THE IMPACT OF EXCESS WATER USE CHARGES IN CHRISTCHURCH

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ABSTRACT

The Christchurch City Council introduced an excess water supply residential targeted rate in its 2021-31 Long Term Plan. The additional water use charge responded to ongoing calls for volumetric charging to support water demand management after excess use charges were removed for residential customers in 1989 when the city was amalgamated with Banks Peninsula.

The excess water supply residential targeted rate created much controversy about the fairness of a uniform water allowance and its impact on the garden city image. However, it also prompted customers to find and repair leaks and to be more mindful of their garden watering habits in order to avoid paying extra for water. This positive change in customer behavior has resulted in huge water demand savings over the past two summers. The 30% reduced peak water demand exceeds Council's predicted water demand savings and is equivalent to the production capacity of 9 medium-sized water supply pump stations. Because up to 50% of residential water was used by only 20% of customers, the majority of residents were not adversely affected by the new excess water use charge.

The immediate benefits of the reduced summer peak demands were reduced energy costs and avoided water restrictions that would have been needed because of ongoing capital improvement projects. If the change in the garden watering habits of Christchurch residents can be sustained, water supply capacity will be released to accommodate growth and provide significant capital and operating cost savings to existing and future Christchurch residents.

The policy provides for residential excess water use to be charged at a fixed rate of $1.35 for every 1,000 litres of water used in excess of the daily allowance.

Responding to 191 submissions, the Christchurch City Council adopted a change in the excess water supply residential targeted rate to increase the average daily water allowance from 700 to 900 litres as of 1 July 2023. This change will allow the garden city residents to use more water than the average New Zealander.

This paper outlines the Christchurch City Council journey towards excess water supply residential targeted rates and provides the detail of the water demand savings experienced over the past two summers. The benefits of continuing to charge excess residential water use are noted whilst recognizing that an increased daily water allowance will likely impact the water consumption in the next peak demand season.

KEYWORDS

Residential excess water use charges, volumetric charging, water demand management, peak water demand, water consumption

PRESENTER PROFILE

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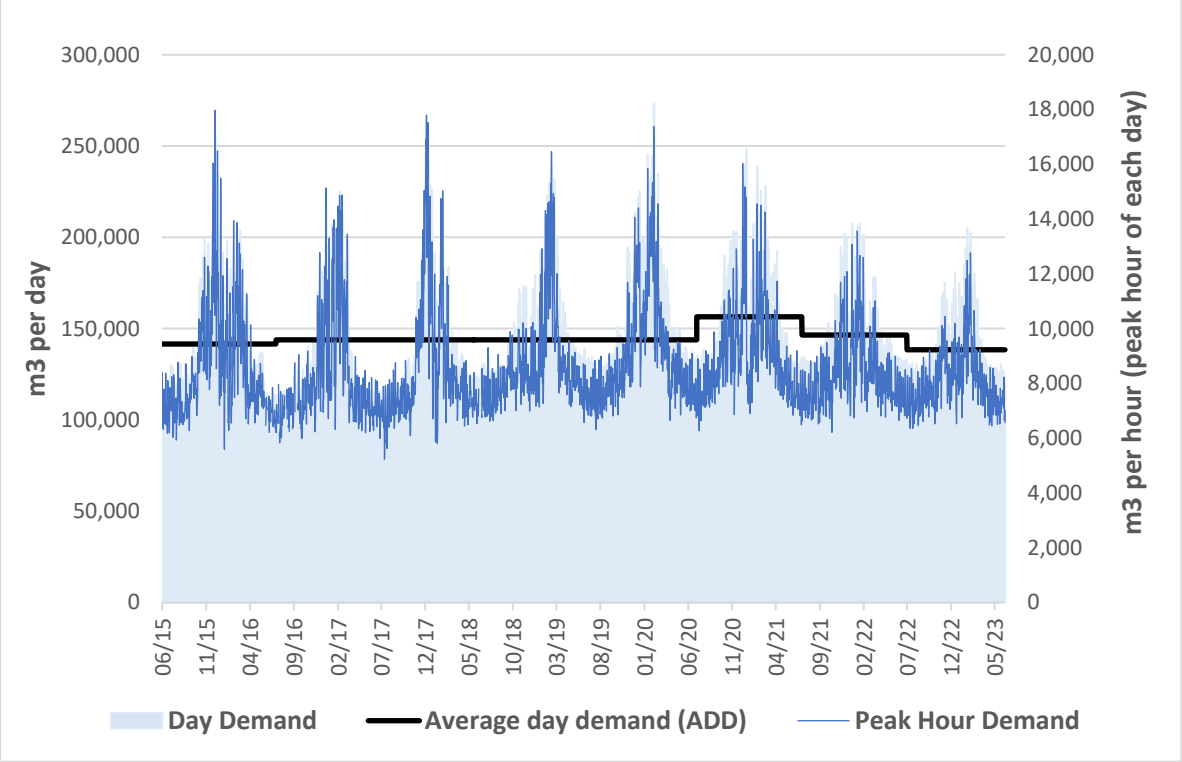
INTRODUCTION

Volumetric water charging is applied worldwide as a fair and equitable cost recovery mechanism by charging for water in proportion to the volume consumed. It is also well known that volumetric water charging promotes and enables water demand management. Water New Zealand (2014) has stated its support of metering and direct volumetric charges, noting that pricing mechanisms assist in the management of water demand by reducing household use. However, despite this support, the 2020-21 National Performance Review showed that most water services provider participants used targeted rates rather than employing direct volumetric charging.

Figure 1 below provides the Christchurch water demand profile and highlights the fact that the peak summer water demand is approximately double the peak winter demand. The high demand peaks in Christchurch are largely because of excessive residential garden watering over summer. One of the key objectives of volumetric charging in Christchurch is therefore not to simply reduce household water use, but rather to improve the utilization of water supply infrastructure capacity by reducing the peak demand.

Figure 1: Christchurch water demand profile



The Christchurch City Council adopted its *Te Wai Ora o Tāne Integrated Water Strategy* in September 2019. The strategy promotes volumetric charging as a measure to achieve water sustainability. Based on this mandate, staff continued to lobby for the introduction of an excess water use charge for residential customers and which resulted in the Christchurch City Council introducing an excess water supply residential targeted rate in its 2021-31 Long Term Plan.

DISCUSSION

BACKGROUND: EXCESS RESIDENTIAL WATER USE CHARGES

JOURNEY

Prior to the 1989 amalgamation with Banks Peninsula, Christchurch City was fully metered, and a capital value-based water charge was augmented by an excess water use charge for both residential and commercial customers. This changed after amalgamation when a uniform capital value-based water rate was applied to all properties and with excess water use charged for commercial customers only.

In July 1991, the Christchurch City Council initiated a program to achieve full water meter coverage. A total of 35,000 domestic water meters were installed over a five-year period.

Records that explore and promote volumetric charging for the city of Christchurch were traced back to 1990, including:

June 1990:	Report to Council entitled 'Charging for water in the new Christchurch City' recommends the installation of residential water meters so that water can be charged based on the volume of water consumed.
November 1992:	Council adopts a policy change that supports separate water supply connections to dwellings on a single parcel of land.
March 1995:	Report to Council entitled 'Charging Policy for Christchurch City's Water Supply' recommends a volume-based charge to support the efficient use of the Christchurch artesian aquifers.
May 1995:	Council releases for public consultation a 'Proposed Water Charging Policy' that recommends a capital value-based water rate and an excess water use charge for domestic users.
September 1995:	70% of 253 public submissions are opposed to a capital-value based charge with excess water use charges. The matter is referred back to the Committee, but Council adopts the implementation of meter reading. The Committee recommends further public consultation on alternative volume-based charging mechanisms. Due to the imminent elections, the matter is reverted to the new Council.

October 1996: Report to Council on 'Strategies for the Efficient Use of Water' that focuses on water conservation and the protection of the Christchurch artesian aquifers. The report references a significant drop (12%) in consumption between 1990 and 1995 that is attributed to increased water conservation publicity associated with meter installation. The report recommends that due to these savings and because of the large number of unmetered flats, that Council should NOT introduce volume-based charges during its current term, provided that the total consumption does not exceed a 'reasonably' determined consumption target.

June 1997: Council endorses that three or more residential units under single ownership on a single title should continue to be charged as a commercial user.

September 2000: Council agrees that meter reading should continue, and that the top 20% domestic water users should be identified but confirms that there is no intention to introduce consumption-based charges for consumers.

April 2008: The Maunsell Limited, *Water Charging Options Study* for the Christchurch City Council recommends that Council reviews the options available to fund water supply services and selects the mechanism which would best support the water supply objective of sustainable water supply management.

September 2019: The Christchurch *Te Wai Ora o Tāne Integrated Water Strategy* is adopted with the mandate to assess volumetric charging as a water demand management intervention.

December 2020: Briefing to Council on 'Demand Management and Charging for Water Services' that presents options for volumetric charges and recommends that residential water use above 700 litres per day should be charged in addition to the existing capital value-based targeted rate.

July 2021: An excess water supply residential charge targeted rate is introduced by the Christchurch City Council as part of its 2021 Revenue and Financing Policy.

The 'Funding Impact Statement' provide the specifics of the excess water supply residential targeted rates, including:

- Liability is calculated as a number of cents per cubic metre of water used in excess of an allowance of 0.7 cubic metres per day per separately used or inhabited part (SUIP) of a rating unit.

- A rate of $1.35 per cubic metre ($m^3$) of excess water supplied will be applied.

- This rate will be charged to all metered residential rating units where the meter records usage for a single rating unit.

- The rate will also be charged where the meter that records usage for multiple rating units has a special agreement in force specifying which rating unit/ratepayer is responsible for payment.

- Water meters are read progressively throughout the year. Following each reading, a water-excess charge invoice is issued for those rating units which are liable.

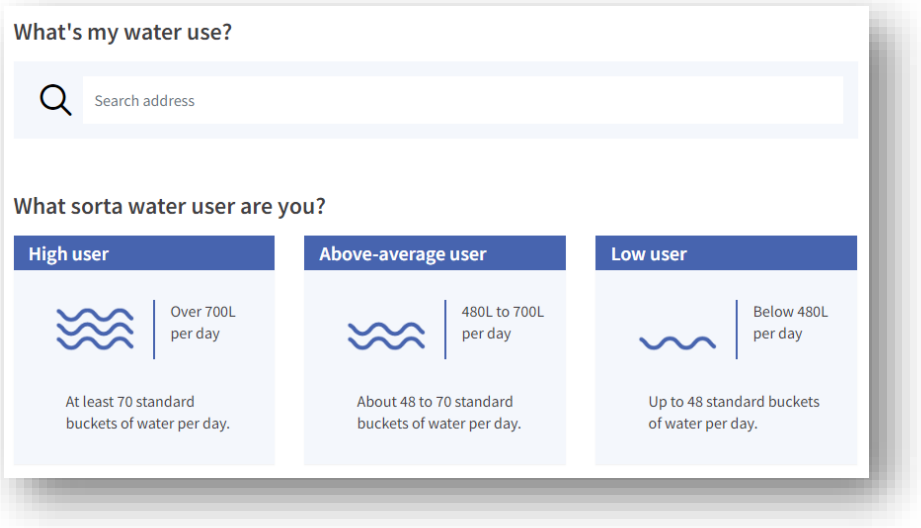
- The invoice will refer to the assessment and will bill for the consumption for the period of the reading.

IMPLEMENTATION

The following actions were taken to implement the Excess Water Supply Residential Targeted Rate:

October 2021: The Christchurch City Council increases the reading frequency of its residential water meters from bi-annually to quarterly and also introduces an intensive customer communication campaign termed 'Water like you Oughta'. The campaign included an online Water Reporter tool (as shown in **Figure 2**) that provides customers with access to their water consumption data. High water users received letters from Council, alerting them to a potential excess water use charge and providing them with an opportunity to identify and repair leaks before the excess charges are initiated.

Figure 2: Online Water Reporter Tool



October 2022: Charging for excess residential water use becomes effective as of the 1st of October 2022.

February 2023: The first invoices for residential excess water use are issued. The following administrative provisions apply:

- Households with high water use will not get charged until their bill tops $25 and their average use measures more than 900 litres a day. This provision was included to reduce the administrative burden on Council.

- Remissions are offered to households with nine members or more, who are using water responsibly, as well as households that are using more water due to personal circumstances, such as a medical condition.

- Ratepayers who can provide evidence that a leak has been fixed in a timely manner may also be eligible for a remission.

The billing statistics for the period October 2022 to June 2023, are as follows:

- 66,211 of 306,205 meter read records (22%) triggered an excess water use charge.
- Because of the $25 administrative remission, only 35,705 invoices (54%) were raised.
- The average invoiced amount was $128.74 for 3 months of excess water use.
- The median invoiced amount was $59.54 for 3 months of excess water use.
- The maximum invoiced amount exceeded $10,000 for 3 months of excess water use.
- 435 invoices of more than $1,000 were issued for 3 months of excess water use.
- 95% of invoices (33,816) were less than $300 for 3 months of excess water use.

INCREASED ALLOWANCE

As part of the draft FY2024 Annual Plan consultation process, the Christchurch City Council Mayor recommended that the average daily water allocation that is used for the excess water supply residential targeted rate should be increased from 700 litres per day to 900 litres per day.

Precisely half of the 381 Annual Plan submissions received on the matter were vehemently opposed to the uniform daily allowance, stating that it is not fair towards larger families and also that it is inadequate for maintaining gardens in the garden city. Some also complained about the unfair advantage that those with a shared water meter may have.

The vote on the Annual Plan recommendation was tied and therefore resulted in the adoption of the Mayor’s request to increase the average daily residential water allowance to 900 litres as of 1 July 2023.

OVERVIEW OF THE CHRISTCHURCH WATER SUPPLY SYSTEM

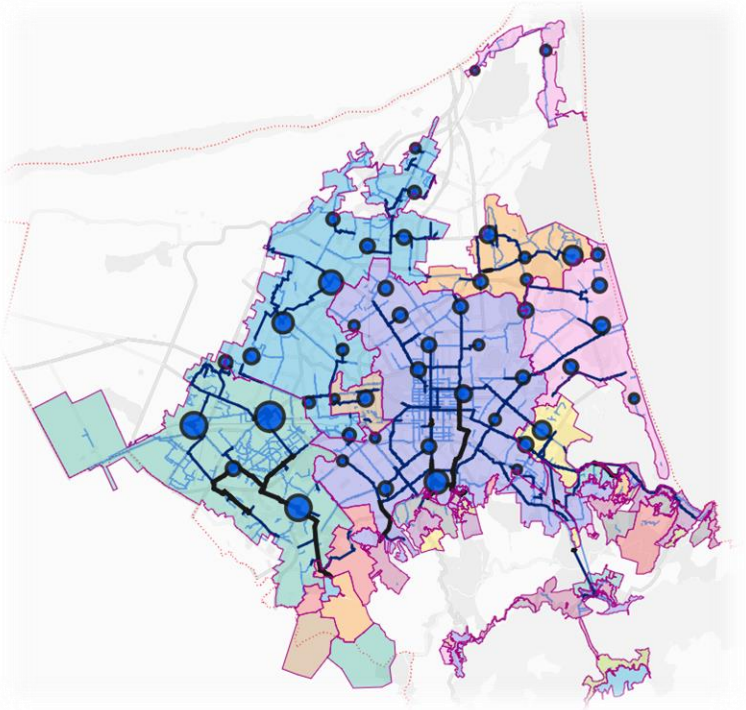
Christchurch is serviced by groundwater that is abstracted from deep, confined aquifers below the city at multiple and dispersed locations. A total of 49 pump stations are used to abstract groundwater and to supply drinking water into 8 primary water supply zones as shown in **Figure 3.** Drinking water is pumped on-demand into an integrated reticulation network to service approximately 160,000 customers. Parts of the city which border the hills to the south are supported by water storage facilities that are grouped into secondary water supply zones. The water supply infrastructure evolved over time to match the development within each water supply zone.

The Christchurch City Council operates self-sufficient water supply zones. This means that there must be adequate capacity in each water supply zone to allow the zone to operate independently in delivering the demand in accordance with the adopted levels of service.

Because of the nature of the Christchurch water supply system, water supply pump stations and networks are sized to deliver the full peak water demand that occurs for only a few days over summer. This means that for most of the time, the available capacity is under-utilized. Maximum pump station capacity is used only 5% of the time each year. If peak water demand can be permanently reduced, then the underutilized water supply capacity can be used to accommodate growth. Reduced peak demands will also provide opportunities to rationalize the water supply system by reducing the number of groundwater abstraction pump stations that are needed to service the demand.

Figure 3: Map of the Christchurch urban water supply system

Map Notes: Blue circles indicate pump stations with the size of the circle a reflection of the pump station capacity. The main water supply network is presented as lines. Each water supply zone is shaded with a different colour.



WATER DEMAND PLANNING

Water demand forecasting forms the basis of water services planning. The Christchurch water demand is projected over a 50-year planning horizon and then mapped against available capacity to inform the water supply master plan.

For Christchurch, additional water supply capacity is required when:

1. Volume is exceeded when the peak demand is higher than the capacity of the groundwater abstraction wells that are used to supply water into the zone (measured as cubic metres per day); or

2. Flow Rate is exceeded when the instantaneous peak demand is higher than the capacity that can be delivered by pump stations supported by storage (where applicable) into the zone (measured as cubic metres per hour and referenced as peak hour peak day demand).

In the event that capacity is exceeded for either of the above cases, a reduced level of service will be experienced as reduced pressure or less flow at the tap. If demand continues to exceed capacity, a total systems failure can occur where sections of the network would be without water flow.

To avoid a loss of service, it is best practice to provide for water supply resilience either through additional supply capacity, more storage or the ability for cross boundary supply. A last resort is available through the Christchurch Water Supply and Wastewater Bylaw (2022) which entitles Council to impose water restrictions in cases of drought, emergency, maintenance, excessive demand or other reasons. Water restrictions are targeted at limiting outdoor water use in the form of volume restrictions, type of garden watering and restrictions on the time of day, or day of garden watering.

Future Christchurch water supply infrastructure is therefore sized by adding the demand projection to the historic peak demand, termed the design base.

REALIZED IMPACTS OF EXCESS WATER USE CHARGES

REDUCED CONSUMPTION

Water consumption means the volume of water used by a customer as measured by a water meter. Because of the variation in the granularity and rotation of water meter reads, care must be taken when interpreting a collective water consumption value, especially because this does not represent the demand on any particular day.

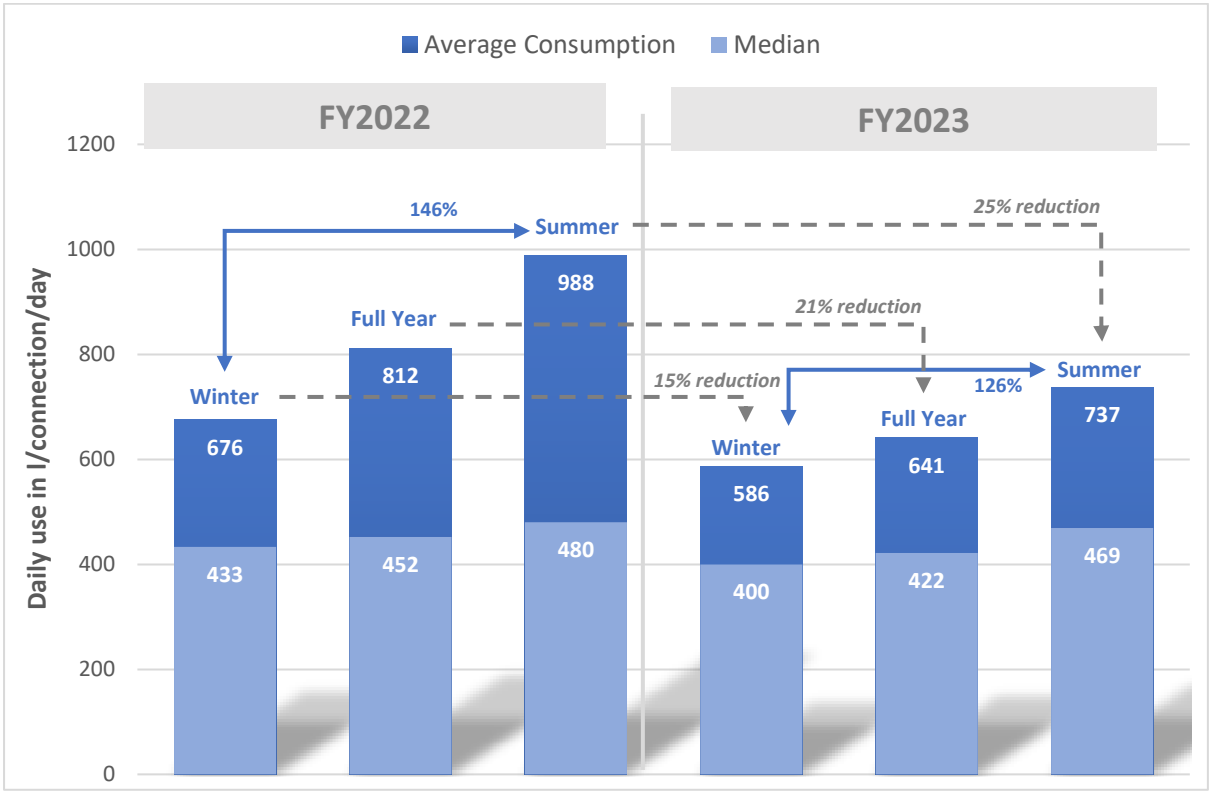
Smart water meter technology will increase the granularity of meter reads to better support private leak detection and to improve knowledge about customer water use patterns.

As mentioned above, the first step towards implementing the excess water supply residential targeted rate was to increase the water meter reading frequency from bi-annually to quarterly. This now makes it possible for Council to understand the seasonal variation in customer consumption. Because meters were only read bi-annually before October 2021, a comparison with historic summer water consumption cannot be performed.

Figure 4 demonstrates that, after the excess water supply residential targeted rate was introduced in the 2022 financial year (FY2022), but before charges were raised for the first time in the 2023 financial year (FY2023), Christchurch residents used on average 988 l/connection/day of water over the Nov'21 to Mar'22 summer period. This represents 150% of the average winter water consumption for FY2022. By comparing the FY2022 average water use of Christchurch residents with the 2021-22 National Performance Review (Water New Zealand, 2022), it is concluded that Christchurch residents used more water than many others in New Zealand.

After the charging of excess residential water use started in October 2022, the residential water consumption dropped by 25% to 737 l/connection/day over the Nov'22 to Mar'23 summer period. Because of this drop, which is attributed to reduced garden watering, the average summer water consumption also reduced to 126% of the winter water consumption. As shown in **Figure 4**, the average winter water consumption reduced by 15% in FY2023 and the annual average consumption by 21%

Figure 4: Seasonal variations in consumption

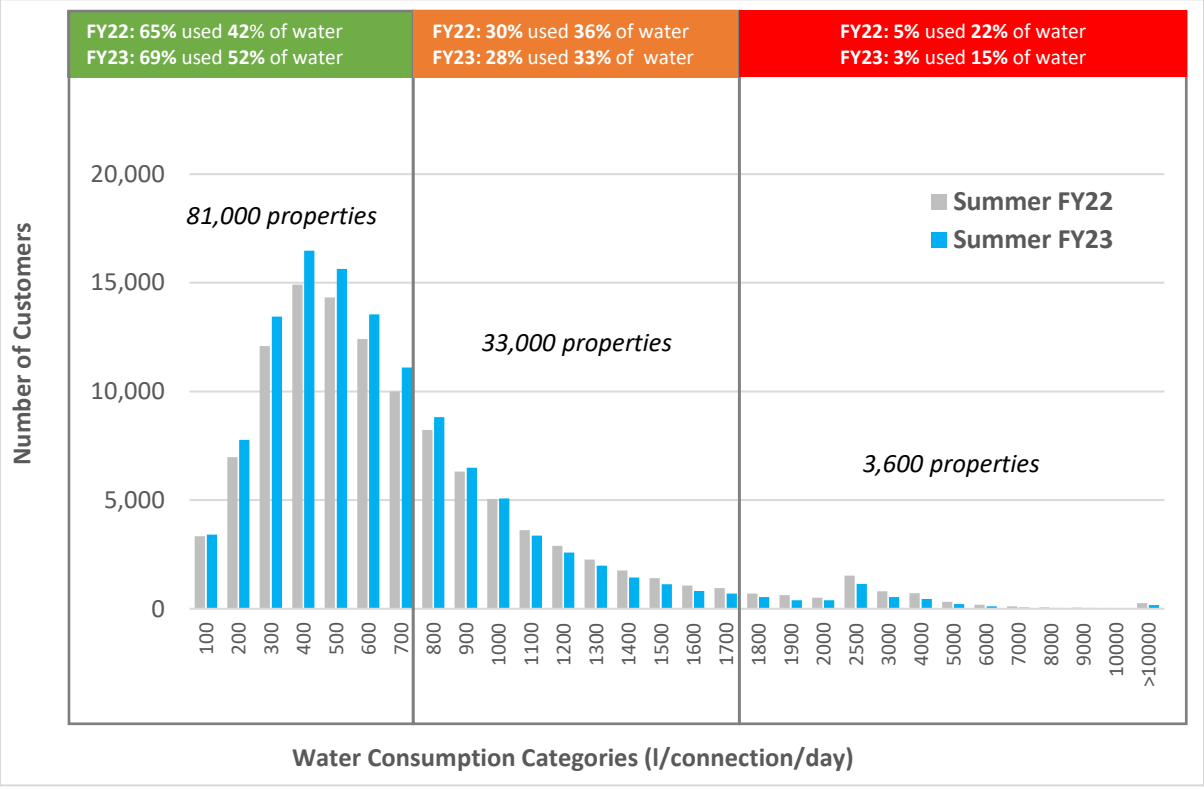


A customer consumption comparison and histogram based on customers' highest quarterly consumption are presented in **Table 1** and **Figure 5** respectively.

Table 1: Summer customer consumption comparison

	Summer FY22 Nov'21 to Mar'22	**Summer FY23** Nov'22 to Mar'23	**% Change**
Number of meters read	113,517	117,878	+4%
Total consumption (Ml)	27,854	15,176	-45%
Water users < 700 l/day			
- % of users	65%	69%	+3%
- % of consumption	42%	52%	+10%
Water users < 900 l/day			
- % of users	78%	82%	+4%
- % of consumption	52%	65%	+13%

Figure 5: Christchurch customer consumption histogram



It is apparent that residents became more mindful of their water use and garden watering habits as a result of excess water use charges. The change in water use patterns confirms that more customers used less water after Council started charging for excess residential water use. Before the excess residential water use charges were activated, the top 20% of customers consumed approximately 50% of the total residential demand. After the implementation of excess water use charges, the water consumption of the top 20% of customers reduced to 35% of the total residential demand.

Almost 70% of customers managed to use, on average, less than 700 litres of water per day and approximately 80% of customers used on average less than 900 litres of water per day. This resulted in only 12% of water meter reads triggering an invoicing of excess water use charges.

PEAK WATER DEMAND SAVINGS

The water supplied into the network from the city's several pump stations is termed the 'water demand' and includes both residential and commercial consumption as well as water losses. Since all Council's water supply pump stations are equipped with telemetered flow meters, water demand can be determined at high granularity.

Peak day demand refers to the maximum volume of water supplied into the network on a particular day of the year and normally occurs in summer. The instantaneous demand represents the maximum water flow rate delivered at a particular time on a particular day.

The Christchurch City Council's hydraulic water network model was updated in September 2021 and provided for the reset of the historic peak water demand used for planning purposes. A new peak day demand occurred in February 2020 (previous peak was set in December 2015).

Table 2 provides the peak demand per water supply zone over the past two summers as compared to the February 2020 peak demand.

The data confirms the massive impact that excess water use charges had on customer behaviour and resulting in a reduction of almost 30% in the city's peak day demand and peak instantaneous flow demands. The instantaneous peak demand saving of 1,300 l/s (4,618 m^3/hr) is equivalent to the production capacity of 9 medium sized pump stations (at 500 m^3/hr per pump station).

The peak day demand savings of 68,000 m^3/day is equal to 12% of the Christchurch City Council's water take consent.

The change in peak demand patterns was seen in most of the water supply zones (with the exception of the Riccarton WSZ), but the degree of reduction and the impact of the reduction varies from zone to zone. The largest reductions were seen in the Parklands WSZ and the Rawhiti WSZ. These zones are known for its intensive and frequent garden watering practices due to the presence of sandy soils.

Table 2: Peak water demand comparison

PEAK INSTANTANEOUS FLOW DEMAND					
Water Supply Zones	**Historic Peak** (Feb 2020)	**FY22 Peak**	**FY23 Peak**	**Saving** (Historic Peak minus FY23 Peak)	FY23 Peak **% Change** from Historic Peak
	m^3 per hour				
Brooklands/Kainga	156	107	113	43	-28%
Central	5,440	5,287	4,804	636	-12%
Ferrymead	1,101	895	847	254	-23%
North West	4,276	2,610	2,650	1,626	-38%
Parklands	1,519	1,257	941	578	-38%
Rawhiti	1,503	1,344	1,148	355	-24%
Riccarton	583	562	763	-180	+31%
West	3,391	2,204	2,320	1,071	-32%
TOTAL	**17,382**	**13,560**	**12,764**	**4,618**	**-27%**
PEAK DAY DEMAND					
Water Supply Zones	**Historic Peak** (Feb 2020)	**FY22 Peak**	**FY23 Peak**	**Saving** (Historic Peak minus FY23 Peak)	FY23 Peak **% Change** from Historic Peak
	m^3 per day				
Brooklands/Kainga	2,414	1,443	1,752	661	-27%
Central	104,166	83,756	81,531	22,635	-22%
Ferrymead	21,298	17,261	15,887	5,411	-25%
North West	57,207	37,921	39,268	17,939	-31%
Parklands	18,533	14,286	11,890	6,643	-36%
Rawhiti	21,919	16,920	14,626	7,293	-33%
Riccarton	5,845	6,021	6,379	-533	-9%
West	48,860	38,276	37,611	11,248	-23%
TOTAL	**273,268**	**207,810**	**204,805**	**68,443**	**-25%**

Note: Total is not the sum of individual WSZ peaks but rather the actual overall peak

The peak demand reduction achieved in the city of Christchurch because of excess residential water use charges is graphically presented in **Figure 6** and **Figure 7** below. The black line on the graphs shows the measured peak and average flow (including records with and without excess water use charges that were introduced in October 2021 and became effective in October 2022). The measured peak flow for both the peak instantaneous demand (**Figure 6**) and peak day demand (**Figure 7**) is well below the demand scenario predictions developed for the city water master plan.

The comparison of the measured flow after excess residential water use charges versus the predicted future demand indicates that there is an opportunity to sustain considerable demand savings through the ongoing use of excess water charges (refer to yellow bars on the graphs showing the predicted savings).

Figure 6: Christchurch peak instantaneous demand forecast versus measured savings

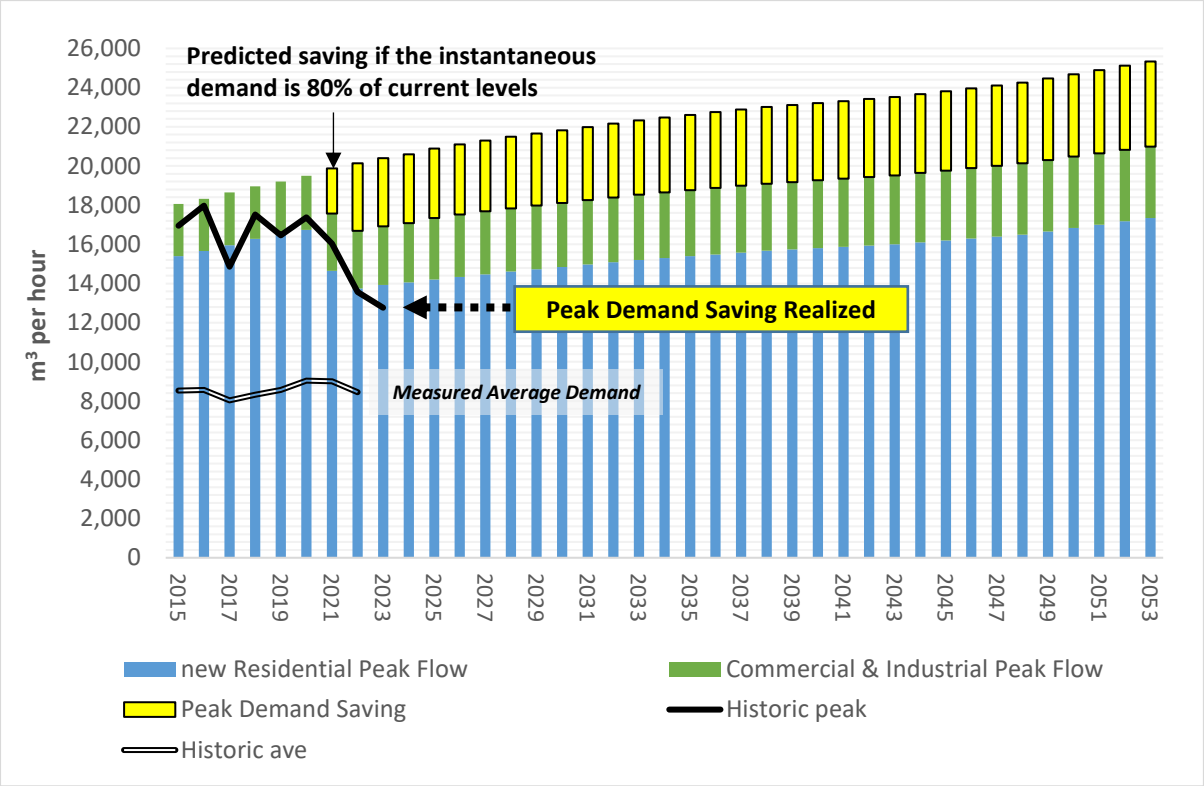
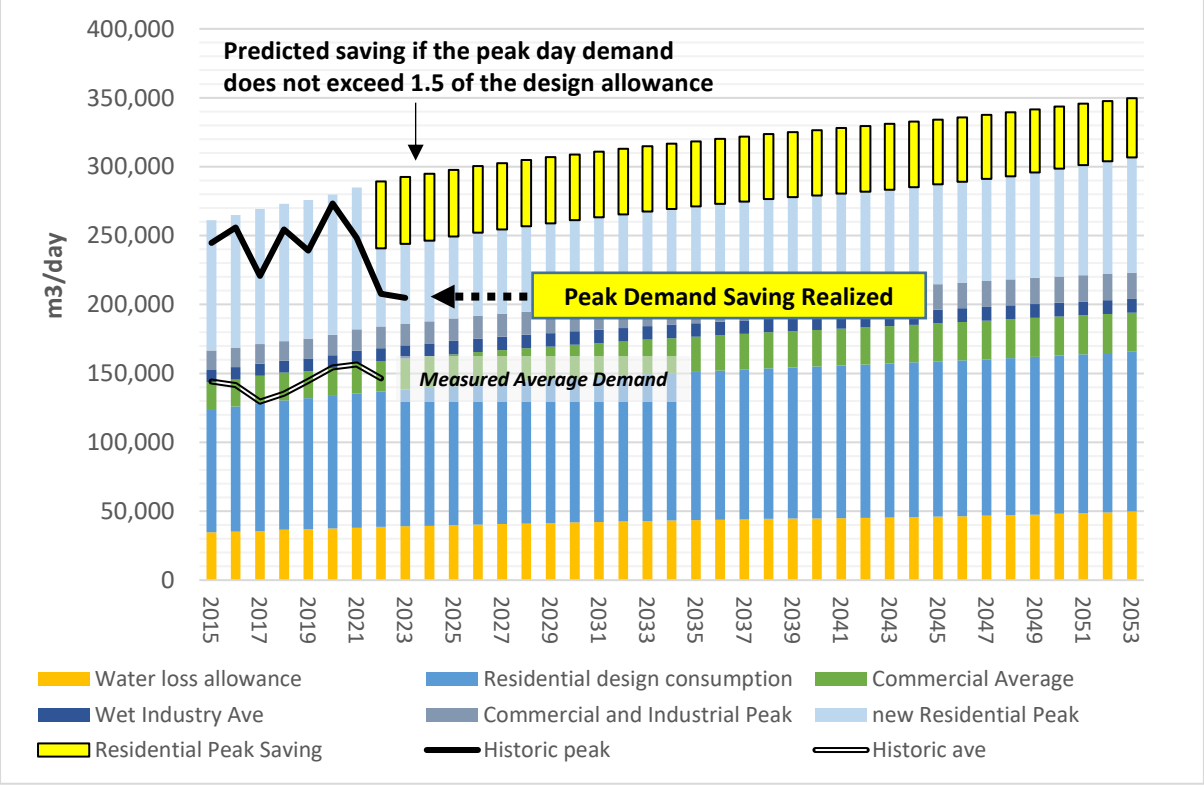


Figure 7: Christchurch peak day demand forecast versus measured savings



SUMMARY OF BENEFITS OF REDUCED DEMAND

The benefits of reduced peak water demand are characterized as both immediate and long-term effects as described below.

Immediate benefits:

- A reduced instantaneous peak water demand of 4,618 m^3/hour, that is equal to the production capacity of up to 9 medium sized water supply pumpstations (sized at 500 m^3/hour per pump station).
- Water restrictions could be avoided despite the reduced capacity in several water supply zones because of many ongoing capital improvement projects.
- Reduced pumping energy costs as opposed to previous summers.
- Reduced greenhouse gas emissions for FY2023 and FY2022.

Long-term benefits:

The economic benefits of a reduced peak water demand are quantified in the *Christchurch Water Master Plan Optimisation Report*. It was determined that a 20% reduction in peak instantaneous flow demand will have the following impact over the 50-year planning horizon and a 100-year economic life cycle:

- Capital saving of up to $150 million because 25 fewer wells and 8 less pump stations will be needed to service the predicted future water demand.
- An estimated operating cost saving of $48 million over the 100-year economic life cycle.
- Pump energy saving of approximately $1 million per year.

If the change in customer behaviour can be sustained and the reduced peak can be accepted as the new design base, capacity would be released to accommodate growth and opportunities could arise to rationalize the water supply system.

A practical example of rationalization opportunities can be found in the Parklands water supply zone (see **Figure 8**), where it is proposed to decommission two non-compliant water supply pump stations. With a reduced peak demand, the capacity of the remaining three pump stations will be sufficient to deliver the future demand but because of insufficient resilience capacity, additional mitigation measures are needed before these pump stations can be decommissioned. However, if the full 38% reduction in the peak instantaneous demand can be sustained, sufficient capacity is available to meet the future demand even if the largest water supply pump station should fail to operate.

Figure 8: Demonstrating the opportunity to rationalize the Parklands WSZ

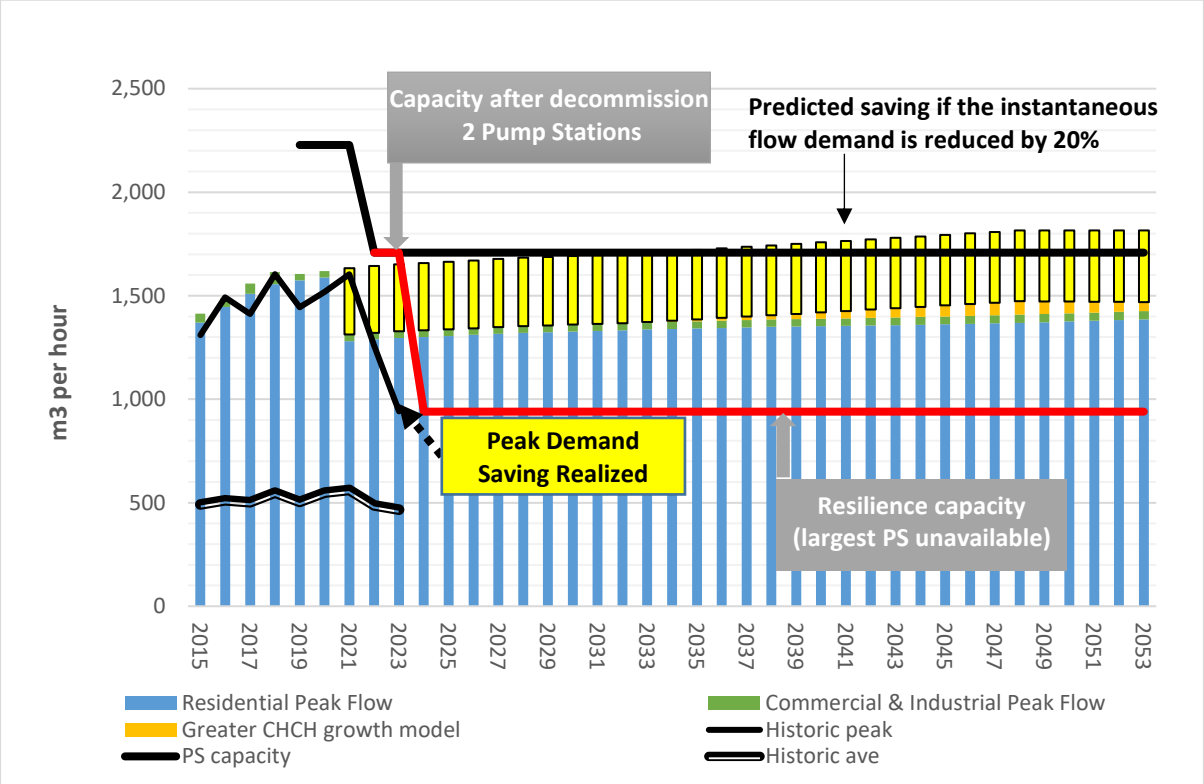


Table 3 confirms that the excess water supply residential targeted rate also supports water conservation and water sustainability. The annual volume of water supplied into Christchurch city reduced by more than 6 million cubic metres in FY2023. Council received many reports of customers that have identified and repaired leaks.

Table 3: Annual profile of Christchurch water savings

Financial Year	**Total Volume of Water Supplied** (m3)	**Change from FY2020** (m^3/%)
FY2020	56,506,029	
FY2021	57,112,933	606,903 (+1%)
FY2022	52,546,456	-3,959,573 (-7%)
FY2023	50,100,900	-6,204,129 (-11%)

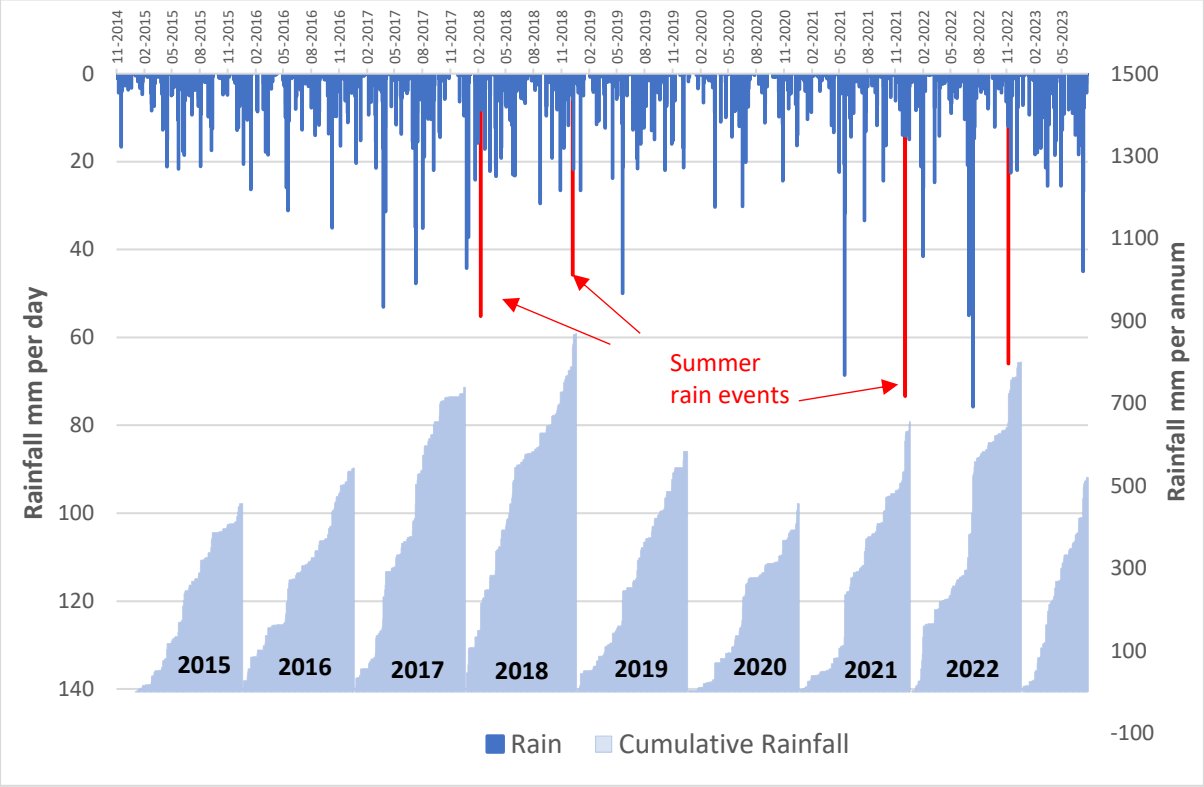
IMPACT OF RAIN ON GARDEN WATERING

The Christchurch rainfall since 2015 is presented in **Figure 9** and shows the cumulative annual rainfall on the bottom axis and the daily rain volumes on the top axis.

Although the cumulative rainfall for 2021 and 2022 was higher than the rainfall in 2020 when the historic peak day water demand occurred, it is similar to the rainfall experienced in prior years with higher peak instantaneous water demands.

Figure 9 also demonstrates that Christchurch experienced summer rain in December 2021 and in November 2022. Again, this is similar to what was experienced in the 2017 and 2018 summer periods when peak water demand remained high.

Figure 9: Christchurch annual and daily rainfall



Antecedent dry days refer to the cumulative number of days between rain events.

A comparison of water demand with antecedent dry days in **Figure 10** below suggests some relationship between the reduced water demand in FY2023 to a decline in antecedent dry days.

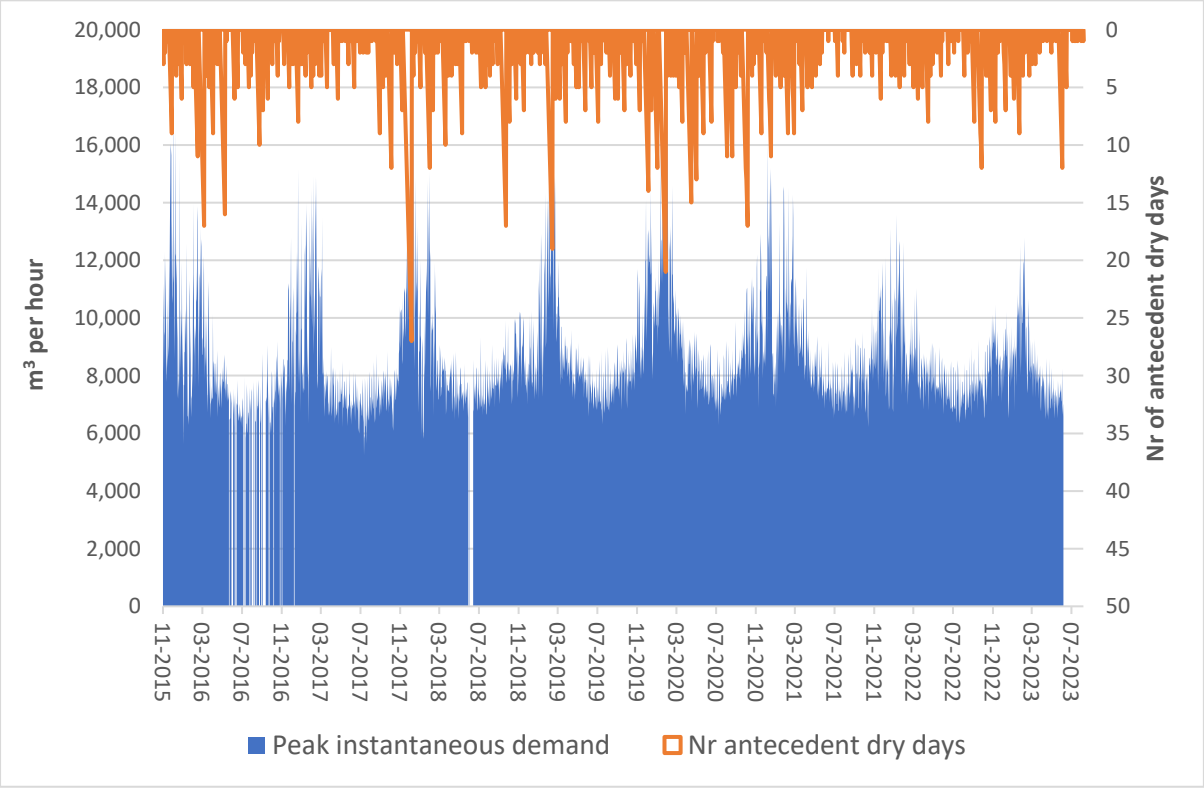
Table 4 compares the antecedent dry days, averaged over each financial year and total rainfall over the past 7 years with the peak day and peak hour, peak day water demand.

Table 4: Comparison of rainfall, antecedent dry days and peak demand

Financial Year	Antecedent Dry Day Average	Max Antecedent Dry Days	Cumulative Rainfall	Peak Day Demand	Peak Instantaneous Demand
	Nr days	Nr days	mm	m^3/d	m^3/hr
FY2017	1.07	10	629	225,106	15,137
FY2018	2.40	27↑	915 ↑	259,123	17,797 ↑
FY2019	2.00	19	571	239,122	16,462
FY2020	2.82 ↑	21	545	273,268 ↑	17,382
FY2021	1.91	17	531 ↓	248,371	16,034
FY2022	0.80 ↓	8 ↓	660	207,810	13,560
FY2023	1.33	12	888	204,805 ↓	12,764 ↓

Note: ↑ highest; ↓ lowest

Figure 10: Peak instantaneous demand compared with antecedent dry days



According to Figure 10, the higher peak water demand in previous years followed an increased number of days without rain. The relationship between antecedent dry days and peak demand is less pronounced in FY2022 and FY2023.

The increased rainfall and fewer dry days in FY2022 and FY2023 may have contributed to the reduced peak water demand, but higher peak water demands were also experienced in previous years with similar rainfall patterns. Although it can be argued that some of the reduced demand is because of higher rainfall received over the past two years, the overall savings are more than can be credited to rain only.

CONCLUSIONS

This paper presented the information to demonstrate that the introduction of an excess water supply residential targeted rate in Christchurch has resulted in significant water consumption and water demand savings. The Three Waters team are delighted about the reduction in the peak water demand and its potential to release capacity for growth and to provide opportunities for water supply rationalization, whilst also supporting water sustainability. Christchurch residents should also be pleased with the operational cost savings that will come from reduced pumping and the operations and maintenance of fewer pump stations.

As of 1 July 2023, the residential allowance that will apply before excess water charges are raised will increase to 900 litres per property per day. It is uncertain to what degree this will impact garden watering habits next summer and whether sufficient impetus would remain for customers to detect and fix plumbing leaks. Because of the previous year's well publicized administrative remission whereby customers with an average daily water use of 900 litres per day were not charged, the hope is that the increased allowance will not completely reverse the peak consumption and peak water demand savings seen to date. It will also be necessary to test whether a dryer summer will impact the peak summer demand, despite excess residential water use charges.

Because of the uncertainty in this respect, the Christchurch City Council water services master plan will remain unchanged, and funding will be requested in the next Long-Term Plan for additional water supply capacity to accommodate growth as based on the historic high peak demands.

In the meantime, the Christchurch City Council is replacing its water meters with smart water meters to further support water supply demand management.

ACKNOWLEDGEMENTS

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