WAIMAKARIRI
DISTRICT COUNCIL

Water Conservation Strategy

3 Waters Unit | June 2010 (revised 2020)

2020 Revision Prepared by:

Colin Roxburgh, Water Asset Manager

2020 Revision Reviewed by:

Kalley Simpson, 3 Waters Manager

Approved following adoption by Council on 6 October 2020

Manager - Utilities and Roading

Revision Schedule			
Date	**Description**	**Prepared By**	**Reviewed By**
11/03/10	Revision following peer review	Ric Barber	Gary Boot
12/05/10	Revision following Council resolution on 04/05/10	Ric Barber	Gary Boot
15/09/2020	Full review of document to bring up to date with current data and methodology used.	Colin Roxburgh	Kalley Simpson

Contents

Figures

Tables

1. Executive Summary

1.1. Introduction

The Water Conservation Strategy (WCS) has been developed to provide a practical and targeted strategy that identifies and prioritises opportunities for water conservation within Waimakariri District. The WCS was first adopted in 2010, and has been revised in 2020.

The key aim of the strategy is to provide targets, initiatives and a monitoring regime to achieve higher levels of water conservation within the Waimakariri District Council community water supplies.

The principal drivers for conserving water are:

- Environmental – minimising water use reduces the impacts on the environment.
- Financial – reduced water use results in lower costs to build and operate water supplies.
- Regulatory – resource consent holders are now required to use water efficiently.
- Cultural – water conservation promotes cultural wellbeing.

1.2. Council Water Use

The Waimakariri District Council currently owns and operates 14 community water supplies. These supplies provide water to approximately 19,800 properties for household and commercial use, as well as domestic irrigation, firefighting, and drinking water for stock.

The Council water supplies provide potable water to approximately 80% of the Waimakariri District population. The remainder of the population is generally serviced by private wells.

The Council water supplies use approximately 41,000 cubic metres of water on the peak day of the year and approximately 19,000 cubic metres on the average day of the year.

The total volume of water used throughout the year is approximately 6.8 million cubic metres of water.

1.3. Reasonable Water Use

To assess the efficiency of Waimakariri District Council's 14 water supply schemes, an assessment of "reasonable" water use was made.

The 'reasonable use' for each scheme was made up assessments of water use of the following components:

- Household use
- Domestic irrigation
- Commercial use
- Stock Use
- Leakage

The calculation of reasonable water use was first undertaken in 2010, but was updated in the 2020 revision of the Water Conservation Strategy document. The following improvements were made to the reasonable water use calculation methodology in the 2020 revision relative to 2010:

- Referenced data from the LUCAS Land Use Map 2016 was used to inform the amount of grazed area per scheme, and hence to better inform the 'stock use' calculation. In 2010, all rural schemes were assumed to use 100% of the serviced area for stock.
- The calculation for water demand from the Waikuku Beach Holiday Park was treated as residential use, rather than commercial, as this more accurately represents this site.
- Stock density statistics by animal type for the Waimakariri District Council sourced from Statistics New Zealand data from 2013 (which was not available in 2010) was used to better inform the 'stock use' calculation.

The following table summarises the comparison between actual and reasonable use for each of the water schemes in the district and on average across the whole district. Where the percentage is above 100%, then actual water use exceeds the assessed reasonable water use.

Table 1: Summary of Reasonable versus Actual Water Use

Scheme Type	Scheme	Ratio of Actual / Reasonable Average Use %	Ratio of Actual / Reasonable Peak Use %
Urban On Demand	Rangiora	71%	103%
	Kaiapoi	61%	97%
	Woodend-Pegasus	73%	87%
	Oxford Urban	73%	156%
	Waikuku Beach	104%	159%
	Cust	68%	135%
Semi-Restricted	Ohoka	68%	190%
	Garrymere	149%	208%
Rural Restricted	Mandeville- Fernside	59%	64%
	Oxford No 1	60%	61%
	Oxford No 2	61%	76%
	Summerhill	61%	77%
	Poytnzs Road	74%	94%
	West Eyreton	86%	98%
TOTAL		**68%**	**98%**

The reasonable water use assessment demonstrates that as per the 2020 assessment:

- The combined actual average daily use is generally lower than the assessed reasonable use. Therefore, average water use in the district is assessed to be reasonable.
- The combined actual peak daily water use is 2% lower than the assessed reasonable use. Therefore, on a peak day, across the district as a whole, the amount of water used is deemed to be reasonable.
- At an individual water scheme level, there are some schemes that have water use higher than the assessed reasonable amount.
- Garrymere, Ohoka, Oxford Urban and Waikuku Beach have the largest per property differences between actual and reasonable peak use.

1.4. Water Use Context

It is important to provide some context to the amount of water used by the community water supplies in the Waimakariri District.

The WDC water supplies are consented to take only 18% of the total annual consented groundwater take in the district. WDC actual water use is approximately 25% of the consented water take, meaning that overall 4.5% of the total consented take for groundwater in the district is used for community supplies in the district (refer to ‘Stats’ tab of 200409044078 for calculation).

That is, the Council supplies approximately 80% of the district population while using only 4.5% of the consented groundwater take within the district.

The importance of conserving water is acknowledged, and this strategy is evidence of the Council’s commitment to that goal. However, in adopting any conservation measures, there is a need to balance the cost of those measures against the likely benefits.

1.5. Limitations

The assessment of reasonable water use was hindered by a lack of specific data relating to where the water was being used. That is, the lack of water metering on individual properties means it is not possible for the amount of water being used by commercial users to be separated from domestic users. Likewise the assessment of stockwater use is similarly hindered by a lack of metering at the property boundary, as well as a lack of data showing how water use is distributed among different potential uses for any given property.

This is a second generation strategy, and it is envisaged that it will be revised periodically. In order to improve the underlying data and assumptions on which the strategy is based, the measures to be adopted have the goal of improving our knowledge of water use as well as conserving water.

1.6. Water Conservation Measures

The WCS includes the implementation of three primary and three other initiatives. These are summarised below:

Primary Measures

Community Awareness Programme

The Council will continue to run a Community Awareness Programme. This will typically involve such actions as:

- Use of media campaigns during times of high demand to educate residents on water conservation measures.
- Implementation of a school education programme.

This will be an ongoing programme. The main benefits of implementing these measures are that it can reduce the peak water use at a relatively low cost and it can change public perception and awareness of the importance and value of conserving water.

Leak Reduction

The Council will continue to implement a leakage monitoring and reduction programme involving the following steps:

- Minimum night flow analysis at a scheme level every year;
- Calculation of leakage on each scheme in terms of L/property/day, m^3/km of pipe/day, % of total water used, and in terms of an Infrastructure Leakage Index (ILI) score on each scheme.
- Determination of the assessed cost of leakage on each scheme, as a function of the cost of supplying (pumping) water, and treatment.
- Where a scheme scores an ILI result of C or D, an economic assessment of leakage will be undertaken to determine the merit and extent of further leak identification and reduction work (i.e. the assessed cost of leakage will be considered alongside the ILI score, to help inform the level of investment in further leak reduction work).
- Where further work is recommended, this may involve such strategies as step testing, acoustic logging, temporary metering, leak correlation, pinpointing and repair.

A summary of the calculation of leakage on each scheme is given below:

Table 2: Leakage Assessment 2019

On-Demand	Operating Pressure (m)	Min Night Flow (L/s)	Assessed Leakage				
			L/conn./ day	m^3/km/day	Percent %	ILI	Band
Rangiora	46	22.8	212	7.3	24%	3.5	B
Kaiapoi	44	10.4	119	4.1	15%	2.0	B
Woodend	44	2.5	104	2.9	15%	1.6	A
Pegasus	49	1.8	50	1.1	8%	0.6	A
Cust	43	0.3	117	1.5	12%	1.2	A
Waikuku Beach	42	1.3	194	6.3	17%	3.4	B
Oxford Urban	51	3.6	289	6.7	23%	3.6	B
Semi Restricted / Restricted							
Ohoka	54	0.3	150	2.6	15%	1.5	A
Poyntzs Road	50	0.7	463	6.5	33%	4.4	C
Garrymere	51	0.6	1035	9.1	36%	7.1	C
Fully Restricted*							
Oxford Rural No.1	88	13.4	1805	4.5	53%	2.6	B
Oxford Rural No.2	107	7.5	1050	4.5	54%	2.0	A
West Eyreton	30	1	480	2.7	40%	3.9	B
Summerhill	111	3.1	706	3.3	39%	1.4	A
Mandeville	36	13.9	692	7.9	50%	8.1	D
Fernside	34	0.7	401	6.0	30%	5.9	C
All Schemes Average		83.8	239	5.1	25%	2.7	B

*Note: *The night flow analysis method used is likely to significantly over-estimate leakage on restricted schemes. The actual percentages of leakage on these schemes is likely lower than the values in the table above.*

The annual budget across all schemes for the water conservation strategy implementation (community awareness and leakage reporting and reduction) was approximately $74,000 in the 2020/21 Annual Plan. This budget is reviewed annually through the Annual Plan and Long Term Plan process.

The benefits of implementing this measure is that it does not rely on customer participation, it allows Council's water leakage levels to be benchmarked against other authorities, and ensures that investments in addressing issues are targeted in the right areas, so that the best value for money is obtained.

Initial steps proposed to be taken in the schemes achieved a 'C' or 'D' ILI are:

- For Poyntzs Road and Garrymere, staff will undertake a short term volumetric flow balance for each scheme to more accurately assess leakage levels on these schemes.
- For Mandeville and Fernside, analysis is being undertaken to refine the night use for restricted properties, which will enable more accurate reporting and assessment of leakage on these schemes. In addition, a renewal is planned in the Fernside scheme, which may reduce leakage levels.

Water Metering Investigations

In 2010 Council installed flowmeters at 114 properties that were considered to be potential high users (defined in the Water Supply Bylaw as potential 'Extraordinary Water Users'. This data has been collected since this time, and will be valuable in informing future decisions on the way in which water supply is rated.

This information collected from these meters and subsequent analysis is included in report 180704074511 which was published in 2018. This work identified two high use site that were further investigated. It also suggested that charging a fixed annual charge based on connection size for each property should be considered as it is a more fair and reasonable way of charging for water consumption. This is something that should be included in the next 3 Waters Rating Review in 2022.

Other Measures

There are a number of other measures that the Council is already using, or will either implement or investigate in the future, these include:

Water Restrictions

The Council will continue to consider the use of water restrictions as a tool to reduce demand during critical times. The water restrictions may be used to:

- Comply with resource consent conditions.
- Keep demand within the capacity of the infrastructure.
- Avoid outages.

These measures are not regularly required, but are a useful tool to have available to manage demand if required.

Restrictor Checks

The Council currently undertakes inspections of restrictors on restricted water supplies, to ensure that excessive wear or damage has not occurred that could increase the flow allocation to each property. These restrictor checks are programmed within the 3 Waters / Water Unit Service Level Agreement to be carried out on a four yearly basis.

Water Efficient Technologies

The Council will investigate and install where appropriate, water efficient technologies at WDC facilities. This is included as one of the actions from Council's Corporate Sustainability Strategy 2019.

As a future initiative, the Council will aim to collate and make information available to other consumers on water efficient technology that can be used by industry and other users. This can be carried out as part of the Community Awareness Programme.

Investigations into Alternative Sources of Non-Potable Water

The Council will undertake investigations into on-site options of non-potable water. These will primarily include rain water collection and grey water reuse for garden water use.

The investigations will consider the feasibility of these options within the Waimakariri District and methods for implementing them. This will include options such as doing nothing (if these options are found to be unsuitable), encouraging their use through the Community Awareness Programme, or regulating for their use through the District Plan or a Bylaw. This task is not actively programmed in, but remains in the WCS as a future improvement.

Measures Not To Be Adopted

The option of implementing a universal water metering programme was considered as part of the original WCS in 2010. It was acknowledged that there are a number of benefits associated with universal water metering, specifically relating to water conservation and fairness of rating structure.

However, a universal metering programme across all on-demand schemes at the time was estimated to cost $8.7 million capital cost with annual costs of $145,000 (excluding debt servicing). The savings are estimated to be $36,000 per year. This was calculated in 2010 as having a net effect on rates of $93 per ratepayer per year.

It was concluded that, the costs outweigh the advantages, and therefore universal metering did not form part of the Water Conservation Strategy adopted at that time.

It is acknowledged, however, that increasing competition for water resources and increasing regulatory drivers are likely to result in a future need to implement a universal metering programme.

The option of charging extraordinary users for water on a volumetric basis was considered, but was not included in 2010 for three main reasons:

- There is considerable cost with implementing metering and volumetric charging and uncertainty around the costs and benefits.
- There are inherent inequities associated with metering one group of users and not another.
- The definition of extraordinary users needs to be further defined.

The Council may consider this matter again when it is scheduled to undertake a 3 Waters Rating Review, in 2022.

Funding of the Strategy

The costs associated with implementing the WCS in the coming three years are summarised in the following table:

Table 3: Funding of the WCS

	Community Awareness Programme*	Leak Reduction	Annual Totals
2020/21	$15,000	$60,000	$75,000
2021/22	$20,000	$70,000	$90,000
2022/23	$20,000	$70,000	$90,000
TOTAL	**$75,000**	**$180,000**	**$255,000**

* *Budget allows for wastewater education, as well as water conservation*

The Community Awareness and Leak Reduction Programmes will be funded across all schemes that are rated for water on a proportional basis.

The budgets will continue to be assessed as part of the Annual Plan and Long Term Plan processes, as progress and data is gathered from the previous years' work.

1.7. Targets

The original 2010 version of the WCS outlined targets for each scheme relating to leakage levels, and reasonable water use. In the time since the original targets were set, the following key improvements to the derivation and reporting of targets have been made:

- The primary measure for assessing leakage was re-defined as the Infrastructure Leakage Index (ILI), as opposed to litres per connection per day. This will continue to be used as the primary measure.
- The calculation for reasonable water use has been improved, taking into account more up to date and relevant data fields.

These targets also relate to both mandatory and non-mandatory levels of service that Council reports on. The following table summarises the relevant targets, at the time of the 2020 revision of the strategy.

Table 4: Summary of Mandatory Performance Measures Related to Leakage and Water Use

Level of Service	Performance Measure	2021 Target
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%

Table 5: Non-Mandatory Performance Measures Related to Leakage and Water Use

Level of Service	Performance Measure (2021)	Target
Losses	Water losses as determined by the Infrastructure Leakage Index (ILI) based on an annual assessment	**Scheme Level:** ILI >= "B" or an economic assessment carried out and recommended measures implemented **District Level:** ILI >= "B"
Water Usage	Actual usage on average day	Maintain the average daily water use below 100% of the assessed reasonable water use
Water Usage	Actual usage on peak day	Reduce the peak daily usage to below 110% of the assessed reasonable water use
Flow – Allocated Units	Percentage of properties where flow received is consistent with allocated units at the point of supply in restricted or semi-restricted schemes as demonstrated by restrictor checks completed.	100% of restrictors tested at no more than 5 yearly intervals.

2. Introduction

The Waimakariri District Council (WDC) has written the Water Conservation Strategy to take a proactive approach in managing the demand on the 14 water supply schemes that are managed by the Council. Water is a precious resource and WDC have recognised the importance of efficient water use on the drinking water supplies in the District to preserve this resource, save money for the Council and the customers, minimise the effects on the environment and provide a sustainable water supply system into the future.

2.1. Background to the Water Conservation Strategy

The Waimakariri District Water Conservation Strategy (WCS) has been developed to provide a practical and targeted strategy that identifies and prioritises areas for water conservation within the Waimakariri District. The need to conserve water has been identified by the Council and this strategy provides a starting platform to implement water conservation initiatives throughout the district.

The 2009-19 LTCCP identified the need to develop and adopt a Water Conservation Strategy that identifies:

- Conservation targets and timeframes
- Measures to be adopted
- An implementation plan

The original version of the WCS was adopted in 2010. The specific strategies utilised to conserve water have evolved since the original version of the strategy. To reflect more up to date methods of fulfilling the requirements of the strategy, a 2020 revision of the document was produced. Key changes incorporated were:

- Adoption of the Infrastructure Leakage Index (ILI) as the primary measure of leakage across the district, in place of a litres per connection per day target.
- Refinement of the method for calculating reasonable water use.
- Updating the document to include more recent data and figures.

2.2. Purpose of the WCS

The key aim of the WCS is to provide the targets, initiatives and monitoring regime for water conservation in the Waimakariri District. The environmental and financial implications of each of the proposed water conservation measures are also considered. The WCS document should be reviewed and updated every three years in line with the Long Term Plan (LTP) planning period.

The purpose of implementing a water conservation strategy is to ensure that water use is reasonable and efficient, and losses are well understood and minimised, and funding for improvements are targeted in the right areas. If the targets for water conservation (discussed further in Section 5) are realised then there are many potential benefits including:

- Reduced environmental impacts associated with water abstractions and wastewater discharge
- Deferral of capital costs for infrastructure expansions
- Reduced operational costs
- Avoidance of supply limitations
- Increased capacity of the reticulation system
- Demonstrating the efficient use of water to the Regional Council

The WCS aims to attain water conservation targets by addressing both consumer behaviour and improving Council infrastructure management.

2.3. Key Drivers for developing the WCS

There are four main drivers behind the development and implementation of a water conservation strategy:

- Environmental
- Financial
- Regulatory
- Cultural

2.3.1. Environmental

Awareness in environmental responsibility has increased in recent years. The need to balance increasing pressures placed on water resources by a growing district population has been recognised. This needs to be coupled with the responsibility to manage the resource wisely in order to ensure the sustainability of high quality drinking water for the current and future generations.

This increased public awareness was originally reflected in a number of Community Outcomes identified in the 2018-28 LTP, the principal one being that “Core utility services are provided in a timely and sustainable manner”.

By pro-actively managing water demand in the district, the Waimakariri District Council will reduce the environmental impact by abstracting and treating less water per capita in the district and by disposing of less wastewater effluent through reductions in indoor usage.

2.3.2. Financial

There are two main financial savings connected with water conservation:

- Reduction in operational costs
- Deferred capital costs

The reduced operational costs are realised as an annual saving by lower pumping and water treatment costs due to lower water demand.

Larger capital projects such as new reservoirs and upgraded pipework can be deferred if the water demand can be managed within the existing installed supply capacity for a longer time period.

Other financial savings which are harder to quantify include reduced wastewater discharges. Reduced indoor water demand will reduce wastewater production. This can lead to capital and annual cost savings with respect to wastewater collection, treatment and disposal.

There will also be a financial benefit associated with raw water being available for other users as a result of lower abstraction rates.

2.3.3. Regulatory

Figure 1 shows the regulatory drivers split up into national, regional and local authority sectors. This shows the WCS is part of the local authority LTP, environmental strategy and sustainability commitment by Waimakariri District Council.

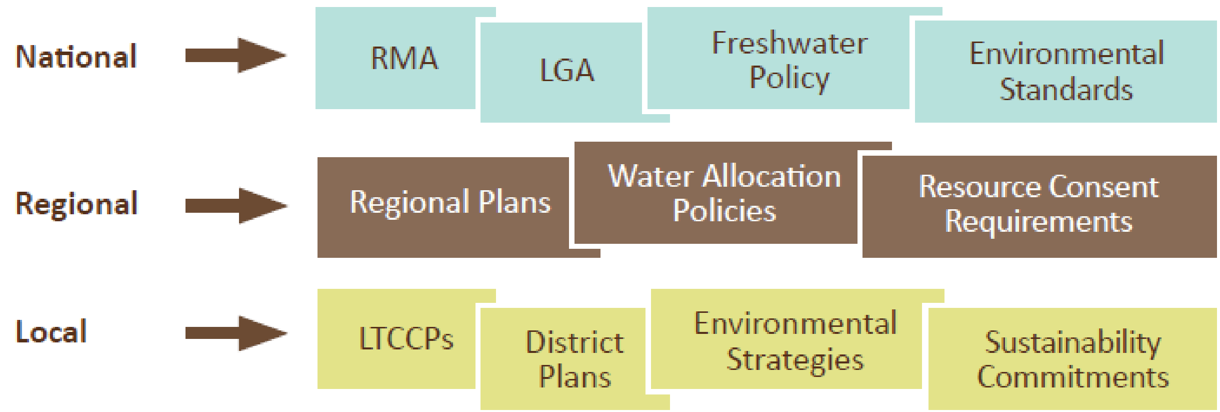


Figure 1: Regulatory drivers for water conservation[1]

2.3.3.1. National Level Regulatory Drivers

In June 2009, the Government introduced its new strategy, 'New Start for Fresh Water'. It outlines the Governments direction for water management in New Zealand and sets out a number of choices and implications for these. This strategy broadly covers:

- Sound water management is essential to provide for New Zealand's economic development and growth, and to maintain social and cultural values.
- In some parts of New Zealand, water resource limits are being approached, which is seen in deteriorating water quality, water demand outstripping supply, and constrained economic opportunities.
- The right balance needs to be found between the different interests and values in water, as not all values and expectations can be met in all places at all times.
- Some other contributing issues that need to be addressed are the interests of Māori in New Zealand's fresh water
- Many New Zealanders don't understand the limits of water resources – information about how much water we use is poor, and there is limited institutional capacity and expertise needed for sound water management.

In July 2008 the Ministry for the Environment notified a proposed National Policy Statement (NPS) for Freshwater Management. It included objectives and policies relating to managing the demand for freshwater, the efficient use of fresh water and ensuring effective monitoring and reporting. This came into effect on 1 August 2014, and amendments made in August 2017 took effect in September 2017. There were further amendments in 2020, which are to come into effect in September 2020.

The NPS included provisions requiring regional policy statements to specify objectives, policies and methods that guide and direct regional and district plans to promote efficient freshwater use, and for regional councils to more consistently and transparently plan for freshwater objectives.

The NPS also specifies that every regional council shall managed fresh water and land use in an integrated and sustainable way to avoid, remedy or mitigate adverse effects, including cumulative effects (Policy C1). The 2020 amendment also introduced a hierarchy in which drinking water takes were given a priority behind the need to protect the health and wellbeing of water bodies and freshwater ecosystems.

Also in 2020, the Resource Management (Measurement and Reporting of Water Takes) Amendment Regulations 2020 was adopted by Government. This introduced a requirement for water takes over 5 L/s to submit their flow data daily, rather than annually.

These regulations aim to achieve the following objectives:

- ensure consistent measuring and reporting of actual water taken at national, regional and catchment levels;
- enable water users and regulators to easily determine compliance with water take consents;

[1] The Case for Demand Management in Council Water Supplies, Water New Zealand, 2009

- provide accurate information about actual (consented) water taken in any catchment (including the catchments of groundwater resources)
- improve allocative efficiency through accurate measurement of water abstracted for consumptive uses;
- ensure the comprehensive uptake of water measuring in a cost effective and timely way.[2]

These regulations require qualifying consent holders to measure their water takes and report water use data to regional councils. WDC already measures and records water abstraction from all its consented water takes.

As part of the New Start for Fresh Water strategy back in 2009, the Ministry for the Environment implemented two new national environmental standards (NES) to complement the NPS for Freshwater Management. The two relevant National Environmental Standards are:

NES on Ecological Flows and Water Levels – The proposed standard aims to promote consistency in the way we decide whether the variability and quantity of water flowing in rivers, ground water systems, lakes and wetlands is sufficient. The proposed standard would do this by:

- Setting interim limits on the alteration to flows and/or water levels for rivers, wetlands, and groundwater systems that do not have limits imposed through regional plans.
- Providing a process for selecting the appropriate technical methods for evaluating ecological flows and water levels in rivers, lakes, wetlands, and groundwater systems.[3]

NES for Sources of Human Drinking Water – this standard came into effect in June 2008. The purpose of this NES is to reduce the risk of contamination to drinking water sources. It complements the Health (Drinking Water) Amendment Act to provide a "multi barrier" approach to reducing the risk of disease occurring from New Zealand's drinking water.

The Government is currently proposing to make amendments to the National Environmental Standard for Sources of Human Drinking Water (NES) as part of the Three Waters Review. The aim is to strengthen the ability of regional councils and territorial authorities to manage risks to drinking water posed by activities in drinking water catchments. The amendments are currently being refined and we expect to be consulted on the changes before June 2021.

2.3.3.2. Regional Level Regulatory Drivers

On a regional level, Environment Canterbury (ECan) has a responsibility to manage water resources in the Canterbury region. The Land and Water Regional Plan provides regulatory instruments such as resource consents and compliance monitoring and rules to set out conditions to apply to each activity.

Chapter 4 of the LWRP addresses issues on the efficiency of water use. Future resource consents for water takes, including renewals of existing consents, will be required to demonstrate efficiency of use as part of their compliance monitoring.

One of the policies in chapter 4 states "*The rate, volume and seasonal duration for which water may be taken will be reasonable for the intended use.*." And also "*Systems to convey or apply fresh water are designed to maximise efficient use of water, including the improvement over time of existing systems, taking into account: (a) practicable options to implement any change to existing systems; and (b) the benefits and costs of achieving a higher level of efficiency.*."

Also on a regional level, the Canterbury Water Management Strategy (CWMS) sets out the future direction for the management of Canterbury's water resources. The Canterbury Mayoral Forum has driven a framework to help develop the water management strategy for the region in partnership with local communities, and has established an overall approach and some delivery models for the sustainable management and development of the region's water resources.

The CWMS implemented a shift from the effects based management of individual consents to integrated management based on water management zones, and a focus on managing the cumulative effects of human activities in a way that will address sustainable environmental limits.

[2] Regulations on the measurement and reporting of water takes, Ministry for the Environment, 2010.
[3] National Environmental Standards, Ministry for the Environment, 2010

Over time as subsequent phases of the CWMS is implemented it is expected that projects will need to be identified in subsequent Council plans and work programmes addressing both water allocation and conservation issues, and the Waimakariri District Water Conservation Strategy will be part of this process.

WDC has been proactive in developing this strategy and the demonstration of a pro-active water conservation strategy has been crucial for gaining new water take consents and adhering to their compliance monitoring.

2.3.4. Cultural

The desire to conserve water can also be understood in terms of the cultural and spiritual value of water to communities. Cultural values about conserving water may include attitudes about over consumption of water, water scarcity or source contamination. These community views may have arisen from historic events, or recent rapid land use change and population growth that impose costs on communities that affect their water use and change behaviour over time.

The conservation of water has further cultural value to communities in recognising the need to maintain suitable water for drinking, cleansing and bathing, healing and in supporting general community health. The perception of the value or quality of water can be an important factor in making decisions on its future use, in conjunction with other financial or regulatory considerations.

The Local Government Act 2002 and Resource Management Act 1991 contain specific provisions relating to the incorporation of the views of tangata whenua into the Council's decision making. The Local Government Act 2002 also contains more general requirements to promote the social and cultural wellbeing of communities alongside their environmental and economic wellbeing. These requirements all apply to decision making about future water use that affects local communities.

In 2012 reference to the four well-beings (social, economic, environmental and cultural) were removed from the Local Government Act. In 2019, these four well-beings were reinstated, meaning that the need for local government to consider these well-beings in decision making is reinstated.

2.4. Structure of the Strategy

The strategy is structured as follows:

Section 3 – Outlines WDC's assessment of reasonable water use, current leakage levels and which areas are priorities for the coming three years of the strategy.

Section 4 – Describes the options available for water conservation and which are most applicable for the Waimakariri District.

Section 5 - Sets the targets for water conservation in the Waimakariri District.

Section 6 - Discusses how the programme will be implemented for the coming five years.

Section 7 - Details the budget to be spent for the coming five years.

Section 8 - Outlines the monitoring and reporting regimes to be followed throughout the programme.

2.5. WDC Water Supplies Overview

The Waimakariri District Council currently operates 14 potable water supply schemes within the District. It is noted that while there are 14 schemes rated for, there are 12 physically distinct schemes as two pairs of schemes were joined physically but not financially (Oxford Urban and Rural No.2, and West Eyreton and Summerhill).

Table 6 shows an overview of all the water supply schemes, giving an indication of the size of the scheme by connections and length of reticulation, as well as the supply type, source and treatment. Appendix 1 shows a map of the location of all 14 schemes.

Table 6: Water Supply Schemes Overview

Scheme	Number of Connections	Length of Reticulation (km)	Dominant Supply Type	Rating Method	Primary Source	Treatment
Rangiora	7,615	207	On Demand	Fixed Charge	Secure Groundwater	None
Kaiapoi	5,383	140	On Demand	Fixed Charge	Secure Groundwater	None
Woodend Pegasus	3,174	114	On Demand	Fixed Charge	Secure Groundwater	Sand filter (manganese removal) and chlorination (Pegasus only)
Oxford Urban	907	38	On Demand	Fixed Charge	Secure Groundwater	None
Waikuku Beach	460	15	On Demand	Fixed Charge	Unsecure Groundwater	None
Cust	142	11	On Demand	Fixed Charge	Secure Groundwater	None
Ohoka	116	6	Semi-Restricted	Fixed Charge	Secure Groundwater	Chlorination
Garrymere	42	5	Semi-Restricted	Fixed Charge	Shallow Well	Filtration, UV disinfection, Chlorination & pH Correction
Mandeville Fernside	952	79	Restricted	Fixed Charge	Unsecure Groundwater	UV disinfection, Chlorination & pH Correction
Oxford No 1	332	143	Restricted	Variable Charge	Secure Groundwater	Chlorination
Oxford No 2	333	78	Restricted	Variable Charge	Secure Groundwater	Chlorination
Summerhill	184	43	Restricted	Fixed & Variable Charge	Secure Groundwater	Chlorination
Poyntzs Road	87	7	Restricted	Fixed & Variable Charge	Shallow Well	Chlorination
West Eyreton	72	15	Restricted	Fixed & Variable Charge	Secure Groundwater	Chlorination

2.6. Water Supply Context

Whilst WDC sees the Water Conservation Strategy as an important programme to ensure it operates efficient and sustainable water supplies, some context has to be maintained of other water use in the district. Table 7 shows the actual peak and average daily water use for all 14 WDC water supply schemes.

Table 7: Peak and Average Daily Water Use

Scheme	Peak Use (L/property/day)	Peak Daily Use (m^3)	Average Use (L/property/day)	Average Daily Use (m^3)
Rangiora	2,000	14,715	900	6,575
Kaiapoi	1,900	9,955	800	4,139
Woodend Pegasus	1,600	4,921	900	2,783
Oxford Urban	3,800	3,378	1,300	1,148
Waikuku Beach	3,700	1,672	1,200	547
Cust	3,000	412	1,000	138
Ohoka	4,200	482	1,100	122
Garrymere	5,600	232	2,900	119
Mandeville Fernside	1,900	1,801	1,400	1,319
Oxford No 1	4,600	1,503	3,500	1,156
Oxford No 2	3,100	1,019	2,000	650
Summerhill	2,500	456	1,500	272
Poyntzs Road	2,400	206	1,400	119
West Eyreton	2,000	141	1,300	87
TOTAL		**40,893**		**19,174**

There are some important points to note regarding the water supply in the Waimakariri district:

- WDC water supplies provide water to 80% of the district population.
- WDC peak daily water use is 41,000 m^3 and average daily use is 19,000 m^3.
- WDC consented groundwater take is 26,883,750 m^3 per year (for its primary sources), which equates to 73,600 m^3/day.
- WDC actual average water use is 25% of its consented water take.
- WDC water supplies consented take is 18% of the total consented groundwater take of the district.

In summary, while the Council supplies water to 80% of the district population, the consented water take represents only 18% of the consented groundwater take in the district, and WDC is using only approximately 25% of its consented allocation on a peak day. This means that overall 4.5% of the total consented take for groundwater in the district is used for community supplies.

The table of the groundwater allowance for each of the WDC water supply schemes and for the total district is shown in Appendix 4.

It is important to conserve water but it is also important to keep the amount of water used by public supplies in context and ensure money spent in conserving water is spent in the most effective areas.

3. Reasonable Water Use

This section details the current use of water in Waimakariri District compared to an assessment of what would be ‘reasonable’ water demand. The levels of leakage in the water schemes are also discussed. These highlight where there is a current need for water conservation measures in the Waimakariri District.

3.1. Definition of Reasonable Water Use

To assess the efficiency of Waimakariri District Council’s (WDC) water supplies, values of ‘reasonable’ water use were calculated for each scheme. At present bulk water metering is carried out at a scheme level, there is no universal metering or volumetric charging to individual properties in the district.

In the absence of actual water use data for individual properties it was necessary to estimate water use for various consumer groups using typical flow data from other New Zealand towns.

The calculated values for reasonable water use for both peak and average day use for each scheme are presented in Appendix 2.

The ‘reasonable use’ for each scheme was made up of the following components:

- Household use
- Domestic irrigation
- Commercial use
- Stock Use
- Leakage

These assessments were calculated for both peak daily flow and average daily flow. Peak daily use is the day during the year when water use is highest. This generally coincides with a period of hot dry weather and is most influenced by domestic irrigation demands. Average daily use is an average value of the total demand for the year and reflects the overall usage of a water supply throughout the year.

3.1.1. Reasonable Household Use

Household water use includes all indoor water use, leakage within the property and any other potential use not including domestic irrigation or swimming pools. Household indoor water use is largely dominated by showers and baths, toilet flushing, cleaning, cooking and laundry, and is dependent on the number of occupants in a household. An assumption was made that this value did not vary between peak and average daily use.

Volumes of daily domestic water use have been cited in numerous sources, these vary between 180 and 600 litres/property/day.

A study of 35 water supplies run by 14 different Councils throughout New Zealand showed an average domestic consumption level of 300 litres/person/day. However, when this was just restricted to the 5 councils on the South Island this level rose to 410 litres/person/day[4]. This figure appears to be somewhat skewed by some high consumption in some regions and did include domestic irrigation.

The Ministry of Health recommends 300 L/person/day as a household requirement which does not include domestic irrigation[5].

Refer to Table 8 below for a breakdown of the estimated amount of water people use on average each day.

[4] Water Loss Guidelines, Water New Zealand, February 2010
[5] Household Water Supplies, Ministry of Health, September 2019

Table 8. Household Domestic Water Requirements (Ministry of Health, 2019)

Household Use (Not including domestic irrigation)	Litres/Person/Day
Drinking	2
Cooking and Food preparation	3
Bathing/showering/cleaning	100
Toilet flushing	80
Clothes washing	65
General use	50
Total	**300**

An assessment of reasonable use of 300 litres per person per day for the Waimakariri District was considered most appropriate.

This indoor household use per person per day was multiplied by the average number of people per household for each water supply scheme to estimate the total consumption of indoor household use[6].

Table 9: Indoor Household Use Calculated Figures for Average and Peak Day

Scheme	Peak Household Use (L/conn./day)	Average Household Use (L/conn./day)
Rangiora	780	780
Kaiapoi	800	800
Woodend Pegasus	860	860
Oxford Urban	790	790
Waikuku Beach	760	760
Cust	800	800
Ohoka	930	930
Garrymere	900	900
Mandeville Fernside	880	880
Oxford No 1	870	870
Oxford No 2	870	870
Summerhill	840	840
Poytnzs Road	850	850
West Eyreton	900	900

3.1.2. Reasonable Domestic Irrigation

Domestic irrigation demands can vary significantly due to the relatively dry climate in the Canterbury region. Domestic irrigation is usually a significant proportion of demand on a peak day basis and for this reason has been considered separately to other household use. Average day domestic irrigation use was assumed to be 25% of peak day domestic irrigation use for the assessment of reasonable use.

Assessing a reasonable amount of water for domestic irrigation for the district was challenging due to many variables such as climatic conditions, soil types, different size gardens, population demographics and the lack of actual water use data at individual households.

The assessment assumed an average garden size of 300m^2 with 50% of properties applying 5mm of water per day[5]. This gives a peak daily water use of 750 litres per property per day for domestic irrigation.

This was verified by an independent assessment of reasonable outside water use using rainfall and evapotranspiration records for Rangiora. The irrigation requirement for a 300m^2 garden to maintain soil moisture in an average January (measured between 1970 and 2006) was 1,400 litres per day. With the assumption that 50% of the properties irrigated their garden to this extent, the figure of 750 litres per property per day for domestic irrigation was deemed reasonable.

[6] 2013 Census – Stats NZ

Conclusion: Average day domestic irrigation: 188 L/residential property/day
Peak day domestic irrigation: 750 L/residential property/day

3.1.3. Reasonable Commercial Use

Calculating a reasonable amount of water use for commercial properties is similarly challenging due to the large variation in type and nature of industry, the associated varied demands and the absence of specific water metering for businesses.

For the calculation of 'reasonable' water use by commercial properties in the district, a value of 20% of the total daily household use was adopted based on typical figures for similar sized towns in New Zealand. This total volume was divided by the number of commercial properties to estimate the consumption by commercial properties.

It was noted that schemes with a high proportion of residential water users and a small number of commercial water users were not accurately represented using this assumption. As a refinement to the WCS 2010 commercial water use assumptions, the commercial use was determined for Rangiora and Kaiapoi using the assumption above. The average commercial use per connection for Rangiora and Kaiapoi was then applied over all schemes for consistency.

A minor refinement from WCS 2010 has been made for the calculation of the reasonable water use at the Waikuku Beach Holiday Park. Reasonable water use at holiday parks is largely dependent on the number of guests per night. Therefore, reasonable water use at the Waikuku Beach Holiday Park was determined using the estimated number of recorded guests per night and the assumed domestic consumption level of 300 L/person/day. Past records show that the holiday park can reach up to 1000 guests per night between Boxing Day and New Year's, and that the average number of guests over the year is approximately 100 per night (note that this occupancy data was obtained from 2013 records used for the WDC Waikuku Beach and Woodend Beach Sewer Model Builds).

Conclusion:

Table 10: Commercial Use Calculated Figures for Schemes with Commercial Properties

Scheme	Commercial Connections	Peak Commercial Use Per Connection (L/conn./day)	Average Commercial Use Per Connection (L/conn./day)	Total Peak Commercial Use (m^3/day)	Total Average Commercial Use (m^3/day)
Rangiora	338	7,500	4,500	2,535	1,521
Kaiapoi (Incl Pines Kairaki)	214	7,500	4,500	1,605	963
Woodend Pegasus (Incl Tuahiwi)	37	7,500	4,500	278	167
Oxford Urban	29	7,500	4,500	218	131
Waikuku Beach	1	300,000	30,000	300	30
Cust	8	7,500	4,500	60	36
Ohoka	4	7,500	4,500	30	18
Garrymere	0	0	0	0	0
Mandeville-Fernside	4	7,500	4,500	30	18
Oxford No 1	0	0	0	0	0
Oxford No 2	3	7,500	4,500	23	14
Summerhill	0	0	0	0	0
Poytnzs Road	0	0	0	0	0
West Eyreton	0	0	0	0	0
Total				**5,078**	**2,897**

It is acknowledged that there is a significant gap in the information relating to volume of water used by industry, and the estimates for reasonable commercial use are very coarse and further work is required to refine this assessment. This is best achieved by the metering of commercial properties.

3.1.4. Reasonable Stock Use

Waimakariri District has a high level of stock water use for farming. The initial calculation of 'reasonable use' for stock included consultation with the Summerhill Water users group, the Ministry of Agriculture and Forestry, Statistics New Zealand, Ministry for the Environment, ANZECC and Federated Farmers. These sources helped to ascertain the water demand for different stock types and different stocking rates.

The stock use was calculated by using the following formula for each of the ten rural schemes.

RSU = ASR x DCA x ASS x PAD

Where
RSU: Reasonable Stock Use (litres per day)
ASR: Average Stocking Rate by animal (number of stock per hectare)
DCA: Daily Consumption by Animal - average or peak (litres per head per day)
ASS: Area used for stock (hectares)
PAD: Percentage of Animals in the District (%)

The area used for stock for each scheme in the Waimakariri District was estimated from the Land Use and Carbon Analysis System (LUCAS) Land Use Data Map 2016. LUCAS is an inventory derived from satellite images used primarily to estimate New Zealand's greenhouse gas emissions and removals that are attributable to different land uses. LUCAS Land Use Map 2016 is prepared by Landcare Research for the Ministry for the Environment. As part of this work, LUCAS provided estimates of which areas within the district are grazed by stock.

A shapefile was exported from the LUCAS Land Use Map and used to determine the total 'grazed' area for each scheme. The shapefile indicates whether the stock activity is dairy or non-dairy. However it does not provide further detail due to privacy requirements and data source limitations.

Refer to Figure 2 below for an overview of the LUCAS Land Use Data Map used in this review.

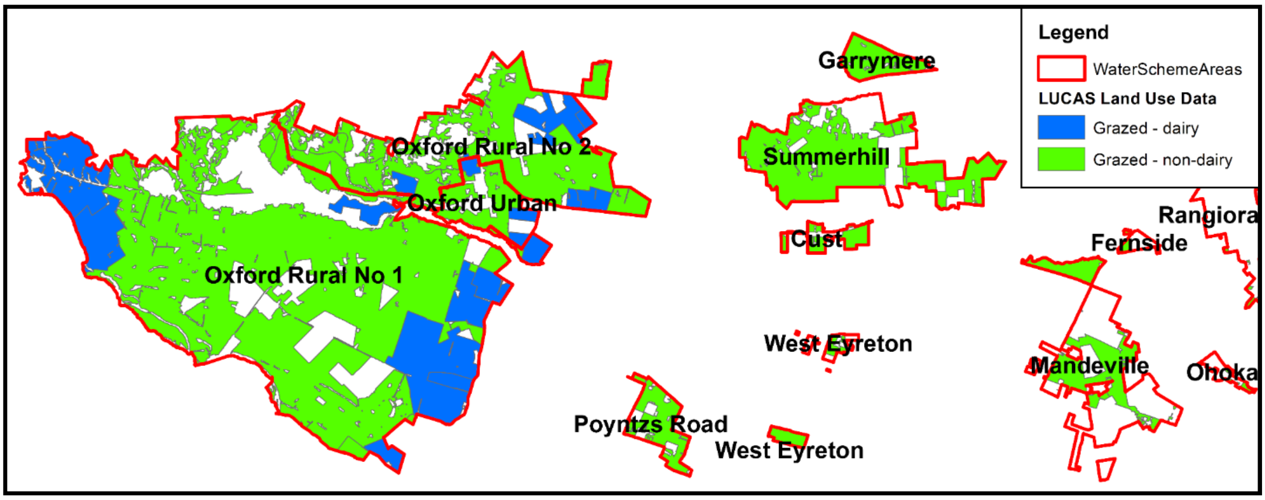


Figure 2. LUCAS Land Use Data Map 2016 within Waimakariri District Water Supply Schemes

This is a variation from assumptions made in WCS 2010 where all rural schemes were assumed to use stock on their full serviced area.

The average day and peak day consumption figures were calculated. The results, figures and sources for these are shown in Appendix 3

Conclusion:

Table 11: Stock Use Calculated Figures by Scheme

Scheme	Calculated Stock Use - Average day (L/d)	Calculated Stock Use - Peak day (L/d)
Oxford Urban	39,000	52,000
Cust	10,000	14,000
Ohoka	1,000	2,000
Garrymere	20,000	28,000
Mandeville-Fernside	44,000	61,000
Oxford No 1	1,125,000	1,490,000
Oxford No 2	280,000	374,000
Summerhill	114,000	159,000
Poytnzs Road	23,000	33,000
West Eyreton	7,000	10,000

3.1.5. Reasonable Leakage

In 2018/19 WDC Project Delivery Unit carried out specific night flow monitoring to calculate leakage rates for each scheme in the Waimakariri district[7]. These estimated leakage rates were used to determine the amount of assumed leakage within the district to feed into the reasonable water use calculation.

This is a variation from assumptions made in WCS 2010 where an overall reasonable leakage of 240 L/ property/day was applied to all serviced properties.

Conclusion:

Table 12. Leakage Calculated Figures for Reasonable Water Use Calculation

Scheme	Leakage per Connection (L/con/day)	Total Leakage (m^3/day)
Rangiora	86	657
Kaiapoi	134	719
Woodend Pegasus	118	373
Oxford Urban	608	551
Waikuku Beach	138	63
Cust	174	25
Ohoka	299	35
Garrymere	343	14
Mandeville Fernside	1243	1,183
Oxford No 1	1379	458
Oxford No 2	1261	420
Summerhill	779	143
Poytnzs Road	555	48
West Eyreton	220	16
Total		**4,706**

3.2. Actual Use Versus Reasonable Water Use

Both peak and average daily actual water use were taken from a 5 year average of the total flow for each scheme then divided by the total number of connected properties. The estimated peak and average reasonable water use figures were then compared to the equivalent actual water use figures.

[7] 2018/19 Water Leak Benchmarking and Reduction Summary (TRIM 190916129250)

3.2.1. Peak Daily Water Use

Figure 3 shows a graph of the comparison between actual peak flow and the calculated values for reasonable peak flow for each of the WDC water schemes.

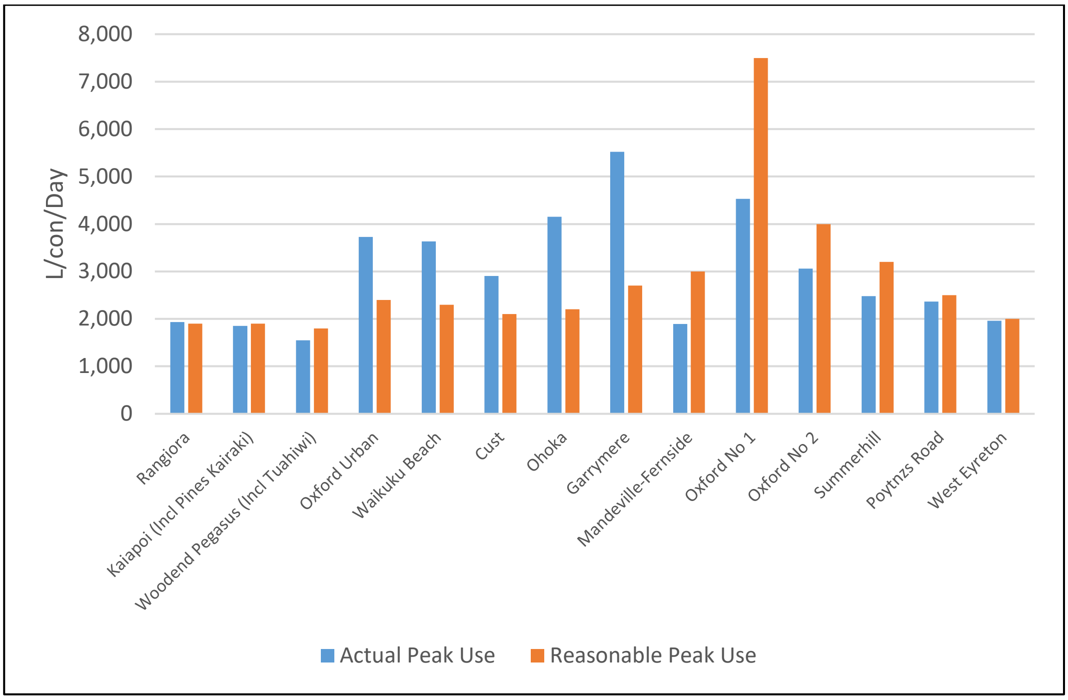


Figure 3: Actual versus Reasonable Peak Use

Figure 3 shows the largest differences between actual and reasonable use were in Garrymere, Ohoka and Oxford No. 1 in terms of flow per property. Garrymere and Ohoka are using more than what is assessed as reasonable, while Oxford Rural No.1 is using less.

The graph in Figure 4 shows the volumetric difference between actual and reasonable peak flow. This shows Oxford Urban and Waikuku Beach are using a greater amount of water above the assessed level of 'reasonable' water use. Woodend-Pegasus, Mandeville-Fernside and Oxford Rural No.1 uses a significantly lesser amount of water than the assessed reasonable peak water use. Garrymere and Ohoka, whilst using a higher per property peak flow, are unsurprisingly using a significantly lower volume of water than the larger schemes of Rangiora and Oxford.

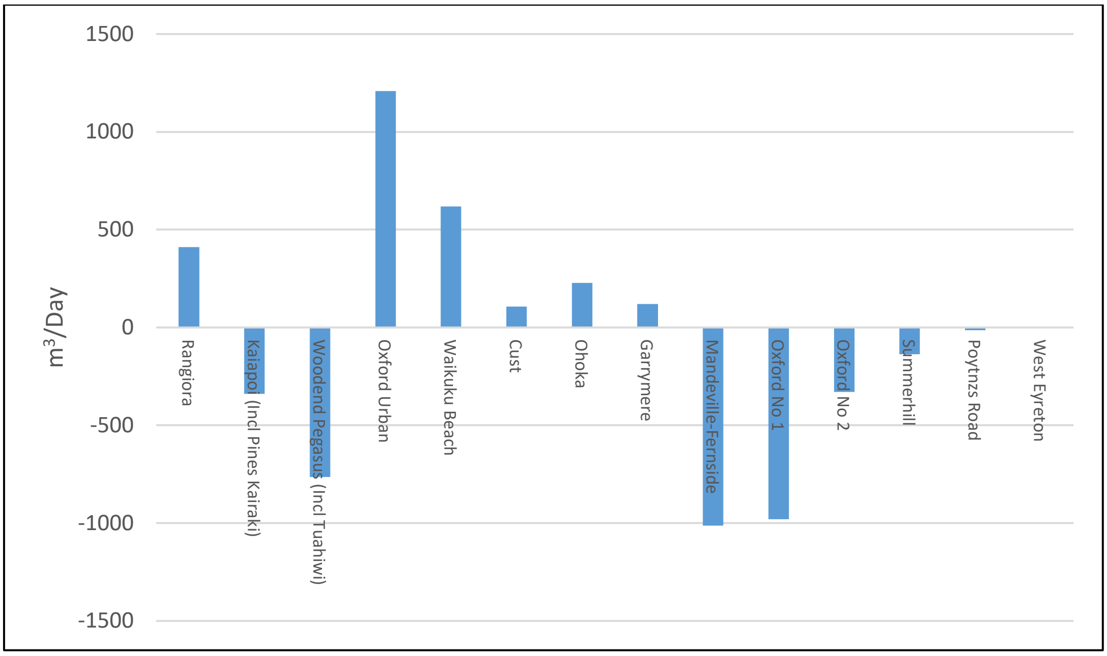


Figure 4: Volumetric difference between actual and reasonable peak use

3.2.2. Average Daily Water Use

The same comparisons were carried out between actual daily use and reasonable use for the average day. Figure 5 shows a graph of the comparison between actual average use and the calculated values for reasonable average use for each of the WDC water schemes.

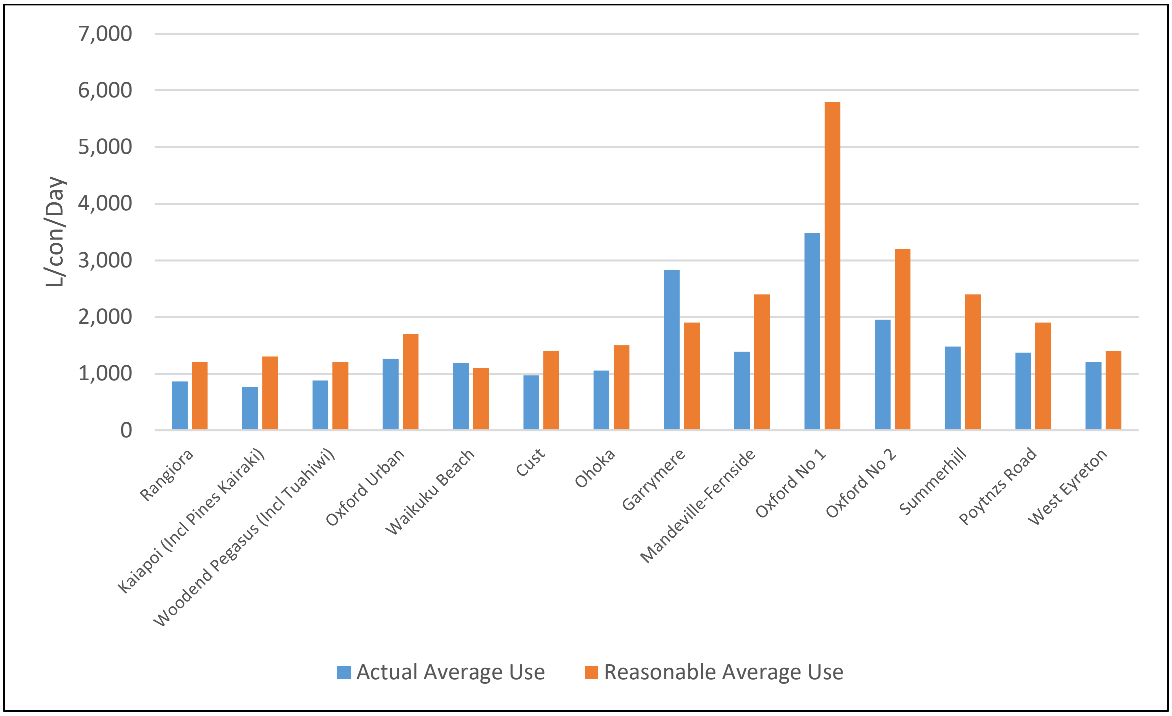


Figure 5: Actual versus Reasonable Average Use

As can clearly be seen, most of the schemes use less than the assessed reasonable use on an average day. Only Garrymere and Waikuku Beach show higher actual average use than assessed reasonable use. It is noted that these two schemes have larger than typical connection sizes, so this may mean that domestic irrigation use on these schemes is higher than others. It is noted that land parcel size is not part of the calculation currently for reasonable use.

The results demonstrate that the main focus of the WCS should be to reduce peak water use as there does not appear to be a significant problem with average water use within the district.

To keep the results in context, the average use is the most significant in terms of overall use and sustainability of the resource. Peak use has little to no impact on the overall groundwater resource, but can affect infrastructure sizing. So there may be some economic benefits in reducing peak use by potentially deferring capital upgrades, but little environmental benefits in doing this.

3.3. Reasonable Water Use Summary

Table 13 summarises the comparison between actual and assessed reasonable water use for each of the WDC water schemes. The values shown in green represent values lower than 100%, orange are between 100% and 150% and red are any values over 150%.

Table 13: Summary of Reasonable versus Actual Water Use

Scheme Type	Scheme	Ratio of Actual / Reasonable Average Use %	Ratio of Actual / Reasonable Peak Use %
Urban On Demand	Rangiora	71%	103%
	Kaiapoi	61%	97%
	Woodend-Pegasus	73%	87%
	Oxford Urban	73%	156%
	Waikuku Beach	104%	159%
	Cust	68%	135%
Semi-Restricted	Ohoka	68%	190%
	Garrymere	149%	208%
Rural Restricted	Mandeville-Fernside	59%	64%
	Oxford No 1	60%	61%
	Oxford No 2	61%	76%
	Summerhill	61%	77%
	Poytnzs Road	74%	94%
	West Eyreton	86%	98%
TOTAL		**68%**	**98%**

The results above shows that both the average and peak water use, when averaged across the district, are below the assessed reasonable amounts. The results of the average use are of most significance, as these figures represent the overall volume used. While the peak use is important to consider, this looks only at the more extreme points in time (i.e. the hottest day of the year triggering the highest demand), rather than a typical day.

The data shows there are limited opportunities to reduce average use, but there are some opportunities to look to reduce peak use on some schemes.

3.4. *Leakage Benchmarking*

The 2010 WCS included some relatively coarse estimates of leakage on a litres per connection per day basis. Determination of alternative measures of leakage and methods of estimating leakage has been explored further since the initial WCS in 2010.

While litres per connection per day provides a consistent method of comparing one scheme to another, there are a number of significant factors that are not taken into account with this measure. These include:

- **Length of pipework on a given scheme.** In particular rural schemes can have large lengths of pipework, and relatively low numbers of connections.
- **Operating pressure of a scheme.** Schemes with pipe in an equivalent condition of pipework will experience different levels of leakage depending on the operating pressure of the scheme. In general, a higher pressure scheme will experience significantly more leakage than a scheme operating at a lower pressure, even if the pipework is in equivalent condition.

Given the deficiencies with the litres per connection per day measure, consideration was given to a new measure. In 2019, the Council's Utilities and Roading Committee Adopted the Infrastructure Leakage Index (ILI) as the primary measure (refer to report 190130010451[v2]).

The ILI is determined to be the ratio of actual leakage relative to a calculated 'Unavoidable Annual Real Losses' (UARL). Essentially accepting that there is a level of leakage that cannot be realistically avoided for a given amount of pipework, connections and pressure and therefore calculating how much actual leakage is occurring relative to this unavoidable amount.

The bands of leakage that were adopted are given in Table 14 below:

Table 14: World Bank Institute for Leakage Management in Developed Countries

Band	ILI Range	Guideline Description of Real Loss Management Performance Categories for Developed Countries
A	**< 2.0**	Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective leakage management
B	**2.0 – 4.0**	Possibilities for further improvement; consider pressure management, better active leakage control, better maintenance
C	**4.0 – 8.0**	Poor leakage management, tolerable only if plentiful cheap resources; even then, analyse level and nature of leakage, intensify reduction efforts
D	**<8.0**	Very inefficient use of resources, indicative of poor maintenance and system condition in general, leakage reduction programs imperative and high priority

Leakage levels were estimated for all schemes, using the night flow analysis method. The results are presented in terms of litres per connection per day, m^3/km/day, percent and Infrastructure Leakage Index (ILI).

The way in which the bands are proposed to be used, once a banding has been assigned to each scheme is:

- If a scheme is measured as an A or a B, it is considered that the scheme's pipework is generally in good condition and that no further work is required to actively identify and repair leaks.
- If a scheme is measured as a C or a D, an economic assessment will be carried out to determine the cost of the leakage which will help inform the level of investment that should be made into actively identifying and repairing leaks. The assessed annual cost of the leakage will be considered to determine an appropriate investment in active leak detection and repair.

In late 2019 and 2020, an assessment was undertaken to estimate leakage on each scheme. This assessment was done using the following general methodology:

- The night flow analysis method was used as the starting point for all schemes. This involves looking at the minimum flow at night when demand is the lowest, making an allowance for genuine night use, and assuming the rest of water demand at this time is leakage. This was initially done using data up to June 2019, with some follow up work triggered following this.

- Further work was undertaken on two schemes which were assessed in more detail:

    - **Waikuku Beach:** Targeted leak detection was undertaken at Waikuku Beach. This resulted in some minor leaks being repaired, and a toilet cistern being turned off which had been running continuously. Follow up night flow analysis was then undertaken following this (refer to memo 200623076686).
    - **Fernside:** Flowmeters were installed at 57 properties on the scheme for a period of time (September 2019 to January 2020). An average use per property was determined and compared to total volume of water being supplied through the headworks. This work identified that the actual leakage level was able to be shown to be significantly less when the volumetric method was used, relative to the night flow method. The level of leakage using the night flow method was calculated at 58%, versus 30% using volumetric data.

The calculated leakage on each scheme is outlined below on Table 15 and Figure 6. Table 15 shows the full range of measures that can be used to express leakage, while Figure 6 shows only the ILI.

Table 15: Leakage Assessment 2019

On-Demand	Operating Pressure (m)	Min Night Flow (L/s)	Assessed Leakage				
			L/conn./ day	m^3/km/day	Percent %	ILI	Band
Rangiora	46	22.8	212	7.3	24%	3.5	B
Kaiapoi	44	10.4	119	4.1	15%	2.0	B
Woodend	44	2.5	104	2.9	15%	1.6	A
Pegasus	49	1.8	50	1.1	8%	0.6	A
Cust	43	0.3	117	1.5	12%	1.2	A
Waikuku Beach	42	1.3	194	6.3	17%	3.4	B
Oxford Urban	51	3.6	289	6.7	23%	3.6	B
Semi Restricted / Restricted							
Ohoka	54	0.3	150	2.6	15%	1.5	A
Poyntzs Road	50	0.7	463	6.5	33%	4.4	C
Garrymere	51	0.6	1035	9.1	36%	7.1	C
Fully Restricted*							
Oxford Rural No.1	88	13.4	1805	4.5	53%	2.6	B
Oxford Rural No.2	107	7.5	1050	4.5	54%	2.0	A
West Eyreton	30	1	480	2.7	40%	3.9	B
Summerhill	111	3.1	706	3.3	39%	1.4	A
Mandeville	36	13.9	692	7.9	50%	8.1	D
Fernside	34	0.7	401	6.0	30%	5.9	C
All Schemes Average		83.8	239	5.1	25%	2.7	B

** Note: The night flow analysis method used is likely to significantly over-estimate leakage on restricted schemes. The actual percentages of leakage on these schemes is likely lower than the values in the table above.*

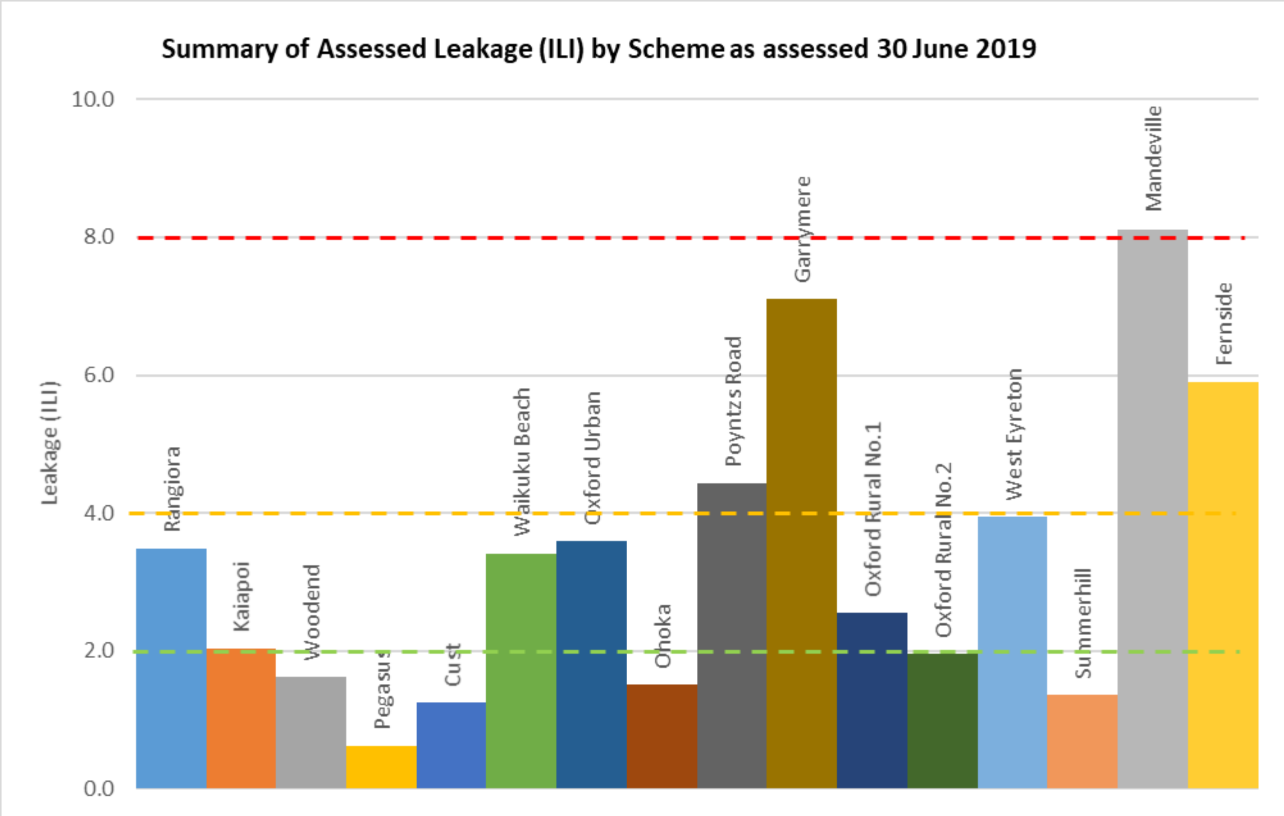


Figure 6: Infrastructure Leakage Index for Water Schemes

Key points to note are:

- The weighted average of the district is an ILI of 'B' which indicates the reticulation networks are performing reasonably well, although there is still some room for improvement.
- There is a distinct difference between the performances of the on-demand schemes versus the restricted schemes. This is not necessarily thought to be because the pipework is in worse conditions on restricted schemes, but that the night flow method is prone to over-estimating leakage on restricted schemes.
- Of the on-demand schemes, where there is a greater degree of confidence in the appropriateness of the analysis method, all schemes are achieving an ILI score of either A or B.
- The initial area of focus for the restricted or semi-restricted schemes is better understand actual leakage levels by improving the method of analysis. Strategies to more accurately calculate losses on restricted schemes are discussed in Section 4.6.1.

4. Strategy Options

This section outlines a number of water conservation initiatives that have been considered by Council for the Waimakariri District. These initiatives were chosen from a wide range of globally implemented demand management tools. Each of the options presented requires further work to determine the exact methodology for implementation.

4.1. WDC Water Conservation Work Prior to 2010

Prior to the 2010 Water Conservation Strategy the Waimakariri District Council carried out limited active water conservation work. The initiatives that had been underway in 2010 were limited to the following:

- Water restrictions at times of diminished water resource
- Sporadic public notices to remind consumers of the need to conserve water, usually prior to the peak summer period (examples shown in Appendix 5)
- Routine maintenance work such as water leak repairs and restrictor checks

There is also public information on the Council website about water conservation measures available to individual customers.

4.2. Water Conservation Initiatives Available

Table 16 provides a summary of the water conservation tools considered for implementation as part of the 2010 version of the WDC Water Conservation Strategy, along with commentary on its implementation since this time. These options are discussed more in the following sections.

Table 16: Summary of Water Conservation Initiatives Considered

Classification	Water Conservation Initiative	Advantages	Disadvantages	Implementation Since 2010
Metering, Pricing and Other Financial Incentives	Universal Metering	• Provides a fair and equitable rating regime • Creates significant incentive to conserve water • Reduces property leakage • Gives very good data for water consumption and system leakage	• Financial costs greatly exceed savings. • Opposition would be expected from consumers	Not progressed at this time. Although WDC understands that new drivers may emerge in the future to make universal metering more attractive.
	Metering of Extraordinary Users	• Provides a fairer and more equitable rating regime than current system • Creates incentive to save water for large users • Reduces property leakage for extraordinary users • Assists in understanding consumption patterns	• Costs of metering exceeds financial benefits of reduced water consumption • Expected opposition from commercial properties	A sample of approximately 10% of extraordinary users were metered and data assessed to help inform future policy decisions.
Community Engagement	Community Awareness Programme	• Relatively low cost • Council is seen to be promoting water conservation • Helps raise the 'perceived value' of water	• Can be difficult to influence behavioural changes without incentive such as saving money	Yes. This is an ongoing programme. To date has involved education in schools, and advertisements in newspapers and through social media.

Classification	Water Conservation Initiative	Advantages	Disadvantages	Implementation Since 2010
	Water Audits	• Relatively inexpensive tool to encourage water conservation for high demand users. • Should be carried out on Council properties to show Council is 'leading the way' in water conservation	• Action plans need to be followed up to realise any benefit.	Not carried out comprehensively. Some limited targeted work completed in response to metering of extraordinary users.
Infrastructure Management	Leakage Reduction	• Includes a large suite of tools to understand and reduce water demand. • Effective way of reducing peak flows and total use • Does not rely on customer participation to be successful • Provides comparable information on the condition of the network	• Can temporarily disrupt water supply to customers	Yes. Understanding and reducing leakage on Council water supplies is an ongoing programme. Night flow analysis generally used as an initial screening tool, followed by selected targeted leak detection.
Infrastructure Management	Water Restrictions	• Simple, quick and low cost • Effective short term measure for reducing peak demand in times of water shortage	• Relies entirely on customer participation • Has very little impact on annual demand reduction • Only to be used as a 'last resort'	Yes. This has historically been used either in response to specific consent requirements, or in response to particular events. The need for this has diminished over time, particularly as surface water takes have been relegated to backup sources.
Infrastructure Management	Restrictor Checks	• Checking programme already in operation • Does not rely on any customer participation to ensure correct water allocation	•	Yes. This is an ongoing annual programme.
Infrastructure Management	Pressure Management	• Reduces pressure related consumption and leakage. • May reduce frequency of mains bursts. • May extend the life of infrastructure. • Does not require customer participation to achieve results	• Costs outweigh savings • Difficult to quantify benefits of fewer mains bursts and extended infrastructure life. • Potential difficulties with fire protection systems	This tool has not been utilised historically, but will be considered for the future.
Water Efficient technologies	Use of Water Efficient Devices	• Many different devices available for a wide variety of budgets • Most devices easily applied to either new properties or retrofitted to existing properties	• Relies on consumer willingness to install devices • Little incentive for homeowners to change without volumetric water charging regime	Not actively promoted. However the use of water efficient technologies at WDC facilities is included as one of the actions from Council's Corporate Sustainability Strategy 2019. A future action will be to promote more widely.
Water capture, reuse & recycling	Use of Rain water and Grey water Tanks	• Reduces peak water demand	• Relatively expensive for individual property owners with little incentive to fit them.	Allowance has been made within Engineering Code of Practice for dual purpose tanks to re-use roof runoff. While not a requirement to install, provision is made for this to be allowed (refer SD 600-251).

4.3. Classification of Initiatives

Water conservation measures can be used by both the Council and the consumers to better understand and improve the efficiency of water use. Not all the initiatives result in a reduction in water demand, there are also initiatives to enable Council to better understand the water network to enable effective network management.

Water conservation tools can be classified in terms of the main effect they have in managing water demand. Table 17 shows the three main classifications and their objectives in managing water demand.

Table 17: Water Conservation Objectives

Classifications	Key Features and Objectives	Examples of initiative
Reduce Annual Demand	Reduces demand on a limited water resource Reduces treatment and operational costs Promotes efficient water use	Water metering Restrictor checks
Reduce Peak Flow	Needed where there is short term restrictions on water source or where peak use is very high Avoids oversizing of water supply network and associated costs inefficiencies Can delay capital works Promotion of efficient water use	Water metering Community Awareness Programme Water restrictions Rainwater and grey water tanks Water efficient devices
Reduce Base Flow	Improve understanding of leakage levels Target problem areas for maintenance Better infrastructure management	Leak reduction Pressure management Water efficient devices

There are measures included within this strategy cover the three classifications above, to reduce annual demand, reduce peak flow and reduce base flow.

4.4. Metering, Pricing and Other Financial Incentives

4.4.1. Water Metering and Volumetric Pricing

Background

Preliminary work was carried out prior to the 2010 revision of the WCS looking into water metering and volumetric pricing for the Waimakariri District. Historically there have been very few customer water meters and consumers are charged for water depending on the type of their supply. The on demand schemes, serving primarily urban communities, are charged a fixed charge to which there is minimal financial incentive to reduce water demand. The current situation sees industrial and commercial properties paying the same water charge as small domestic properties.

Water metering is essential for the adoption of any volume based pricing structure. Some research has shown that water metering alone, without any changes to pricing, can result in water reductions of between 10% and 40%. In order to sustain such reductions in the long term, volumetric pricing would need to be implemented.

There were two main types of water metering considered for WDC; universal metering and metering of extraordinary users. These were considered for implementation in the on-demand schemes only, as the metering of restricted supplies offers significantly lower benefits.

Advantages / Disadvantages

The main benefits of water metering are:

- Enables the Council to implement a fair and equitable user pays water charging system.
- The efficient use of water is promoted as consumers become aware of the true cost of water.
- Reduced property leakage as property owners become aware of leaks and there is incentive to fix them.
- Water meters provide the best overall water network performance data, which is used to determine detailed water loss analysis and detailed system demands allowing efficient infrastructure management.
- Assists in applications for future resource consents.

The main disadvantages are:

- The cost of meter purchase, installation, reading and maintenance will exceed the financial benefits of reduced water consumption.
- There is often rate payer resistance to volumetric pricing.

In 2010 the Council estimated the net cost of universal metering at $93 per ratepayer per year. This is a substantial additional cost, which the Council believes at this time outweighs the benefits of universal metering. The estimated costs of universal metering as estimated in 2010 are shown below:

- Capital Cost - $8,700,000
- Annual Cost - $145,000 / year
- Estimated Savings - $36,000 / year

The consumers on restricted schemes are physically restricted to a set daily volume of water on trickle feed and already pay on a pseudo volumetric basis. That is, restricted supplies generally pay either part or all of their rates based on their water allocation. This is not strictly a volumetric charge but it does create some incentive to minimise the water allocation to a given property, as if the resident exceeds their allocation, they will eventually run out of water.

Proposed WDC Approach

Whilst it is likely that regulatory drivers will lead to the need to implement universal metering at some point in the future, the large capital investment required makes this initiative less attractive at present.

The Council undertook a 3 Waters rating review in 2017. This did not result in any changes to the rating policy at that time, but the Council resolved that the 2021-31 Long Term Plan would include a proposal to carry out a comprehensive public engagement process regarding an alternative 3 Waters rating structure (refer to report 170721076345). While not included explicitly as part of the resolution, the 3 Waters rating review is seen as the appropriate time to consider alternative ways of rating for drinking-water, including consideration of metering.

4.4.1.1. Metering of Extraordinary Users

Background

In the context of the 2010 version of the WCS, extra-ordinary users were considered to be; businesses, institutions, education facilities, public facilities, and non-standard residential properties, such as properties with a large land holding, swimming pools, and properties with a water connection larger than the standard 15-20mm diameter. This includes all of Council's facilities such as parks, sports grounds, toilets, civic buildings etc. This will allow Council to implement water conservation initiatives on their own supplies demonstrating Councils commitment to water use efficiency.

Two relevant definitions were included within the 2012 Water Supply Bylaw, which was renewed in 2018:

> **EXTRAORDINARY SUPPLY** means a category of an on demand supply including all purposes for which water is supplied other than ordinary domestic supply and which may be subject to specific conditions and limitations.
>
> **EXTRAORDINARY USER** means a customer that receives an extraordinary supply of water and that specifically includes the following water users:
>
> - Commercial or business premises (including home-based commercial activities e.g. dentists, hairdressers, bed and breakfast and other cottage type industries).
> - Industrial premises.
> - Temporary supplies.
> - Out of District customers (supply to or within another local authority).
> - Public facilities, parks and reserves.
> - Educational facilities.
> - Any premises at which a horticultural or agricultural land use is occurring and that is potentially a high water user.

- Properties with fire protection systems other than sprinkler systems designed to comply with NZS 4517.
- Any property with a connection larger than 20mm nominal bore.
- Any other property found by the Council to be using more than 150% of the assessed reasonable average daily use over a 12 month period as defined in the Waimakariri District Council Water Conservation Strategy (available to view on the Council's website).

Following recommendations from the 2010 WCS, 114 water meters were installed throughout the district on potential extraordinary water users. These meters have been read and recorded since February 2011. Of the 114 water meters, 71 are commercial connections and 43 are residential connections with a property size greater than 2000m^2.

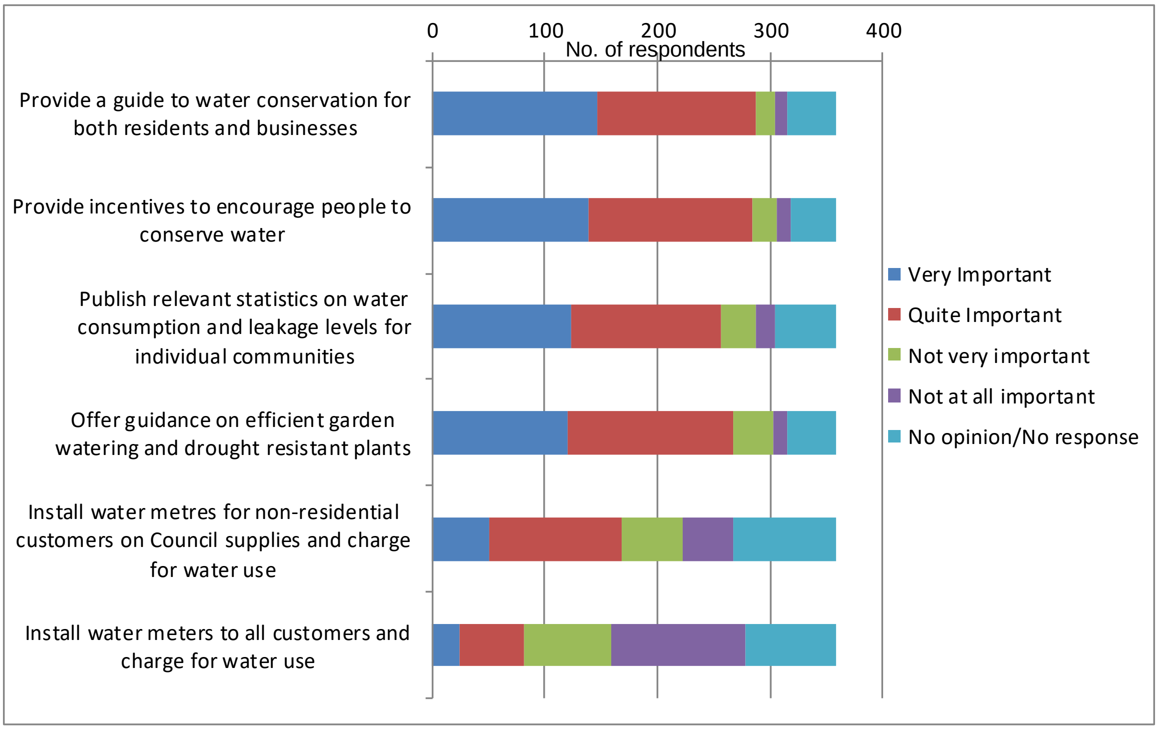
Data from these meters was assessed, first in 2011 (refer to repot 111103051701[v2]) and again in 2018. For the 2018 analysis refer to PDU report 180704074511 and report 190130010451[v2] which was presented to Council. The 2011 assessment also included a customer survey on potential water conservation measures.

A summary of where these meters are installed is given below:

Table 18: Water Meters Installed and Read Since 2011

Scheme	No. of Water Meters Installed
Rangiora	41
Kaiapoi	24
Woodend	5
Oxford	30
Waikuku Beach	6
Cust	8
TOTAL	**114**

The key results from the 2011 customer survey are below:



It can be concluded that the most widely favoured options were for Council to provide guides to water conservation, and incentives to encourage people to conserve water. There was less support for options involving the installation of water meters.

Some key findings from the assessment of water meter data, from both 2011 and 2018 are below:

- There are large variations in water use by property.
- On average commercial use was significantly higher than residential use, but this was not exclusively the case for each property.
- There was no direct correlation between water use and specific business type (i.e. some restaurants had much higher use than others, and some schools had much higher use than others).
- There was some correlation between connection size and volume of water used.

Proposed WDC Approach

To address the points raised above, the following actions are proposed:

- Review water rating policy as part of the 3 Waters rating review (as noted previously) following the 2021-31 Long Term Plan process, taking into account data from the extraordinary meter assessment, and 2011 customer survey.
- Consider extending water meter readings to residential properties that have had meters installed as part of new subdivisions, to gather typical residential use in additional to the extraordinary water use data.

4.4.1.2. Volumetric Pricing

Background

There are a wide variety of different volumetric charging regimes used by local authorities to charge for water in New Zealand. There are four main types of tariff for volumetric charging, which can also be combined to form further options:

- **Uniform Volumetric Rate** – This system uses a flat rate for water consumed ($/m3). This has the advantages of being easy to understand and relatively simple to implement and administer. It is fair and equitable and provides an incentive to conserve water as less water use means lower water bills.

- **Decreasing Volumetric Rate** – Under this system, the unit price decreases with the volume of water consumed. There are usually bands of pricing such as <100,000 m3 is one rate and 100,000 to 200,000m3 is another rate etc. One of the reasons for this pricing regime is the assumption that the cost of water production decreases as total volume of water produced increases. This provides a slightly lower incentive to conserve water, but does not unduly penalise water intensive industry.

- **Increasing Volume Rate** – This charging regime increases the unit price of water with higher consumption, again this would be applied in bands. The rationale behind this structure is that increasing water demand may require investment in capital works, and therefore it encourages water conservation and can defer capital works. This price regime is not known to be used in New Zealand at present.

- **Seasonal Tariff** – This structure can incorporate any of the above options, but can provide differential prices between peak periods (i.e. summer) and the remainder of the year. This reflects the scarcity of the resource at that time or limits in the capacity of the network infrastructure. This price regime is not known to be used in New Zealand at present.

Any of the above charging regimes can be combined with a Fixed Charge that is either one set price or varied depending on the size of the meter.

If a conservative estimate of a 5% reduction in water demand over all on-demand schemes was achieved there would be a saving of approximately 340,000 m^3 per year in water production through the combined introduction of extraordinary metering and volumetric pricing. These savings would be made through consumers having a greater awareness of the quantity of water they using and the value of water.

Proposed WDC Approach

As noted previously, it is proposed that Council review water rating policy as part of the 3 Waters rating review following the 2021-31 Long Term Plan process.

4.4.2. Water Supply Bylaw

At the time the 2010 WCS was prepared Council did not have a Water Supply Bylaw. This was seen as a key regulatory tool to allow certain water conservation measures to be implemented. Since this time, Council has adopted a Water Supply Bylaw in 2012, which was renewed in 2018. Key requirements relevant to water conservation that the bylaw covers are listed below:

- Water metering (see section 4.4.1)
- Designation of extraordinary users (see section 4.4.1.1)
- Specific water restrictions such as garden watering (see section 4.6.1.3)
- Requirement to install low flow devices in new households (see section 4.7.1)
- Requirement to retrofit low flow devices in existing households (see section 4.7.1)
- Requirement to fix leaks within private property

4.5. Community Engagement

This section details how the Council will educate the public of Waimakariri to raise awareness and encourage participation in water conservation. The effectiveness of these initiatives is very difficult to measure in terms of actual savings. However, it is internationally recognised that public understanding and education is essential to the success of any water conservation programme. Even mandatory initiatives such as water restrictions are rarely successful without publicity and promotion.

4.5.1. Community Awareness Programme

Background

A community awareness programme can provide benefits by increasing understanding of consumers' water use and their authority's assets and operations. This understanding can provide an ideal platform for communication and public cooperation in times of water shortage. This is seen as an essential part of any successful water conservation programme. The programme must be long term and consumers must be convinced that changed use habits are in their own and the community's best interests. To achieve this, a varied approach is needed to target different groups of consumers such as commercial properties, home-owners, renters and tourists. Council must also demonstrate that it can lead the way in water conservation through the implementation of various initiatives (e.g. active leak detection and repair, efficient parks irrigation, water audits on council buildings) in order to encourage the public to follow suit.

There are many different formats for water conservation education, with the effectiveness changing depending on the target audience. Some of the most effective education based strategies for New Zealand local authorities have been:

- Signs in public places in the communities describing water issues and the need to conserve water
- Producing an advertising leaflet with information and discount vouchers for the purchasing of water saving devices.
- Developing a comprehensive guide to water conservation for both residents and businesses
- Distribution of water saver kits to households to encourage them to implement low cost water saving methods e.g. Dye tablets to test toilet leakage.
- Development of a school education programme
- Providing information on setting up a low impact garden, using drought resistant plants.
- Offering a doorstep service to the local community for small plumbing needs.

It has been shown that information campaigns alone will not generate a change towards more sustainable behaviours. The purpose of the community awareness programme is not just to educate on water conservation, but to also influence behaviour. There needs to be sufficient motivation to change habits, and as most properties are unmetered and do not pay directly for water consumption, there is not the incentive of saving money. Financial savings through lower energy consumption through fitting water efficient devices such as low flow showerheads can provide an immediate incentive to the customer. Other motivating factors can be used such as saving energy, reducing environmental impacts and being sustainable citizens. If a volumetric pricing regime is implemented, the motivation to save money will lead to a greater buy in of water conservation methods at individual properties.

Advantages / Disadvantages

The main benefits of a good community awareness programme include:

- Instilling good conservation habits in water users
- Increased public awareness of the need to conserve water which leads to greater acceptance of other measures such as metering and volumetric pricing.
- A reduction in total demand through cumulative water conservation from a number of properties.
- Changed values towards a lasting ‘water ethic’

Some disadvantages include:

- Can be difficult to influence behavioural changes with little financial incentive such as saving money
- Often has ‘intangible’ benefits that are very difficult to measure

Proposed WDC Approach

The Council’s approach to community education currently includes the following:

- Education on water conservation measures, through a school education programme.
- Information on water saving initiatives being made available on the Council’s website.
- Targeted campaigns through newspapers and social media in times of high demand, to reduce peak use.

At the time that the 2020 WCS was being prepared, Council was undertaking a Section 17A service delivery review of how the Council delivers community education programmes as a whole. This review had not been completed at the time this document was being prepared, but this will make recommendations to how community education can be improved, and strategies to widen the audience from predominantly schools, to a greater cross section of the community.

4.5.2. Water Audits

Background

With the metering of a select group of extraordinary water users, voluntary water auditing services are able to be offered to these properties. This can encourage consumers to conserve water, and if volumetric charging were introduced in the future, this would in turn assist consumers to reduce their water bill.

A water audit can provide an account of the amount of water used by each process and operation for an entire organisation. The results are an important part of creating an action plan to make an organisation more water efficient. Typical aspects of a water audit include:

- Carry out a water balance for the property
- Check water flows of taps, showers and toilets
- Perform leak detection tests on all toilets
- Carry out regular meter readings to determine any leakage
- Audit irrigation practices
- Recommend targeted effective water efficient devices e.g. Tap aerators, dual flush toilets, alternative washing machines etc.
- Assist in the preparation of an action plan for greater water efficiency.

These audits should not just be limited to buildings, but also efficient use in parks and reserves, sports grounds etc. This would encourage more efficient water use, and reduce water costs for Council as well as being seen to lead the way in water conservation.

Proposed WDC Approach

As widespread water metering is not being implemented at this stage, water audits have rarely been carried out. However, in the future if Council implements water metering and volumetric pricing then water audits could be carried out as a voluntary free service on high water use businesses as well as Council properties.

In the meantime, there have been some limited opportunities to undertake audits. An example was following the 2018 review of the extraordinary water meter readings. A school was identified as having high use relative to other similar schools, and subsequently Council contacted the school. It was since identified that it was likely older style urinals contributing to the high use. The school was in the process of upgrading their toilets, and follow up data suggested this largely addressed the issue. Other opportunities to work with consumers will be sought, where metered data is available, and outliers are identified.

4.6. Infrastructure Management

This section describes the water conservation initiatives that maintain and improve efficiency of the water supply network. These include better understanding of the ‘health’ and operation of the system and physical changes to ensure more efficient operation.

4.6.1. Leak Reduction

Background

Leak reduction involves a suite of different water conservation tools aimed at understanding, targeting and reducing levels of leakage in a water supply network. Leak reduction has been proven to provide significant savings on total average flow in water networks, therefore whilst it is not specifically targeting peak demand, there are significant cost savings in total demand reduction.

Water take resource consents are now stating the consent condition requiring the consent holder to ‘*take all practicable steps to minimise leakage from the reticulation system’*.

Water use in a reticulated system can be categorised into either authorised consumption or water loss. Figure 7 shows the water use in a water supply network, with the last three columns of real losses being the area targeted by leakage reduction.

<table>
<tr><td colspan="4">Authorised Consumption</td><td colspan="4">Water Loss</td></tr>
<tr><td colspan="2">Metered</td><td colspan="2">Unmetered</td><td rowspan="2">Apparent Loss
Unauthorised consumption - Reduce through Auditing of illegal connections, restrictor checks.</td><td colspan="3">Real Losses
Leaks from Mains, services, hydrants etc.</td></tr>
<tr><td>Billed</td><td>Unbilled</td><td>Billed</td><td>Unbilled</td><td>Background Leakage (unavoidable real losses)</td><td>Reported Bursts</td><td>Unreported Bursts - Reduce by Active Leakage detection, renewals programme.</td></tr>
</table>

Figure 7: Water use in a Supply Network

Advantages / Disadvantages

The main benefits of leak reduction are:

- Does not rely on customer participation to be successful.
- Maintaining an economic level of leakage is considered a cost neutral exercise (see section 4.6.1.2).
- Reduces operational costs.
- Provides comparable information on the condition of the network.
- Provides for a safer network, with less opportunity for contaminants to enter the network during any pressure loss events, through leaks in the network.

The main disadvantages are:

- Work can disrupt supply to customers
- After initial ‘quick wins’ the cost of identifying and rectifying leaks can exceed the cost savings made by addressing them.

Proposed WDC Approach

The following three tools will be implemented by WDC as part of the water conservation strategy:

- Minimum night flow monitoring.
- Estimating the cost of unavoidable leakage.
- Active leak detection and repair.
- Water balances (where economic to do so).

These are discussed fully in the following sections.

4.6.1.1. Leakage Estimates

Background

Before effective leak detection and repair work can be carried out, leak detection efforts should be prioritised on the water supply schemes with the highest leakage levels. Accurately determining the current level of leakage for each scheme is a vital part of leakage reduction. The leakage levels shown in Table 15 are generally based on minimum night flow data assessed over a 12 month period, with some modifications made to data where a follow up assessment has been undertaken.

The most cost effective method of determining an accurate level of leakage for water supplies with less than 10,000 connections without residential metering is through a minimum night flow test[8]. Minimum night flow tests are typically carried out during the minimum demand period, often between 2am and 4am. During this time period, leakage is typically at its highest proportion of demand.

The night flow method relies on very low genuine use during this assessment period of 2am to 4am to be accurate. Where there is genuine use during this time, there is a risk that this approach overestimates leakage. This is a particular issue on restricted schemes, where by nature properties connected to these schemes continue to receive water through their 'trickle feed' connection, even when they have stopped consuming water at that particular point in time. The data presented reflects this likely overestimation of leakage on these restricted schemes.

Proposed WDC Approach

The following actions are proposed to assess leakage, which in turn will identify and prioritise follow up work:

- Undertake a high level review of night flows on all schemes annually, to estimate leakage rates.
- Undertake analysis of actual night use rates on restricted schemes, through meters with loggers. This will generate a more realistic assessment of actual night use on restricted schemes, making the leakage estimate using the night flow method more accurate.
- On small schemes where it is economic to do so, consider installation of bulk water meters to undertake a flow balance for the scheme, as opposed to relying on the night flow monitoring data as the primary method of estimating leakage.

4.6.1.2. Estimating the Cost of Leakage

Background

Estimating the economic level of leakage goes hand in hand with determining leakage levels and is fundamental in developing an economically sustainable water conservation strategy. The economic level of leakage is the point at which the cost of reducing leakage is equal to the benefit gained from further leakage reductions.

Figure 8 shows the various levels of leakage, with the outer edge being the current level of leakage, also referred to as real losses. The largest yellow area represents the amount of leakage that could be effectively reduced, the inner green area is the underlying real losses that occur in any water supply system that cannot be changed. The middle blue area represents leaks that could be detected and repaired, but to do so would cost more than if they were left running.

Incidentally, the infrastructure leakage index (ILI) is the ratio of CARL to the UARL, this gives a comparable level of leakage for benchmarking with other Councils. It is therefore vital for WDC to understand the economic level of leakage for each of its water supply schemes.

[8] Water Loss Guidelines, Water New Zealand, February 2010

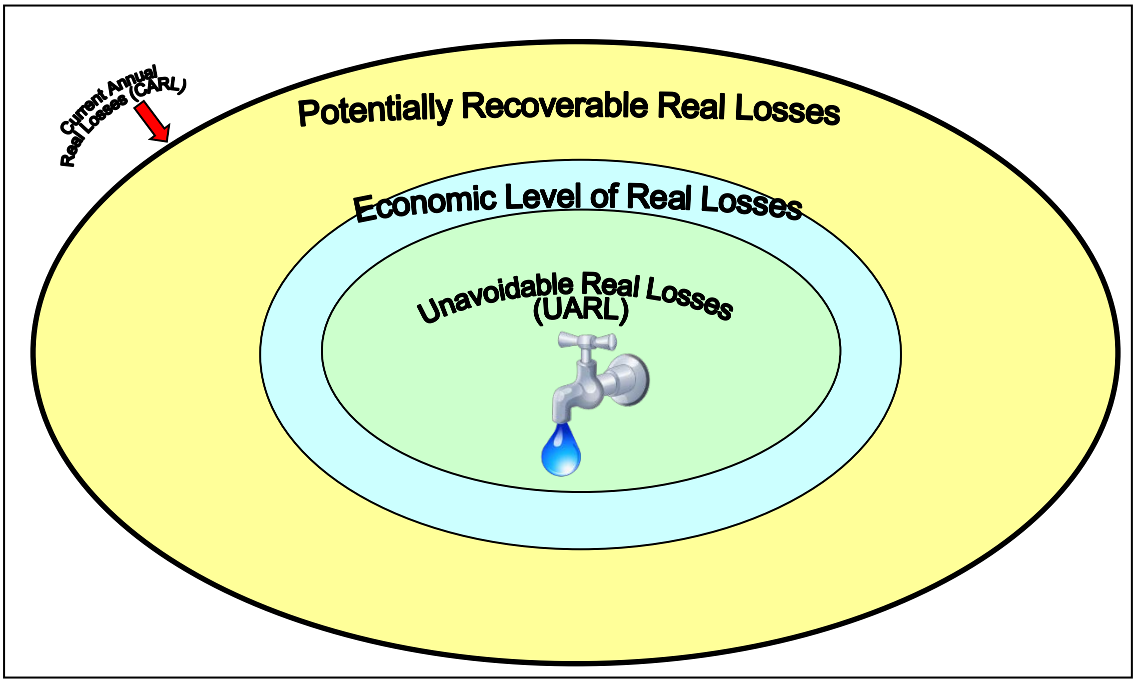


Figure 8: Different Levels of Real Losses

Proposed WDC Approach

The cost of leakage will be estimated for all water supplies annually, as a function of the key variable costs in producing water (power and chemicals). This will then be considered when leakage on each scheme is assessed, to determine an appropriate level of investment to identify and repair leaks. It is noted that economics are not the only driver for implementing leak reduction. However, as there are safety and compliance benefits to minimising leakage as well. Therefore, the direct cost associated with wastage of water is just one factor to be considered when evaluating the need for further works.

4.6.1.3. Active Leakage Detection and Repair

Background

Prior to the implementation of the 2010 WCS, there was no active leakage detection programme, therefore leakage repairs were only carried out when Council is notified of an issue such as a burst. All water supply networks leak, some leaks are obvious and show on the surface, but the vast majority of leaks just run underground, especially in the Waimakariri district where there is a high quantity of gravels in the underlying ground. Active leak detection has been undertaken across the district since 2010, and involves the finding and fixing of leaks in the water supply network that would have otherwise gone un-noticed.

Proposed WDC Approach

The active leak detection programme for WDC includes the following work:

- Step testing
- Acoustic logging
- Temporary metering
- Leak correlation, pinpointing and repair

The active leak detection programme will be focussed on those schemes identified by night flow monitoring and economic level of leakage calculations that have the highest leakage levels.

The budget for this work does not include the repair costs to be carried out by the Water Unit on Council owned infrastructure, as these costs are funded out of existing pipe repair or valve repair budgets. It is expected a large number of private leaks will also be found during this programme, these will remain the property owners' responsibility to repair. Where these are identified, Council will inform the property owner, and request that they remediate leaks found. There are powers under the Council's Water Supply Bylaw where Council can undertake enforcement action if private property owners refuse to remediate leaks once identified. This approach is not commonly followed. However, it is Council's preference to work proactively with property owners, rather than resorting to enforcement actions.

4.6.2. Water Restrictions

Background

Water restrictions are one of the active water conservation methods currently available to be used by Waimakariri District Council. Water restrictions enable significant water savings on peak flows with quick implementation, low cost and relative simplicity. The main disadvantage about water restrictions is that they are entirely reliant on customer participation. Currently in the district, water restrictions are entirely voluntary, although there are provisions in the Water Supply Bylaw to undertake enforcement if required.

A breakdown of the different levels of restrictions is shown in Appendix 6. During recent years, water restrictions have not been required to be used as a demand management tool. A pre-cursor to the need for restrictions that has been utilised is advertising messages to the public to encourage wise water use, to avoid the risk of restrictions being put in place.

Proposed WDC Approach

WDC aims to continue to implement water restrictions when necessary as a 'last resort' measure and can be implemented for two main reasons:

- To comply with resource consent conditions. Some consents require the Council to apply restrictions when low flow conditions in rivers are reached (consents with these types of conditions are generally from surface water takes only, and are only applicable to backup sources rather than primary sources currently).
- To keep demand within the capacity of the infrastructure and avoid risk of loss of supply.

Water restrictions will not generally be used to keep water use within 'reasonable' levels, as public information campaigns are utilised for this.

4.6.3. Pressure Management

Background

Pressure management is seen as a key method in managing leakage in water supply networks.

Reduction in pressure in the network has benefits of extending infrastructure life, lowering flow rates from existing leaks, reducing consumption from customers and creating fewer new leaks. A significant part of Waimakariri District where the water schemes are located is relatively flat, meaning differential pressure zones within the schemes are less pronounced. This also means in most schemes that the pressure is controlled by the pumping regime as opposed to gravity, meaning opportunities for pressure reduction within the system are limited. Pumping regimes where the pressure is reduced at times of lower demand, such as overnight, could be considered for implementation in WDC.

The target level of service for WDC on demand schemes is to provide greater than 300kPa for 95% of the time and greater than 250 kPa 100% of the time. One area where work is required is pressure monitoring on all schemes, to ensure the levels of service are met but not exceeded too greatly. Pressure has a big influence on the operational regime of a water supply network. Currently pressure is generally set on schemes through pumpstations having a target set-pressure that they aim to maintain, with the pressure set point based on hydraulic modelling to achieve minimum target pressures during peak demand events.

Verification that target pressures are being met is currently only carried out through responses to service requests to monitor pressure temporarily, rather than through continuous monitoring of pressure in the network. This presents an opportunity to gain an improved understanding of network pressure throughout the system.

Proposed WDC Approach

Initial steps that are being considered relating to pressure management include:

- Investigate viability of pressure management on larger supplies (Kaiapoi and Rangiora). Initially, consideration will be given to output pressure from pumpstations varying with demand, such that when demand is low, the network is not at a higher pressure than it needs to be, but as demand increases, the pressure delivered from the pumpstation should increase alongside this. This will likely involve a trial on one scheme, which will help inform the benefit of extending this approach to other schemes.
- Feasibility study on the creation of pressure zones within the network.

4.6.4. Restrictor Checks

Background

Restrictor checking is one the tools currently being used by WDC for water conservation. Water restrictors are used on restricted rural water supplies to physically limit the flow of water to a property to an agreed volume. The flow is restricted by a fixed diameter orifice on the service at the boundary to the property. Over time the restrictors can wear out or be removed, leading to higher flows than agreed and increased demand on the water supply.

Proposed WDC Approach

By carrying out a scheduled restrictor checking programme, WDC are ensuring the flow to individual properties is not above the prescribed levels. Restrictor check budgets are already allowed for on all schemes with restrictors. This programme of works will continue. There is a key level of service relating to this, with all restrictors required to be checked at no more than a 5 yearly interval (currently programmed for every 4 years in the 3 Waters / Water Unt Service Level Agreement).

4.7. Use of Water Efficient Technologies

This section describes the water conservation tools that are aimed at providing customers with the ability to conserve water. Each of these measures need to be closely incorporated with the Community Awareness Programme to ensure there is some understanding of the need for water conservation and the benefits that this brings to individuals.

4.7.1. Water Efficient Devices

Background

High residential indoor water use can often be partly attributed to inefficient fixtures and appliances. There is no requirement in Waimakariri District to fit water efficient fittings when building a new property, and with no volumetric pricing, there has traditionally been little incentive to conserve water.

Studies show that the largest volumes of water in domestic properties are used by showers, washing machines, toilets, taps and outdoor use, therefore these should be the areas focussed on for water efficient devices. The results of this study are shown in Appendix 7.

Table 19 shows a comparison between traditional and water efficient fittings with potential savings of both water and energy. In December 2009 the Government agreed to proceed with Water Efficient Labelling regulations. This means all new washing machines, dishwashers, showers, toilets, urinals and taps will have water efficiency labels on them similar to the energy efficiency labels currently seen on appliances. This is expected to change the market share of water efficient devices over time.

Table 19: Comparison of water efficient fittings

Appliance	Traditional Water Use	Efficient Fitting Water Use		Approximate Water Savings (litres/person/day)	Approximate Energy Savings kilowatt hours/person/day)
Toilet	11 litres per flush	Ultra Low Flow	6 litres per Flush	30 – 50	n/a
		High Efficiency	<4.8 litres per flush	30 – 64	n/a
		Composting	Negligible	60 - 110	n/a
Shower	15 – 20 litre per minute	9 litres per minute		10 – 40	0.4 – 1.8
Tap	15 litres per minute	8 litres per minute		6 – 40	0.4 – 0.8
Washing Machine	150 –180 litres per load	60 – 100 litres per load		17 – 40	0.5 – 1.0
Dishwasher	20 litres per load	8 - 10 litres per load		1 - 3	0.4 – 1.4

Council has options whether to subsidise products, use legal methods such as the Water Supply Bylaw to restrict the use of inefficient fittings on new homes or to purely raise awareness through the Community Awareness Programme. Another well used option in New Zealand is to give away inexpensive fittings such as tap aerators or a toilet gizmo to reduce flush volume in combination with the Community Awareness Programme.

Proposed WDC Approach

The use of water efficient devices will be encouraged through the following means:

- Education, as part of the Community Awareness Programme. The specific strategy of which groups are targeted with this education will be determined following the Section 17A review into how this is delivered.
- Implementation of water efficient devices in Council buildings. It is intended that implementation of this could also be done using the same resource (whether external or internal) who delivers the Community Awareness Programme going forward.
- Continue participation in BRANZ study to update assessment of domestic water use. Council had installed meters at some properties, and the data has been analysed, but the final report was yet to be published by BRANZ at the time the 2020 revision of the WCS was published.

4.8. Water Capture, Reuse and Recycling

This section describes the initiatives considered for the capture and re-use of water on domestic properties.

4.8.1. Use of Rain Water and Grey Water Tanks

Background

Water for non-potable uses such as irrigation and toilet flushing does not need the same amount of treatment and contamination protection as required in the New Zealand Drinking Water Standards. This means alternative water sources can be considered that do not comply with the strict water quality standards, which reduces demand for potable water. There are three main ways this can be introduced to the district;

- Councils encouraging homeowners to install alternative water capture devices through education and / or financial incentives.
- Councils using planning legislation to require new developments to install alternative water capture devices on all new properties
- Councils using the Water Supply Bylaw to require all properties to install alternative sources. This is not currently used anywhere in New Zealand.

At the time the 2010 WCS was published, it had not been resolved how the potential use of rain water and grey water tanks would be addressed.

Proposed WDC Approach

The current approach taken is that re-use of rainwater is allowed for, but there are no specific incentives to increase the uptake of this. It can still be encouraged through education (through the Community Awareness Programme), but the real incentive to increase update further would be financial, if volumetric charging is introduced in the future.

The Engineering Code of Practice makes provision for properties to install either a dual purpose tank, or a detention tank, both of which collect rainwater. The difference is that the detention tank simply detains the rainwater, to mitigate against downstream impacts of runoff into the stormwater system. The dual purpose tank provides the same function as the detention tank, but also allows for the runoff to be re-used as an added benefit (refer to Standard Drawing 600-251-B in the Engineering Code of Practice).

5. Targets

This section details the potential savings of each of the water conservation initiatives to be implemented by WDC. From these potential savings, targets for water demand and leakage reduction have been formulated for each scheme and at a district level. Progress towards meeting the targets will be measured over time and can be used as a measure of the success of the Water Conservation Strategy.

5.1. Potential Savings

The potential savings from water conservation measures has been assessed by following the steps as outlined below:

- Determine the variable cost of water on each scheme as a sum of the following:
  - Electricity cost in terms of the cost of power consumed divided by the volume of water produced.
  - Chemical cost in terms of the cost of chemicals consumed to treat the water, divided by the volume of water produced.
- Determine the volume of potentially avoidable losses of water. This is the Current Annual Real Losses (CARL) minus the Unavoidable Annual Real Losses (UARL), as defined in the Water New Zealand Water Loss Guidelines.

The above is an easy way to assess the cost of leakage that could realistically be expected to be avoided. There are several limitations to the above:

- The CARL and UARL are calculated for a set operating pressure of a scheme. If pressure management can be implemented, then savings can be over and above those calculated above.
- The above looks only at the cost of leakage. Any savings associated with voluntary reduced consumption would be over and above this figure.

A summary of the cost of this potentially avoidable leakage is given below:

Table 20: Estimate of Cost of Potentially Avoidable Leakage on Council Water Supplies (Based on 2018/19 Flow Data)

Scheme	Total Variable Cost (Electricity + Treatment)	Total Annual Volume (m^3/year)	Cost per Volume ($/$m^3$)	Total Leakage Cost ($/year)	Unavoidable Leakage Cost ($/year)	Avoidable Leakage Cost ($/year)	Avoidable Leakage Cost per Conn. ($/conn.)
Rangiora	$191,199	2,413,071	0.08	$49,456	$13,317	$36,139	$4.77
Kaiapoi	$77,917	1,519,011	0.05	$11,976	$5,885	$6,091	$1.13
Woodend	$33,134	351,031	0.09	$5,072	$3,113	$1,959	$1.38
Pegasus	$33,134	378,640	0.09	$2,553	$4,121	$-	$-
Cust	$9,306	50,819	0.18	$1,107	$886	$221	$1.56
Waikuku Beach	$13,503	200,928	0.07	$2,209	$647	$1,562	$3.37
Oxford Urban	$52,992	421,323	0.13	$12,106	$3,367	$8,740	$9.56
Ohoka	$4,187	44,864	0.09	$602	$396	$205	$1.74
Poyntzs Road	$7,595	43,679	0.17	$2,529	$571	$1,958	$22.76
Garrymere	$7,717	43,712	0.18	$2,802	$394	$2,408	$57.34
Oxford Rural No.1	$63,637	424,200	0.15	$33,406	$13,060	$20,346	$60.20
Oxford Rural No.2	$45,536	238,396	0.19	$24,513	$12,483	$12,030	$35.91
West Eyreton	$12,589	31,876	0.39	$4,982	$1,263	$3,719	$51.65
Summerhill	$43,234	99,932	0.43	$16,395	$12,105	$4,290	$29.19
Mandeville	$91,607	439,039	0.21	$45,439	$5,602	$39,838	$46.22
Fernside	$10,120	45,186	0.22	$2,915	$494	$2,421	$27.20
Total	**$697,407**	**6,745,707**	**0.10**	**$218,061**	**$77,703**	**$141,926**	**$7.24**

The following key points can be drawn from the above:

- The total variable cost of supplying water (the electricity and chemicals consumed each year) is calculated at approximately $700,000 per year, to supply approximately 6,700,000 m^3. This gives a variable rate of supply of about $0.10 per m^3.
- If all potentially avoidable leaks were repaired, such that all water supplies had an ILI value of 1.0, there would be a direct annual saving of $142,000.
- The challenge with the above is that once initial investigations have been undertaken, there are diminishing returns in terms of the size of leaks found versus the expenditure to find them.
- The other possibility is that, due to the night flow method potentially over-estimating leakage, this potential for savings too may be over-estimated. Again this reinforces the need to invest in better understanding actual leakage levels, before over-committing to expenditure to find and resolve leaks.

5.2. *Annual Targets*

To measure the effectiveness of the overall WCS, targets need to be set to ensure the level of success can be quantified.

The original 2010 version of the Water Conservation Strategy outlined targets for each scheme relating to leakage levels, and reasonable water use. In the time since the original targets were set, the following key improvements to the derivation and reporting of targets have been made:

- The primary measure for assessing leakage was re-defined as the Infrastructure Leakage Index (ILI), as opposed to litres per connection per day. This will continue to be used as the primary measure.
- The calculation for reasonable water use has been improved, taking into account more up to date and relevant data fields.

These targets also relate to both mandatory and non-mandatory levels of service that Council reports on.

The following table summarises the relevant targets, at the time of the 2020 revision of the strategy.

Table 21: Summary of Mandatory Performance Measures Related to Leakage and Water Use

Level of Service	Performance Measure	Target
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%

Table 22: Non-Mandatory Performance Measures Related to Leakage and Water Use

Level of Service	Performance Measure	Target
Losses	Water losses as determined by the Infrastructure Leakage Index (ILI) based on an annual assessment	**Scheme Level:** ILI >= "B" or an economic assessment carried out and recommended measures implemented **District Level:** ILI >= "B"
Water Usage	Actual usage on average day	Maintain the average daily water use below 100% of the assessed reasonable water use
Water Usage	Actual usage on peak day	Reduce the peak daily usage to below 110% of the assessed reasonable water use
Flow – Allocated Units	Percentage of properties where flow received is consistent with allocated units at the point of supply in restricted or semi-restricted schemes as demonstrated by restrictor checks completed.	100% of restrictors tested at no more than 5 yearly intervals.

The assessment of performance against the above targets can help inform where investment is needed to address deficiencies. The analysis of potential savings can be referred to in order to inform an appropriate level of investment in a particular issue, to ensure that this is proportionate to the issue requiring resolving.

Where targets are being met currently, this does not mean no work is required on that water scheme. If no work is carried out water consumption and leakage levels will continue to rise, and the monitoring work is required to ascertain demand and leakage levels.

6. Implementation

This section details the timing and processes required to implement the Water Conservation Strategy in Waimakariri District. To enable this, each of the water schemes have been assessed as to which initiatives would be most appropriate and effective for each water supply scheme.

6.1. WCS Programme

To ensure the targets set in Section 5.2 are achieved, a programme of implementation is required that stays within defined budgets. Section 6.3 shows which initiatives will be implemented in each of the water schemes.

The Water Conservation Strategy has been set up as a rolling programme. Maintaining efficient water supply schemes is crucial work for any local authority in New Zealand.

6.2. Communication Methods

The methods of communication required vary for each water conservation initiative depending whether public notification is required. The entire strategy should be made known to all Council staff, particularly where there are opportunities to influence the outcome across different teams or individuals within Council.

There are five main communication methods to be used, many of the initiatives will require a combination of different ones:

- Internal information – Council staff only made aware of the work that will not directly affect any customer supplies e.g. night flow monitoring.
- Council Approval – Some of the work will need approval from the elected members e.g. metering of extraordinary users.
- Public Notification – The public will be notified for work affecting their water supplies by methods such as advertising in local media regarding some initiatives such as water restrictions.
- Public Consultation – Feedback from the public will be sought on some of the initiatives e.g. metering of extraordinary users
- Advertising Campaign – Work where public inclusion and cooperation is sought will be advertised in the affected communities, this includes work such as the Community Awareness Programme

Table 23 shows a summary of which type of communication would be required by each of the alternate water conservation initiatives.

Table 23: Summary of Communication Methods for Each Water Conservation Initiative

Initiative	Internal Information	Council Approval	Public Notification	Public Consultation	Advertising Campaign
Community Awareness Programme	✓		✓		✓
Water Restrictions	✓		✓		✓
Leak Reduction	✓				
Pressure Management	✓				
Restrictor Checks	✓				

It is noted that the 'Council Approval' and 'Public Consultation' columns are currently not populated. These were included within the 2010 WCS alongside the initiative to create a Water Supply Bylaw. Given the bylaw has now been created and passed by Council, this is no longer included as a future initiative. This is the same as the metering of extra-ordinary users. This required Council approval at the time. However the ongoing monitoring of these meters does not require approval.

6.3. Initiative Implementation

To enable the most effective programme of water conservation, only some of the initiatives should be applied to all the water schemes. Table 24 shows which water conservation initiatives are going to be implemented in which water supplies.

It is noted that previously restrictor checks were shown only on restricted schemes. However, all on-demand schemes have at least a small number of restricted properties, generally at the out-skirts of the relevant supplies. Therefore, going forward restrictor checks will be programmed on all supplies, rather than just fully restricted supplies. This also means that there is not as much distinction between the initiatives implemented on the various supplies as had been previously indicated.

Table 24: Implementation of Initiatives by Scheme

Scheme	Community Awareness Programme	Water Restrictions	Leak Reduction	Pressure Management **preliminary trials*	Restrictor Checks
Rangiora	✓	As required	✓	✓	✓
Kaiapoi	✓	As required	✓	✓	✓
Woodend - Pegasus	✓	As required	✓		✓
Oxford Urban	✓	As required	✓		✓
Waikuku Beach	✓	As required	✓		✓
Cust	✓	As required	✓		✓
Ohoka	✓	As required	✓		✓
Garrymere	✓	As required	✓		✓
Mandeville - Fernside	✓	As required	✓		✓
Oxford No 1	✓	As required	✓		✓
Oxford No 2	✓	As required	✓		✓
Summerhill	✓	As required	✓		✓
Poyntzs Road	✓	As required	✓		✓
West Eyreton	✓	As required	✓		✓

7. Budgets

This section looks at the costs involved with implementing the Water Conservation Strategy, and compares the cost of investment with the annual cost of leakage.

The relevant annual budget for the implementation of the WCS are summarised below. The 2020/21 budget was reduced following Covid-19 as part of wider cost reductions across Council. However, this returns to stable annual levels from 2021/22 onwards.

Table 25: Funding of the WCS

	Community Awareness Programme*	Leak Reduction	Annual Totals
2020/21	$15,000	$60,000	$75,000
2021/22	$20,000	$70,000	$90,000
2022/23	$20,000	$70,000	$90,000
TOTAL	**$75,000**	**$180,000**	**$255,000**

**Budget allows for wastewater education, as well as water conservation*

The Community Awareness and Leak Reduction Programmes will be funded across all schemes that are rated for water on a proportional basis.

The budgets will continue to be assessed as part of the Annual Plan and Long Term Plan processes, as progress and data is gathered from the previous years' work.

The 2010 WCS showed some initial higher investment in early years for implementation of extra-ordinary user meter installations. As these initial investments have now been made, the budgets are now at a stable level to maintain the annual work programmes that are currently in place.

If new initiatives are proposed in the future, these will require Council approval through an Annual Plan or Long Term Plan process. Examples of potential future initiatives which such as widespread metering, pressure reducing valve installations for example.

For context, it is noted that in Section 5 the annual cost of avoidable leakage was estimated at $142,000 per year. It is difficult to gauge the reductions in annual costs that will result from the investment above. However, as part of the investment may stop increases in leakage that would have otherwise occurred (which will not be a visible benefit), and on other schemes leakage levels may be reduced. Despite these uncertainties in measuring the return on investment for the leakage work, the comparison between the annual budgets and the estimated cost of leakage demonstrates that the investment is proportional to the cost that is trying to be minimised.

8. Monitoring and Reporting Progress

This section details the monitoring and reporting to be carried out on an ongoing basis to measure the success of the WCS. Monitoring is crucial to the success of the programme as it allows changes to be made and targets to be met.

8.1. Monitoring and Reporting of the Water Conservation Strategy

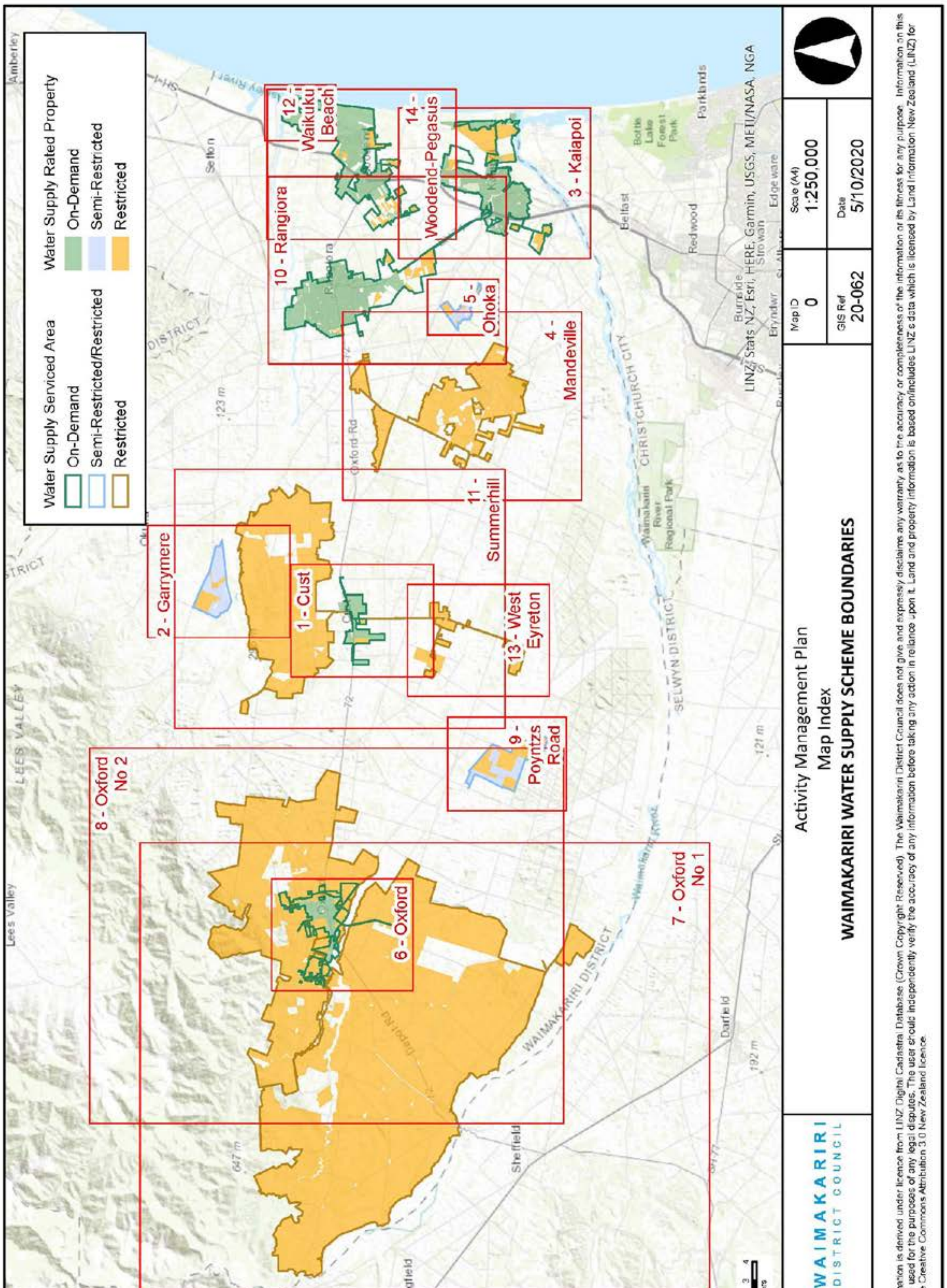
The performance against the targets within the WCS are to be monitored and reported in the following ways:

Table 26: Summary of Measurement and Reporting on Success of WCS

Initiative	Measure	Frequency / Method of Assessment	Reporting
Metering of extra-ordinary users	Data is collected quarterly on selected sample properties where meters have been installed.	Two assessments of this data have been carried out to date. This data will be utilised again if required, to help inform any future policy decisions / changes.	This will be reported as part of the wider consideration into 3 Waters rating, if opted for following consultation as part of the 2021-31 Long Term Plan
Community Awareness Programme	Number of classroom hours / students engaged with to be reported on as part of school education programme. General report on progress for other elements.	A summary of activities undertaken as part of this initiative will be collated annually. May include water audits, or education regarding water efficient devices.	To be included within annual report to Council's Utilities and Roading Committee.
Leak Reduction	Infrastructure Leakage Index (ILI)	Annual calculation based on minimum night flows, comparison with level of service for this measure.	Annual report to Council's Utilities and Roading Committee. Included within water supply Activity Management Plans. Percentage is reported to the Department of Internal Affairs as part of the mandatory performance measure reporting.
	Percentage of total water used	Annual calculation based on minimum night flows, comparison with level of service.	
	L / conn. / day	Annual calculation on each scheme based on minimum night flows	Included within annual report to Council's Utilities and Roading Committee.
	m^3 / km / day		
Restrictor Checks	Percentage of properties where flow received is consistent with allocated units at the point of supply in restricted or semi-restricted schemes as demonstrated by restrictor checks completed. 100% of restrictors to be checked at no more than 5-yearly interval.	The Asset Management Information System (AMIS) project Phase 2 is required to be completed to allow this to be reported on. When completed test dates will be stored against each restrictor asset, and a query run to determine the percentage tested within the last 5 year interval.	This is included within performance level reporting, within each relevant scheme Activity Management Plan on a three yearly basis.
Pressure Management	NA	NA	The use of pressure management to reduce night flows while still ensuring adequate pressures are able to be achieved during high demand times will be trialled initially on Kaiapoi or Rangiora in the 2020/21 financial year, and the results of this reported back to the Utilities and Roading Committee as part of the annual WCS implementation report.

Appendices

Appendix 1 – Map of Waimakariri District Water Schemes



Appendix 2 – Reasonable Water Use Calculations

Scheme	Reasonable Peak Day Use						
	Household use (m^3/day)	Domestic Irrigation (m^3/day)	Commercial Use (m^3/day)	Stock Use (m^3/day)	Leakage (m^3/day)	Reasonable peak daily use (m^3/day)	Reasonable peak daily use (l/con/day)
Rangiora	5,654	5,458	2,535		657	13,991	1,900
Kaiapoi (Incl Pines Kairaki)	4,094	3,877	1,605		719	10,283	1,900
Woodend Pegasus (Incl Tuahiwi)	2,682	2,353	278		373	6,415	1,800
Oxford Urban	690	659	218	52	551	2,222	2,400
Waikuku Beach	346	344	300		63	1,053	2,300
Cust	106	101	60	14	25	286	2,100
Ohoka	103	84	30	2	35	262	2,200
Garrymere	37	32	0	28	14	111	2,700
Mandeville-Fernside	828	711	30	61	1,183	3,091	3,000
Oxford No 1	286	249	0	1,490	458	2,483	7,500
Oxford No 2	284	248	23	374	420	1,432	4,000
Summerhill	153	138	0	159	143	593	3,200
Poytnzs Road	74	65	0	33	48	220	2,500
West Eyreton	64	54	0	10	16	144	2,000

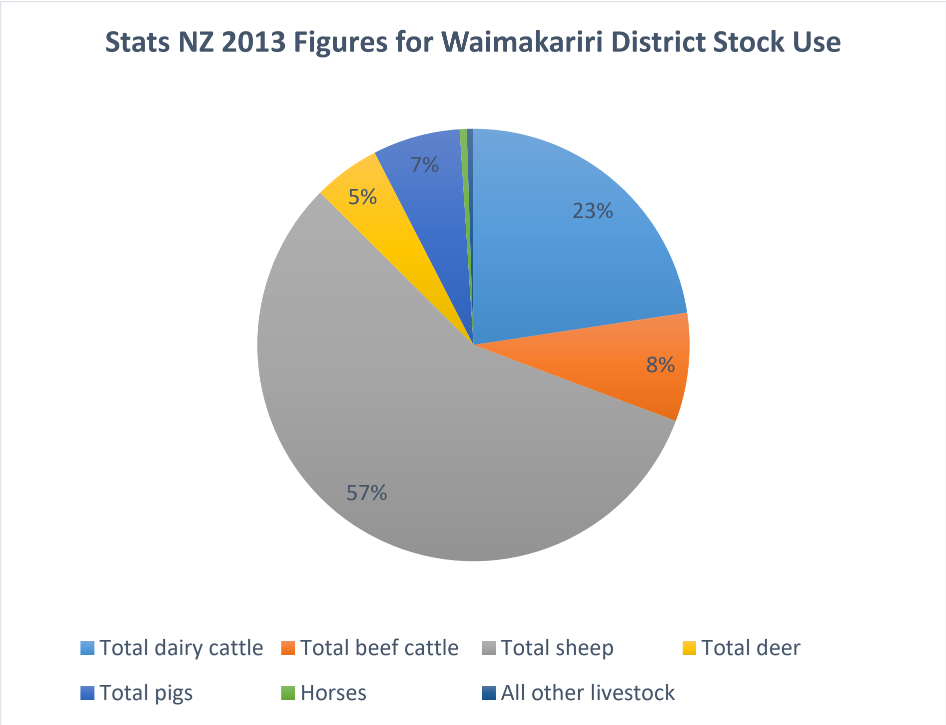
Scheme	Reasonable Average Day Use						
	Household use (m^3/day)	Domestic Irrigation (m^3/day)	Commercial Use (m^3/day)	Stock Use (m^3/day)	Leakage(m^3/day)	Reasonable Average daily use (m^3/day)	Reasonable Average daily use (l/con/day)
Rangiora	5,654	1,368	1,521		657	9,083	1,200
Kaiapoi (Inc Pines Kairaki)	4,094	972	963		719	6,797	1,300
Woodend Pegasus (Inc Tuahiwi)	2,682	590	167		373	4,299	1,200
Oxford Urban	690	165	131	39	551	1,616	1,700
Waikuku Beach	346	86	30		63	525	1,100
Cust	106	25	36	10	25	192	1,400
Ohoka	103	21	18	1	35	186	1,500
Garrymere	37	8	0	20	14	80	1,900
Mandeville-Fernside	828	178	18	44	1,183	2,434	2,400
Oxford No 1	286	62	0	1,125	458	1,931	5,800
Oxford No 2	284	62	14	280	420	1,115	3,300
Summerhill	153	35	0	114	143	444	2,400
Poytnzs Road	74	16	0	23	48	162	1,900
West Eyreton	64	14	0	7	16	101	1,400

Appendix 3 – Reasonable Stock Water Use calculations

Estimated Area Used for Stock; Source: LUCAS Land Use Data Map 2016

Scheme	Total Stock Area in Ha
Oxford Urban	567
Cust	188
Ohoka	28
Garrymere	386
Mandeville-Fernside	836
Oxford No 1	12,927
Oxford No 2	3,653
Summerhill	2,718
Poyntzs Road	449
West Eyreton	137

Stock type figures for Waimakariri District



Average Stocking Rate Figures for New Zealand

Stock Use Figures	Number of stock/Ha	Source
New figures - Sheep	8	MAF 2009/10 Canterbury Sheep report
Dairy Cows	3.5	MAF 2009/10 Dairy modelling report
Beef Cattle	2.5	Beef.org.nz/research
Deer	13.8	MAF 2009/10 Pastoral modelling report
Pigs	15	http://www.biosecurity.govt.nz/animal-welfare/codes/pigs/index.htm#3
Other (based on horses)	10	http://www.biosecurity.govt.nz/animal-welfare/codes/horses/index.htm

Estimates of water requirements for livestock; Source: ANZECC (2000), derived from Burton (1965).

Stock	Daily Consumption	
	ADD (l/h/d)	PDD (l/h/d)
Dairy - Milking Cows	70	85
Dairy - Dry Cows	45	60
Beef Cattle	45	60
Calves	22	30
Sheep	5	7
Deer	5	7
Horses	45	58
Pigs	17	22

Calculated 'Reasonable' Stock water use

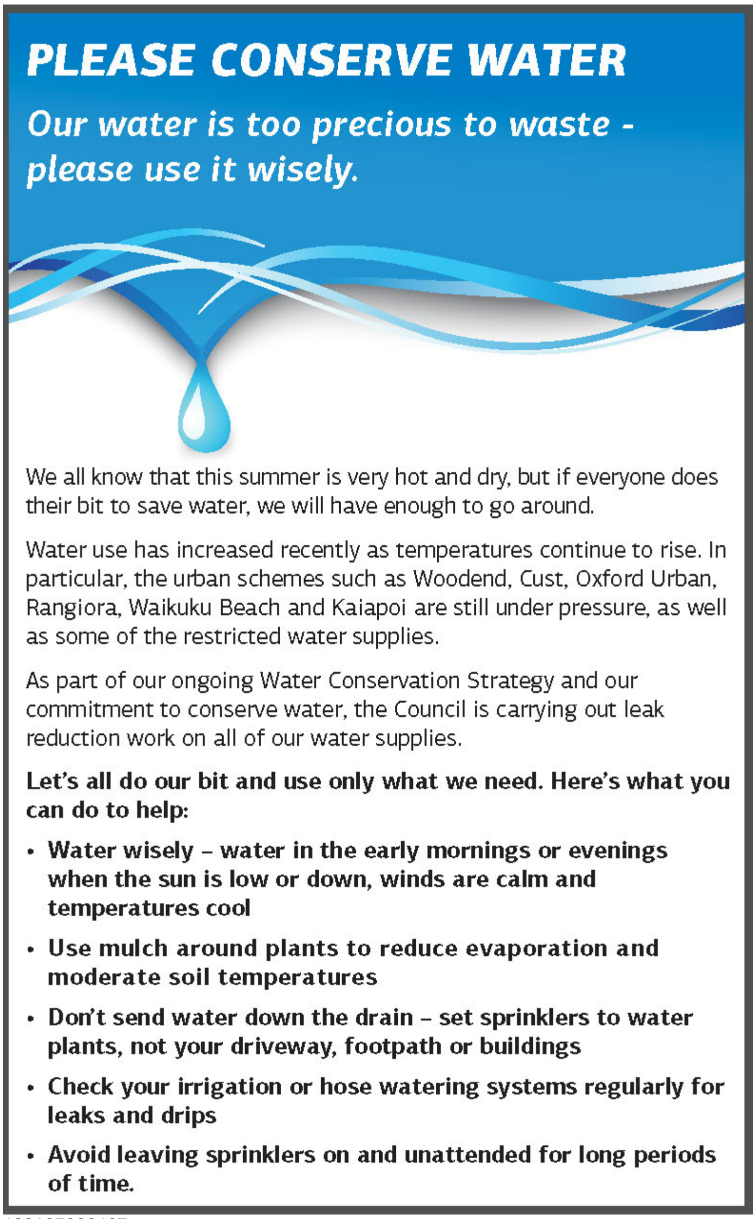
Scheme	Area Used for Stock (Ha)	Assumed Number of Stock						Total Peak Stock Use (m3/day)	Total Average Stock Use (m3/day)
		Dairy Cattle	Beef Cattle	Sheep	Deer	Pigs	Other		
Oxford Urban	567	215	103	2,296	349	496	52	52	39
Cust	188	0	38	854	130	184	19	14	10
Ohoka	28	0	6	126	19	27	3	2	1
Garrymere	386	0	78	1,752	266	378	39	28	20
Mandeville-Fernside	836	0	169	3,794	576	820	86	61	44
Oxford No 1	12,927	10,589	2,007	44,936	6,827	9,706	1,013	1,490	1,125
Oxford No 2	3,653	2,091	619	13,867	2,107	2,995	313	374	280
Summerhill	2,178	0	442	9,885	1,502	2,135	223	159	114
Poytnzs Road	449	0	91	2,039	310	440	46	**33**	**23**
West Eyreton	137	0	28	621	94	134	14	10	7
Total	**21,349**	**12,895**	**3,581**	**80,170**	**12,180**	**17,317**	**1,807**	**2,224**	**1,663**

Appendix 4 – WDC Groundwater Take Allowance

Scheme	Site Name / Well Name	Consent Number	Max Take (L/s)	Max Take (m^3/day)
Cust	Springbank 2	CRC990930.1	22	1,900
	Springbank 1			
Kaiapoi	Sewell Street Well	CRC021733	60	NA
	Ashley Pl Well	CRC021737	60	NA
	Porter Pl Well	CRC970304	76	3,010
	Davie Street Well	CRC970305	76	3,010
	Rugby Park Well	CRC970306	100	5,760
	Peraki Street Well	CRC990929	100	8,640
	Rinaldi Ave	CRC990933	26	2,246
Mandeville	Two Chain Road Wells 1 and 2	CRC990952.1	35	NA
	Tram Road (back-up)	CRC111974	10	864
Ohoka	Ohoka Wells	CRC990932 & CRC166054	18	942
Oxford Rural No.2	Coopers Creek infiltration gallery	CRC990931.1	NA	NA
	Gammans Creek (back-up)	CRC166592	NA	NA
Oxford Rural No.1	Rockford Road Intake	CRC990926.1	23	1,987
	McPhedrons Road Well	CRC183143	30	2,592
	Rockford Road Deep Well	CRC144773	7	864
Oxford Urban	Domain Road Well 1	CRC169510	55	5,300
	Domain Road Well 2		60	
Poyntzs Road	Poyntzs Road Well	CRC990927	11	NA
Rangiora	Smith Street 1, 2, 3 and 4	CRC081320	350	30,100
	Western Wells No.1, 3 and 5.	CRC160704	300	25,920
	Ayers Street No.1 and 2			
	Dudley Park No.1 and 2			
Waikuku Beach	Kings Ave	CRC971821.1	40	3,456
	Campground			
West Eyreton	West Eyreton Well 2	CRC990953	8	691
	West Eyreton Well 3	CRC186214	37	15,120
	West Eyreton Well 1			
Woodend - Pegasus	Gladstone Park 1 and 2	CRC074057	80	6,912
	Chinnerys Rd Well #2 & Chinnerys Rd Well #1			
	PW1	CRC167262	142	12,288
	EQ1			
	EQ2			
	EQ3			
Fernside	Fernside well	CRC990925	5	432
Garrymere	Garrymere well	CRC971822	4.5	389

**refer 200409044078 for further breakdown and details*

Appendix 5 – Example Water Conservation Material



PLEASE CONSERVE WATER

Our water is too precious to waste - please use it wisely.

We all know that this summer is very hot and dry, but if everyone does their bit to save water, we will have enough to go around.

Water use has increased recently as temperatures continue to rise. In particular, the urban schemes such as Woodend, Cust, Oxford Urban, Rangiora, Waikuku Beach and Kaiapoi are still under pressure, as well as some of the restricted water supplies.

As part of our ongoing Water Conservation Strategy and our commitment to conserve water, the Council is carrying out leak reduction work on all of our water supplies.

Let's all do our bit and use only what we need. Here's what you can do to help:

- **Water wisely – water in the early mornings or evenings when the sun is low or down, winds are calm and temperatures cool**
- **Use mulch around plants to reduce evaporation and moderate soil temperatures**
- **Don't send water down the drain – set sprinklers to water plants, not your driveway, footpath or buildings**
- **Check your irrigation or hose watering systems regularly for leaks and drips**
- **Avoid leaving sprinklers on and unattended for long periods of time.**

180125006467

Why save water?

Although our fresh water is ranked in the top ten globally for both cleanliness and abundance, we have had to impose water restrictions again this year on some of our water supplies in the district.

The Council operates 16 water schemes supplying water to over 18,900 properties.

With our rapidly growing population and increasingly erratic rainfall, we must change our habits to maintain the same access to water tomorrow as we have today.

Our water is precious. Don't waste it.

waimakariri.govt.nz
Phone: 0800 965 468

Conserve our water

Our water is precious. Don't waste it.

A guide to saving water in the Waimakariri District

waimakariri.govt.nz

WAIMAKARIRI DISTRICT COUNCIL

WAIMAKARIRI DISTRICT COUNCIL

Be aware of your water footprint

Using less water benefits the environment and can reduce the costs to run our water supplies, which benefits you. Conserving water now could avoid expensive upgrades to supplies in the future.

The costs involved with providing water to and taking waste water away from households include pumps, treatment, pipes and reservoirs. If all households conserve water then the costs of treatment, pumping and pipe replacement can be reduced. Using water sparingly will also reduce your household's water heating bills.

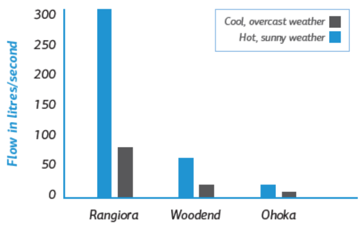
How much water do I use?

The average Waimakariri household uses approximately 1,650 litres of water per day.

Weather makes a big difference to water use.

The bars in the chart show the flow from our water treatment plants at two points in the same week. The blue bars portray usage on a hot sunny day. The grey bars are the flow from the same treatment plants exactly one week later at the same time - a cooler, overcast day. In each town, water use more than trebled.

Everybody can save substantial amounts of water easily and at little cost. On hot, sunny days, demand for water is highest. On these days everyone needs to be most aware of their own water use.



What can I do?

We need to reduce water usage during hot sunny days, as this is when water is most scarce and when the water schemes have their highest demand.

Water use in the garden contributes most to this peak in water demand, therefore water savings in the garden have the largest benefit for everyone.

In the garden

- *Water either early in the morning or in the evening to avoid evaporation*
- *Water the ground, not the leaves and branches, and definitely not paved areas*
- *Use a trigger device on the hose so that you can stop and start water flow instantly*
- *Use water sparingly, especially on hot days when water is in the highest demand.*

In the kitchen

- *Keep a jug of cold water in the fridge so you don't have to run the tap for cold drinking water*
- *Don't wash vegetables or rinse dishes under a running tap - put the plug in the sink or use a bowl of water*
- *If washing dishes by hand, use the minimum amount of detergent to reduce rinsing*
- *Aerated taps are inexpensive and can reduce water flow by 50%.*

In the bathroom

- *Keep shower length to a minimum, ideally 5 minutes or less. Install a low flow shower head and save on water heating costs as well*
- *If you want a long soak, a bath is more efficient, but only use as much water as required*
- *Turn the water off whilst brushing your teeth, shaving or soaping your hands.*

In the laundry

- *Use washing machines for full loads only*
- *Use water efficient appliances - all new appliance have a water efficiency labelling (WELS) rating on them*
- *In-sink waste disposal units waste a lot of water, use organic waste in the garden or compost it.*

In the yard

- *Use a broom instead of water to clean the yard or driveway*
- *Use a bucket of soapy water to wash cars and bikes, then rinse quickly with a hose*
- *Wash cars and bikes on a grassed area to allow water to soak into the ground*
- *Check outside pipes, taps and sprinklers and repair any leaks promptly*
- *Report any leaks on the road or the footpath to the Council.*

170428041376

Appendix 6 – Water Restriction Levels for WDC

LEVEL 1 Restriction Conditions:

1) Properties with a street address that ends with an odd number may only water gardens and lawns when the day of the month is an odd number.

   For example, a property with a street number of 21 can only water gardens and lawns when the date is an odd number, such as 1st, 3rd, 5th February, etc.

2) Properties with a street address that ends with an even number may only water gardens and lawns when the day of the month is an even number.

LEVEL 2 Restriction Conditions:

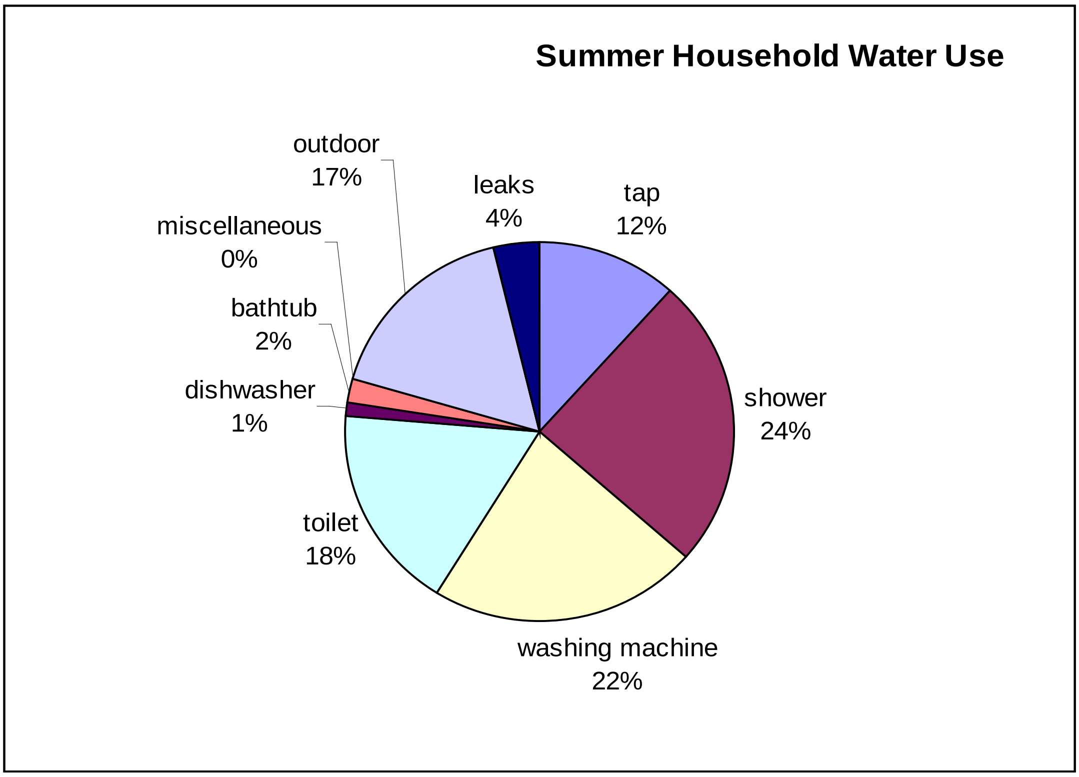
1) The use of automated watering systems is prohibited at all times. This includes rotary, pop-up, dripper, or other types of watering systems.

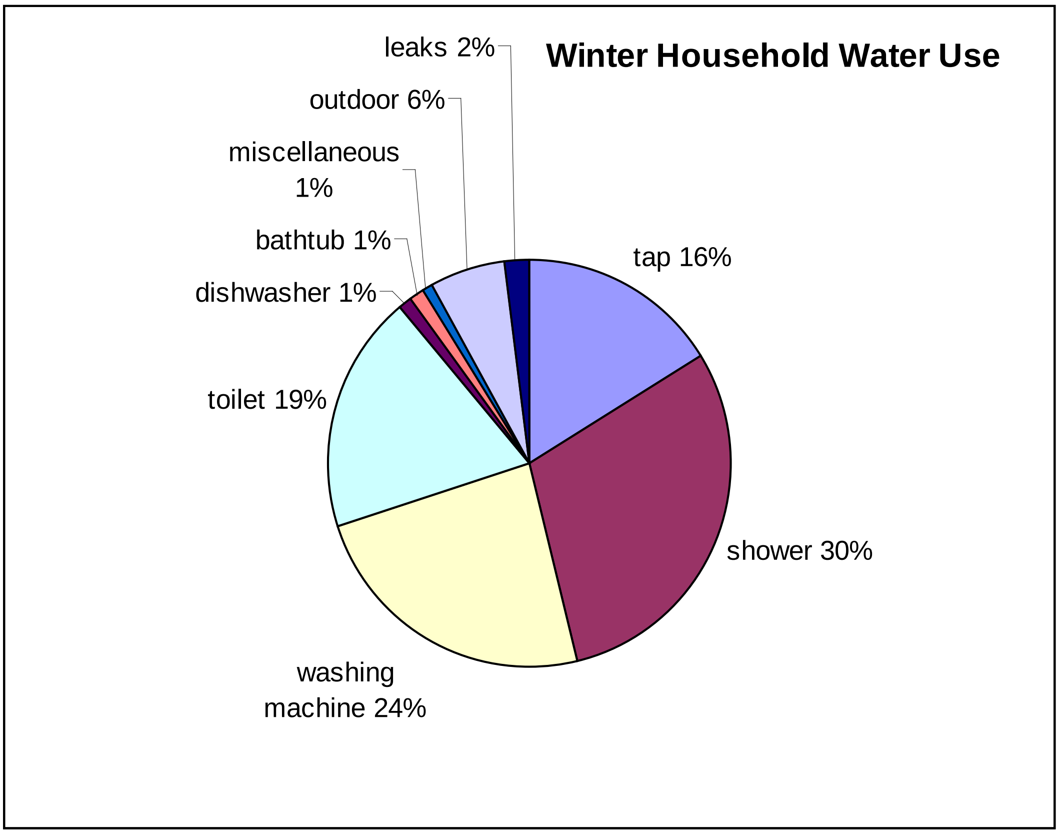
2) Hand Held hoses only may be used for watering of gardens and lawns. The use of hand held hoses is permitted at all times.

LEVEL 3 Restriction Conditions:

1) There is a complete ban on all watering systems. Water may only be used for domestic purposes such as drinking and washing and to provide drinking water for stock.

Appendix 7 – Summer and Winter Household Use (based on Auckland Homes)





Source: BRANZ Water Use Study on water efficient fittings