Selwyn District Council

Water Conservation and Demand Management Plan

June 2016

Working Draft

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Selwyn District Council

Water Conservation and Demand Management Plan

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8 June 2016	1.0		Murray Washington
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8 June 2016	Murray England		Asset Manager – Water Services
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Executive Summary

Selwyn District Council's (**SDC**) Water Conservation and Demand Management Plan (**WCDMP**) provides background information and an analysis of water management in Selwyn District, and presents a plan for improved water demand management.

Why manage water demand?

The WCDMP reflects a growing awareness of the need for sustainable and efficient use of natural water resources. National legislation such as the Resource Management Act 1991 (**RMA**), the Local Government Act 2002 (**LGA 2002**) as well as Canterbury Regional Council, Iwi and SDC planning instruments, strategies and policies acknowledge the importance of sustainable management of our water resources.

As a provider of Water services SDC has an obligation to the community to provide safe and wholesome water for drinking water and sanitation.[1]

Freshwater is essential for a variety of values and uses, for example, drinking water and stockwater; customary uses and food supplies; contact and non-contact recreation; irrigation and hydrogenation; industrial and other economic activities. SDC is mindful of the need to protect water quality as well as considering these other uses and competing demands.

In recent years, Selwyn District has consistently been one of the fastest growing territorial authorities in New Zealand. The district population has increased from amalgamation in 1989 by over 25,000 to 49,000 in 2014 (25 years). As well as population growth, Selwyn District is experiencing significant economic activity. This presents challenges for SDC in maintaining a rural identity as well as developing townships and providing services and infrastructure to a growing population in a sustainable way.

What services does the community receive?

SDC's goal for the 5Waters activity is:

'To provide water services that meet all relevant standards and are at a service level the public can afford and have confidence in, now and forward to the future'.

Selwyn District provides a water service to protect the health and to promote the wellbeing and economic growth of the city.

How much water do we use?

On average, a Selwyn urban household uses 1400[2] litres per day. As the Selwyn communities grow there is expected to be an increase in demand for water resources. The implementation of demand management strategies will see the volume required to service this future demand and the infrastructure investment required optimised.

How do we manage water demand?

To manage water demand the SDC currently employs a number of water demand management techniques to promote and encourage water conservation including:

No.	Action
1	Measurement and understanding of current average and peak water usage
2	Deliver education and information to the community to implement water conservation
3	Implement water restrictions where required

[1] Health Act 1956

[2] Annual Report 2014/15

4	Maintain growth projections and carry out master planning
5	Implementation of mechanisms such as the Water Supply Bylaw 2008 and the Proposed District Plan to encourage and promote efficient use of water
6	Management of asset lifecycle to minimise water losses
7	Conducting regular review of the water balance and benchmarking against other municipal suppliers

Key improvements to demand management initiatives include:

No.	Action	Priority
1	District wide water metering and demand analysis	High
2	Water education programme on low water demand gardening	High
3	Targeted Water Audits	Medium
4	Review drought management plan	Medium
5	Rainwater harvesting feasibility	Medium
6	Wastewater re-use and recycling	Low

CONTENTS

1 Introduction

1.1 Water Demand Management

Selwyn District Council's (**SDC**) Water Conservation and Demand Management Plan (**WCDMP**) provides background information and an analysis of water management in the Selwyn District, and presents a plan for improved water demand management.

The WCDMP reflects a growing awareness of the need for sustainable and efficient use of natural water resources. National legislation such as the Resource Management Act 1991 (**RMA**), the Local Government Act 2002 (**LGA 2002**) as well as Canterbury Regional Council, Iwi and SDC planning instruments, strategies and policies acknowledge the importance of sustainable management of our water resources.

As a provider of Water services SDC has an obligation to the community to provide safe and wholesome water for drinking and sanitation.[3]

Freshwater is essential for a variety of values and uses, for example, drinking water and stockwater; customary uses and food supplies; contact and non-contact recreation; irrigation and hydro-generation; industrial and other economic activities. SDC is mindful of the need to protect water quality as well as considering these other uses and competing demands.

In recent years, Selwyn District has consistently been one of the fastest growing territorial authorities in New Zealand. The district population has increased from amalgamation in 1989 by over 25,000 to 49,000 in 2014 (25 years). As well as population growth, Selwyn District is experiencing significant economic activity. This presents challenges for SDC in maintaining a rural identity as well as developing townships and providing services and infrastructure to a growing population in a sustainable way.

1.2 Objectives

The objectives of this WCDMP is to:

- Provide an overview of Selwyn District Council's (**SDC's**) current water demand management practices;
- To provide a strategy for water demand management;
- Efficiently manage the demand for water by users;
- Identify where there are opportunities to improve our understanding of how much water we supply to our customers and when; and
- Provide improvements to water management initiatives.

A WCDMP must be dynamic so that it is able to evolve as experience and knowledge grows.

1.3 Report Structure

This report is set out in the following sections:

- Section 1 provides an introduction to the WCDMP;
- Section 2 outlines the need for water demand management in the context of New Zealand legislation and regional and district plan requirements;
- Section 3 outlines the Selwyn District context;
- Section 4 introduces the SDC's water supply network;

[3] Health Act 1956

- Section 5 examines water use in Selwyn;
- Section 6 looks at managing Selwyn's water use;
- Section 7 outlines the existing water demand management practices that SDC undertakes; and
- Section 8 presents the Water Conservation and Demand Management Actions to be adopted and implemented by the SDC.

1.4 Māori Values and Demand Management

There are several iwi planning documents that deal with freshwater. Mahaanui Iwi Management Plan 2013 and Te Taumutu Resource Management Plan refer specifically to issues and values associated with water management within Selwyn District. Ngāi Tahu Freshwater Policy identifies tribal issues, values and positions in relation to freshwater generally.

Appendix D includes an assessment of the Water Conservation and Demand Management Plan against these three documents. Te Whakatau Kaupapa is also a relevant iwi planning document that provides the framework or the tribal relationship with the natural environment. It has been considered as part of this assessment, but all relevant matters are also addressed in the other three more specific documents.

1.5 Māori Involvement in Decision Making

As per the Long Term Plan 2015-25: "*the Council recognises an obligation to take into account the principles of the provisions of the Local Government Act 2002 to recognise and provide for the special relationship between and with Māori, their culture, traditions, land and taonga.*

The Council has entered into a service and funding agreement with Mahaanui Karataiao Limited to assist the Council in the meeting its obligations under Section 81 of the Local Government Act 2002.

Mahaanui Karataiao Limited is a Rūnanga-owned entity and a consultancy which has been established specifically for the purposes of engaging with local government.

A broad range of services is offered under the agreement including advice, liaison and the facilitation of consultation on resource management issues, advice on policy and democratic processes and training for the Council and Runaga staff.

The Council will also continue to schedule six-monthyl meetings to engage with and share information with the Taumutu Rūnanga."[4]

1.6 Plan Review

SDC's WCDMP will be subject to annual review to ensure it remains consistent with the outcomes of the actions and demand management initiatives as they are refined and implemented.

Every third year prior to the Long Term Plan (**LTP**) review, the WCDMP and budgets will be reviewed and new programmes set to ensure water conservation remains a key focus.

[4] Selwyn District Council Long Term Plan 2015-25 pg. 4

2 Policy Framework

Nationally and regionally there has been significant focus on issues relating to managing and allocating water. This has resulted in a number of statutes which aim to ensure that water is conserved, appropriately allocated, used efficiently and that there are no significant effects on the environment from water takes. For Selwyn District, these legislative drivers include the Resource Management Act, National Policy Statement for Freshwater Management, Canterbury Water Management Strategy, Iwi Management Plans and the Land and Water Plan. In support of addressing challenges, central government is progressing a number of initiatives for water reform.

The Selwyn District must respond to the water demand management requirements of this legislation and also ensure that it abides by the Local Government Act 2002 principle for a local authority to "ensure prudent stewardship and the efficient and effective use of its resources in the interests of its district or region[5]". The Council does this through District Plan rules, bylaw enforcement, policy, strategies, management plans, assessing projected future water demand[6] and long term planning.

Figure 2-1 shows the National, Regional and District policy framework for water demand management as related to the SDC.

[5] LGA 2002 s4

[6] LGA2002 s123-129

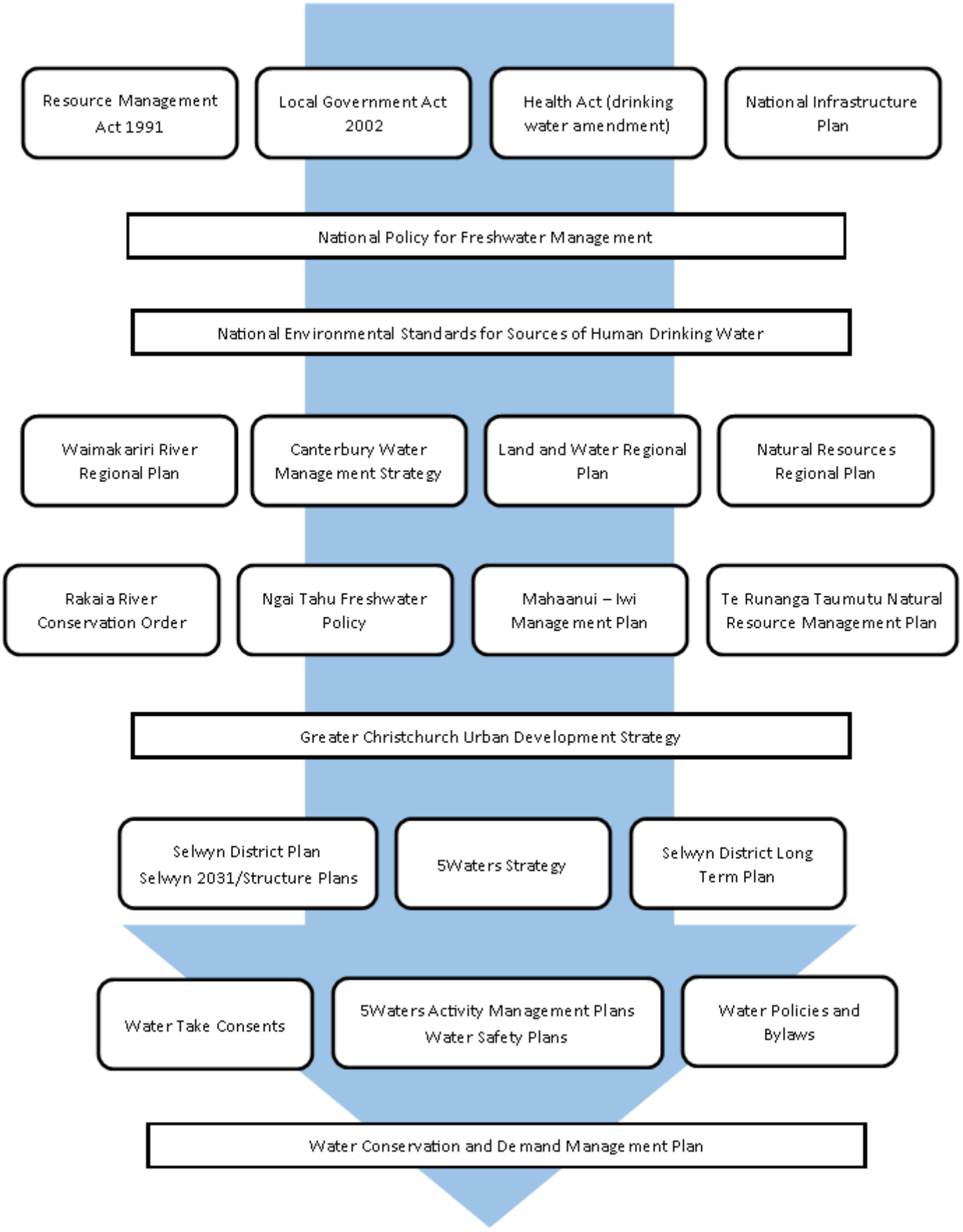

Figure 2-1 Water Conservation and Demand Management Policy Framework

3 The Selwyn District Context

3.1 Selwyn District's Population

The Selwyn District has been the fastest growing territorial authority in New Zealand in 9 out of the last 10 years. The district population has increased from amalgamation in 1989 by over 25,000 to 49,000 in 2014 (25 years). Over the 2014/15 year the population growth was the most rapid in New Zealand with 6.5 percent growth.

Prior to the 2013 census, Council worked with Business and Economic Research Limited (BERL) to develop growth scenarios for the purposes of activity management and long term planning. Following the census, Council has developed and refined a model for projections. This reflects the current situation; with high levels of growth initially, then dropping back to the growth that was experienced prior to the 2010-2011 earthquakes. This approach considers the impact of the Land Use Recovery Plan.

It is projected the population in 2041 will be approaching 90,000. The majority of the growth is expected to occur in Rolleston, Lincoln, Prebbleton and West Melton (the eastern Selwyn townships).

There are a high proportion of commuters, especially to Christchurch City. This trend is expected to continue as transportation links between Christchurch and Rolleston improve.

3.2 Selwyn District Council Plans

In addition to this WCDMP, there are several plans that outline how the water supply is to be managed in the Selwyn District along with defining levels of service for the supply of water. These plans include:

- SDC's 5Water Activity Management Plan. This plan provides an overview of how SDC manages its water supply network;
- SDC's 2015-2025 Long Term Plan. This Plan provides an overview of key Council projects and programmes for the next ten years and the structure of Council and how it operates. It also contains information on Selwyn's community outcomes and how Council intends to address them through its significant services, projects and programmes;
- SDC's 2015/16 Annual Plan. This Plan informs the first year of the 2015-25 Long Term Plan; and
- SDC's 5Waters Strategy. This strategy describes the desired position of the Councils 5Waters activity in 60 years (and was published in 2009).

The development of this WCDMP needs to be in accordance with the strategic framework for Selwyn's long-term development as outlined in these plans.

3.3 Levels of Service

SDC's goal for the 5Waters activity is:

'To provide water services that meet all relevant standards and are at a service level the public can afford and have confidence in, now and forward to the future'.

Selwyn District provides a water service to protect the health and to promote the wellbeing and economic growth of the district. SDC has developed levels of service for key activities, including the provision of water supply, in consultation with Selwyn residents. The development of any water demand management practices needs to accommodate the delivery of these levels of service.

SDC's level of service statements are:

1. The water supply network is managed in accordance with resource conditions;
2. Residents are satisfied with the water supply provided;
3. The water supply network is managed to give a good quality service;
4. Water system faults or problems are attended to promptly by contractors and/or staff;
5. The water supply network is provided to growing communities, where this growth is sustainable;
6. The water supply network is managed to minimise the leakage or loss from the system;
7. There is adequate fire fighting supply in the approved areas;
8. There is enough water supplied to meet customer needs;
9. Water is safe to drink and complies with the Drinking Water Standards of New Zealand; and
10. The water supply is provided at a reasonable cost.

3.4 The Role of Council

Water supply is the responsibility of SDC's Water Services Team, and delivery services are managed by a contractor. The management of the water supply includes:

- Abstraction, treatment of water and the water supply reservoirs, and
- Reticulated water supply network and customer supply issues.

There are other internal stakeholders, such as the communications team, involved in the management of water supply who assist to develop and implement strategies for public education on efficient water use practices.

3.5 Key Demand Drivers

Future demand in the district will be driven by:

- Growth within the district;
- Changes within water usage patterns;
- Water consumption for domestic, commercial and industrial purposes;
- Increased irrigation resulting from climate variation;
- Water loss rates;
- Conservation strategies; and
- Existing resource consent conditions and their flow rate limitations.

The growth within the district has been the primary factor affecting the demand for water. As part of the 2015-25 Activity Management Plan, water supply capacity assessments have been completed for all of the community drinking water supplies. These assessments have been completed to varying levels of detail relative to the nature of the supply, known issues, and anticipated growth pressures.

3.6 Benefits of Demand Management

Increasing demand for a service typically requires additional capital investment and the use of additional resources. If increased demands cannot be accommodated then a decline in level of service will be experienced (e.g. low water pressure).

The use of demand management strategies has the benefit of:

- Deferral of capital investment;

- Maintaining levels of service;
- Complying with consenting authorities requirements ;
- Reducing operational and maintenance costs;
- Conserving valued resources; and
- Minimising adverse impacts.

Demand management initiatives will be taken where existing water use is inefficient, or where resource constraints limit the availability of water. The impact of such initiatives will vary depending on the specific measures implemented. Although it is expected that demand management initiatives will see a decreasing per/household demand trend it is considered prudent to assume that current usage patterns will continue until measurable reductions are evident. The planning impacts of this approach are small, with deferral of capital works the likely outcome.

3.7 Charging for Water

Residential water users are charged for water services via targeted rates. Within the 2015-25 Long Term Plan Council resolved to introduce a standardised district rate for water schemes within the district. Prior to this the water charges varied across the district. The district rate for water for 2015/16 is $350, Table 3-1 below outlines the different rates depending on whether a property has a water meter or not.

Table 3-1 Rating Charges

Rating Options	Base Rate	Metered usage charge
Fully-metered township supply	$200	$0.40/$m^3$
Partially-metered township supply: metered connection	$350	$0.40/$m^3$
Partially-metered township supply: non-metered connection	$350	No usage charge

(1) All charges are subject to annual plan review process

(2) Above charges as at 2015/16

The Council also plans to progressively install water meters at all properties connected to a Council supply by the end of the 2017/18 year.

There are three schemes (Malvern Hills, Te Pirita and Hororata Acheron) within Selwyn District which are on a “restricted” supply. These schemes are exempt from the district rate and users are charged per water unit.

4 Selwyn District's Water Supplies

4.1 Overview

SDC manages 29 water supplies, located between the main divide – Arthurs Pass, and Pacific Coast – Taumutu. They supply water for public needs including household, gardens, and public reserves. The water supplies service 74% of residential properties within the district. Figure 4-1 below shows the location of the Selwyn water supplies.

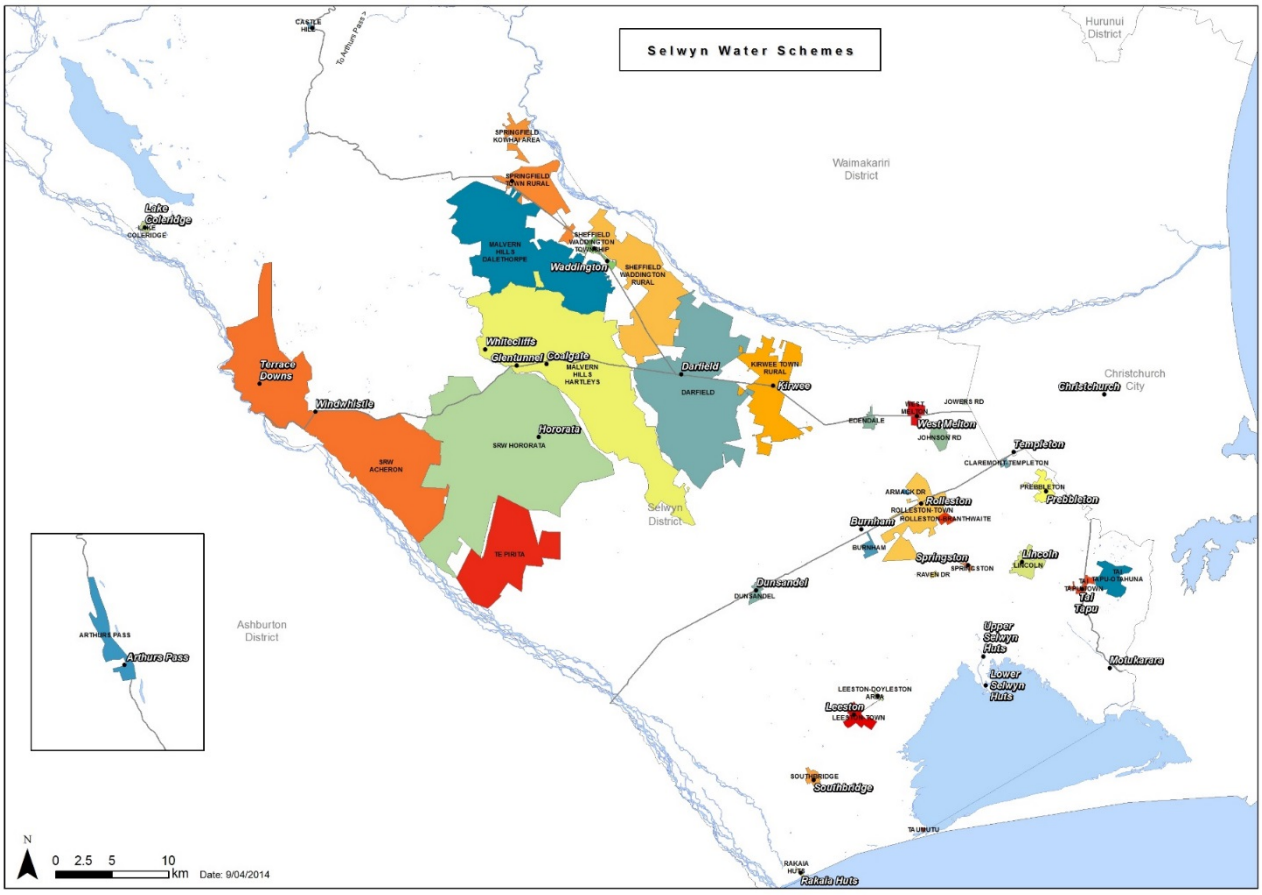

Figure 4-1 Location of Selwyn's Water Supplies

The diverse geographic supply locations brings with it the need to provide water that meets the particular communities' needs. For example Arthurs Pass is frost prone and has a high tourist and bach population, generally water for outdoor needs is not required. In comparison Rolleston has a dense urban population, with large recreation reserves and highly permeable soils. Water use is high in summer, driven by long periods of north-west wind conditions.

A summary of the 30 water supplies is provided below in Table 4-1.

Table 4-1. Summary of Water Schemes[7]

Scheme	Connected Properties (April 2016)	Average Daily Demand	Consented Max Daily Volume m3/day	# Water Sources	# Reservoirs Capacity
Armack Drive Water Supply	20	-	334	1 bore	1 25m^3
Arthur's Pass Water Supply	126	124	200	1 intake	0
Castle Hill Water Supply	115	242	1,192	1 intake	3 1500m^3
Claremont Water Supply	55	273	340	1 bore	1 110m^3
Darfield Water Supply	1215	2,006	6,000	2 bores	1 1450m^3
Doyleston Water Supply	100	100	n/a	n/a	3 90m^3
Dunsandel Water Supply	174	581	1,944	1 bore	1 60m^3
Edendale Water Supply	70	151	1,088	1 bore	1 450m^3
Johnson Road Water Supply	59	96	1,296	1 bore	2 60m^3
Jowers Road Water Supply	18	-	366	1 bore	1 23m^3
Kirwee Water Supply	423	742	3,110	1 bore	1 450m^3
Lake Coleridge Water Supply	53	44	101	1 bore	0
Leeston Water Supply	860	1,354	2,140	3 bores	0
Lincoln Water Supply	1,724	1,654	5,985	3 bores	0
Malvern Hills Rural Water Supply	588	1,200	2,249	2 intakes	16 626m^3

[7] Updated table, originally sourced from 5Waters Activity Management Plan 2015-25

Prebbleton Water Supply	1,226	1,925	4,320	3 bores	0
Rakaia Huts Water Supply	114	56	519	1 bore	1 21m^3
Raven Drive Water Supply	13	11	600	1 bore	0 90.8m^3
Rolleston Water Supply	4,671	6,171	22,217	6 bores	2 770m^3
Hororata-Acheron Water Supply		1,736	2,184	2 intakes	5 580m^3
Sheffield/Waddington Water Supply	207	299	842	2 bores	1 250m^3
Southbridge Water Supply	349	748	2,140	2 bores	0
Springfield Water Supply	190	426	575	1 intake	1 481m^3
Springston Water Supply	190	234	900	1 bore	2 60m^3
Tai Tapu/Otahuna Water Supply	234	393	937	1 bore	4 120m^3
Taumutu Water Supply	Approx. 11	-	76	1 bore	0
Te Pirita Water Supply	11	172	450	1 bore	1
Upper Selwyn Huts Water Supply	-	-	60	1 bore	-
West Melton Water Supply	646	1,126	2,563	3 bores	10 360m^3

4.2 Selwyn District's Water Take

The SDC holds resource consents to abstract water using bores and surface water supplies. There are 9 river/gallery intakes and 34 deeper groundwater takes. Figure 4-2 below shows the majority of the consented annual volume is for Rolleston, Lincoln and Darfield[8].

[8] Updated graph, originally sourced from 5Waters Activity Management Plan 2015-25

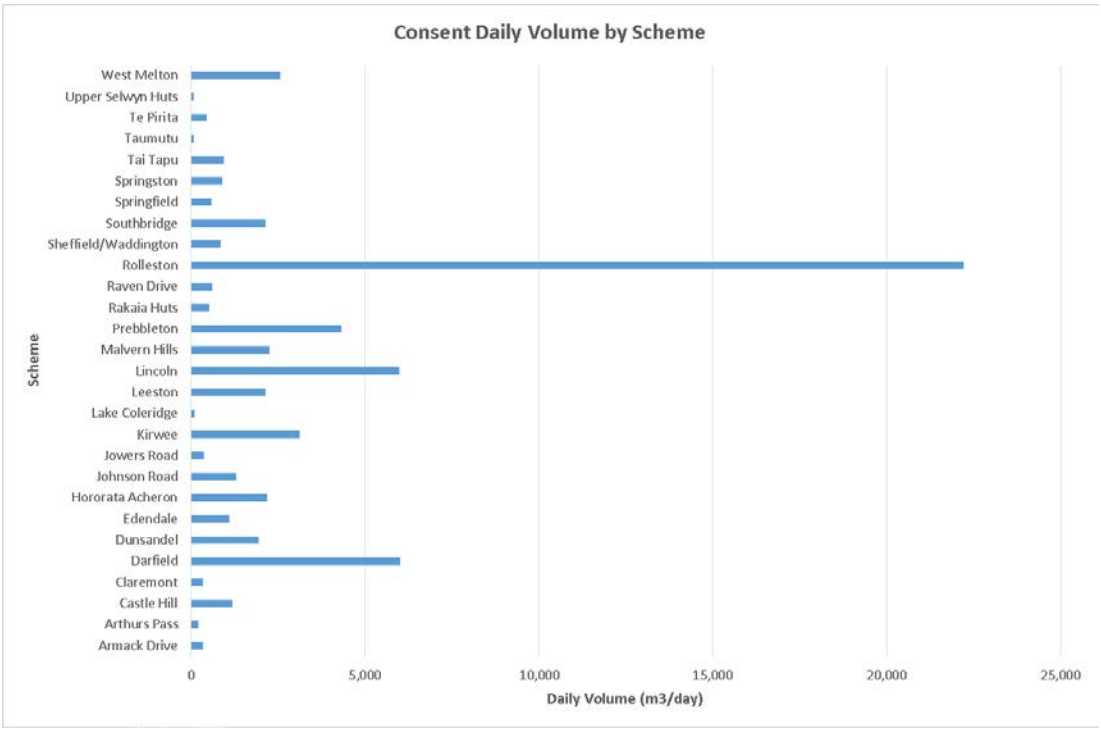

Figure 4-2 Consented Daily Volume per Scheme

The majority of public water is sourced from the Waimakiriri zone with wells located from 0-140m below ground. A full list of resource consents is listed in Appendix A.

4.3 Process Losses

As part of the treatment process at water treatment plants, some abstracted water is used for bore flushing on start up. A number of Council groundwater bores experience high turbidity on start up, this water is discharged to waste to eliminate the effects of this over the network.

Council also carries out a routine mains flushing program for 'dead end' lines and 'low use' networks, this water is flushed to waste.

5 Selwyn's Water Use

5.1 Water Use

Water is supplied to a wide range of customers within the Selwyn District. During 2015 ratepayers connected to the water supply on average used a total of 21,863m^3 per day. This includes domestic, commercial, industrial and agricultural users. Within the rural water supplies, water is used both for domestic and stockwater.

As schemes vary in size from 11 to over 4,000 connections, the individual water scheme needs differ. However when looking at a per connection demand (m^3 per connection per day) is it clear that the schemes which supply larger properties use more water than those with smaller average section sizes. This is shown below in Figure 5-1, for the period of 1st January to 31st December 2015. The rural schemes have been excluded[9].

[9] The rural schemes are Malvern Hills, Hororata Acheron and Te Pirita which are on restricted connections.

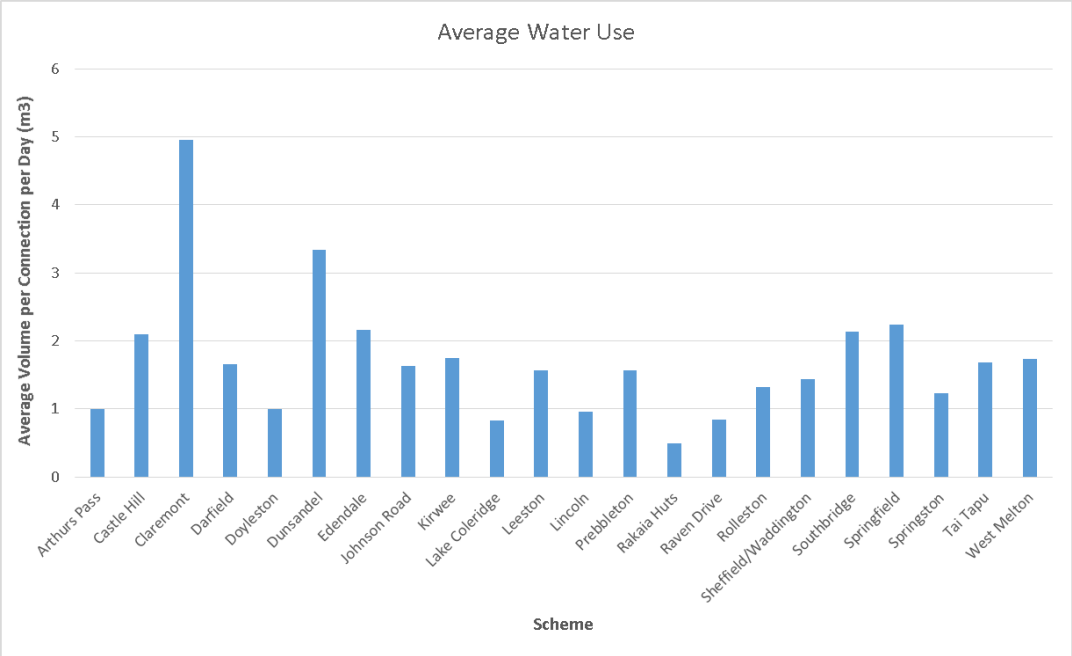

Figure 5-1. Average Water Use per Scheme

5.2 Peak Demand

Peak demand occurs mostly in summer. Reservoirs are located within the network to provide storage and meet these peaks. Along with significant infrastructure to treat the water, and pump it through the reticulated network to peoples homes. The graphs below show the max summer daily demand and the average winter demand for each water scheme within the Selwyn District (for the period 3 December 2014 – 3 December 2015).

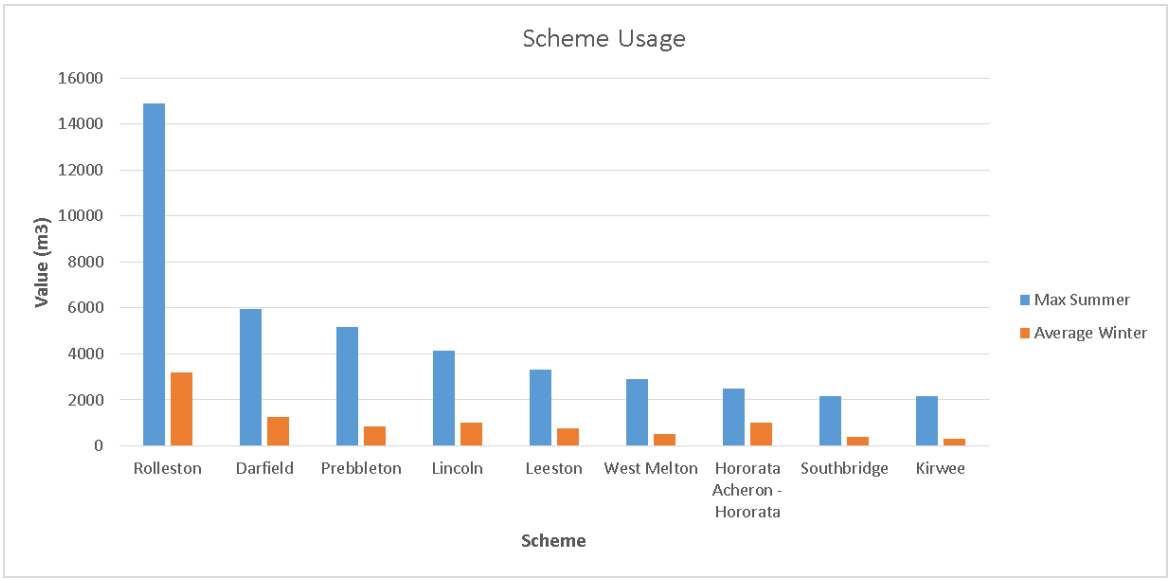

Figure 5-2 Scheme Usage for Townships: Rolleston - Kirwee

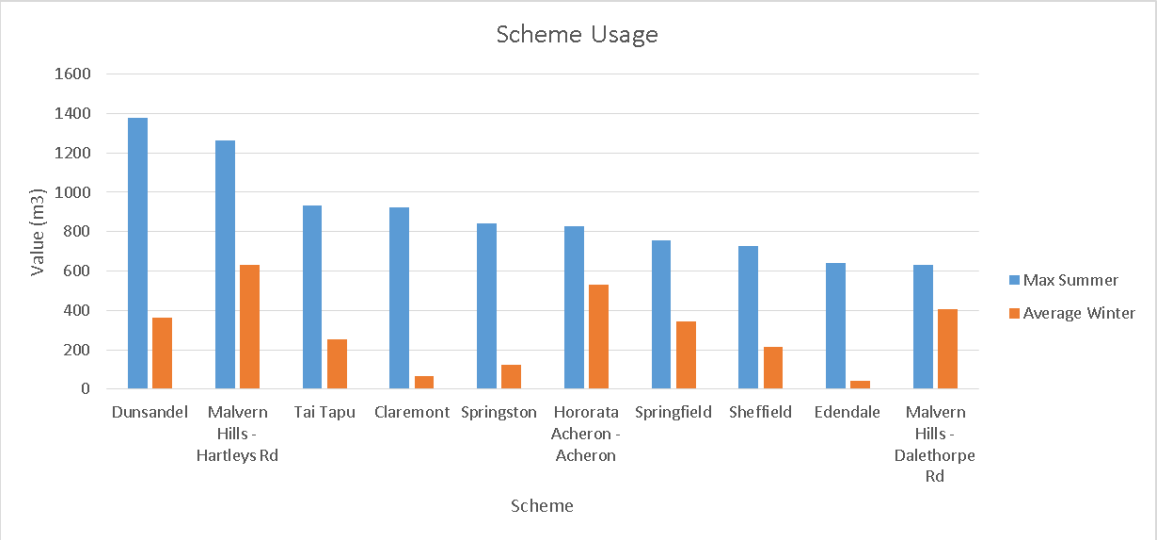

Figure 5-3 Scheme Usage for Townships: Dunsandel – Malvern Hills

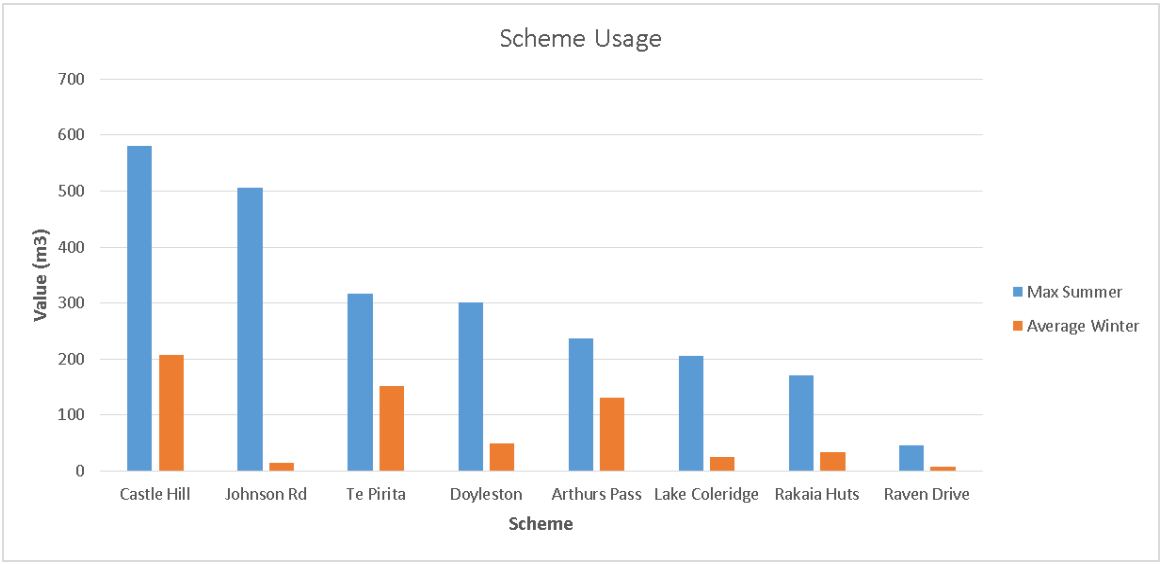

Figure 5-4 Scheme Usage for Townships: Castle Hill – Raven Drive

Figure 5-5 below shows the peak demand factor for each water supply within the Selwyn District. The peak demand factor is the ratio of peak daily demand over average daily demand and is often reflective of summer usage patterns.

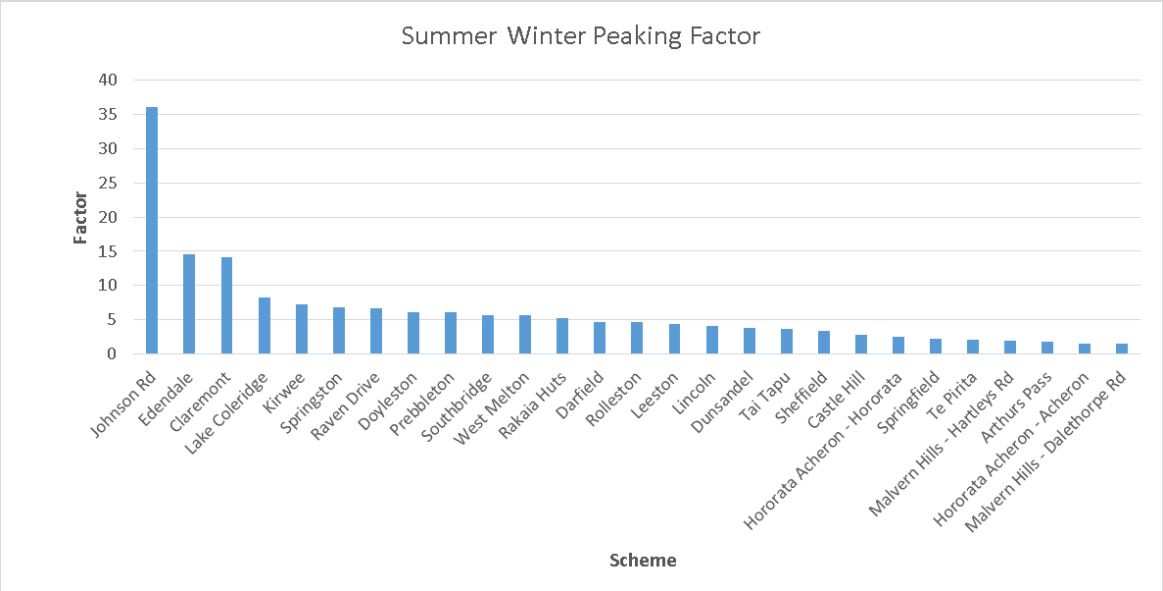

Figure 5-5 Water Supplies Winter to Summer Peaking Factor

5.3 Selwyn's Water Supply Customers

The following table presents the breakdown of the number of water users across the main sectors.

Table 5-1 Number of water users by sector

	Sector	Number of Users[10]
1	Urban connections	14,368
2	Rural Connections	986
3	Schools	26
4	Universities	1
5	Hospitals	3
6	Prisons	1

5.4 Water Balance

A water balance was calculated to establish the level of water loss occurring within the water supply network.

The water supply schemes include:

- Fully metered systems (10);
- Partly metered systems (10 including five with restricted connections); and
- Unmetered systems (10 including two with only restricted connections).

Two approaches were used to ascertain unmetered water use for systems with no restricted connections; an analysis of a period of low daily water use (generally using a 14 day rolling average of water supplied into the system), and minimum night flows (MNFs). For the systems with restricted

[10] As at December 2015 – defined as those connected to the system.

connections, a graphical presentation of water supplied was utilised for the analysis (the results for these systems have high uncertainty).

The results showed:

- three systems have very high real water losses (Jowers Road, Taumutu and Upper Selwyn Huts);
- three have high real water losses (Arthur's Pass, Castle Hill and Southbridge);
- five systems have medium real water losses (Dunsandel, Leeston, Springfield, Tai Tapu/Otahuna and West Melton); and
- 19 systems have a low level of real water losses.

5.5 Forecasted Water Demand

Over the last decade Selwyn District has consistently been one of the fastest growing territorial authorities in New Zealand. Demand for water is expected to increase in proportion to this growth. Growth in 2013/14 is shown in Figure 5-6. Figure 5-7 shows the expected Selwyn population growth prediction. The majority of growth will occur in the eastern Selwyn townships.

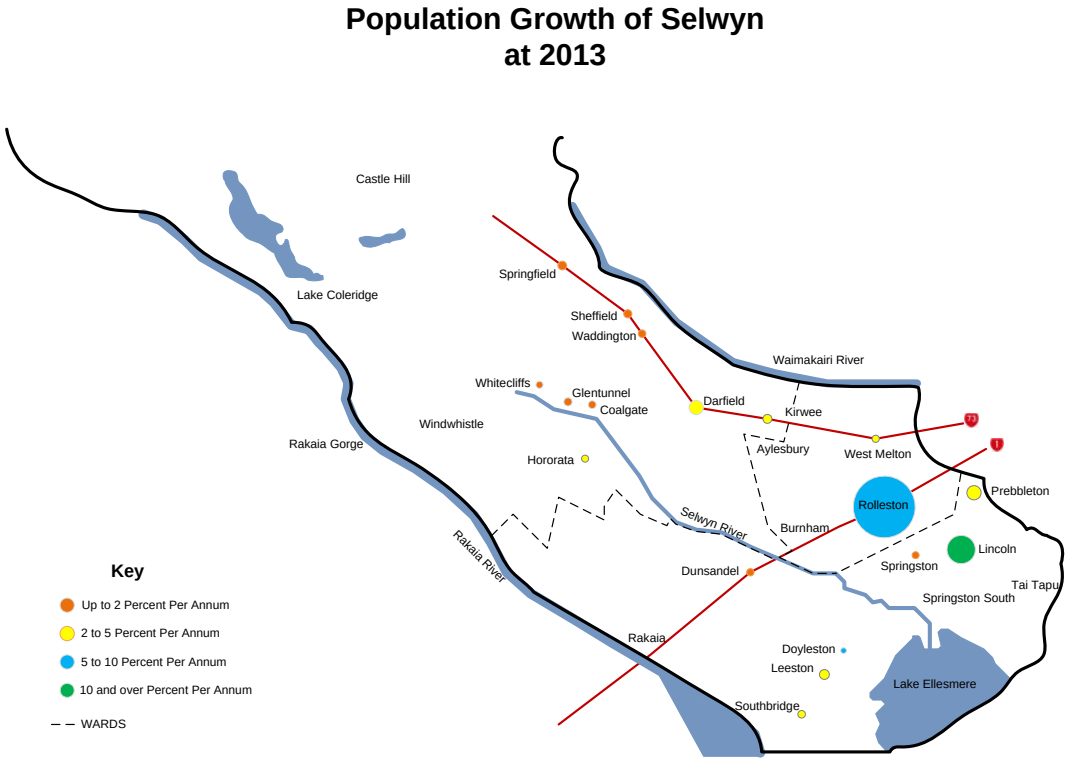

Figure 5-6 Selwyn Population Growth

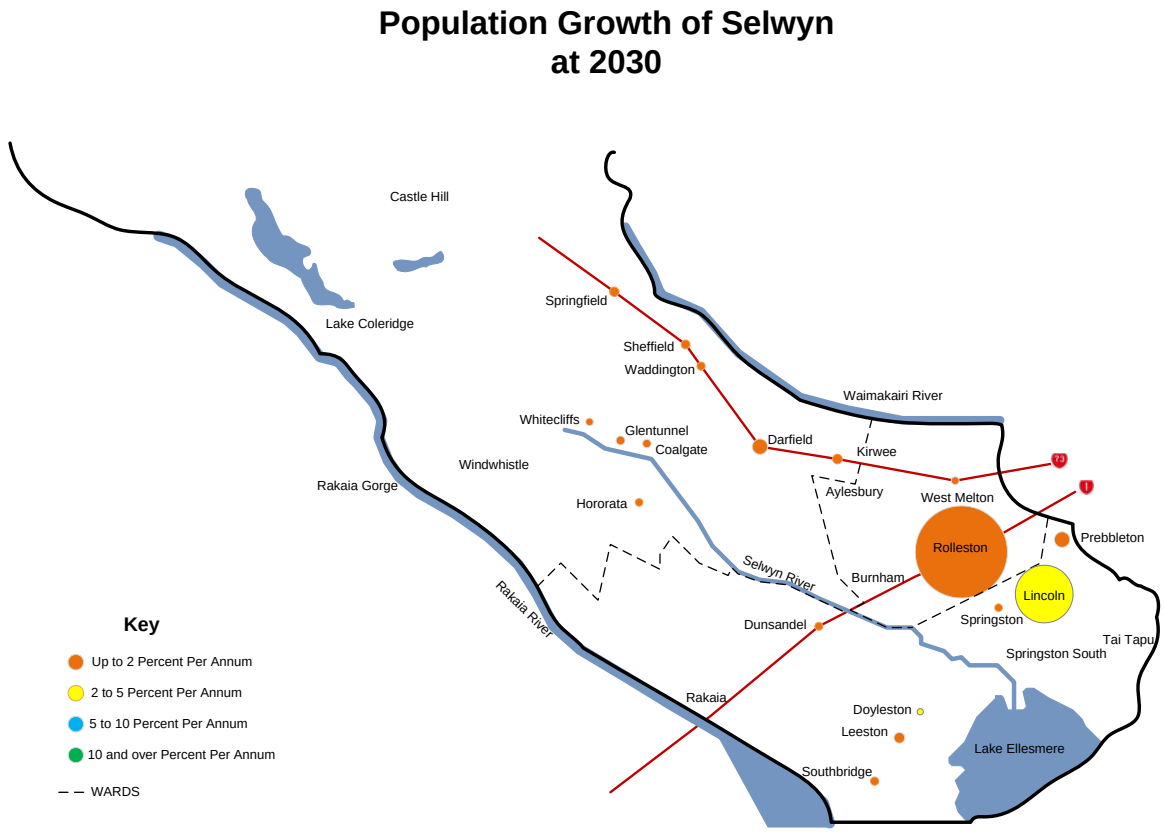

Figure 5-7 Selwyn Population Growth Projections

In response to the accelerated growth within the Selwyn District and the introduction of the Canterbury 'Land Use Recovery Plan', hydraulic models have been used to plan future water infrastructure for the major water supplies (Section 6.1 explains these models in more detail).

Figure 5-8 shows the forecasted abstraction rates for the seven largest townships within the Selwyn District.

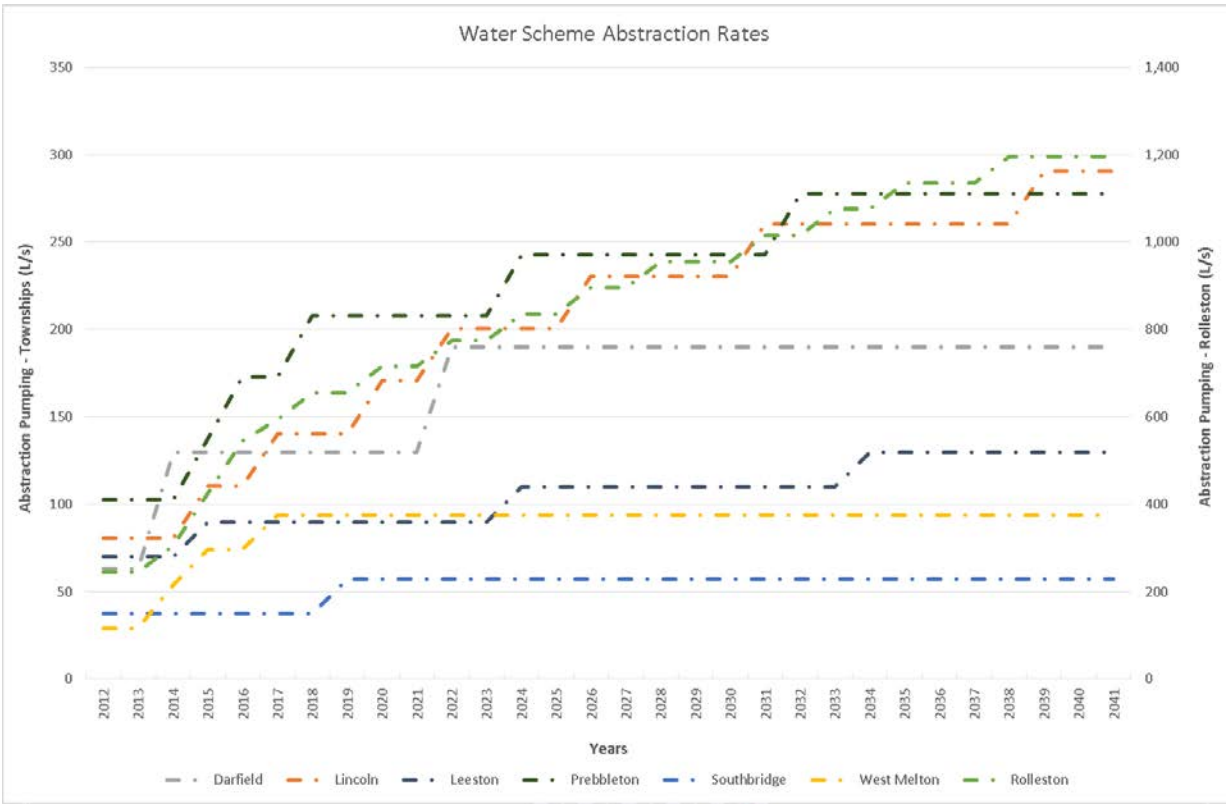

Figure 5-8 Forecasted Abstraction Rates

6 Knowing Where Selwyn's Water Goes

6.1 Current Practise

Water Models

Water supply capacity assessments have been completed for all of the community drinking water supplies. These assessments have been completed to varying levels of detail relative to the nature of the supply, known issues, and anticipated growth pressures.

Council holds hydraulic water models for eight townships (Darfield, Lincoln, Leeston and Doyleston, Prebbleton, Rolleston, Southbridge and West Melton), these are the major townships and rapidly developing areas. The hydraulic models have been used to plan future water infrastructure for the water supplies. Hydraulic models have been built and calibrated to international best practice to carry out the '30 year Water Infrastructure Master Planning'.

The mater planning provides an assessment of the sizing and timing of new infrastructure for new water sources (wells) and pipelines to service growth. Part of the master planning requires a water balance to be developed to forecast growth, using historical peak demand per household. The water balance forecasts the peak instantaneous flow per year versus the water resources available to determine the staging of new wells. The well staging assumes that one well is redundant for each water supply, to take into consideration maintenance of wells, planning/timing of new wells and security of supply i.e. to maintain average/peak demand.

Population projections are based on SDC 'Household Projections 2013 to 2041' and have been applied to the latest connection figures for each township, as provided by SDC.

The results of the master planning for the townships Darfield, Lincoln, Leeston and Doyleston, Prebbleton, Rolleston, Southbridge and West Melton is cited in the 5Water Activity Management Plans.

SCADA and Telemetry

SDC operates a "Datran" SCADA (Supervisory Control and Data Acquisition Software) which is used to control the functions of plant items and pump stations for a majority of facilities within the district.

The SCADA system is used for:

- Trending of historical information (data is available back to 2000)
- Alarm monitoring (operators informed of alarms via mobile phones)

The monitoring equipment records well flow, reservoir level, pressure, turbidity etc.

SDC is able to maintain a high level of service by using SCADA to monitor the water supplies, ascertain faults and instigate repairs while limiting the affect of service provided to ratepayers.

SDC's Water Billing System

Townships that are currently electronically billed, store water meter readings in NCS (the accounting software). This provides a mechanism for a robust assessment of domestic water use. However, the database is currently primarily used for billing purposes. Council is migrating this water meter database to AMS (Asset Management System) to enable long term trend mapping of water use.

6.2 Non Revenue Water

Non-Revenue Water is calculated as the difference between:

- System Input volume and Billed Authorised Consumption, or Water Supplied; and
- Billed Metered and Unmetered Consumption by Registered Customers

Non-Revenue Water is then split into three principal components - Unbilled Authorised Consumption, Apparent Losses and Real Losses. SDC has utilised the Benchloss NZ manual estimates to initially estimate non revenue water and the water balance. These estimates were:

- Unbilled Authorised Consumption = 0.5% of Water Supplied
- Apparent Losses: Unauthorised Consumption = 0.1% of Water Supplied
- Apparent Losses: Customer meter under--registration = 2.0% of Billed Metered Consumption by Registered Customers

The results of this estimation are aggregated and summarised in the Table 6-1 below[11].

Table 6-1 Non-Revenue Water Balance

Non-Revenue Water Balance Calculation		
	Water Supplied	**$6,497,276**
Less	**Consumption by Registered Customers**	**$5,199,890**
	Unbilled Authorised Consumption	$32,486
	Unauthorised Consumption	$6,497
	Customer Meter Under-registration	$5,7538
Equals	**Non-Revenue Water**	**$1,200,865**

6.3 Water Metering

Currently around 60% of properties connected across the district have meters installed, including all new subdivisions. In 2015/16 four townships were charged on a volumetric basis (Burnham, Edendale, Rolleston and Raven Drive). Twelve townships within Selwyn are fully metered this includes Rolleston, Darfield, Doyleston and West Melton. The Council is planning to progressively complete the installation of water meters at all Selwyn properties connected to a Council supply over the next few years. As townships become fully metered they will move from a fixed charge to a volumetric charge.

[11] Further detailed is cited in the water loss report.

7 Demand Management Interventions

The Selwyn District employs a variety of mechanisms to manage demand for water.

7.1 Education and Information Initiatives

Selwyn District co-ordinate a number of Educational and Information initiatives to influence water use choices and raise community understanding of water related issues. Educational campaigns have been used by Council in the past to reduce water demand. Education programs are implemented to engage the community and take a proactive approach to water demand management. The benefits of this approach is that it can increase consumers understanding of their water use and the Councils assets and operations.

Types of Education

There are many different ways to carry out water conservation education with the effectiveness depending on the target audience. Some suggestions are:

1. Signs in public places such as shop windows which describe water issues and the need to conserve water;
2. Development of a school education program;
3. Newspaper articles; and a
4. Pamphlet drop about water use and the need to conserve water.

The most important message to get across is why and how to conserve water. The benefits of an education program is to:

- Instill good habits in water users;
- Increase public awareness of environmental constraints and influences; and
- Reduce peak and total daily demand.

The main disadvantage of this approach is that it can be difficult to induce behavioural change without financial incentives. Educational programs may also have intangible benefits that are difficult to measure such as growing awareness of water issues.

The other challenge that Council will face is that there is a traditional mindset of abundant water. Council will compete with the perception of plentiful water and water wastage that is created by the public seeing farm irrigation nearby.

Over the past few years Council has undertaken newspaper advertising through the summer to encourage residents to be waterwise. Historically, Council has also collaborated with Christchurch City on their waterwise campaigns. An example of these is cited in Appendix E.

Wise Irrigation Campaign

Selwyn District Council is participating in the wise irrigation campaign along with Timaru, Ashburton and Waimakariri District Councils.

The campaign is designed to:

- Raise public awareness that water is precious;
- Promote that we all have a responsibility to use water wisely and can all act to make water savings;
- Educate rate payers (home & garden), industrial users and farmers about simple ways to save water (take action);

- Promote that industry have product, practice and technologies available to help minimise and more effectively target water use; and
- Encourage wider industry to promote SMART water-use products, practices and technologies.

More information about the campaign is on the website: http://smartirrigation.co.nz/.

Scheme performance dashboards

Council has developed scheme performance dashboards for a number of water schemes as a trial. The purpose of the dashboards is to allow residents to self-monitor scheme capacity and adjust water usage to suit e.g. don't irrigate lawns while the scheme is under pressure. These are displayed on our website:

www.selwyn.govt.nz/wmwater (West Melton)
www.selwyn.govt.nz/doywater (Doyleston)
www.selwyn.govt.nz/edwater (Edendale)

The dashboards show the township water use using a live traffic light system, it shows when residents should be reducing their water usage. It also shows reservoir capacity, if a reservoir is situated on that scheme. An example of this system is for West Melton, shown below by Figure 7-1.

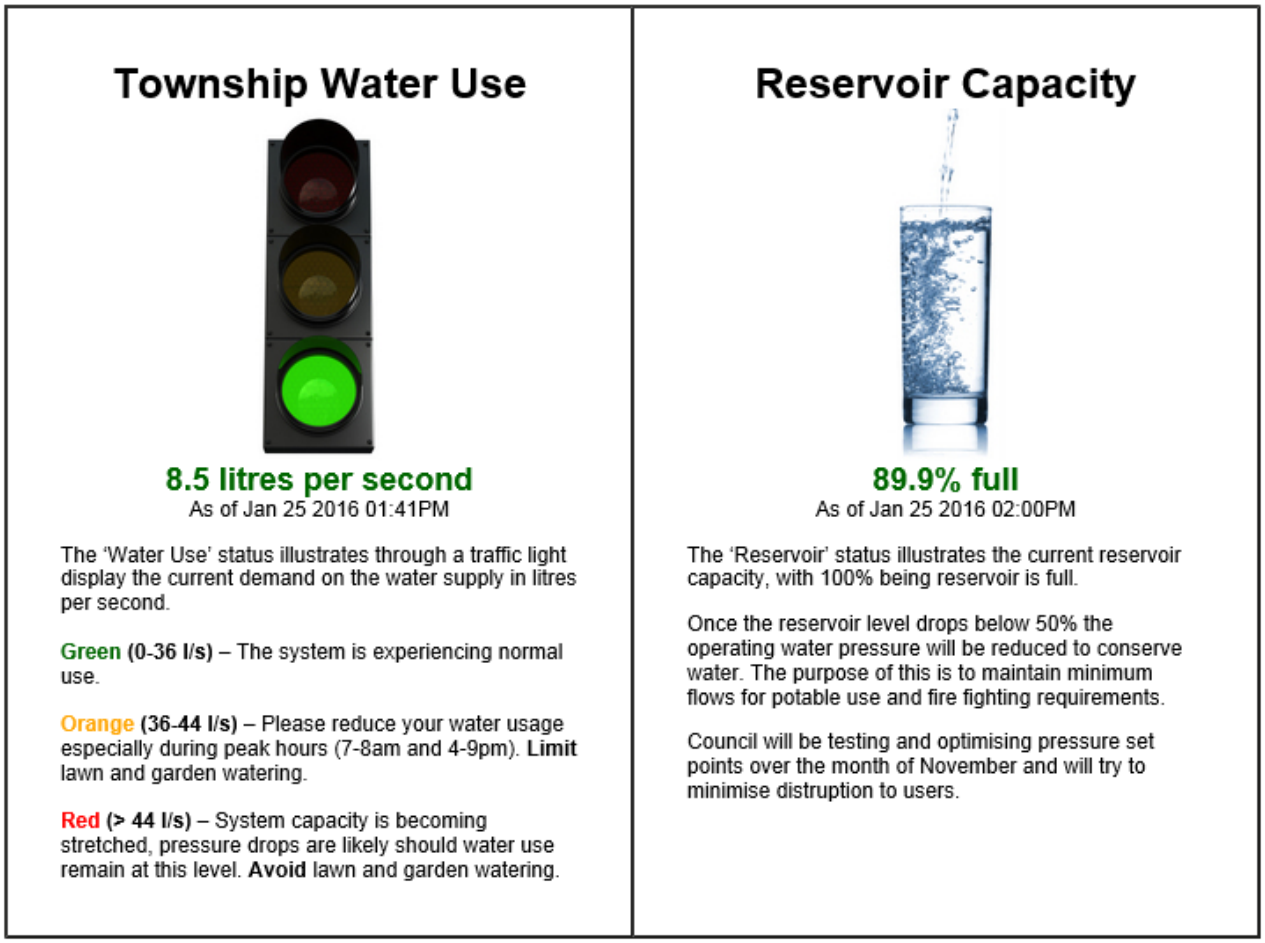

Figure 7-1 West Melton Water Scheme Performance

7.2 Operation and Maintenance

Leak Detection Programme

The Council has recently undertaken a project to estimate the water loss within the reticulation for each scheme. From this, the Council can develop and implement a comprehensive leak reduction

program. Leak reduction involves reducing levels of leakage in the water supply network. Leak reduction can provide significant savings on total average flow in the water networks, therefore while it does not target peak demand, there are significant cost savings in total demand reduction.

The main advantages of this approach is are that it:

- Does not rely on customer participation to be successful;
- Reduces operational costs; and
- Provides information on the condition of the network.

The main disadvantage is that work can disrupt supply to customers.

Council intends to undertake a leak detection program. This program will start Castle Hill and will then focus on other townships in order of calculated losses.

Reduced Pressure

Council operates its water supplies at a moderate pressure (generally between 350 to 400kpa) which reduces the impact of water leaks.

Council automatically adjusts the reticulation target pressure on some schemes based on reservoir level. That is, as the water level in the reservoirs drop so does the target pressure the pump station tries to meet. This setup helps to preserve reservoir storage and system failure by reducing water use by lowering the operating pressure.

An example of where this is utilised is in the township of West Melton. In summer the water demand in West Melton is often greater than the supply. As mentioned prior the website shows a live reservoir status, once the reservoir drops below 50% the operating pressure of the system is reduced to conserve water. The purpose of this is to maintain minimum flows for potable use and fire fighting requirements.

The advantage of this approach is that it does not require customer participation to achieve results. However, it does impacts the level of service received by the ratepayer.

Renewal Programme

SDC's annual water mains renewal programme helps to maintain the infrastructure in a good condition and mitigate potential water losses in the network.

The water mains renewal programme is a key component of SDC's Annual Plan, with a significant annual investment allocated to replacing pipes identified as being in poor condition. The current funding is shown in the Table 7-1 below.

Table 7-1 Projected costs - water mains renewal programme[12]

Year	Projected Cost
2015/16	$1,352,187
2016/17	$815,921
2017/18	$434,500
2018/19	$1,144,432
2019/20	$7,271,660
2020/21	$1,230,315
2021/22	$1,475,224

[12] As per the 2015 5Waters Activity Management Plan.

2022/23	$1,038,458
2023/24	$1,068,371
2024/25	$1,334,946
Total	**$17,166,013**

Actual spend depends on actual performance of pipework e.g. number of pipe breaks etc.

7.3 Regulatory

Water Supply Bylaw 2008

The water supply bylaw was written for the purposes of managing, regulating against, or protecting from damage, misuse, or loss, or for preventing the use of; the land structures, or infrastructure associated with the water supply. It also allows Council to apply water restrictions, restrict and or meter the supply to reduce unnecessary and unauthorised water use and loss, and fix leaks where the owner does not do so.

Owners must not allow water to run to waste from any pipe, tap, or other fitting or allow leaks to continue unchecked or unrepaired, and allow the unattended operation of hoses. Owners are also required to maintain devices that have been installed for the purposes of water demand management. Failure to comply with the bylaw can result in an infringement notice or fine.

District Plan

The Selwyn district plan recognises the value of water resources. In the townships contained in the Selwyn District, the District Plan uses the following basic strategy to address issues relating to water:

Water Quality

The Plan focuses on maintaining and improving water quality because:

- It is the most significant water issue in Selwyn District; and
- It is not easily managed through controlling discharge permits alone.

The Plan does this by:

- Requiring any proposed activity to demonstrate that it can be supplied with water supplies, and effluent and stormwater treatment and disposal, without adversely affecting the environment.
- Requiring activities to have reticulated sewage treatment and disposal where the Regional Council will not issue discharge permits for onsite effluent disposal.
- Rules to manage effects of activities along the edge of waterbodies – earthworks; structures; hazardous substances.
- Rules to manage effects of erecting structures across waterbodies and permanent moorings.
- Rules to take esplanade strips to protect the natural character of waterbodies, and esplanade reserves to allow public access along specifically identified waterbodies.
- Voluntary programmes to enhance vegetation planted along waterbodies and the opportunity to use esplanade reserves, strips and planting to improve amenity and natural character.
- Focusing on water quality, the Plan provisions should also help:
    - To maintain and enhance the ecological habitat values of the waterbodies and riparian margins; and
    - To protect or enhance the values of sites of mahinga kai, waahi tapu and waahi taonga.

In the rural areas of the District, the District Plan uses the following basic strategy to address issues relating to water:

Ground and Surface Water

- Most of these issues are managed by Environment Canterbury
- The District Plan:
    - Requires people to keep the zones of influence from wells and septic tanks within property boundaries.
    - Manages activities near waterbodies to reduce the risk of accidental discharges.

Riparian Margins and Waterbodies

- Provisions to manage activities likely to affect the natural character of riparian margins (earthworks, structures, tree planting and hazardous substances).
- Policies and rules to create esplanade strips to protect the natural character of waterbodies.

Activities on the Surface of Water

- Policies and rules to manage the use of motorised craft on small and medium lakes.
- Policies and rules to manage structures across the surface of water and permanent moorings.
- Monitoring activities on the Waimakariri and Rakaia rivers.

Water Restrictions

Water Restrictions are one of the active water conservation methods currently used by the SDC. Water restrictions enable reduction of peak flows with quick implementation. The main disadvantage is that they are entirely reliant on residents participating and after a restriction is lifted residents return to their normal behaviour. Restrictions are used to reduce demand by implementing various levels of restrictions.

In summer of 2015 water consumption in Selwyn increased significantly due to the warmer weather. Many of the Council's water supplies were struggling to meet demand and experiencing issues such as:

- Depletion of reservoir storage;
- Pressure drops throughout the reticulation;
- Exceeding resource consent limits in some townships;
- Some bores were starting to fail due to low groundwater levels; and
- Firefighting capacity was reduced.

Council implemented water restrictions. The objectives of the water restrictions were to:

- Inform residents of the introduction of water restrictions;
- Reduce water consumption in the target areas immediately/in the short term;
- Modify water consumption behaviour in the long term; and
- Enable residents to gain an increased understanding of the factors contributing to the current water demand issues.

Letters, emails, texts, media releases and updates to the Council website were used as a medium of communication for residents.

The water restrictions were set at 4 levels, these are outlined in Appendix C.

Rating Structure

Through the 2015-25 long term plan Council introduced a district rate for all urban water supplies. As part of this rating change Council is introducing water meters to all "on demand" properties. Water metering and charging on a volumetric basis highlights to users the cost of water use.

Going forward, Council could investigate a tiered rating structure so that disincentives are placed on those properties which use large volumes of water. For an example a lower cubic metre rate could be applied for the first 375m^3 of water used with a greater cubic metre rate for any water use above that allocation.

7.4 Water Management

Water Metering

Water metering is one of the active water conservation methods currently used by the SDC. Water metering has been introduced in many townships, this will enable consumers to place an appropriate value on clean safe water.

Adopting a volumetric pricing charge encourages people to reduce their water use. The advantages of this approach are:

- Fair and equitable user pays system;
- Efficient use of water promoted; and
- Incentive for property owners to fix their leaks.

The disadvantage of this approach are the costs of meter purchase, installation, reading and maintenance.

Council is planning to progressively complete installation of water meters at all Selwyn properties connected to a Council supply over the next three years. In order to achieve this, in 2015/16 Council staff will determine:

- Which properties require meters and what infrastructure is existing (e.g. toby valve or manifold);
- What type of meter should be installed (e.g. manual or smart); and
- The tender process for the installation of water meters.

Currently approximately 60% of properties connected to a Council water supply have a meter installed. Water meters have been budgeted for in the 2015-25 Long Term Plan.

Water Balance Monitoring

SDC has used a water balance approach to measure estimated water loss within the network. The water balance can be also be used to monitor the amount of non-revenue water flowing within the network.

SDC will calculate a water balance each year. This will enable SDC to monitor non-revenue water and water loss over time. Calculating the percentage of real water loss is also a key performance indicator for the SDC, as per legislative requirements, which is reported within the annual report.

This water balance will also enable leak detection work to be prioritised.

Water Network Monitoring

SDC utilises its SCADA system to continually monitor water consumption in relation to consented water takes allowance and system performance. In particular SDC monitors:

- Abstraction Rates
- Reservoir Levels
- Network Pressures

In conjunction with SDC staff monitoring, SCADA alarms are set so to alert staff when certain events take place. For example, if a reservoir drops to a certain level, or pressure within the reticulation is too high/low. SDC will continue to monitor water network via SCADA and add more monitoring points when appropriate.

Environmental Monitoring

SDC monitors environmental attributes, these include:

- Groundwater Levels
- River Flow levels

Environmental attributes are monitored by SDC as these impact on abstraction limits and system performance.

Restricted supplies

Where Council supplies water to a large property (generally over 3000m^3) a restricted supply is provided. This allows Council to provide a set volume of water per day by restricting the flow rate to that property.

8 Water Conservation and Demand Management Actions

Management of water demand is an ongoing and evolving process. As a greater understanding of water uses and technologies develop further opportunities arise for improving demand management techniques.

8.1 Business as usual demand management initiatives

As outlined throughout this plan SDC employs a range of initiatives to manage demand including:

No.	Action
1	Measurement and understanding of current average and peak water usage
2	Deliver education and information to the community to implement water conservation
3	Implement water restrictions where required
4	Maintain growth projections and carry out master planning
5	Implementation of mechanisms such as the Water Supply Bylaw 2008 and the Proposed District Plan to encourage and promote efficient use of water
6	Management of asset lifecycle to minimise water losses
7	Conducting regular review of the water balance and benchmarking against other municipal suppliers

8.2 Water Demand Management Improvement Actions

The following water conservation and demand management actions have been identified to enable future improvements in water demand management and are in addition to the “business as usual“ demand management initiative throughout this document.

No.	Action	Priority	Intent
1	District wide water metering and demand analysis	High	Ensures customers place a value on clean fresh water by incentivising low water use, and efficiency of water use. Provides a fair and equable rating system for low and high water users.
2	Water education programme on low water demand gardening	High	Provides guidance to existing and new residences, on the unique dry environment in the Selwyn District. This enables appropriate plantings and garden watering practices.
3	Targeted Water Audits	Medium	Reduce daily and peak demand by working with high water users to reduce demand.
4	Review drought management plan	Medium	Review management of water supplies with staff and contractors following periods of dry weather to confirm what worked well and what can be improved.
5	Rainwater harvesting feasibility	Medium	Investigate the benefits and issues with rain water harvesting.
6	Wastewater re-use and recycling	Low	Review the option to re-use treated wastewater for irrigation use on Council reserves and gardens.

Water Metering

The strategy for the water meter roll out will be reviewed every year in conjunction with the annual plan review. This will include a review of timeframes and budgets. Council staff aim to have the majority of townships fully metered by the end of year 2017/18.

Table 8-1 below outlines where water meter charging will be introduced for each township.

Table 8-1. Water Scheme Water Meter Volumetric Charging

Scheme	Year Implemented and Charged
Armack Drive	2016/17
Arthur's Pass	2018/19
Burnham	2015/16
Castle Hill	2018/19
Courtenay	Restricted
Darfield	2016/17
Darfield Rural A	Restricted
Darfield Rural B	Restricted
Doyleston	2016/17
Dunsandel	2017/18
Edendale	2015/16
Hororata Acheron	Restricted

Hororata Township	Restricted
Johnson Road	2016/17
Jowers Road	2018/19
Kirwee	2017/18
Kirwee - Courtenay Bealey Exte	Restricted
Kirwee - Courtenay Extension	Restricted
Lake Coleridge	2018/19
Leeston	2018/19
Lincoln	2018/19
Malvern Hills	Restricted
Prebbleton	2017/18
Rakaia Huts	2018/19
Raven Drive	2015/16
Rolleston	2015/16
Sheffield/Waddington	2018/19
Southbridge	2018/19
Springfield	2017/18
Springfield - Annat Extension	Restricted
Springfield - Kowai Bush Exten	2017/18
Springston	2017/18
Tai Tapu	2018/19
Tai Tapu Otahuna Valley	Restricted
Te Pirita	2018/19
Templeton (Claremont)	2016/17
West Melton	2016/17

Education – Low water demand gardening

Council would encourage communities to shift to low water demand / drought tolerant plants and grasses. Regulatory and non-regulatory mechanisms are available including the following, in order of increasing cost:

- Provision of information regarding suitable species;
- Promotion and encouragement of suitable plantings and species;
- Subsidy of plants;
- Rates rebates for low demand plantings; and
- District Plan rules requiring planting of drought tolerant species.

With respect to District Plan rules, this is only likely to be feasible for areas which are being rezoned to provide residential development. Given the expected growth of the community, some rezoning is likely to be required to meet the demand for residential properties.

Encouragement of low water demand gardening could be effective in new residential areas, particularly where the Council works cooperatively with the developer and the developer seeking an "eco-friendly" or "sustainable" subdivision. However, a large scale change in established gardens and plantings is unlikely. This technique is therefore more suited to growth areas in order to reduce the rate of growth in water demand rather than to reduce existing water demand.

Rain water

Rainwater harvesting involves installation of rainwater collection and tanks on each property to provide for outdoor irrigation use. First flush diverters on the rainwater collection system are not necessary given that the intended use is for irrigation.

Targeted Water Audits

Analysis of water meter data has shown that there are a small number of users who utilise a significant portion of the available water. Council could choose to identify these users and offer targeted advice to reduce water use.

Waste-water Re-use and Recycling

Waste-water reuse can be implemented at the individual property level or community level. At the individual level, this involves using grey-water (e.g. laundry wash water) for non-potable use such as irrigation. However, there are concerns over odour if storage is required and potential for salt build up in the soils.

At a municipal level, wastewater can be treated to a high level and recirculated in a separate reticulation for non-potable use. This would require effluent treatment via micro-filtration and/or UV disinfection and installation of a secondary reticulation network. Whilst expensive to retrofit, dual water reticulation in new developments is becoming increasingly common in water areas.

APPENDIX A

WATER RESOURCE CONSENTS

Summary of Resource Consents

Consent #	Scheme	Permit Type	Application Status	Expires
CRC010889	Armack Drive	Water Permit	Issued - Active	31/01/2035
CRC991057	Arthurs Pass	Water Permit	Issued - Active	9/02/2034
CRC951094	Burnham	Water Permit	Issued - Active	25/01/2030
CRC991053	Castle Hill	Water Permit	Issued - Active	23/12/2033
CRC000094	Claremont(Templeton)	Water Permit	Issued - Active	15/11/2034
CRC991604	Darfield	Water Permit	Issued - InActive	8/09/2039
CRC991423	Darfield	Water Permit	Issued - Active	8/09/2039
CRC960148.1	Darfield	Water Permit	App In Process	
CRC143985	Darfield	Water Permit	Issued - Active	16/11/2045
CRC010891.1	Dunsandel	Water Permit	Issued - Active	31/01/2035
CRC010888	Edendale	Water Permit	Issued - Active	16/02/2040
CRC970985.1	Hororata Acheron	Water Permit	Issued - Active	11/12/2031
CRC991054	Hororata Acheron	Water Permit	Issued - Active	9/02/2034
CRC010173	Hororata Acheron	Water Permit	Issued - Active	30/11/2035
CRC010886	Johnson Road	Water Permit	Issued - Active	16/01/2017
CRC010885	Jowers Road	Water Permit	Issued - Active	9/01/2017
CRC158020	Kirwee	Water Permit	Issued - Active	31/01/2035
CRC991051	Lake Coleridge	Water Permit	Issued - Active	13/01/2034
CRC160101	Leeston	Water Permit	Issued - InActive	31/01/2035
CRC950937.1	Leeston	Water Permit	Issued - Active	22/02/2030
CRC161472	Lincoln	Water Permit	Issued - InActive	31/01/2035
CRC981830	Lincoln	Water Permit	Issued - Active	20/05/2033
CRC090427	Lincoln	Water Permit	Issued - Active	12/08/2039
CRC010903	MH Dalethorpe	Water Permit	App In Process	
NCY870170	MH Dalethorpe	Water Permit	Issued - Continuance	30/04/2001
CRC010904	MH Hartleys	Water Permit	Issued - InActive	19/11/2044
CRC010900	Prebbleton	Water Permit	Issued - Active	31/01/2035
CRC161101	Prebbleton	Water Permit	Issued - Active	2/08/2040
CRC991055.1	Rakaia Huts	Water Permit	Issued - Active	27/01/2034
CRC010905	Raven Drive	Water Permit	Issued - Active	31/01/2035
CRC962218	Rolleston	Water Permit	Issued - Active	28/08/2031
CRC962217	Rolleston	Water Permit	Issued - Active	28/08/2031
CRC160628	Rolleston	Water Permit	Issued - Active	31/01/2035
CRC940683.1	Rolleston	Water Permit	Issued - Active	19/01/2029
CRC133773	Rolleston	Water Permit	Issued - Active	2/08/2040
CRC010898	Sheffield/Waddington	Water Permit	App In Process	
NCY880041	Sheffield/Waddington	Water Permit	Issued - Continuance	30/04/2001
CRC010893.1	Southbridge	Water Permit	Issued - Active	31/01/2035
CRC155932	Springfield	Water Permit	Issued - InActive	5/11/2028
CRC991058	Springfield	Water Permit	Issued - InActive	28/08/2035
CRC010895.1	Springston	Water Permit	Issued - Active	31/01/2035

CRC134786	Tai Tapu	Water Permit	Issued - Active	31/01/2035
CRC010894.1	Taumutu	Water Permit	Issued - Active	31/01/2035
CRC991530.1	Te Pirita	Water Permit	Issued - Active	9/04/2034
CRC146688	Upper Selwyn Huts	Assest/Services	Issued - Active	31/01/2035
CRC010887	West Melton	Water Permit	Issued - Active	16/01/2017
CRC080102.2	West Melton	Water Permit	Issued - Active	14/12/2044
CRC121242	West Melton	Water Permit	Issued - Active	13/03/2047
CRC052839.1	West Melton	Water Permit	Issued - Active	31/05/2041

APPENDIX B

DRAFT DROUGHT MANAGEMENT PLAN

DROUGHT AND SYSTEM CAPACITY MANAGEMENT PLAN

Drought management addresses environmental flow and peak demand management issues by providing levels that will trigger implementation of the response plan and monitoring requirements used to identify when we are nearing or have reached trigger levels. Detailed actions to be taken when trigger levels are reached are detailed in this plan.

The roles and responsibilities of the stakeholders belong to:

Stakeholder	Roles
Canterbury Regional Council	– Provide overview of the river and ground water management – Provide stakeholders with information – Ensure resource consents are being met
Public Health Unit	Not involved in day to day operations but will need to be notified if emergency situation arises

The roles and responsibilities within SDC belong to:

Selwyn District Council	Roles
Operations Team	– Monitor situation – Organise setup and implementation of contingency measures when required – Monitor water use alert levels and communicate timing for Alert Levels to be implemented and removed – Coordinate review of summer water use campaign and any drought response required
Strategic Team	– Coordinate review of summer water use campaign and any drought response required – Consider recommendations made in these reviews and consider asset upgrades
Communications Team	Maintain communication with internal and external stakeholders
SICON Limited	– Monitor situation – Adjust and manage network to best meet demand requirements – Provide assistance to the operations team as required

Monitoring

The Operations Team carries out daily monitoring of the summer demands on all systems including abstraction, consumption, reservoir levels, network pressures and flows.

At the beginning of summer (November/December) each year and assuming that trigger levels have not been reached already, the Operations Team will ensure that an assessment of summer climate outlook is undertaken. This will involve checking long term forecasts and outlook predictions made by NIWA.

Data Source

Data is sourced primarily from the following websites:

1. Councils SCADA System
2. Canterbury Regional Council - http://ecan.govt.nz
3. NIWA - http://www.niwa.co.nz
4. Metservice - http://metservice.com

Trigger Levels

Trigger levels guide staff to initiate emergency and communication measures. Without these trigger levels resources may be used too early or not implemented soon enough. Review of these levels each year is important as climatic conditions, resource consent conditions, groundwater levels and surface water flows may change over time.

Trigger	Actions
A	Demand exceeds daily consent limits
B	Pressure drops below 250kPa for more than 30 minutes on two days within a week due to lack of source capacity
C	Reservoir levels drop below 40% on two days within a week
D	Groundwater monitoring bores reach trigger levels
E	River gauging site reaches trigger levels
F	Water abstraction capacity reduced to a level where peak demand can not be met
G	Water supply network capacity results in significant supply restrictions

Scheme	Triggers	Scheme	Triggers
Armack Drive	A,C	**Lincoln**	A,B,F
Arthur's Pass	A,B,F	**Malvern Hills**	A,C,E,G
Burnham	G	**Prebbleton**	A,B,F,G
Castle Hill	A,B,C,F	**Rakaia Huts**	A,B,C,F
Darfield	A,B,C,F,G	**Raven Drive**	A,B,F
Doyleston	A,B,C,G	**Rolleston**	A,B,C,F,G
Dunsandel	A,B,C,F	**Sheffield/Waddington**	A,B,C,E,F
Edendale	A,B,C,F	**Southbridge**	A,B,F,G
Hororata Acheron	A,C,F,G	**Springfield**	A,B,C,E,F,G
Johnson Road	A,C,F,G	**Springston**	A,B,C,F
Jowers Road	A,C,F,G	**Tai Tapu**	A,B,F,G
Kirwee	A,B,C,F,G	**Te Pirita**	A,C,F,G
Lake Coleridge	A,B,F,G	**Templeton (Claremont)**	A,B,C,F,G
Leeston	A,B,F	**West Melton**	A,B,C,F,G

Detailed Scheme Specific Drought Management Plans

Details to be developed – refer section 8.2 Improvement Actions

APPENDIX C

Peak Demand Management

Peak Demand Management

This management plan provides guidance on using water restrictions to manage peak demand.

Restriction Trigger Levels

The most effective way to reduce water consumption in times of drought or water shortage is to introduce water restrictions. Water restrictions theoretically allow the water source to be sustained under a variety of usage and drought scenarios. Restrictions will apply to the Selwyn District area including residential, rural restricted areas and commercial/industrial water users.

The table below details levels for restrictions for water supplies under SDC's control. Water restrictions can be initiated by the Asset Manager or as delegated to staff.

Levels	Actions
Level 1	• *No watering of lawns is permitted between the hours of 6am to 9am and 4pm to 9pm only* • *Garden watering is permitted* • *There is a requirement to decrease demand especially during peak periods.*
Level 2	• *Watering of lawns is permitted between 9am-4pm and 9pm-6am on alternate days only.* *(Note. If your street address number is even then water on even-numbered days, if your street address number is odd then water on odd-numbered days. For example if your property number is 2, 24b or 108 you can water your lawn as needed on the 8, 10, 12 December and so on during the permitted times. If watering during the daytime we recommend choosing a cooler day to reduce evaporation.)* • *Garden watering is permitted.* • *There is a requirement to decrease demand especially during peak periods*
Level 3	• *No watering of lawns is permitted.* • *Hand garden watering is permitted, total ban on domestic sprinklers* • *There is a requirement to decrease demand*
Level 4	• *Total ban on all external non-essential use of water* • *Consumers may carry water using a bucket, watering can or similar to maintain plants as necessary*

Communications

The key messages publicised with the water restrictions are:

- Water restrictions are now being introduced.
- Residents in several Selwyn towns are being urged to immediately reduce their water usage at peak times.

- Water consumption is already high and is increasing significantly, mainly from residential water use for garden and lawn watering.
- Water supplies in some locations are struggling to meet demand, in some cases resulting in significant pressure drops and depletion of reservoir storage.
- A range of factors is contributing to the high demand including extreme weather conditions, low river flows, and continuing growth in some residential areas.
- Council is working on improvements to increase capacity for a number of supplies.

APPENDIX D

Iwi Management Plans
Assessment of Consistency

Introduction

Te Taumutu Rūnanga and Te Ngāi Tūāhuriri Rūnanga represent those who hold mana whenua over the land and water resources in the Selwyn District. Te Hapū o Ngāti Wheke (Rāpaki), Te Rūnanga o Koukourārata, Wairewa Rūnanga and Onuku rūnanga also hold mana whenua over Te Waihora/Lake Ellesmere. Mahaanui Iwi Management Plan is a joint management plan for all six of these rūnanga while Te Taumutu Resource Management Plan is specific to Taumutu Rūnanga.

There are several iwi planning documents that deal with freshwater. Mahaanui Iwi Management Plan 2013 and Te Taumutu Resource Management Plan refer specifically to issues and values associated with water management within Selwyn District. Ngāi Tahu Freshwater Policy identifies tribal issues, values and positions in relation to freshwater generally.

This appendix includes an assessment of the Water Conservation and Demand Management Plan against these three documents. Te Whakatau Kaupapa is also a relevant iwi planning document that provides the framework or the tribal relationship with the natural environment. It has been considered as part of this assessment, but all relevant matters are also addressed in the other three more specific documents.

Iwi Management Plans

The Mahaanui Iwi Management Plan explains the relationship of Ngāi Tahu with freshwater. It states "*Water is a significant cultural resource that connects Ngāi Tahu to the landscape and the culture and traditions of the tūpuna. All water originated from the separation of Rangi and Papatūānuku and their continuing tears for one another. Rain is Rangi's tears for his beloved Papatūānuku and mist is regarded as Papatūānuku's tears for Rangi. For tāngata whenua, the current state of cultural health of the waterways and groundwater is evidence that water management and governance in the takiwā has failed to protect freshwater resources. Surface and groundwater resources are over-allocated in many catchments and water quality is degraded as a result of urban and rural land use. This has significant effects on the relationship of Ngāi Tahu to water, particularly with regard to mauri, mahinga kai, cultural well-being and indigenous biodiversity. The policies in this section are intended to guide freshwater management in a manner consistent with Ngāi Tahu cultural values and interests. They provide a general policy statement to sit alongside catchment specific issues and policy identified in Part 6 of this IMP. The anticipated outcome is the restoration of the cultural health of freshwater resources of the region, mō tātou, ā, mō kā uri ā muri ake nei. A significant kaupapa that emerges from this policy section is the need to rethink the way water is valued and used, including the kind of land use that water is supporting, and the use of water as a receiving environment for contaminants such as sediment and nutrients. Fundamental to tāngata whenua perspectives on freshwater is that water is a taonga, and water management and land use should reflect this importance.*" [13]

[13] Reference: Mahaanui Iwi Management Plan pg. 75

Assessment of draft Selwyn District Council Water Conservation and Demand Management Plan against Mahaanui Iwi Management Plan 2013 (MIMP)

This Iwi Management Plan is an expression of kaitiakitanga and rangatiratanga. The plan provides a tool for local authorities to understand what is important to mana whenua and why; and to help them meet statutory obligations under the Resource Management Act 1991, Ngāi Tahu Claims Settlement Act (NTCSA) 1998 and other legislation, including the Local Government Act 2002.

Ngā Take – Issues of Significance		**Assessment and SDC draft WCDMP/Response**
Issue WM1: Rights and interests	Tāngata whenua have specific rights and interests associated with freshwater.	Acknowledged in the development of the plan, and specifically mentioned sections 1.4 and 1.5 along with Appendix D.
Issue WM2: Value of water	Changing the way water is valued.	The plan shows that the value of water is communicated through education and information initiatives.
Issue WM3: Priorities for use	Priorities for use based on Ngāi Tahu values.	The MIMP advocates an order of priority for freshwater resource use that is consistent with the Te Rūnanga o Ngāi Tahu Freshwater Policy Statement. The statement prioritises the protection of instream values and uses as a first priority. The management plan aims to meet base health and safety requirements for human needs whilst protecting natural environment via compliance within consent limits.
Issue WM4: Management of water	Appropriate management scale, principles, tools and processes to deliver Ngāi Tahu cultural outcomes.	This issue has been acknowledged in the development of the plan but has not specifically been mentioned in the document.
Issue WM5: Statutory Acknowledgements	Recognition of freshwater statutory acknowledgement sites.	Acknowledged in the development of the plan, however, no specific mention of Statutory Acknowledgment Areas in the Selwyn District.
Issue WM6: Water quality	The decline in water quality in the region as a result of point and non-point source pollution, low flows and loss of wetlands and riparian areas.	Plan helps Council manage water supplies within consent limits. Water quality and quantity are both significant water issue in Selwyn District and is not easily managed through controlling discharge permits alone. The Selwyn District Plan is one of the mechanisms that can be used to manage water quality

		by recognising the link between land uses and impacts on water quality.
Issue WM7: Rural land use	Intensive rural land use is having unacceptable effects on water quality and quantity, and Ngāi Tahu values.	As above.
Issue WM8: Water quantity	Freshwater resources in the takiwā are over-allocated or under increasing pressure from abstractive use.	Plan helps Council manage water supplies within consent limits
Issue WM9: Regional infrastructure	The need for a robust cultural framework to assess proposals for in-stream water storage, irrigation and hydro-generation.	This issue is not applicable to the WCDMP except where water storage may provide for an enhanced community water supply; e.g. Kowai River take with CPW storage pond
Issue WM10: Mixing of water	There are cultural issues associated with the unnatural mixing of water between and within catchments.	Acknowledged in the development of the plan, however, not specifically mentioned in the document.
Issue WM11: Transfer of permits	The transfer of water permits is inconsistent with tāngata whenua perspectives on how to achieve the sustainable management of water.	Not really relevant to Council drinking and community supplies. However in over-allocated catchments Ngāi Tahu position would be any water not required for drinking or community supply should be returned to the environment and not reallocated.
Issue WM12: Beds and margins	Activities occurring within the beds and margins of rivers and lakes can adversely affect Ngāi Tahu values.	Acknowledged as activities within the beds of rivers and lakes are dealt with by ECan.
Issue WM13: Wetlands, waipuna and riparian margins	Loss of wetlands, waipuna and riparian margins, and the cultural and environmental values associated with them.	The WCDMP acknowledges that the Selwyn District Plan has provisions for the protection of riparian margins.
Issue WM14: Drain management	Drain management can have adverse effects on Ngāi Tahu values, particularly mahinga kai.	Drains are not included in the WCDMP so this issue is not applicable.
Issue WM15: Invasive weeds	The spread of invasive woody weeds and standing trees in the beds and margins of rivers.	This issue is not applicable to the WCDMP.
Issue WM16: Coastal marine area	The freshwater-saltwater interface is an important feature of freshwater management.	This issue is not applicable to the WCDMP.

Te Waihora – Issues of Significance		Assessment and SDC draft WCDMP/Response
Issue TM1: Governance and management	Improving the ability of Ngāi Tahu to exercise kaitiakitanga and influence decision making.	The draft management plan does not mention the importance of kaitiakitanga in the management of fresh water. Acknowledged within Appendix D.
Issue TM2: Ngāi Tahu as owner of lakebed	Effective recognition of Ngāi Tahu ownership of the Te Waihora lakebed.	This issue is not applicable to the WCDMP.
Issue TM3: Joint Management Plan	Implementation and review of the Mahere Tukutahi o Te Waihora/Te Waihora Joint Management plan 2005.	This issue is not applicable to the WCDMP.
Issue TM4: Cultural Health of Te Waihora	The cultural health of Te Waihora is degraded as a result of lake margin land use and settlement, land use in the catchment and lake level management.	This issue is not applicable to the WCDMP.
Issue TM5: Lake level management	Lake level management must be consistent with the protection and restoration of Ngāi Tahu values and interests.	This issue is not applicable to the WCDMP.
Issue TM6: Mahinga Kai	Loss of mahinga kai resources and opportunities in Te Waihora and its catchment.	Mahinga kai is recognised in the SDC plan. This plan helps Council manage water supplies within consent limits.
Issue TM7: Cultural health of lowland waterways and groundwater	The cultural health of lowland waterways and groundwater is compromised as a result of intensive land use and over-allocation.	Selwyn District Council is planning to progressively complete the installing of water meters at all Selwyn properties connected to a Council supply. This will aid in tracking the amount of water used and may help the cultural health of waterways in the catchment.
Issue TM8: Wetlands, waipuna, and riparian margins	Degradation and loss of wetlands, waipuna and riparian margins in the catchment.	This issue is not directly applicable to the WCDMP but is part of the overall issue of water abstraction and efficient use
Issue TM9: Wāihi tapu me wāhi taonga	Protection of wāhi tapu and wāhi taonga.	The WCDMP recognises that the Selwyn District Plan provisions help protect wāhi tapu and wāhi taonga.
Issue TM10: Coastal erosion	Coastal erosion along the Taumutu coastline and effects on the lake opening management regime and wāhi tapu and wāhi taonga, including urupā.	This issue is not applicable to the WCDMP.
Issue TM11: Kaitōrete spit	Protecting Ngāi Tahu values associated with Kaitōrete Spit.	This issue is not applicable to the WCDMP.

An assessment of consistency with the Taumutu Rūnanga Natural Resource Plan was completed and is listed on the following page.

The Taumutu Rūnanga Natural Resource Plan states "*The objectives of this plan are:*

- *Identify tāngata whenua values associated with natural resources in the takiwā of Ngāi Te Ruahikihiki ki Taumutu;*
- *Identify the primary issues associated with natural resources management in the takiwā;*
- *Clearly articulate Te Taumutu Runanga policy for natural resource management, ki uta ki tai (from the mountains to the sea);*
- *Provide a management tool for Te Taumutu Rūnanga to further effectively and proactively participate in natural resources management and planning.*
- *Provide local, regional and central government authorities, and the wider public community, with baseline information about the position of Te Taumutu Rūnanga on important issues and appropriate management strategies for resources over which they hold kaitiakitanga;*
- *Provide a sound basis from which consultation with Te Taumutu Rūnanga can occur."* [14]

This is the background to the assessment of the Taumutu Rūnanga Natural Resource Plan.

[14] Reference: Te Taumutu Runanga Natural Resource Management Plan pg. 12

Assessment of draft Selwyn District Council Water Conservation and Demand Management Plan against Te Taumutu Rūnanga Natural Resource Management Iwi Management Plan

Ngā Whāinga – General Policy Objectives		Assessment and SDC draft WCDMP/Response
Section 1: Atmosphere and Air	*That the life supporting capacity of air be maintained and enhanced.*	Not applicable to the WCDMP
	That the concerns of tāngata whenua towards discharges of contaminants into airways are reflected in the resource consent process.	Not applicable to the WCDMP
Section 2: Mountain and foothill regions	*The quality and quantity of water in all mountain and foothill regions be improved to the point where it supports those fish and plant populations that were sourced from them in the past, and that these mahinga kai are fit for human consumption in accordance with tikanga.*	The WCDMP focuses more on delivery of council water supplies, but could recognise the linkages to overall management of water quantity in this catchment as discussed in relation to the MIMP above.
	Respect for mountain and foothills, and their significance to tāngata whenua.	This is not applicable to the WCDMP.
	That land use practices in these regions be appropriate to the nature of the landscape and natural carrying capacity of the land and water.	Not applicable as the WCDMP does not manage land use.
	That the values of unique mountain and foothill ecosystems such as repo raupō (wetlands) and tussocklands be restored and recognised.	Not applicable to the WCDMP
	That natural resource management in these regions reflect catchment based planning and the continued capacity for future generations to access, use and protect the resource.	The WCDMP recognises this policy by working within consenting framework.
Section 3: Canterbury Plains	*Respect for rivers and other waterways.*	The WCDMP does not directly state respect for rivers and other waterways. However, the WCDMP aims to manage water supply abstractions from rivers in a respectful way
	An understanding of tāngata whenua values such as no artificial mixing of waters to protect mauri.	The WCDMP does not include tāngata whenua values such as the unnatural mixing of waters.
	That land use practices on the plains be appropriate to the nature of the land and waterways.	Not applicable to the WCDMP does not manage land use.
	That the values of ecosystems such as wetlands/ repo raupō be restored and recognised.	Not applicable to the WCDMP

	All mahinga kai must have uninhibited passage from the rivers to the sea at all times.	Not applicable to the WCDMP
	That riparian and wetland enhancement is seen as a means for erosion control and as a means to enable waterways to regain their natural protection functions (e.g. bank stabilisation).	Not applicable to the WCDMP
	That natural resource management in these regions reflect catchment based planning and the continued capacity for future generations to access, use and protect the resources.	This WCDMP forms part of the larger catchment based planning framework.
	That the history of tāngata whenua remain on the landscape, through the protection of wāhi taonga, wāhi tapu, mahinga kai and wāhi ingoa.	Not applicable to the WCDMP
Section 4: The Lake and its Tributaries	*That Te Waihora be managed to improve the quality and quantity of the mahinga kai resources in the lake and surrounding areas, particularly the fishery.*	The management of Te Waihora is outside the scope of the WCDMP.
	That the lake's natural protection and resilience be restored, and that the values of ecosystems such as repo raupō be restored and recognised.	Not applicable to the WCDMP
	That natural resource management in these areas reflect catchment based planning and the continued capacity for future generations to access, use and protect the resource.	SDC will work with the zone committee.
	That the complexity and interdependence of different parts of the hydrological systems must be considered when carrying out activities that have known effects to water.	The WCDMP works within consenting framework.
	That Te Waihora and its tributaries be managed with respect for their cultural values.	Cultural values are discussed under section 1.4 of this document.
	That the land use practices and settlement patterns around the lake have the best interests of the lake first (learning to live with the lake).	Not applicable to the WCDMP
	All mahinga kai must have uninhibited access to and from the rivers that flow into the lake and the lake itself, and the sea, during spawning and migration periods.	Mahinga kai is not recognised in the WCDMP. However cultural values are discussed under section 1.4 of this document.
	That management must enhance the mauri of the lake and uphold the mana of Ngāi Te Ruahikihiki ki Taumutu.	The management of Te Waihora is not included in the WCDMP

Section 5: Coastal and Marine Environments	*Protection and sustainable management of coastal wetlands. All mahinga kai must have unlimited access between the rivers and the sea, at all times.*	Not applicable to the WCDMP
	Protection of kaimoana for future generations. Protection and sustainable management of coastal wetlands.	Not applicable to the WCDMP
	Protection of coastal dune areas for their ecological significance, and as landscapes that hold tāngata whenua history. Protection of kaimoana for future generations.	Not applicable to the WCDMP
	That natural resource management in coastal regions reflect catchment based planning (integration of land and sea) and the continued capacity for future generations to access, use and protect the resource. Protection of coastal dune areas for their ecological significance, and as landscapes that hold tāngata whenua history.	Not applicable to the WCDMP
	Support for further research on coastal erosion and other processes occurring in coastal areas from Kaitōrete Spit to the Rakaia River. That natural resource management in coastal regions reflect catchment based planning (integration of land and sea) and the continued capacity for future generations to access, use and protect the resource.	Not applicable to the WCDMP
	Support for further research on coastal erosion and other processes occurring in coastal areas from Kaitōrete Spit to the Rakaia River.	Not applicable to the WCDMP

Assessment of draft Selwyn District Council Water Conservation and Demand Management Plan against Ngāi Tahu Freshwater Policy.

The purpose of the Ngāi Tahu Freshwater Policy is to '*provide a foundation for resource management agencies and Papatipu Rūnanga planning for freshwater.'* It will continue the process of consultation and discussion which will further define:

- *The specific priorities and needs of Papatipu Rūnanga across the rohe of Ngāi Tahu; and*
- *The ways in which these priorities and needs can best be met.*[15]

[15] Reference: Ngāi Tahu Freshwater Policy

APPENDIX E

Education Initiatives

Be water wise this summer

Selwyn's population has grown by 33% since 2006. New bores and water supply upgrades are planned and underway for Rolleston, Lincoln and West Melton to provide additional capacity for the growing population.

Reducing water use is important in all areas of the district as Selwyn households tend to be high users of water. Residential properties connected to a Council supply used an average of 1,470 litres of water per day in 2012/13 and 1,386 litres per day in 2011/12. As a comparison, typical household use in New Zealand is around 675 litres per day.

Part of the reason why Selwyn households have higher water consumption is because properties tend to have large sections and over dry summers water use can increase significantly. Additional bores can be added to increase the capacity of Council water supplies, but this is costly and unsustainable.

Over summer, demand for water is much higher than in winter, as people use more water to maintain their lawns. When demand for water is very high during dry summers, water restrictions can be introduced if necessary.

Demand is especially high at the peak times of 6–9am in the morning and 4–9pm in the evening, when people use water for cooking, washing and dishwashers, and often water their lawns at the same time.

So that there is enough water to go around this summer, we are asking everyone to be careful about how they use water. Some areas like Rolleston also pay for their water based on metered use so reducing your water consumption will mean you spend less on water bills.

Tips for managing your water use

You can help manage your water consumption wisely by following these tips:

Your garden and lawn

- Water your garden and lawn every few days rather than every day. Wetting the soil surface every day encourages roots to develop at the surface, making them more vulnerable to hot dry spells.
- Water your garden and lawn outside of peak water usage hours (avoid 6am–9am, and 4pm–9pm). Watering in the early morning (before 6am) or late evening (after 9pm) will minimise evaporation loss. Also avoid watering in a Nor' West wind as the water will quickly evaporate.

Garden sprinklers can use up to 1,500 litres of water per hour. See the watanwise advice on how best to water your garden.

- Using a watering can or hand watering plants that need it by hose often uses far less water than a sprinkler.
- Use a timer to avoid overwatering as it makes plants more susceptible to fungus diseases and will leach out soil nutrients.
- Use mulch or cover the soil with a layer of organic matter to keep the soil moist. Mulches help protect plant roots from drying effects of sun and wind and also reduce weed growth.
- Check if the soil needs watering by digging down with a trowel and having a look. This is more accurate way to see if watering is needed than looking at the surface.
- Check you have the right head for your sprinkler. Sprinklers should apply water gently so that it seeps into the soil. Some sprinklers apply water at rates higher than the soil can absorb.
- When planting new additions to your garden choose drought resistant plants that don't require a lot of water.

Outdoors

- Wash your car with a bucket of water rather than a hose.
- Use a broom rather than hosing down paths and driveways.
- Inspect hoses and taps both indoors and outdoors to check for leaks which waste water.
- Collect rainwater for use watering gardens and lawns.
- If you have a swimming pool, keep it covered to stop the water evaporating.

Indoors

- Turn off the tap while brushing your teeth.
- Reduce your water consumption at the peak times of 6–9am and 4–9pm. Easy ways to do this include using your washing machine after 9pm at night, and putting your dishwasher on just before you go to bed.
- Take a short shower instead of a bath.
- Don't switch on the dishwasher or washing machine until you have a full load.
- Use a half flush when using the toilet.
- Rinse and peel vegetables in a bowl or sink instead of running them under the tap.

How much water do you use?

This chart shows the amount of water typically used for different household activities. Once you know where your water is going, you can think about how you could reduce your water use. If your water is metered and billed this will help reduce how much you spend on water.

Kitchen—Activity	Water used	Buckets
Dishwashing by Hand	12 to 15 litres per wash	1–1½
Dishwasher	20 to 60 litres per wash	2–6
Drinking, Cooking, Cleaning	8 litres per person	¾–1
Bathroom—Activity	Water used	Buckets
Toilet	4.5 to 11 litres per flush	½–1
Bath	50 to 120 litres (half full)	5–12
Shower (8 minutes)	70 to 160 litres per 8 minutes	7–16
Handbasin	5 litres	½
Tap Running (Cleaning teeth, washing hands)	5 litres	½
Leaking Tap	200 litres	20
Laundry—Activity	Water used	Buckets
Washing Machine (Front loading)	23 litres per kg of dry clothing	4–5
Washing Machine (Top Loading)	31 litres per kg of dry clothing	5–6
Outside—Activity	Water used	Buckets
Hand Watering by Hose	600 to 900 litres per hour	60–90
Garden Sprinkler	Up to 1500 litres per hour	150
Car Wash with Hose	100 to 300 litres	10–30
Filling Swimming Pool	20,000 to 50,000 litres	2,000–5,000
Leaking Pipe (1.5mm hole)	300 litres per day	30

Water Restrictions Introduced in Selwyn

Due to the very dry weather, and high demand for water at peak times, water restrictions are now in place for properties connected to the following Council water supplies:

Doyleston	Leeston	Prebbleton	Springfield
Kirwee	Lincoln	Rolleston	West Melton

Properties connected to the water supplies listed above may not irrigate lawns between the hours of 6am – 9am and 4pm – 9pm. Garden watering is permitted during these times. Lawn watering should also be limited at other times to conserve water.

These water restrictions are in place every day until further notice. We appreciate your helping us to sustainably manage our water supplies by observing the restrictions while these remain in force. For more information on water restrictions see www.selwyn.govt.nz.

Tips for managing your water use

- Water your garden and lawn every few days rather than every day. Wetting the soil surface every day encourages roots to develop at the surface, making them more vulnerable to hot dry spells
- If you have a timer, the best time to irrigate your lawn is in the early morning hours *(between midnight and 6am)*. This will allow the water to soak into the ground and minimise evaporation loss. Also avoid watering in a Nor' West wind as the water will quickly evaporate
- Using a watering can or hand watering plants that need it by hose often uses far less water than a sprinkler
- Use mulch or cover the soil with a layer of organic matter to keep the soil moist. Mulches help protect plant roots from the drying effects of sun and wind and also reduce weed growth
- Check you have the right head for your sprinkler. Sprinklers should apply water gently so it seeps into the soil. Some sprinklers apply water at rates higher than the soil can absorb
- When planting new additions to your garden choose drought resistant plants that don't require a lot of water
- Inspect hoses and taps both indoors and outdoors to check for leaks which waste water.

How much water do you use?

This chart shows the amount of water typically used for different household activities. Once you know where your water is going, you can think about how you could reduce your water use.

Inside - Activity	Water Used	Buckets
Dishwashing by hand	12 to 15 litres per wash	1 - 1½
Dishwasher	20 to 60 litres per wash	2 - 6
Drinking, Cooking, Cleaning	8 litres per person	¾ - 1
Toilet	4.5 to 11 litres per flush	½ - 1
Bath	50 to 120 litres (half full)	5 - 12
Shower *(8 minutes)*	70 to 160 litres per	7-16
Leaking Tap	200 litres per day	20
Washing Machine *(Front Loading)*	23 litres per kg of dry clothing	4 - 5
Washing Machine *(Top Loading)*	31 litres per kg of dry clothing	5 - 6
Outside - Activity	**Water Used**	**Buckets**
Hand Watering by Hose	600 to 900 litres per hour	60 - 90
Garden Sprinkler	Up to 1500 litres per hour	150
Car Wash with Hose	100 to 300 litres	10 - 30
Filling Swimming Pool	20,000 to 50,000 litres	2,000 - 5,000
Leaking Pipe *(1.5mm hole)*	300 litres per day	30

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