory requirements and observed deterioration in water quality; Drinking water safety plans are being implemented.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
ECONOMIC				
Population Growth The population growth rate is significantly different from that assumed.	Relative to recent and reasonably foreseeable growth based on development activity, the Council is taking a conservative approach to future projected growth for financial planning purposes; This approach together with close ongoing monitoring is consistent with established practice whereby growth assumptions have historically been very accurate.	Population growth and hence the development rate affects the demand for Council's services and infrastructure investment, as well as the ability for the community to afford improved facilities; If the population does not grow as quickly as projected then the revenue from rates and development contributions will not be accurately forecasted and improvements in community facilities and infrastructure will be delayed.	Making conservative (i.e. medium) growth assumptions for financial planning purposes that account for reasonably foreseeable development activity; For long term infrastructure planning purposes a medium-high growth assumption ensures sufficient capacity; Closely monitoring local trends, as well as wider demographic and development activity changes affecting Greater Christchurch, which has the potential to impact growth in the District; Formally review growth projections every three years as part of the LTP process and adjust programmes accordingly.	The estimated resident population of the District at 30 June 2021 is 62,200. This is projected to grow to 74,600 by 30 June 2031; For the IS out to 2051 it is assumed that population growth will trend towards the latest available Statistics New Zealand 'medium' variant growth rate and so increase to 97,000 by 2051. For capacity planning purposes, a population of XX,XXX by 2051 has been considered.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
ECONOMIC				
Growth Distribution Residential and business development does not occur within the expected locations.	The distribution of future urban and rural-residential development is determined by statutory plans and policies. This includes a shortly to be adopted District Development Strategy that sets out an anticipated development distribution through to 2048.	Unexpected or out-of-sequence development would put pressure on Council's head-works and trunk infrastructure as well as roading investment; The availability of services and facilities to cater for growth may be compromised.	Consenting new development in accordance with the adopted District Development Strategy and the Canterbury Regional Policy Statement directed provisions of the Waimakariri District Plan as reviewed.	Urban development over the next 10 years occurs within the Infrastructure Boundary and generally in Priority Areas identified in the Canterbury Regional Policy Statement; Over the 30 year period of the IS to 2051 development occurs in accordance with the adopted District Development Strategy and gives effect to the amended provisions of the Canterbury Regional Policy Statement as may be required in order to give effect to the National Policy Statement on Urban Development Capacity; To service urban and rural-residential development under these policy settings provision is made for networked infrastructural services in activity management plans.
Insurance The Council generally maintains prudent insurance cover that is readily available. However in the event of 1. above the risk is that cover may be withdrawn/ be unavailable to provide for reinstatement of otherwise insured Council assets.	It is likely Council will retain full replacement cover for above ground assets and cover, along with Government support, is in place for below ground assets.	Should insurance be lost, the cost of damage reinstatement from a major disaster would be significant and works prioritised and funded through borrowing and rates.	Allowing adequate borrowing 'headroom' in LTP in case full replacement cover is not retained for above and below ground assets.	Council will retain full replacement cover for above ground assets; The 60% Government share for below ground assets is maintained; Borrowing 'headroom' is provided for in the FS, in the unlikely event full cover is not available.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
ECONOMIC				
Inflation Inflation is significantly higher than that allowed for in the FS. The risk category is low in the short term (1 to 3 years), but medium in the longer term (4 to 10 years).	A comprehensive local government sector-wide approach to inflation projections has been used which allows for the fact that costs typically increase at a faster rate than the consumer price index (CPI).	Greater than anticipated cost increases, especially in construction and contracting rates increases the overall cost of the capital and maintenance programmes, in turn having an impact on debt servicing costs and rates.	Greater than anticipated cost increases, especially in construction and contracting rates increases the overall cost of the capital and maintenance programmes, in turn having an impact on debt servicing costs and rates.	Greater than anticipated cost increases, especially in construction and contracting rates increases the overall cost of the capital and maintenance programmes, in turn having an impact on debt servicing costs and rates.
Asset Revaluation Asset revaluation is higher than estimated.	A comprehensive local government sector-wide approach to inflation projections has been used which allows for the fact that costs typically increase at a faster rate than the Capital Goods Price Index (CGPI).	Greater than anticipated cost increases, especially in construction and contracting rates increases the overall cost of the capital and maintenance programmes, in turn having an impact on rates.	Council monitors the valuation movements for all significant infrastructural assets on a yearly basis.	In the LTP, Council has revalued its significant infrastructural assets on a yearly basis in line with the CGPI.
New Zealand Transport Agency (NZTA) Revenue Sufficent funds may not be available to pay for the planned capital projects.	Past roading capital projects were performed in line with approved NZTA policies.	There is a risk that sufficient funds will not be available to pay for the planned capital projects. For example, because growth does not provide sufficient funding from development contributions or the community considers that required rates rises are not affordable.	The Council will assess the availability of funds as part of the annual budget process and if funds are not available, it may revise the capital programme that is set out in the LTP.	It is assumed that the level of financial assistance received from NZTA will remain at 51% for the period of the LTP. Funding assistance for large capital transport works would be achieved on a case by case basis through a Business Case approach with NZTA. NZTA funding will be awarded for 3 year periods and that the following 7 years will be funded in a similar manner.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
ECONOMIC				
Interest Rates Long-term interest rate on loans will exceed a weighted average of 5% (Existing loans have a weighted average interest cost of 4.2 %).	It is likely that interest rates on loans will stay within a 4% to 6% range over the next 10 years.	Increases in interest rates flow through to higher debt servicing costs and higher rates.	Maintaining a prudent level of debt and related hedging programme established within the limits of adopted treasury policy.	Interest rates on loans will average 5% over the next 10 years.
Economic Growth Long-term economic growth will not continue to be consistent with historic trends and remain moderate.	Long-term projections by Treasury last updated on a four-year cycle in 2016 indicate favourable or better long-term prospects and are reasonably likely to be accurate. These projections do not allow for major/catastrophic world events leading to sustained adverse economic downturn, nor disruptive technological change. However, the underlying assumptions do anticipate a continuing incremental impact of technology on the labour market and productivity. Government fiscal policies will seek to ameliorate significant adverse effects, as was the case during the Global Financial Crisis.	A persistent downturn in economic prospects may mean the Waimakariri District is not able to sustain high employment and continued real growth in incomes; Ratepayers are unable or unwilling to support maintaining Council levels of service.	Making conservative projections for growth and development and so the contribution of growth to revenue; Allowing for moderate overall rates increases.	Treasury's 40-year economic growth outlook and related fiscal projections are an adequate basis for the Council assuming continuing moderate economic growth and consistent Government financial policies; Underlying assumptions make some provision for incremental technological change and this is reflected in the LTP provision for information technology expenditure.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
ECONOMIC				
Useful Life of Significant Assets and Depreciation Funding The useful lives of significant assets are not accurate and major assets do not have a lifespan of 50-100 years as estimated; Fully funding depreciation does not accurately reflect the life cycle of assets.	It is unlikely that the useful life of significant assets will fall short and they will require replacement before their estimated life; Even though assets wear out at different rates and the depreciation allowed for their wear and tear may not be enough to reinstate the asset when due for replacement or be too much over and above replacement costs, this is unlikely given historic use of fully funded depreciation rates.	Depreciation and borrowing costs would increase if capital expenditure was required earlier than anticipated; Rates will be affected where depreciation funding is set too high or too low.	Maintaining realistic estimates of asset useful life; Continuing efforts to improve knowledge of the condition and useful life of assets; Funding of depreciation is set at amounts that reflects the replacement cost of assets; Allowance for excess capacity or additional provision that is made to cater directly or indirectly for growth is excluded from the depreciation charge until such a time that the capacity of the network is used; If required, reprioritising the capital expenditure programme.	The life of significant assets is as set out in Accounting Policies; Funding sources for the required replacement of assets are identified in the Council's Revenue and Financing Policy; Rating levels are set to recover depreciation costs in accordance with the Council's Revenue and Financing Policy.

RISK AND ITS SIGNIFICANCE *Level of significance = likelihood x consequence, shown as:* low medium high	LIKELIHOOD OF RISK *With level of likelihood shown as:* low medium high	CONSEQUENCE OF RISK *With level of severity shown as:* low medium high	MITIGATION MEASURES	ASSUMPTIONS FOR LONG TERM PLAN (LTP) AND INFRASTRUCTURE STRATEGY (IS)
SOCIAL				
Impact of Demographic Change Projected change in the age structure and household characteristics of the population do not come to fruition.	Projected demographic changes are well known and recently adopted profiles have proved generally accurate.	The Council's policy approach in relation to provision and levels of service are not maintained which affects the Council's overall financial position.	Continuing to monitor and assess District demographic change; Consider adjusting planning for levels of service accordingly.	Statistics New Zealand medium variant projections for demographic change are used and considered most likely to occur.
Changes to Central and Regional Government Policy Central and Regional Government policy changes place additional requirements on Council and communities to comply.	It is likely that over time changes in Central and Regional Government policy will occur and place additional compliance requirements on councils.	Could have significant financial impact on resources to meet legislative requirements and require changes to service delivery and/or organisational form.	Continuing to advocate for moderate changes in policy that do not place additional compliance cost on Councils; Seeking the most cost effective ways to meet new statutory requirements as they arise.	Known Central and Regional Government policy settings as they impact local government costs in relation to water management have been reflected in LTP budgets but it is assumed in other respects they remain constant; Known changes to Environmental standards have been reflected in LTP budgets but it is assumed in other respects they remain constant.

Appendix 4: Long Term Plan (Incl Mandatory) Water Supply Performance Measures

The following table shows the Council's performance measures that were used for the 2018-2028 LTP for its water supply activity. Monitoring results are reported annually in the Council's Annual Report.

Note: any performance measures in italics on the following page indicate a mandatory performance measure prescribed in accordance with Section 261B of the Local Government Act 2002 for which reporting is required for the 2015/16 year.

WATER SUPPLY				
COMMUNITY OUTCOMES **That this activity contributes to**	COUNCIL RESPONSE **How this activity contributes to outcomes**	WHAT COUNCIL PROVIDES **Major levels of service**	MEASURING PEFORMANCE	TARGETS **(For each of the ten years of the Long Term Plan)**
WATER SUPPLY AND QUALITY				
There is a safe environment for all There is sufficient clean water to meet the needs of communities and ecosystems The demand for water I kept to a sustainable level. Core utility services are provided in a timely, sustainable and affordable manner. Council water supply schemes are provided to a high standard	Providing community water supplies that are affordable, safe and reliable and that provide capacity for anticipated growth, and for improved drinking water quality.	Safety of Drinking Water All Public water supplies comply with the Drinking Water Standards of New Zealand	* The extent to which drinking water complies with the drinking water standards for : Bacterial compliance Protozoal compliance	 Fully compliant Fully compliant
		Maintenance of the Reticulation Network All public water supplies are actively maintained to minimise the loss of water leakage	* The percentage of real water loss from the networked reticulation system	Less than 22% (based on 240 litres/connection/day)

COMMUNITY OUTCOMES That this activity contributes to	COUNCIL RESPONSE How this activity contributes to outcomes	WHAT COUNCIL PROVIDES Major levels of service	MEASURING PEFORMANCE	TARGETS (For each of the ten years of the Long Term Plan)
		Fault Response Times All public water supplies are actively maintained to minimise the outage of water	The median response times to attend a call-out in response to a fault or unplanned interruption to the network reticulation system: Attendance for urgent call-outs from the time that the local authority receives notification to the time that the service personnel reach the site, and Resolution of urgent call-outs from the time that the service personnel confirm resolution of the fault or interruption , and Attendance for non-urgent call-outs from the time that the local authority receives notification to the time that the service personnel reach the site, and Resolution of non-urgent call-outs from the time that the local authority received notification to the time that the service personnel confirm resolution of the fault or interruption	 Less than 60 minutes Less than 480 minutes Less than 660 minutes Less than 660 minutes
			Number of events that cause water not to be available to any On Demand or Semi-restricted connection for > 8 hours, and Restricted connections for .24 hours	 Nil events Nil events

COMMUNITY OUTCOMES That this activity contributes to	COUNCIL RESPONSE How this activity contributes to outcomes	WHAT COUNCIL PROVIDES Major levels of service	MEASURING PEFORMANCE	TARGETS (For each of the ten years of the Long Term Plan)
	Providing community water supplies that are affordable safe and reliable and that provide capacity for anticipated growth, and for improved drinking water quality	Consumer Satisfaction All public water supplies are managed to an appropriate quality of service	* The total number of complaints received about any of the following: Drinking water clarity Drinking water taste Drinking water odour Drinking water pressure or flow Continuity of supply, and Council's response to any of the above Expressed per 1000 connection to the networked reticulation system	Less than 5 complaints per 1000 connections
	Carefully managing water demands, including minimising leakage	Demand Management All public water supplies are managed to ensure demand does not outstrip capacity (PM5)	* The average consumption of drinking water per day resident with the District	Less than 450 L/person/day