Waikato District

Water Demand Management Plan

PREPARED FOR WAIKATO DISTRICT COUNCIL| MAY 2021

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Revision Schedule

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PROJECT MANAGER	PROJECT TECHNICAL LEAD
Ben Davies	Ben Davies

PREPARED BY		
Ben Davies, Jessel Villaflor, Paula Hunter		12 / 05 / 2021
CHECKED BY		
Ben Davies, Jessel Villaflor		12 / 05 / 2021
REVIEWED BY		
Ben Davies		12 / 05 / 2021
APPROVED FOR ISSUE BY		
Ben Davies		12 / 05 / 2021

Level 15, 10 Brandon Street Wellington 6011
PO Box 13-052, Armagh, Christchurch 8141
TEL +6404 381 5700

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Executive Summary

Waikato District Council (WDC) has a District Wide Water Demand Management Plan (WDMP), which provides background information and an analysis of water management in the District's 10 water supply schemes, discusses current business as usual water demand management activities and presents options for improving water demand management in the future.

WDC's first water demand management plan was completed in December 2007. It has been updated four times since then in August 2008, July 2009, April 2015, and now (May 2021). Pokeno, Tuakau, Onewhero and Port Waikato were not included in the 2008 and 2009 WDC WDMPs as they were part of the Franklin District Council which was disestablished as part of the boundary readjustments between the Waikato and Auckland Councils in 2011.

WDC has elected to continue to call this document a WDMP so that the purpose of the document can be readily understood by a general audience and to be consistent with previous WDMPs prepared by WDC. This WDMP covers all of the information required in a Water Management Plan (WMP) by Variation 6 (RPV6) of the Operative Waikato Regional Plan as listed in Table E1-3.

The 10 water supply schemes are Pokeno, Tuakau, Mid Waikato, Huntly, Central District, Southern Districts and Western Districts, Raglan, Port Waikato, Onewhero and Te Akau. The seven main water schemes are Huntly, Central District (including Ngaruawahia and Hopuhopu/Taupiri), Raglan, Mid Waikato (previously known as the Te Kauwhata area), Southern and Western Districts, Pokeno and Tuakau servicing primarily the urban areas of the district. The three remaining schemes service villages and rural areas. The current estimated population served with water is around 44,900.

The main water source for the Waikato District is the Waikato River. This accounts for approximately 90% of the annual water production for the Waikato District. The water sources for Raglan, Onewhero and Te Akau are outside of the Waikato River catchment. The isolated communities of Raglan and Onewhero draw water from springs, and Port Waikato draws from a stream. Te Akau used to be serviced from bore until April 2021 when the water treatment plant experienced difficulties maintaining the chemical compliance of DWSNZ and identified risk of bore pump failure. The water is now trucked from Raglan network for the Te Akau WTP while alternative solutions to supply Te Akau are investigated.

WDC provides reticulated water supply to the community for domestic, industrial, dairy, agricultural uses and firefighting capability. The urban areas receive an "on-demand" supply with most of the surrounding rural areas receiving a "trickle feed" supply.

WDC has almost full universal metering in all schemes. Approximately 1% of customers remain unmetered, spreads across the Huntly, Raglan and Central District systems.

WDC have agreed to have a fixed connected charge across the district plus a targeted rate per volume consumed (subject to adoption of the Final LTP 2021-31). These charges will be the same across all supplies irrespective of the source or whether they are a large water consumer. The meters will continue to be read every 6 months initially, however this may change in the future.

Current Performance

Comparison of recent abstracted water demands with Water New Zealand's (Water NZ) "National Performance Review" (NPR) showed that the WDC schemes generally fit within the spread of values from the other NZ councils. Mid Waikato had the highest bulk demand per connection of the WDC schemes and one of the highest nationally. However, this is not unusual for a predominantly rural scheme such as this. Pokeno and Tuakau had the lowest bulk demands per connection of the WDC schemes and close to the lowest nationally. This is likely due to large proportions of new housing and networks with few leaks and a low proportion of non-residential demand.

Comparison of recent water loss results showed that the 2019/20 water loss performance for Tuakau and Pokeno compared very well against the NZ data from the 2019/20 NPR. Huntly,

Central District and Raglan were closer to the average and Mid Waikato compared badly. However, once again the predominantly rural nature of this scheme should be taken into account. The comparison of the water loss results is shown in Table E1-1 below. The small schemes were excluded as the water loss calculated for these schemes are not reliable.

Table E1-1: CARL comparison of WDC schemes against 2019/20 NPR average

	Current Annual Real Loss (CARL) L/connection/day
Average of participants in 2019/20 NPR Schemes	298
Tuakau	36
Pokeno	43
Huntly	143
Raglan	245
Central District	284
Southern and Western Districts	175
Mid Waikato	543

Significant uncertainties remain in the areas of customer categorisation and bulk metering in some small schemes.

Expected Growth to 2061

Expected growth in demand was determined from household growth projections for each system. The anticipated growth was compared to current WTP capacities, resource consents and third-party agreement limits.

The outcomes are summarised in Table E1-2 below.

Table E1-2: Supply Demand Balance Outcomes Summary

System	**2061 Demand Growth Summary**	**Constraints Summary**
Tuakau	From 2k to 7k m^3/day	No consent or limit through agreement with Watercare.
Pokeno	From 2k to 5k m^3/day Some uncertainty around whether the growth figures used include ongoing developments.	No consent or limit through agreement with Watercare.
Raglan	From 2.5k to 4.0k m^3/day	Consent of 3.1k will be exceeded around 2029 WTP capacity of 3.6k exceeded around 2043.
Huntly	From 5k to 12k m^3/day. Around 4.5k of this is Ohinewai C/I growth - This may be supplied by Mid Waikato at a later stage. It is uncertain whether this will go ahead.	Consent of 7k exceeded by 2026. WTP capacity of 8k exceeded by 2029. Supply of up to 2 MLD to Central District also expected.
Mid Waikato	From 3.5k to 13k m^3/day	Te Kauwhata agreement of 4k (expired in 2016) exceeded by 2022. 3rd party consent expires in 2024. WTP capacity of 4.5k exceeded by 2023.
Central District	From 4k to 5.5k m^3/day	WTP capacity 4.3k exceeded around 2023. Consent rises from 4.3k to 5k over time but may be exceeded around 2030.
Southern & Western District	From 4k to 6k m^3/day	Agreement with HCC of 5k is exceeded around 2040.
Te Akau	All growth assumed self-sufficient for water.	Consent expires in 2024. WTP capacity sufficient for existing demand.
Onewhero	All growth assumed self-sufficient for water.	No consent required - permitted activity. WTP capacity sufficient for existing demand.

System	2061 Demand Growth Summary	Constraints Summary
Port Waikato	All growth assumed self-sufficient for water.	Consent expires in 2051. WTP capacity sufficient for existing demand.

Action Plan

WDC currently has a number of business-as-usual water demand management activities including:

- Annual water balance reports.
- Restriction and metering of rural properties.
- Asset management pipe renewals.
- Comparison of performance with participation in the Water NZ annual benchmarking.
- Preparation of a rainwater tank strategy to encourage implementation of rainwater tanks.

In addition to these business-as-usual activities, WDC has already improved measurement and monitoring of system and customer demands through the implementation of universal metering in all schemes, and leakage reduction projects in the Draft 2021-31 LTP.

This WDMP also includes an action plan for improving water demand measurement through activities such as improving management of the customer billing data. Other priorities for other future water demand management interventions include monitoring of high users, developing a standard water supply agreement for high users and developing a facilities management policy to improve water efficiency in Council owned facilities.

Table E1-3 presents a cross-reference of the contents of this WDMP against the information required in a WMP by RPV6.

Table E1-3: Cross-Reference of information required by Variation 6 with this Water Demand Management Plan

#	Index of information required by Variation 6 to be included in a Water Management Plan	Section of this document
1	A description of the water supply system including system operation, distribution extent, water use measurement, maintenance and asset management procedures.	3 and 4
2	A comprehensive assessment of existing demand and future demand for water with regard to an assessment of reasonable population growth within the planning horizon to meet the following: a) reasonable domestic needs; b) public health needs in accordance with requirements under any Act of Parliament or regulation; c) reasonable community needs (e.g. for public amenities); d) reasonable commercial, rural supply, and industrial need; e) an assessment as to how each of the assessments required by clauses a) to d) above is predicted to vary over time; f) a justification for each of the assessments required by clauses a) to e) above including reference to any relevant planning instruments promulgated under the Resource Management Act 1991 that provide for future growth or relevant documents promulgated under the Local Government Act 2002 such as Long-Term Plans, growth strategies or spatial plans.	5 and Appendices A through H
3	Any existing or proposed water pricing procedures and any linkages with wastewater pricing or management.	3.2
4	How water reticulation networks are planned and managed to minimise their water losses as far as practicable.	7.1
5	A description of patterns of water use practices and/or behaviour in all sectors of use (and distribution) with the objective of maximising water use efficiency and reducing water use, as far as practicable.	5 and Appendices A through H
6	WDC water supply customer levels of service and water loss performance targets.	3.3
7	Key performance indicators for each of the water saving targets.	3.3

#	Index of information required by Variation 6 to be included in a Water Management Plan	Section of this document
8	Any external auditing and benchmarking procedures that have been adopted.	2.5.9
9	A drought management plan that includes: a) steps to be taken to reduce consumption during water shortage conditions, including those uses that will be restricted at the same time as priority SW-B users (in accordance with Policy 18 and Standard 3.3.4.27) and steps to be taken to implement those restrictions. b) Targets for the water savings expected to be achieved via the restriction of activities identified in a) above, which shall align as closely as possible to the restrictions for SW-B users provided for in Standard 3.3.4.27. c) public and commercial user education programmes. d) steps taken to reduce consumption when demand is approaching the maximum take volume specified under the relevant resource consent. e) enforcement procedures.	Appendix K
10	Actions, performance measures and a timeline for implementing actions. The actions and performance measures identified will depend on the circumstances of each applicant.	8
11	Details of an appropriate water conservation and demand management plan review process.	1.5
12	Identification of any anticipated increases in water demand over the term of the consent and ability to stage water take volumes to more closely reflect demand requirements over time.	6
13	Ability to reduce the amount of water used by existing industrial and agricultural users, as a result of improvements in the efficiency of the use of water, in order to meet any increase in water demand over the term of the consent.	7
14	Identification of any single industrial, commercial or agricultural use of water that uses more than 15 cubic metres of water per day (not being water used for human drinking purposes or human sanitation purposes).	5.5.2
15	Identification of future domestic or municipal supply take needs over and above authorised domestic or municipal supply takes required to meet growth and development that is provided for in planning instruments promulgated under the Resource Management Act 1991 or relevant documents promulgated under the Local Government Act 2002, such as Long-Term Plans, growth strategies or spatial plans (or similar).	6

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Abbreviations

Abbreviation	Definition
AADD	Annual average daily demand
ADD	Average daily demand (usually this is the annual average daily demand)
AMP	Activity Management Plan.
Baseline	Baseline water demand forecasts exclude the impact of demand management activities, e.g. implementation of universal metering and volumetric pricing.
BSP	Bulk supply point for a third-party water supply.
Demand management	Water conservation and source substitution approaches to reduce water supply demands.
DWSNZ	Drinking Water Standards New Zealand (2008)
DWA	Drinking Water Assessor of the Ministry of Health
HCC	Hamilton City Council
LTP	Long-Term Plan. A plan that describes what the Council is planning to do for the next 10 years and how they will pay for it. Prepared every 3 years.
NRW	Non-revenue water. Total water production less billed authorised consumption. The NRW volume includes: leakage, unbilled authorized consumption (e.g. firefighting, mains flushing etc.); and apparent losses (customer meter under-registration, systematic data handling errors in customer billing systems and unauthorized consumption).
PDD	Peak day demand.
PDF	Peak Day Factor (the average daily demand is multiplied by the peak day factor to calculate the peak day demand).
RPV6	Variation 6 to the Operative Waikato Regional Plan
SDB forecast	Supply Demand Balance forecast graphs show the forecast water supply availability against the forecasted water demands over the planning horizon.
TKWA	Te Kauwhata Water Association (owns the water take consent for the Mid Waikato water supply scheme in the Waikato District Council).
UV	Ultra-violet disinfection.
Water losses	Water supply system losses. A combination of real losses (leakage) and apparent losses (unauthorised consumption and meter inaccuracies).
WDMP	Water Demand Management Plan (synonymous with the Water Management Plan).
WMP	Water Management Plan (requirements detailed in Variation 6 of the Operative Waikato Regional Plan)
WDC	Waikato District Council
WELS	Water Efficiency Labelling Scheme
WRC	Waikato Regional Council
WTP	Water treatment plant
WSL	Watercare Services Limited

1.0 INTRODUCTION

1.1 OBJECTIVES

The purpose of this Waikato District Council (WDC) Water Demand Management Plan (WDMP) is to provide a detailed understanding of current and future water demands and opportunities for improving water efficiency both district wide and for each of the Council's twelve water supply schemes.

The key objectives for this WDMP are to:

- review Council's existing WDMP;
- acknowledge existing consent conditions;
- align with the Waikato District 50 Year Water Supply Strategy (WSS);
- support future water take resource consent applications; and
- align with the proposed Waikato sub-regional template for water demand management plans.

The Waikato District Council (WDC) has elected to call this document a Water Demand Management Plan (WDMP) so that the purpose of the document can be readily understood by a general audience and to be consistent with previous WDMPs prepared by WDC. This WDMP covers all of the information required in a Water Management Plan (WMP) by Variation 6 (RPV6) of the Operative Waikato Regional Plan.

This WDMP will demonstrate that the volume of water required, including any increase over that previously authorised, has been justified and that the water take will be used efficiently and effectively.

Specifically, this WDMP will (to an extent which is appropriate for the scale of the activity in each scheme):

- Present the analysis of historic metered and non-metered demands, including estimates for non-revenue water and leakage.
- Forecast future demands.
- Provide an overview of WDC's current water demand management practices.
- Identify where there are opportunities to improve WDC's understanding of how much water is supplied to customers and when.
- Develop a programme of investigations to better identify opportunities for demand management.
- Identify a toolbox of demand management interventions suitable for the water supply.
- Provide an action plan outlining proposed water demand management interventions.
- Include a Drought Management Plan.

The water industry generally recognises that WDMPs are evolving documents subject to on-going review. This 2021 update of the WDMP follows on from the Stage 1 WDMP in 2015. The structure and focus of the WDMP remains unchanged, but details have been updated and supplemented where possible.

In the future, the WDMP may evolve to include more sophisticated evaluation of the best water demand management interventions (for example through cost-benefit analysis and/or end-use modelling) and implementation of those interventions in order to meet demand reduction targets.

1.2 HISTORY OF WAIKATO DISTRICT'S WATER DEMAND MANAGEMENT PLANS

Waikato District Council's first water demand management plan was completed in December 2007. It has been updated three times since then in August 2008, July 2009, April 2015, and now

(May 2021). The 2007 demand management plan was based on 2006 annual water use data and information. All relevant details were summarised in a 'Checklist for Water-Efficiency Information' (checklist) form provided by Waikato Regional Council (WRC).[1]

The checklist was used to document water supplies for five of the District's areas: Huntly, Ngaruawahia, Hopuhopu, Raglan and Southern Districts. It captures information on population, customer categories, water rates and pricing, and typical water use as well as estimates of future requirements.

Completed checklists are included in a Water-Use Efficiency Information: Summary & Checklist report prepared for each of the water supplies (five were also included as attachments to the July 2009 WDMP, Huntly, Ngaruawahia, Hopuhopu, Southern Districts and Raglan). These reports, and the demand management plan itself, were updated in August 2008 to include population projections (based on University of Waikato estimates) and water demand projections to 2041.

The July 2009 WDMP compared annual water production for 2007 and 2008 for the four water supplies considered to the 2001 to 2006 trend data included in the checklist reports. No significant differences or unusual developments were apparent and the earlier 2006 detailed analysis was retained for the 2009 WDMP. The July 2009 WDMP covered the water management plan requirements from the amended Section 8.1.2.2 of the Waikato Regional Plan arising out of Variation 6 that was in place at the time. The July 2009 WDMP covered the eight water supply schemes that the council has responsibility at that time.

The 2015 WDMP covers all of the information required in a Water Management Plan (WMP) by Variation 6 (RPV6) of the Operative Waikato Regional Plan as discussed further in Section 1.3. The RPV6 requirements from of the Operative Waikato Regional Plan include a more comprehensive assessment of current and future demand, identification of large non-residential users consuming more than 15 cubic metres of water per day, emphasis on improving water efficiency for non-residential demands and identification of staging water take volumes to meet demands over time.

This 2021 update of the WDMP follows on from the Stage 1 WDMP in 2015. The structure and focus of the WDMP remains unchanged, but details have been updated and supplemented where possible. Water loss estimates have been updated based on 2019/20 data, and an assessment has been carried out of the bulk supply for each system between 2015 and 2020.

There are 10 water supply schemes in the Waikato District Council as listed below:

- Pokeno
- Tuakau
- Mid Waikato (also known as the Te Kauwhata area)
- Huntly
- Central District (Ngaruawahia, Hopuhopu/Taupiri and Horotiu)
- Southern Districts & Western Districts
- Raglan
- Port Waikato (very small scheme with less than 100 connections)
- Onewhero (very small scheme with less than 100 connections)
- Te Akau (very small scheme with less than 100 connections)

The Central District system has not appeared in previous WDMPs as this is the combination of Ngaruawahia and Hopuhopu/Taupiri systems. Analysis of the three very small schemes has often been combined in past WDMPs, and this approach is maintained in this update.

[1] The checklist form was in development at the time data was being gathered for the demand management plan, so Waikato District Council assisted Waikato Regional Council by piloting the use of it.

1.3 REPORT STRUCTURE

This report is formatted as a District-wide WDMP that provides detail for each scheme in scheme specific appendices. The report is set out in the following sections:

Section 1. Provides an introduction to the WDMP;

Section 2. Outlines the need for water demand management in the context of New Zealand legislation and regional and District Plan requirements;

Section 3. Introduces WDC's water supply services;

Section 4. Describes in brief the Waikato District's water supply networks;

Section 5. Examines water demands in each water supply network (detail in Appendices A to H);

Section 6. Presents the water supply demand balance forecasts for each water supply network (detail in Appendices A to H);

Section 7. Outlines the existing water demand management interventions that WDC currently undertakes and presents the future water demand management interventions that WDC may undertake; and

Section 8. Presents the Action Plan, outlining the proposed water management actions to be adopted and implemented by WDC.

The sections above provide overview summary statistics for the water supply schemes. The 10 water supply schemes in the Waikato District Council are discussed in more detail in the scheme specific appendices numbered as follows (the three very small schemes are grouped in Appendix H):

A. Pokeno
B. Tuakau
C. Mid Waikato
D. Huntly
E. Central District
F. Southern & Western Districts
G. Raglan
H. Very small schemes (Port Waikato, Onewhero and Te Akau).

Appendix I details the customer categorisation methodology for the water meter data. Appendix J provides a summary table showing the demand management interventions currently used against the immediate and possible long-term actions. The Drought Management Plan is included in Appendix K.

This WDMP covers all the information required in a Water Management Plan (WMP) by Variation 6 (RPV6) of the Operative Waikato Regional Plan as cross-referenced in Table 1-1.

Table 1-1: Cross-Reference of information required by Variation 6 with this Water Demand Management Plan

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#	Index of information required by Variation 6 to be included in a Water Management Plan	Section of this document
	b) public health needs in accordance with requirements under any Act of Parliament or regulation; c) reasonable community needs (e.g. for public amenities); d) reasonable commercial, rural supply, and industrial needs. e) an assessment as to how each of the assessments required by clauses a) to d) above is predicted to vary over time; f) a justification for each of the assessments required by clauses a) to e) above including reference to any relevant planning instruments promulgated under the Resource Management act 1991 that provide for future growth or relevant documents promulgated under the Local Government Act 2002 such as Long-Term Plans, growth strategies or spatial plans.	
3	Any existing or proposed water pricing procedures and any linkages with wastewater pricing or management.	3.2
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7	Key performance indicators for each of the water saving targets.	3.3
8	Any external auditing and benchmarking procedures that have been adopted.	2.5.9
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13	Ability to reduce the amount of water used by existing industrial and agricultural users, as a result of improvements in the efficiency of the use of water, in order to meet any increase in water demand over the term of the consent.	7
14	Identification of any single industrial, commercial or agricultural use of water that uses more than 15 cubic metres of water per day (not being water used for human drinking purposes or human sanitation purposes).	5.5.2
15	Identification of future domestic or municipal supply take needs over and above authorised domestic or municipal supply takes required to meet growth and development that is provided for in planning instruments promulgated under the Resource Management	6

#	Index of information required by Variation 6 to be included in a Water Management Plan	Section of this document
	Act 1991 or relevant documents promulgated under the Local Government Act 2002, such as Long-Term Plans, growth strategies or spatial plans (or similar).	

1.4 INFORMATION SOURCES

A variety of information and data has been used to develop this WDMP. Key information sources provided by the Waikato District Council included (WDC authored unless noted otherwise):

- 50 Year Water Supply Strategy, February 2015 – MWH Global
- 50 Year Water Supply Strategy Stage 1 Report, February 2015 – MWH Global
- 2015 Water Supply Activity Management Plan (AMP), Draft September 2020.
- 2018 Waikato Regional Policy Statement – Waikato Regional Council
- 2015-25 Long-Term Plan
- 2018-28 Long-Term Plan
- Water Supply Bylaw 2014
- Customer meter billing data database outputs.
- Data from the bulk meter reading records for each scheme.
- Water Safety Plans for each scheme – WDC and Opus International Consultants
- Water Take Resource Consents
- Draft 2021-2031 AMP and LTP
- 2017 Water balance and review report and supporting spreadsheets - Thomas Consultants Ltd
- 2018 Water balance and review report and supporting spreadsheets - Thomas Consultants Ltd
- 2019 Water balance and review report and supporting spreadsheets - Thomas Consultants Ltd
- Population Projections – various

1.5 PLAN REVIEW PROCESS

It is anticipated that this WDC WDMP will be subject to review at least every three years to ensure it remains consistent with the outcomes of the actions and demand management initiatives as they are refined and implemented. Ideally, WDC will review the WDMP and budgets and set new programmes every third year prior to the preparation of the LTP to ensure water demand management remains a high priority. The WDMP is also likely to require review prior to a water take consent application.

2.0 THE NEED FOR WATER DEMAND MANAGEMENT

2.1 RESPONSIBILITY TO RATEPAYERS

WDC has a responsibility to ratepayers to ensure an adequate water supply is provided for the urban areas and selected rural areas of the District. WDC is also responsible for ensuring water resources are used in a sustainable way and therefore undertakes a guardianship role in managing the demand for water which needs to be actively supported by the community.

2.2 POLICY FRAMEWORK

The following sections provide an overview of the of the national reforms, legislation and planning instruments, and the regional and district policies, plans and strategies that are of relevance the WDMP.

2.3 NATIONAL LEGISLATION

Due to the current level of uncertainty around water and resource management reforms, this section will require update as reforms progress and more information is available.

2.3.1 Introduction

The review and update of the WDMP has been done in the context of the Government's Three Waters Review and the planned Resource Management Reforms. These reforms will bring about the most significant changes to the water sector in over 30 years. Legislation that currently applies to the management of municipal water supply and to the allocation of water will ultimately be repealed and replaced with new legislation.

Given the proposed legislative changes the following sections have focused on providing a high-level overview of the reforms and identified key elements of the Government's current national planning framework that are of relevance to the WDMP.

2.3.2 Three Waters Review

The purpose of the Three Waters Review from a water supply perspective is to:

- provide clear leadership for drinking water regulation, through a new, dedicated, centralised regulator
- significantly strengthen compliance, monitoring, and enforcement relating to drinking water regulation
- manage risks to drinking water safety and ensure that source waters are protected

2.3.2.1 Taumata Arowai – Water Services Regulator Act

A key output from the Three Waters review is the Taumata Arowai – Water Services Regulator Act which was enacted on 6 August 2020. The Act establishes Taumata Arowai—the Water Services Regulator as a new Crown agent and provides for its objectives, functions, operating principles, and governance arrangements. When Taumata Arowai becomes fully operational (this is expected to be in the second half of 2021) it will take over from the Ministry of Health as the regulator of drinking water.

When Taumata Arowai takes over it is not expected that registered drinking water will have to do significantly more than they do now. Suppliers will still need drinking water safety plans. Suppliers who provide drinking water for 500 or more people must have a drinking water safety plan in place by the end of the first year that Taumata Arowai becomes the regulator.

The focus of Taumata Arowai will be on providing national oversight, leadership, communication, and co-ordination in relation to drinking water safety and regulation, including the management of risks to sources of drinking water. At this stage it does not appear that Taumata Arowai will be focusing on-demand management and efficient use of water.

2.3.2.2 Water Services Bill

The Water Services Bill is at the Select Committee Stage. The Bill is designed to comprehensively reform the drinking water regulatory system and proposes to repeal parts of the Health Act 1956 and the Local Government Act 2002 relating to water services supplied by local authorities.

The main purpose of the Bill is to ensure that drinking water suppliers provide safe drinking water to consumers including requiring drinking water suppliers to have a drinking water safety plan and comply with legislative requirements (such as drinking water standards) on a consistent basis.

The Bill imposes duties on drinking water suppliers. Those duties will apply to all drinking water suppliers and include duties to:

- provide safe drinking water and meet drinking water standards, along with clear obligations to act when drinking water is not safe or fails to meet standards
- ensure that there is a sufficient quantity of drinking water to support the ordinary needs of consumers, with clear obligations to act where supply is interrupted or restricted for any reason
- register drinking water supplies with Taumata Arowai, and keep essential details relating to supplies updated each year
- have a drinking water safety plan that contains a multi-barrier approach to drinking water safety
- notify Taumata Arowai and take action where there are risks to public health arising from drinking water, breaches of drinking water standards, or other significant risk events.

The Bill also imposes a duty on officers, employees, and agents of drinking water suppliers to exercise professional due diligence. This duty is based on similar requirements in the Health and Safety at Work Act 2015.

Other changes proposed by the Bill include new arrangements relating to sources of drinking water i.e., freshwater bodies from which water is abstracted before treatment. The Bill requires that the risks to source water are identified, managed, and monitored by drinking water suppliers and local authorities. Drinking water suppliers will also be required to prepare and implement a source water risk management plan.

The Bill requires all persons who perform or exercise functions, powers, and duties under the legislation to give effect to Te Mana o te Wai. This parallels the requirements imposed on local authorities under the NPS-FM 2020 and is discussed below.

2.3.2.3 Service Delivery Reforms

The Government is also progressing the three waters service delivery reforms. It is proposing to introduce a legislation to create the new service delivery system in late 2021, with enactment by mid-2022 and the establishment of the new water entities in 2022/2023.

2.3.3 Resource Management Reforms

The Government is planning to repeal the Resource Management Act 1991 (RMA) and replace it with three new pieces of legislation – the Natural and Built Environments Act, the Strategic Planning Act and the Climate Change Adaptation Act. Natural and Built Environments Act is the core piece of legislation to replace the RMA. The purpose of this Act is to enhance the quality of the environment to support the wellbeing of present and future generations. Indications are that the new Act will retain the current allocation functions for resources including allocation of

freshwater in the RMA, however with a greater focus on allocation sustainability, efficiency and equity.

2.3.4 Local Government Act 2002

As discussed above the Water Services Bill proposes to repeal the parts of the Local Government Act 2002 (LGA 2002) relating to water services supplied by local authorities. Therefore, these provisions have not been addressed in this section.

Section 14 of the LGA 2002 which sets out the Principles relating to Local Authorities includes the requirement 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". The WDMP contributes directly toward the requirements of the LGA 2002 by providing population and water demand projections and ways to manage these changes in the future, by reviewing current water supply and water demand management initiatives, monitoring the implementation and effectiveness of the initiatives and identifying future initiatives.

Section 93 of the LGA 2002 requires council to prepare Long-Term Plans (LTPs). LTPs are an important mechanism to strengthen long-term planning, community consultation and participation, and accountability in local government. LTPs must include an infrastructure strategy that outlines how council intends to manage its infrastructure assets having regard to matters such as when assets need to be renewed. Elements of Council's LTP that are of relevance to the WDMP are discussed in Section 2.5.5 below.

2.3.5 Health Act 1956 and Health Amendment Act 2007

As discussed above the Water Services Bill proposes to repeal the parts of the Health Act 1956 relating to water services supplied by local authorities and Taumata Arowai will take over from the Ministry of Health as the regulator of drinking water. Therefore, these provisions have not been addressed in this section.

The Health Act 1956 requires drinking-water suppliers to have and implement a "water safety plan". This requirement has been included in the Water Services Bill.

Council has prepared the following water safety plans:

- Huntly WSP (2018)
- Ngaruawahia WSP (2018)
- Onewhero WSP (2018)
- Port Waikato WSP (2018)
- Raglan WSP (2015)
- Southern WSP (2018)
- Te Akau WSP (2015)
- Te Kauwhata WSP (2018)
- Tuakau and Pokeno WSP (2018)
- Western Districts WSP (2018)

2.3.6 Building Act 2004

The Building Act 2004 governs the building industry in New Zealand.

The Act aims to control and encourage better practices in building design and construction. The Department of Building and Housing is responsible for the administration of the Building Act. The purpose and principles of the Act include requirements for sustainable development and for buildings to help people stay safe, healthy and comfortable. Clause 4(2) (o) states "the need to facilitate the efficient use of water and conservation in buildings". However, no specific detail is provided on how the sustainable development principles will be achieved – and this would be expected to become more apparent in the Building Code.

The Building Code is the primary mechanism for the implementation of the Building Act and is currently being reviewed to take account of the new Building Act's requirements for sustainable development. Under provisions within the Building Act there are requirements "to ensure buildings are designed, constructed and able to be used in ways that promote sustainable development"[2]. Again, what this will mean for water demand management is unclear.

2.3.7 National Policy Statement for Freshwater Management 2020

As part of Government's Essential Freshwater Plan a comprehensive review of the National Policy Statement for Freshwater Management 2017 was undertaken. This has resulted in the new National Policy Statement for Freshwater Management 2020 (NPS-FM 2020) which came into effect in September 2020.

The NPS-FM 2020 will have a significant influence on the future availability of freshwater (surface water and groundwater) for allocation, which will mean that demand management and efficient use of water will become increasingly important.

The key elements of the NPS-FM 2020 of relevance to the WDMP are as follows.

2.3.7.1 Te Mana o te Wai

As set out above the Water Services Bill requires all persons who perform or exercise functions, powers, and duties under that legislation to give effect to Te Mana o te Wai. The NPS-FM 2020 requires that freshwater is managed in a way that gives effect to Te Mana o te Wai.

Te Mana o te Wai in the context of the NPS-FM 2020 relates to the essential value of water as a precious resource. This concept highlights the importance of sustaining the integrity and health of the water before providing for human use, through the following three-tiered hierarchy of obligations.

- First, the health and well-being of water bodies and freshwater ecosystems.
- Second, the health needs of people (such as drinking water).
- Third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

These three obligations are expressed as priorities in the sole objective of the NPS-FM 2020.

2.3.7.2 Allocation and Efficient Use

Policy 11 of the NPS-FM 2020 requires that "freshwater is allocated and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided".

The WDMP will be a useful mechanism to support future water takes applications by demonstrating that once water is allocated for municipal supply Council will ensure it will be efficiently used.

2.3.8 National Environmental Standards

National Environmental Standards (NESs) are regulations that prescribe technical and non-technical standards, methods or other requirements that are to be applied nationwide. The NESs that are relevant to the WDMP are discussed below. The NES for Freshwater 2020 is not discussed as it relates to regulating activities that pose risks to the health of freshwater and freshwater ecosystems such as intensive farming.

[2] Lawton M., Birchfield D. and Kettle D. 2007 Making policy and regulations rain tanks friendly. Report PR205, Beacon Pathway Ltd

2.3.8.1 Resource Management (Measurement and Reporting of Water Takes) Regulations 2010

The Resource Management Act (Measurement and Reporting of Water Takes) Regulations 2010 established a nationally consistent regime for measuring water. They only apply to permit holders who take freshwater at a rate of 5 litres/second or more and they require permit holders to keep records of water taken.

The Regulations were amended in 2020 and permit holders are now required to record measurements of the water taken under a water permit in each 15-minute period (instead of each day). The permit holder must electronically provide the regional council with daily records of the measurements by the end of the next day.

Compliance with these new requirements is staged based on the rate of the take. The stages are as follows:

- 2 years from the commencement of the Regulations (3 August 2020) if the rate is ≥20 litres/second:
- 4 years from the commencement of the Regulations (3 August 2020) if the rate is ≥10 but <20 litres/second:
- 6 years from the commencement of the Regulations (3 August 2020) if the rate is ≥5 but <10 litres/second.

The Regulations are important in ensuring consistent measuring and reporting of actual water taken for the District's water supply.

2.3.8.2 National Environmental Standard for Sources of Human Drinking Water 2007

The NES sets requirements for protecting sources of human drinking water from becoming contaminated. It applies to source water before it is treated and only sources used to supply human drinking water. The NES requires regional councils to ensure that effects of activities on drinking water sources are considered in decisions on resource consents and regional plans.

As part of the Three Waters Review, the Government is proposing amendments to the NES. The aim of the amendments is to strengthen the ability of councils to manage risks to drinking water posed by activities in drinking water catchments.

2.3.9 Water Efficiency Labelling Scheme

The New Zealand Water Efficiency Labelling Scheme (WELS) is designed to provide information, through labelling at the point of sale, to consumers buying products that use water. The labels enable consumers to identify how water efficient a product is. The aim of the rating scheme is to encourage consumers to purchase products that use less water and to encourage suppliers to design products which are more water efficient. The WELS label displays a star rating to demonstrate how water efficient the product is, and a figure which states how much water it uses. The more stars shown, the more water efficient the product is.

The WELS applies to six product classes:

- clothes washing machines
- dishwashers
- lavatories
- showers
- taps
- urinals.

2.4 REGIONAL POLICIES, PLANS AND STRATEGIES

This section sets out the regional and sub-regional policies, plans and strategies that are relevant to the WDMP.

2.4.1 Vision and Strategy for the Waikato River, Te Ture Whaimana o Te Awa o Waikato

The Vision and Strategy for the Waikato River is the primary direction-setting document for the Waikato River and its catchments. It also applies to the activities in the catchments affecting the Waikato River.

The Vision for the Waikato River is: "Our Vision is for a future where a healthy Waikato River sustains abundant life and prosperous communities who, in turn, are all responsible for restoring and protecting the health and wellbeing of the Waikato River, and all it embraces, for generations to come".

The above Vision is supported by a series of objectives and strategies. The Vision and Strategy prevails over any inconsistent provision in a national policy statement, is deemed into the regional policy statement and must be given effect to by district and regional plans.

The Vision and Strategy is relevant to the WDMP as much of the District's water supply is derived from the Waikato River and its catchment.

2.4.2 Waikato Regional Policy Statement: Te Tauākī Kaupapahere Te-Rohe O Waikato 2016

The Waikato Regional Policy Statement (RPS) is a mandatory document that provides an overview of the resource management issues in the Waikato region, and the ways in which integrated management of the region's natural and physical resources will be achieved.

Of particular relevance to WDMP, the RPS includes objectives and policies that require:

- The management, allocation and use of fresh water to:
  - Avoid any new over-allocation of ground and surface waters,
  - Increase efficiency in the allocation and use of water,
  - Recognise the benefits of water takes and uses.
- The management of the allocation of fresh water in a manner that ensures sufficient water is available to meet the reasonably foreseeable needs of people and communities including through the prioritisation of water take applications in the following order:
  i. Domestic and municipal supply;
  ii. Replacement of previously authorised takes;
  iii. All other applications.

The WDMP is an important mechanism to ensuring the objectives and policies of the RPS relating to increasing the efficient use of water are achieved.

2.4.3 Waikato Regional Plan 2007

The Waikato Regional Plan identifies the issues, objectives, goals, and implementation methods for water resource management in the region.

The Regional Plan includes policies designed to ensure the availability of water to meet the requirements of municipal supply authorities and rules to give priority to municipal supply, provided municipal suppliers implement water demand management and water efficient practices. To demonstrate that these polices will be achieved, the Plan requires that applications for takes for municipal supply must be supported by comprehensive Water Management Plans (WMPs). These Plans must reasonably justify the volumes of water sought, set out the methods and mechanisms

to minimise the use of water, and identify the applicant's specific initiatives and objectives in terms of water conservation and demand. The Regional Plan also identifies the matters that as a minimum WMPs must address.

WDC has prepared its WDMP in accordance with the requirements of the Regional Plan. The matters identified in the Regional Plan to be addressed in a WMP are based on international best practice and are consistent with the approach followed by WDC in developing this WDMP.

Proposed Plan Change 1 to the Waikato Regional Plan was notified in September 2016. The decisions version of the Plan Change was notified in April 2020. The focus of the Plan Change is the management of four contaminants - nitrogen, phosphorus, sediment, and microbial pathogens, particularly with respect to diffuse discharges. The objectives of the Plan Change require improvements to the health and wellbeing of the Waikato River, in the short term (10 years) and long term (80 years).

2.4.4 Waikato-Tainui Environmental Plan 2013

The Waikato-Tainui Environmental Plan was published in August 2013. The overarching purpose of the Plan is to provide a map or pathway that will return the Waikato-Tainui rohe to the modern-day equivalent of the environmental state that it was in when Kiingi Taawhiao composed his maimai aroha.

The Plan contains a number of objectives and policies that are relevant to freshwater resources and infrastructure development and maintenance.

2.4.5 Future Proof Strategy 2017

The Future Proof Strategy is a 30-year growth management and implementation plan specific to the Hamilton, Waipa and Waikato sub-region. Future Proof is about how the area should develop into the future. The Future Proof partners include the Waikato Regional Council, Hamilton City Council, Waipa District Council, Waikato District Council, tangata whenua and the Waka Kotahi NZ Transport Agency.

The Strategy includes a settlement pattern that provides the blueprint for growth and development and aims to achieve a more compact and concentrated urban form over time. The settlement pattern is made up of key growth areas that have been identified within the sub-region: Hamilton City, Cambridge, Te Awamutu and Kihikihi, Pokeno, Tuakau, Huntly, Te Kauwhata, Ngaruawahia, Raglan.

The settlement pattern includes growth and density targets. For the Waikato District, 80% of the district's growth is proposed to occur in Te Kauwhata, Huntly, Pokeno, Tuakau, Ngaruawahia, and Raglan. The Greenfield density target for these towns is 12-15 households per hectare.

The Strategy is currently being reviewed to take into account a number of changes since 2017. These include the requirements of the National Policy Statement on Urban Development and the Government's Urban Growth Agenda, particularly the outcomes of the Hamilton to Auckland Corridor Plan. It is anticipated that a draft document will be completed in 2021.

2.4.6 Sub-regional Three Waters Strategy 2012

The Future Proof partners developed a Sub-Regional Three Waters Strategy in 2012 to set out how water, wastewater and stormwater will be managed over a 50-year period. Building on the direction of Future Proof, the Three Waters Strategy sets a long-term strategic vision for three waters in the sub-region.

The vision of the Three Waters Strategy is:

- The delivery of integrated, sustainable and well managed three waters services for the sub-region which ensures the cultural, social and economic needs of the community are met and the quality of the Waikato River is improved.

The Strategy identified the following nine strategic issues:

1. Ensuring the protection and improvement of public health and safety and providing appropriate water sanitary services and hazard management practices.
2. Meeting future anticipated and planned for growth demands.
3. Planning for and adapting to climate change.
4. Ensuring that decisions relating to the three waters are underpinned by best practice, research and knowledge.
5. Ensuring quality, efficient and sustainable infrastructure.
6. The need for integration of relevant council functions, inter-council departments, the three waters, and land use and water planning and management.
7. The availability and allocation of water.
8. Ensuring that iwi and hapū are involved in the management of three waters and tangata whenua values, aspirations and interests are identified and reflected.
9. Ensuring protection and where possible the enhancement of the natural environment.

The Strategy is to be updated to align with the outcomes of the Hamilton to Auckland Corridor Plan.

2.4.7 Sub-regional Three Waters Action Plan - Version 7 2017

The purpose of the Three Waters Action Plan is to implement the Sub-regional Three Waters Strategy. To achieve this the Plan sets out a number of actions including:

Action 2: Water Conservation and Demand Management

The Plan states that "*it is envisioned this action will include developing and implementing mechanisms for ensuring the efficient use of and minimising water demand in both urban and rural areas, for example, technology, pricing, metering, legislation, communication and education*".

The mechanisms identified in the Plan are consistent with those addressed in the WDMP.

2.4.8 Hamilton-Auckland Corridor Plan 2018

The Hamilton-Auckland Corridor Plan provides a framework for development to help manage growth in a way that provides access to the services people need, while protecting and enhancing the corridor's natural and cultural assets.

The Plan identifies Huntly and the Northern metro corridor which includes Ngāruawahia, Hopuhopu, and Taupiri as key initiatives and priority development areas. It also includes as a major enabler new comprehensive and long-term three waters management solutions.

It also identifies Tuakau – Pokeno – Meremere, Te Kauwhata, Huntly, and Taupiri – Hopuhopu–Ngāruawahia – Horotiu as main future housing and employment growth clusters.

Waikato-Tainui has identified a number of aspirations for further investigation, and these are set out in the Plan and include:

1. The redevelopment of the existing Meremere township.
2. The development of land for industrial/commercial purposes to the west of the Waikato Expressway and adjacent to Meremere.
3. Long-term business and water storage opportunities in Huntly (Rotowaro).
4. Long-term residential and industrial opportunities in Huntly (west).
5. Enhancing the well-being of marae communities.

This Plan will help to inform future water demand requirements for the WDMP.

2.4.9 Hamilton-Waikato Metropolitan Plan 2020

The Hamilton-Waikato Metropolitan Plan is being delivered through the Future Proof partnership and is one of the initiatives being delivered as part of the broader Hamilton to Auckland Corridor Plan. The metropolitan area extends from Taupiri in the north to Te Awamutu and Cambridge in the south. The Plan has adopted a scenario of 500,000 people living in this area.

The Plan sets out a framework to respond to the current and future challenges of growth in the metro area and will shape urban development in the long term. The Plan will be implemented through an urban growth programme of priority actions.

This Plan will help to inform future water demand requirements for the WDMP.

2.4.10 Waikato sub-regional Three Waters Study

The Waikato Sub-regional Three Waters Study is being delivered through the Future Proof partnership and is one of the initiatives being delivered as part of the broader Hamilton to Auckland Corridor Plan.

The study focuses on the development, delivery and management of municipal three waters (water, stormwater and wastewater) infrastructure for urban settlements in the study area. The study area includes parts of the Waikato and Waipa districts and all of the Hamilton City Council jurisdiction.

Ten-, 30- and 100-year planning horizons have been adopted for the study.

The Study will help to inform future water infrastructure requirements.

2.5 DISTRICT POLICIES, PLANS, BYLAWS AND STRATEGIES

2.5.1 Waikato 2070

The Waikato District Council Growth and Economic Development Strategy (Waikato 2070) has been developed to provide guidance on appropriate growth and economic development that will support the wellbeing of the district. Waikato 2070 is a guiding document that the Council uses to inform how, where and when growth occurs in the district over the next 50-years.

Waikato 2070 contains development plans for Huntly and Ohinewai, Te Kowhai and a town centre plan for Pokeno.

2.5.2 Structure Plans

Structure plans provide a long-term framework for the future growth and development of a particular area. Recently Council has prepared structure plans for Tuakau and Ngāruawahia.

The purpose of the Ngāruawahia Structure Plan is to provide a long-term 50-year planning framework for the future development and redevelopment of the wider Ngaruawahia area. The plan sets out in broad terms, the layout of land uses, key infrastructure and transport links. Settlements such as Glen Massey, Taupiri and Horotiu along with the rural communities in between contribute to the future development and structure of Ngaruawahia and form part of the structure plan.

The Tuakau Structure Plan sets out the broad layout of appropriate land uses, key infrastructure and transport links and provides a 30-year planning framework for the future growth of Tuakau.

The structure plan programme is set by Council and is reviewed in response to growth demands.

The structure plans help to inform projected water demand for the Waikato District.

2.5.3 Proposed Waikato District Plan

The proposed Waikato District Plan (proposed Plan) was publicly notified on 18 July 2018. The proposed Plan sets out the direction (objectives and policies) and rules for the future growth and development of the district. It determines how land use should be managed and future settlement patterns.

Subdivisions in residential, business and industrial zones are required to connect to a public-reticulated water supply.

The proposed District Plan will help to inform projected water demand for the Waikato District.

2.5.4 Waikato District Council Water Supply Bylaw 2014

The WDC Water Supply Bylaw 2014 came into force on 1 October 2014. One of the five purposes of the WDC Water Supply Bylaw 2014 is to promote “the efficient use of water and protect against waste or misuse of water from the water supply system”.

The bylaw classifies water supplies as either 'on-demand' or 'restricted flow' and the use of water from the supply is classified as either 'ordinary' or 'extraordinary'.

An “on-demand water supply area” is defined as an area serviced by a Council owned reticulated water supply systems (as defined in Schedule 3 of the bylaw: Water Supply Area Maps), that is intended to supply water to customers via on-demand supplies with firefighting capability.

A “restricted water supply area” is defined as an area serviced by a Council owned reticulated water supply system outside on-demand areas (as defined in Schedule 3 of the bylaw: Water Supply Area Maps), for specified purposes via restricted flow supplies which do not have firefighting capability.

The restricted flow supply connections supply a small flow through a flow control device, and storage must be provided by the customer to cater for demand fluctuations. The restricted water supply areas are areas outside on-demand areas that are serviced by a Council owned reticulated water supply system, and do not have firefighting capability. The bylaw requires customers on a restricted flow supply make provision for onsite water storage of a minimum volume of 22m³ or the equivalent of at least 48 hours of average water use where this is greater than 22m³.

Ordinary supply is defined as a category of on-demand supply used solely for domestic purposes.

Extraordinary use is defined as a category of on-demand supply that are subject to water alert and emergency provisions. Extraordinary use connections include:

1. Domestic - spa or swimming pool in excess of 6 cubic metres capacity and fixed garden irrigation systems
2. Commercial and business
3. Industrial
4. Agricultural
5. Horticultural
6. Viticultural
7. Lifestyle blocks (rural supplies)
8. Fire protection systems other than sprinkler systems installed to comply with NZS 4517
9. Outside of Waikato District (supply to, or within another local authority)
10. Temporary supply
11. Water use above 15m³/day
12. Water carriers
13. Auxiliary supply

Clause 9.6 of the bylaw states that “All water connections in Waikato District shall be metered or progressed towards metering and be charged in accordance with clause 9.15. Where an extraordinary supply is used for fire protection only, the supply shall not normally be metered”.

Clause 9.8 of the bylaw specifically addresses water demand management. This includes provisions that the customer shall comply with any water alert or emergency restrictions enacted by the Council to manage high seasonal or other demands. The bylaw also states that a person who fails to comply with the requirements of the Bylaw in relation to a high-level water alert and/or emergency is in breach of clause 10.1 of the Bylaw, commits an offence and will be liable to a penalty.

2.5.5 Waikato District Long-Term Plan 2021 – 2031

Every three years, Council prepares a Long-Term Plan (LTP) which outlines the levels of service and planned works to improve or maintain its services to the community. The LTP is updated annually and undergoes a public consultation process. During the consultation period, the community is invited to provide submissions on the LTP, including the water supply activity.

The Long-Term Plan for 2015 – 25 came into effect on the 1 July 2015. The capital infrastructure projects are from the 2015 WSS. Key decisions from the LTP in relation to the WDMP are:

- allocate funds for implementation of universal metering in Huntly, Ngaruawahia and Raglan
- undertake a complete assessment of the condition of critical water infrastructure assets across the district.

The Long-Term Plan for 2018 – 28 includes the 30-Year Infrastructure Strategy (2018-2048). Waikato District Council is experiencing high levels of urban growth in parts of the district which border the larger urban centres of Hamilton and Auckland. There is also noticeable planned growth in Raglan and Te Kauwhata. Over the next 30 years, Council plans to build new infrastructure to meet development needs as well as renewing existing assets to maintain its level of service and provide resilience to natural hazards.

As of time of writing, the Long-Term Plan for 2021-2031 is being developed. This will be adopted in July 2021. Water supply projects, timeframe and budgeted costs from this LTP are shown in Table 2-1.

Table 2-1: Long-Term Plan 2021 - 2031 water treatment and supply projects

Group	Project	Location	2022	2023	2024	2025-2031
Renewals	Treatment Plant Renewals	District Wide	832	874	916	3,843
	Reticulation Renewals	District Wide	1,040	1,092	1,146	9,607
	Pump Station Renewals	District Wide	52	55	57	480
	Reservoir Renewals	District Wide	520	164	172	1,441
	Connection Renewals	District Wide	312	328	344	2,882
Sub-Total			2,756	2,512	2,635	18,253
Growth	Reticulation Extensions	Huntly	-	66	-	-
	Reticulation Extensions	Raglan	572	109	115	961
	Watermain	Puketaha Road	-	-	-	537
	Reticulation Extensions	Pokeno	-	-	344	3,885
	Reticulation Extensions	Tuakau	-	437	1,604	2,878
	Reticulation Upgrades	Huntly	-	-	115	513
	Reticulation Upgrades	Ngaruawahia	-	546	573	1,227
	Reticulation Upgrades	Raglan	182	-	-	-
	Network Improvement including NMIT Crossing	Pokeno	-	55	52	84

Group	Project	Location	2022	2023	2024	2025-2031
	Pump Station Renewals	Tuakau	78	-	-	627
	Booster Pump Station	Te Kauwhata	42	44	-	-
	Booster Pump Station	Pokeno, Helenslee	-	-	-	1,399
	Booster Pump Station	Tuakau, Dominion	-	-	-	144
	Reservoir Extensions	Matangi	-	-	-	437
	Reservoir and Pump Station	Gordonton	-	-	-	1,050
	Reservoir Extensions	Tamahere	-	-	-	369
	Reservoir Extensions	Pokeno	520	1,638	2,291	-
	Hills Reservoir No.2	Raglan	-	874	1,375	1,938
	Reservoir Upgrades	Tuakau	-	-	573	3,056
	Treatment Plant Renewals	Te Kauwhata	-	-	-	31,340
	Treatment Plant Upgrades	Mid Waikato	73	-	-	-
	Treatment Plant Upgrades	Te Kauwhata	320	-	-	-
	Reticulation Extensions	Te Kauwhata	130	-	-	9,607
	Reticulation Upgrades	Te Kauwhata	-	-	-	4,706
	Reservoir Extensions	Te Kauwhata	2,001	-	-	2,170
Sub-Total			3,917	3,767	7,039	66,928
Level of Service	Reticulation Extensions	Huntly	-	66	-	926
	Reticulation Extensions	Raglan	104	109	115	-
	Matangi Watermain	Matangi	-	-	-	1,341
	Watermain	Tauwhare Pa	-	-	-	328
	Watermain	Puketaha Road	-	-	-	2,148
	New Meremere Watermain	Meremere	-	-	1,203	-
	New Rangiriri Watermain	Rangiriri	-	961	-	-
	Reticulation extensions	Tuakau	-	109	344	360
	Reticulation upgrades	Huntly	-	-	401	813
	Reticulation upgrades	Ngaruawahia	-	546	573	1,227
	Reticulation upgrades	Raglan	1,118	-	-	2,830
	Network zone boundaries modification	Eureka	208	1,638	-	-
	Network Improvement incl NMIT Crossing	Pokeno	-	55	52	84
	Network Upgrades	Tuakau	78	-	-	627

Group	Project	Location	2022	2023	2024	2025-2031
	Pump station renewals	Te Kauwhata	62	66	-	-
	Booster PS	Tuakau Dominion	-	-	-	36
	Newell Road PS Upgrade	Newell Road	73	-	-	-
	Reservoir extensions	Matangi	-	-	-	1,747
	Gordonton Reservoir & PS	Gordonton	-	-	-	4,202
	Reservoir extensions	Tamahere	-	-	-	1,478
	Connection extensions	District Wide	88	-	-	-
	Treatment plant upgrades	Huntly	-	-	-	479
	Treatment plant upgrades	Ngaruawahia	917	-	-	459
	Treatment plant upgrades	Raglan	312	-	-	-
	Hills Reservoir No.2	Raglan	-	218	344	-
	Treatment plant renewals	Te Kauwhata	-	-	-	4,274
	Treatment plant upgrades	Te Kauwhata	44	-	-	-
	Reticulation extensions	Te Kauwhata	365	-	-	1,140
	Reticulation upgrades	Te Kauwhata	-	-	-	1,246
	Pump station upgrades	Te Kauwhata	62	-	-	-
	Reservoir extensions	Te Kauwhata	703	-	-	762
Sub-Total			4,135	3,767	3,030	26,507
Grand Total			**10,808**	**10,046**	**12,704**	**111,689**

2.5.6 Activity Management Plan

WDC prepares asset management plans every three years, in line with the LTP. The 2020 WDC water supply activity management plan (AMP) is currently being prepared and the water demand management sections will refer to this WDMP. The water demand analysis and forecast sections in the 2020 water supply AMP refer to the outcomes of the 50 Year Water Supply Strategy (WSS) foundation document prepared in 2015.

2.5.7 Mid Waikato Water and Wastewater Servicing Strategy 2020

The Mid Waikato Water and Wastewater Servicing Strategy is a long-term strategy for water and wastewater servicing for the five urban centres withing the Mid Waikato Region – Meremere, Te Kauwhata, Rangiriri, Ohinewai and Huntly.

The Strategy identified a long list of options for the servicing the water supply needs of Meremere, Te Kauwhata, Rangiriri, Ohinewai and Huntly. The longlist was intended to capture all possible options, including alternative water sources, and complementary strategies such as demand management and re-use. The longlist of options was assessed, and a shortlist identified.

The preferred option identified by the project team for the future water supply comprises a centralised scheme for Mid Waikato, with a new water intake and treatment plant at Te Kauwhata. Ohinewai will initially be serviced from the Huntly network and then from Te Kauwhata. Huntly will continue to be supplied from the Huntly WTP.

2.5.8 Water Supply Strategy

MWH finalised a 50 Year Water Supply Strategy (WSS) foundation document for WDC in February 2015. This document was framed around understanding the future needs of each community and included the development of options that considered both availability of water resources and the capacity of infrastructure to deliver this across the district. The WSS identified the 50-year capital infrastructure requirements for water source, treatment, transmission and storage infrastructure based on the baseline water supply demand balance forecasts. These 50-year capital infrastructure requirements were used to inform the development of Council's 2015/25 Long-Term Plan.

Key tasks in the development of this strategy included review of the water supply consenting context and levels of service, preparation of individual water supply summaries and baseline water supply-demand balance forecasts, development and evaluation of strategic options and preparation of the supporting reports.

The baseline water supply-demand balance forecasts presented in this WDMP have been updated based on recent historical demands as detailed in Appendix A – H, and the demand forecasts in this WDMP are considered more accurate than the WSS forecasts which were based WDC standard design parameters.

The demand forecasting approach is discussed in detail in Section 6.0 of this WDMP.

2.5.9 Water Benchmarking

WDC is a participant in Water New Zealand's (Water NZ) "National Performance Review" (NPR) benchmarking programme and provided data for the 2009/2010, 2010/2011, 2011/2012, 2013/14, 2014/15, 2015/16, 2016/17, and 2017/18 Summary Reports (WDC was unable to participate in the 2012/13 and 2018/19 annual review). This annual performance review is a benchmarking tool for the three waters industry in New Zealand. It enables WDC to benchmark their water use and set key performance indicators. With this information Council can effectively identify and increase performance matched to other local authorities in New Zealand.

The NZ NPR includes different performance measures from the Local Government mandatory performance measures. Water NZ expect that measures included in future NPRs will need to be aligned with the Local Government mandatory performance measures. However, Water NZ believe that there is potential for the value of the NPR to be enhanced by including additional technical benchmarking measures, for example on the extent that backflow prevention devices are used, fire-fighting provisions or the asset grading of above ground structures.

The 2019/20 NPR Summary Report is yet to be published by Water NZ. The 2012/13 New Zealand NPR of water utilities included results for two water demand management related performance measures:

- Current annual real water loss (litres/connection/day);
- Average daily residential water consumption (litres/person/day).

The performance measure results are presented in the NPR at a council wide level which results in aggregated district wide results for district councils (rather than individual results for each water supply scheme). The NPR results are included in the comparison graphs in Section 5.4.4 and Section 5.6.3. The NPR reports do not recommend benchmarking targets or discuss comparative performance.

3.0 WATER SUPPLY SERVICE

3.1 COUNCIL ROLES

The roles and responsibilities for the delivery of water supply services are shown in the organisation chart in Figure 3-1 and the key roles are summarised as follows:

- Watercare – overall responsibility for WDC water services delivery. Watercare is contracted by WDC to deliver water services to the Waikato District.
- Watercare Waikato Customer Care Team – responsible for water supply billing and customer service.
- Watercare Waikato Production Team – responsible for operations and management of the district's treatment plants and oversees the management of the treatment field staff.
- Watercare Waikato Operations (Networks) Team – responsible for operations and management of the district's reticulation networks and operational contracts and oversees the management of reticulation field staff.
- Watercare Waikato Infrastructure Delivery Team – responsible for strategic planning, infrastructure planning, update and management of three waters asset register, the development and management of the 10-year and annual works programmes, and project design and construction delivery.
- WDC – responsible for overseeing and coordinating legislative and regional consent compliance requirements.

The purpose of the Waters Governance Board is to drive the preparation and implementation of the Council's contract with Watercare for the delivery of water management services. This includes strategic input, oversight and monitoring of progress and subsequent delivery of service. The Boards consists of WDC's Chief Executive and three independent members plus an intern. The Board reports to the Council.

The current management of waters consists of 3 FTE's being the Special Infrastructure Projects Manager (reporting to the CE), Waters Contract Relationship Manager and the Northern Infrastructure Programme Manager as shown in the organisational chart to the right. A Waters Contract Engineer joined the team in January 2021 on a fixed term contract for 2 years (partly funded by the stimulus funding grant).

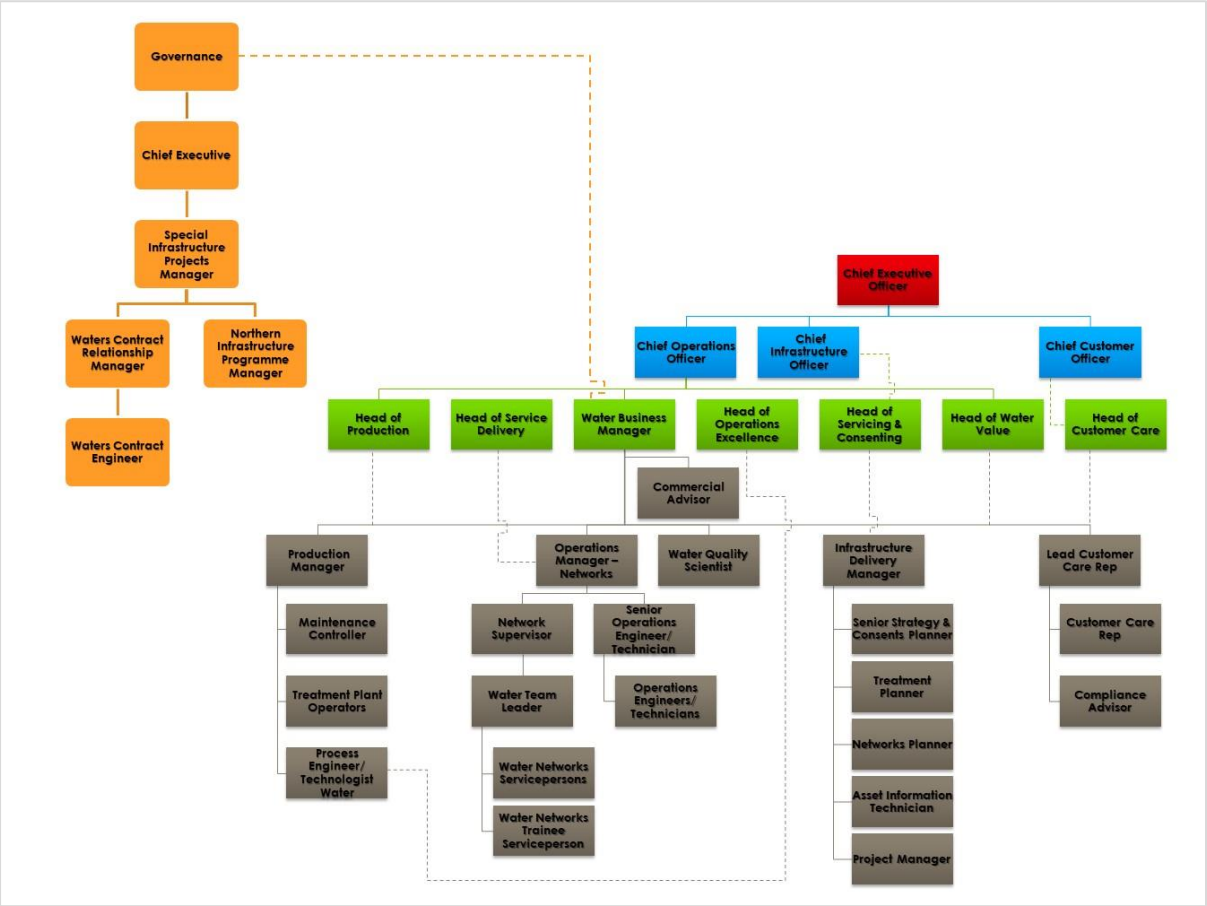

Figure 3-1: WDC water supply services organisation chart (supplied by WDC)

3.2 RATING SYSTEM

As set out in the Asset Management Plan, customers pay for Council water services as part of their annual rates and metered rates (where applicable). Charges are fixed based on actual operational costs and set three years in advance to provide certainty to the community. Only customers who receive the service receive a charge. Costs are also benchmarked against other Councils in New Zealand.

The district-wide targeted rate has been set across all water supply schemes on a per cubic metre basis. The historic and current targeted water rates per cubic metre for metered properties are shown in Table 3-1.

99% of customers are metered. For customers without water meters, WDC has set a targeted rate for water supply based on the provision (connected to the supply) or availability (property situated within 100m of any part of the water supply system) of a water supply service to land. The targeted rates are set as a fixed charge per connection for properties connected to the water supply or 50% of this fixed charge for availability in the main urban centres.

Table 3-1: Historic and current water rates for metered use

Year	Charge $/m^3$
2020/21	2.05
2019/20	1.97
2018/19	1.89
2017/18	1.82
2016/17	1.70

Spring Hill Corrections is the only customer which has a current individual service agreement in place.

For properties that are metered, the Council uses the billing module within Technology One, Council's corporate finance and property and rating management system. The billing system captures a lot of information that is used for consent compliance and for asset management such as:

- Properties on full and restricted flows,
- Average usage per connection,
- Number of connections per property,
- Backflow information.

Council recognises that the data is currently not being used to its full potential and there are constraints on the system and the ability to extract data. A review is proposed on the data structure and how it is stored and ability to then extract and analyse data. This review is part of the recommendations in Section 7.0.

3.3 LEVELS OF SERVICE

WDC has three internal water supply customer levels of service for water supply:

1. The water supply is safe to drink.
2. The water supply is reliable, and water is received at a good flow/pressure.
3. Water extraction and use for potable water supply shall be managed in an efficient and sustainable manner.

The performance measures for these internal levels of service are listed in Table 3-2, along with WDC's current performance and future performance targets.

The key measure relevant to water demand management is "The percentage of real water loss from Council's networked reticulation system". This measure can also be presented in L/connection/day for better comparison between high-use and low-use systems.

The measure "The average consumption of drinking water per day per resident with the Waikato district." is also listed as a water demand management measure in the local government mandatory measures.

The targets and historic performance are shown in Table 3-3 and Table 3-4. These are based on the Draft 2020 Three Waters Asset Management Plan.

Table 3-3 lists the local government mandatory performance measures, along with WDC's current performance and future performance targets. Councils are only required to report a district wide result for the local government mandatory performance measures.

WDC has developed scheme specific targets for the mandatory water loss performance measure, as listed in Table 3-4.

WDC recognises that although the use of percentages is not a consistent measure for comparison of water loss performance across different systems as the number of connections, the length of reticulation, system pressures can all skew the results. However, percentage figures provide a much more immediate general understanding of the state of a network and are therefore the primary metric against which systems are measured. The differences in the system features which contribute to differences in water loss when assessed as a percent are accounted for in the individual system targets.

The WDC's customer levels of service for the water supply service are set out in Schedule 2 of the 2014 water supply bylaw as follows:

- Maximum pressure 100 metres head (1,000 kPa)
- Minimum pressure (on-demand water supplies only) 10 metres head (100 kPa)
- Normal operating pressure 20-30 metres head (200 - 300 kPa)
- Free available chlorine up to 1.5 g/m^3.

In addition to the levels of service outlined above, WDC also adopts the Regional Infrastructure Technical Specification (RITS) for design. The RITS sets out the levels of service for both on-demand and restricted flow water supply areas.

The water supply network shall achieve the following standards for on-demand water supply areas:

a. The residual pressure and flow at point of supply to residential lots shall be a minimum of 200 kPa (20m) and 25 L/min.
b. The minimum fire supply service level shall be FW2 for residential areas and FW3 for all other areas.
c. To protect level of service of new subdivisions, no more than 150 residential Lots shall be serviced, at any point from a single ended 150mm diameter watermain (unless water modelling proves that DN100 will be sufficient, but then no more than 40 residential lots).

The water supply network shall achieve the following standards for restricted flow water supply areas:

a. The flow to the lots within the Water Supply Area Restricted areas shall be no less than 1.8 m^3/day, however some specific areas may require a higher level of service.
b. The flow is to be a steady rate through the meter.
c. Properties reliant on the Water Supply Area Restricted areas must consider the separate provision of fire-fighting capacity as this is not provided by this restriction. Some councils require that the Fire Service SNZ COP PAS 4509 be met through their District Plan provisions.

Table 3-2: Waikato District Council water supply customer levels of service (sourced from Draft 2020 Asset Management Plan)

Level of Service						
The water supply is safe to drink	**Technical Performance Measures**	**Baseline**	**Year 1 2021/22**	**Year 2 2022/23**	**Year 3 2023/24**	**Year 10 2031/32**
	Extent to which Council's drinking water complies with Part 4 of the drinking water standards (bacteria compliance criteria)	18 (no. of WTPs that comply out of 18)	18 (no. of WTPs that comply out of 18)	18 (no. of WTPs that comply out of 18)	18 (no. of WTPs that comply out of 18)	18 (no. of WTPs that comply out of 18)
	Extent to which Council's drinking water complies with the drinking water standards (protozoal compliance criteria)	4 (no. of WTPs that comply out of 4)	4 (no. of WTPs that comply out of 4)	4 (no. of WTPs that comply out of 4)	4 (no. of WTPs that comply out of 4)	4 (no. of WTPs that comply out of 4)
The water supply is reliable, and water is received at a good flow/pressure	**Customer Performance Measures**	**Baseline**	**Year 1 2021/22**	**Year 2 2022/23**	**Year 3 2023/24**	**Year 10 2031/32**
	The total number of complaints received by Council for any of the following: • Drinking water clarity • drinking water taste • drinking water odour • Drinking water pressure or flow, • Continuity of supply • The local authority's response to any of these issues	Maximum 17 per 1000 connections	Maximum 17 per 1000 connections	Maximum 17 per 1000 connections	Maximum 17 per 1000 connections	Maximum 17 per 1000 connections
	Technical Performance Measures	**Baseline**	**Year 1 2021/22**	**Year 2 2022/23**	**Year 3 2023/24**	**Year 10 2031/32**
	Attendance for urgent call-outs: from the time that Council receives notification to the time that service personnel reach the site.	1 hour	1 hour	1 hour	1 hour	1 hour

Level of Service						
	Resolution of urgent call-outs: from the time that Council receives notification to the time that service personnel confirm resolution of the fault or interruption.	4 hours	4 hours	4 hours	4 hours	4 hours
	Attendance for non-urgent call-outs: from the time that Council receives notification to the time that service personnel reach the site; and	5 days	5 days	5 days	5 days	5 days
	Resolution of non-urgent call-outs: from the time that Council receives notification to the time that service personnel confirm the fault or interruption	5 days	5 days	5 days	5 days	5 days
Water extraction and use for potable water supply shall be managed in an efficient and sustainable manner	**Technical Performance Measures**	**Baseline**	**Year 1 2021/22**	**Year 2 2022/23**	**Year 3 2023/24**	**Year 10 2031/32**
	The average consumption of drinking water per day per resident with the Waikato district.	240	240	240	240	240
	The percentage of real water loss from Council's networked reticulation system.	Varies by system - see Table 3-3	Varies by system - see Table 3-3	Varies by system - see Table 3-3	Varies by system - see Table 3-3	Varies by system - see Table 3-3

Table 3-3: Waikato District Council targets and performance for district wide performance measures (sourced from Draft 2020 Asset Management Plan)

Performance Measure	Performance Target for 2016/17	Actual Performance for 2016/17	Actual Performance for 2017/18	Actual Performance for 2018/19
The extent to which Council's drinking water supply complies with:				
Part 4 of the drinking water standards (bacteria compliance criteria)	18	18	18	18
Part 5 of the drinking water standards (protozoal compliance criteria)	15	4	4	4
Where Council attends a call out in response to a fault or unplanned interruption to its networked reticulation system, the following median response times measured				
Attendance for urgent call-outs: from the time that Council receives notification to the time that service personnel reach the site.	60 m	28 m	38 m	36 m
Resolution of urgent call-outs: from the time that Council receives notification to the time that service personnel confirm resolution of the fault or interruption.	240 m	106 m	88 m	117 m
Attendance for non-urgent call-outs: from the time that Council receives notification to the time that service personnel reach the site.	5 days	1 day	1 day	1 day
Resolution of non-urgent call-outs: from the time that Council receives notification to the time that service personnel confirm of the fault or interruption.	5 days	1 day	1 day	1 day
The total number of complaints received by Council about any of the following (expressed per 1000 connections to the networked reticulation system):				
Drinking water clarity Drinking water taste Drinking water odour Drinking water pressure or flow Continuity of supply The local authority's response to any of these issues	17	22.11	26.16	18.25
The average consumption of drinking water per day per resident within the Waikato District.		270L per day	189L per day	221L per day

Table 3-4: Waikato District Council scheme specific targets and performance (water loss) (sourced from Draft 2020 Asset Management Plan)

Performance Measure	Performance Target for 2016/17	Actual Performance for 2016/17	Actual Performance for 2017/18	Actual Performance for 2018/19
The percentage of real water loss from Council's networked reticulation system				
Tuakau	<15%	14.5%	9.8%	16.1%
Pokeno	<15%	34.2%	44.3%	38.8%
Mid Waikato	<25%	34.4%	31.2%	37.8%
Central District	<20%	33.5%	27.1%	30.2%
Raglan	<25%	28.1%	28.6%	32.4%
Huntly	<15%	30.5%	21.8%	18.9%
Southern & Western Districts	<15%	15.3%	14.1%	17.8%
Onewhero	<20%	10.6%	17%	8.0%
Port Waikato	<20%	53%	28.1%	34.9%
Te Akau	<20%	34%	38.5%	14.6%

Table 3-4 shows systems historically not meeting performance targets in red.

4.0 WATER SUPPLY NETWORKS

4.1 OVERVIEW OF SCHEMES

The Waikato District Council covers an area of just over 418,000 ha in the Waikato region.

The district encompasses a diverse area. It borders Hamilton City, Waipa District and Otorohanga District Councils to the south, extends to the West Coast, includes the plains to the east bordering Hauraki District and Matamata-Piako District Councils and stretches north as far as Pokeno and Tuakau (bordering Auckland Council). It has a large rural population, many small communities and six major towns; Huntly, Ngaruawahia, Raglan, Te Kauwhata, Pokeno and Tuakau. Both State Highway 1 and the Waikato River traverse the full length of the district from South to North along its central axis. The region's primary industry is dairy farming and mining with high quality soils located in the central, eastern and far north parts of the district. A map of the water supply schemes in the Waikato District is provided in Figure 4-1. Individual water supply scheme plans are included in the individual scheme appendices.

There are 10 water supply schemes in the Waikato District Council. Each scheme is discussed in more detail in the scheme specific appendices numbered as follows (the three very small schemes are grouped in Appendix H):

A. Pokeno
B. Tuakau
C. Mid Waikato (also known as the Te Kauwhata area)
D. Huntly
E. Central District (Ngaruawahia and Hopuhopu/Taupiri)
F. Southern Districts & Western Districts
G. Raglan
H. Very small schemes (Port Waikato, Onewhero and Te Akau)

The district has a temperate climate with moderate annual rainfall, which ensures excellent growing conditions year-round.

The seven main water schemes are Huntly, Central District, Raglan, Mid Waikato, Southern District, Pokeno and Tuakau servicing primarily the urban areas of the district. A large amount portion of the Mid Waikato demand is for servicing the rural areas. The other remaining schemes service villages and rural areas.

WDC provides reticulated water supply to the community for domestic, industrial, dairy, agricultural uses and firefighting capability. The urban areas receive an "on-demand" supply with surrounding rural areas receiving a "trickle feed" supply. Rural areas beyond the Council reticulated systems are reliant on their own bores or the collection of roof water as their water source.

The water supply schemes are of varying size, quality and age across the district. Most of the schemes were created by the local government body of the time. Some of the schemes that Council now operates and maintains were inherited from businesses/groups within the local community that they served.

The key issues facing the water supply activity are compliance with drinking water legislation and regional consents and managing demand for high growth areas.

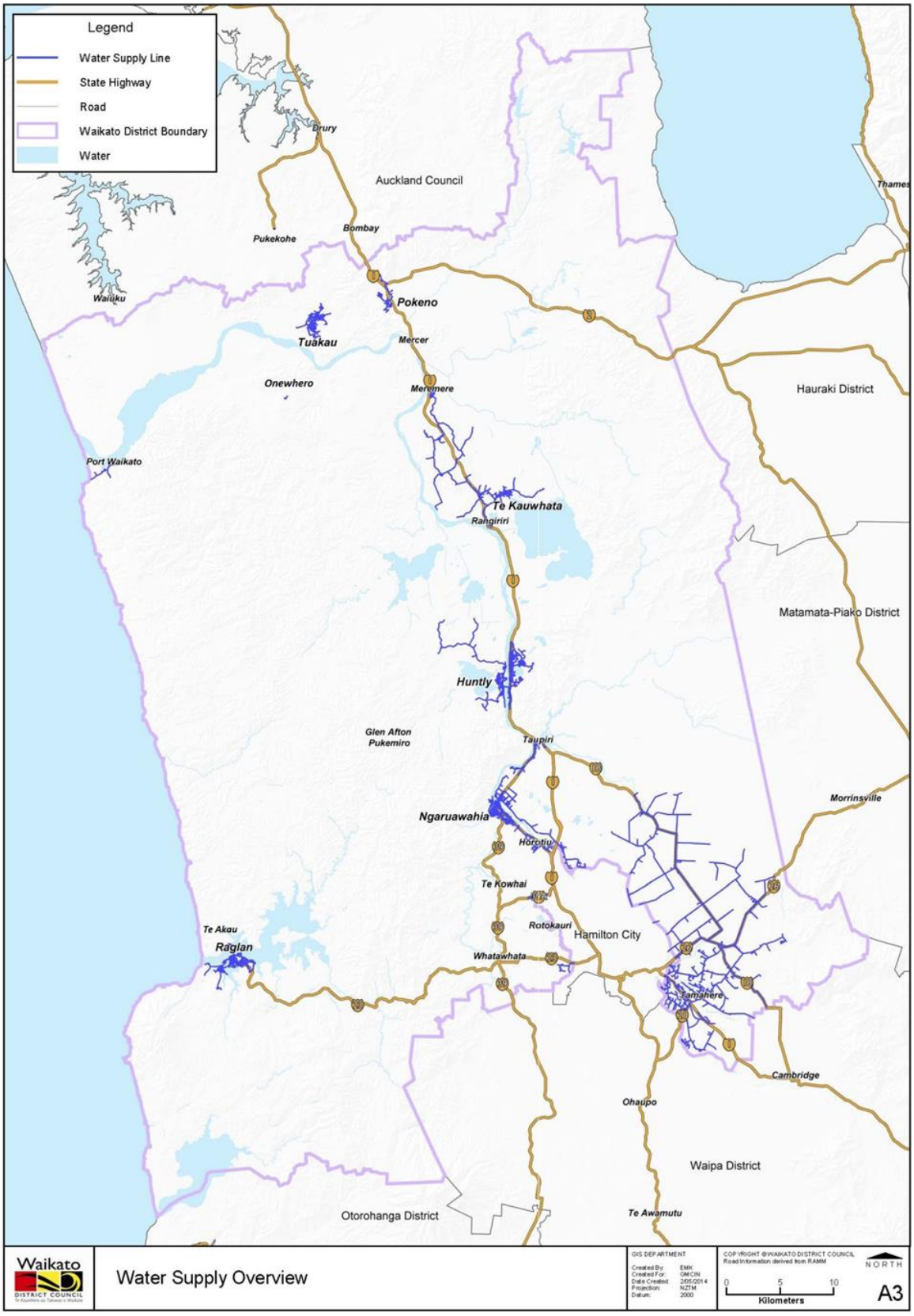

Figure 4-1: Waikato District water supply scheme locality map (Source: Waikato District Council)

4.2 WATER SOURCES

The main water source for the Waikato District is the Waikato River. This accounts for approximately two thirds of the annual water production for the Waikato District. The isolated communities of Raglan and Onewhero draw water from springs, Te Akau, Tuakau and Pokeno draw water from bores, and Port Waikato draws from a stream. The water sources for Raglan, Onewhero and Te Akau are outside of the Waikato River catchment.

Table 4-1 presents an overview summary of the water sources and take consent limits for the 12 water supply schemes.

We note that at the time of writing the supply for Te Akau is currently out of service, with water supplied by tanker from Raglan.

Table 4-1: Summary of water sources and consent limits

Scheme	Water source	Current water take consent limit	Water take consent expiry
Pokeno	Bore and spring	387 m³/day and 998 m³/day, respectively	October 2022 and July 2030
Tuakau	Bore and spring	No limit	N/A
Mid Waikato	Waikato River (third party supply of raw water from the Te Kauwhata Water Association (TKWA))	22,900 m³/day (expired agreement 4,000 m³/day)	June 2024
Huntly	Waikato River	6,700 m³/day with a stepped increase over time to a maximum of 7,000 m³/day	2046
Ngaruawahia	Waikato River	4,400 m³/day with a stepped increase over time to a maximum of 5,000 m³/day	2046
Ngaruawahia, Hopuhopu, and Huntly combined	Waikato River	11,800 m³/day with a stepped increase over time to a maximum of 12,800 m³/day	2046
Southern & Western	Waikato River (third party supply of treated water from Hamilton City Council)	5,000 m³/day (consent transferred to Hamilton City Council).	2046
Raglan	Te Hutewai Road Omahina Spring outside of Waikato River catchment	500 m³/day (groundwater bore) 3,100 m³/day (Omahina Spring)	January 2034
Port Waikato	Maraetai Stream	80 m³/day	April 2051
Onewhero	Spring outside of Waikato River catchment	No consent required as take is a permitted activity due to low volumes.	n/a
Te Akau (currently out of service)	Te Akau Wharf Bore outside of Waikato River catchment	68 m³/day	January 2024

4.3 WATER RETICULATION

4.3.1 Pump stations

There are 11 pump stations installed within the District networks which are listed in Table 4-2 with their corresponding function in the network. The pump capacity data is not currently available and is listed as an improvement action in the 2015 AMP.

Table 4-2: Overview of water supply pump stations

Pump Station	Scheme	Function
Te Ohaki Road	Huntly	Pumps water up Te Ohaki Road and up to Heatherington Reservoir
Hillside Heights	Huntly	Boosts pressure up Hillside Heights
Upland Road	Huntly	Boosts pressure to elevated properties
Hills Road	Raglan	Boosts pressure in the network as required
SH 26 (Eureka)	Southern Districts	Boosts pressure up Eureka zone
Matangi Road	Southern Districts	Boosts pressure up Martangi High (elevation) zone
Newell Road	Southern Districts	Boosts pressure up Tamahere High (elevation) zone
Sainsbury Road	Southern Districts	Boosts pressure up Gordonton
Stonebridge	Western Districts	Boosts pressure up Stonebridge Estate Road
Railway Booster	Tuakau	Boosts pressure up Harrisville Road
Wayside Road	Te Kauwhata	Pumps water up Te Kauwhata Wayside High (elevation) zone

4.3.2 Reservoirs

There are 28 reservoirs within the District's water supply networks. Most of the reservoirs have telemetry to monitor level including high-/low-level alarms. Council aims to have 48 hours storage for each scheme.

Table 4-3: Overview of water supply reservoirs

Supply Scheme	Reservoir	Details	Capacity (m3)
Pokeno	Hitchens Road	Steel	2,400
Tuakau	Harrisville Road (Large)	Steel	2,145
Tuakau	Harrisville Road (Small)	Timber	670
Mid Waikato	Te Kauwhata Water Treatment Works 1	Timber	360
	Te Kauwhata Water Treatment Works 2	Timber	360
	Te Kauwhata Water Treatment Works 3	Timber	1,500
	Springhill Road (Meremere)	Timber	250
	Wayside Road	Timber	500
	Western B	Timber	360
Central Districts	Brownlee Avenue A	Concrete	2,273
(Ngaruawahia/Horotiu)	Brownlee Avenue B	Concrete	2,273
	Hopuhopu	Steel	1,150
	Jackson Street	Steel	3,000
Huntly	Hetherington Road	Concrete	446
	Hillside Height A	Concrete	23
	Hillside Height B	Concrete	23
	Huntly West	Concrete	1,948
	Jackson Road	Concrete	1,500
	Kimihia Road	Concrete	1,128
	Upland Road	Concrete	1,155
	Huntly WTP	Steel	3,200

Supply Scheme	Reservoir	Details	Capacity (m3)
Raglan	Springs	Concrete	1,000
	Bow Street	Concrete	1,136
	Hills Road	Timber	1,250
Southern/Western Districts	Eureka (Hoeka)	Timber	500
	Matangi Road	Timber	250
	Stonebridge	Concrete	22
Te Akau	Te Akau	Timber	45

4.3.3 Flow meters

The bulk flow meters are summarised by water supply scheme in Table 4-4.

Table 4-4: Overview of bulk flow meters

Scheme	Bulk flow meters
Pokeno	Watercare bulk supply point PRV
Tuakau	Watercare bulk supply point PRV
Te Kauwhata (Mid Waikato)	Point of abstraction and after the WTP.
Huntly	Point of abstraction and after the WTP.
Ngaruawahia (Central District)	Point of abstraction and after the WTP.
Southern & Western District	5 bulk flow meters at Hamilton City Council bulk supply points
Raglan	Point of abstraction and before the WTP (before = after as no backwash).
Port Waikato	Point of abstraction and before the WTP (i.e., backwash is not accounted for).
Onewhero	Point of abstraction and before the WTP (before = after as no backwash).
Te Akau	Point of abstraction and before the WTP (before = after as no backwash).

4.3.4 Access to the reticulation system

The WDC Water Supply Bylaw 2014 restricts access to fire hydrants for the purpose of fighting fires, training, and testing to the Fire Service only. The bylaw also restricts the right to draw water from fire hydrants in the water supply system for uses other than firefighting (for example, flow testing or pipe flushing) to the Council (or its authorised agents) and to permit holders. Permit holders need to have submitted an application to the Council to get approval to draw water from designated tanker filling points or a fire hydrant. These bylaw conditions of supply assist in managing unmetered water withdrawals directly from the water supply system however this could be managed better by providing dedicated filling stations in the key schemes.

WDC have commissioned a review of access to the reticulation system for bulk filling which may include future implementation of designated withdrawal points. Currently, WDC monitors usage through registered standpipes but cannot account for unauthorised use.

4.4 EXTENT OF CUSTOMER METERING AND POPULATION SERVED

The billing data provided by WDC lists all the metered customers in the schemes. However, there are uncertainties on how to differentiate the urban from the rural customers, and the commercial from the residential customers. Table 4-5 summarises the total number of customers in each scheme. Population estimates for schemes are given in the Water Safety Plans but these appear out of date due to the rapid development in some areas, so a population density (population per connection) of 2.7 was assumed in line with RITS.

Table 4-5: 2020 connections and estimated population served (billing data)

Water supply scheme	# of metered connections	# of unmetered connections	Total # of connections	Estimated population
Tuakau	2,131		2,131	5,754
Pokeno	1,699		1,699	4,587
Raglan	1,839	32	1,871	5,052
Huntly	3,054	82	3,136	8,467
Mid Waikato	1,396		1,396	3,769
Central District	3,109	67	3,176	8,575
Southern & Western District	3,179		3,179	8,583
Te Akau	26		26	70
Onewhero	11		11	30
Port Waikato	15		15	41
TOTALS	16,459	181	16,640	44,928

5.0 WATER DEMAND ANALYSIS

5.1 INTRODUCTION TO WATER DEMAND ANALYSIS

This section of the report outlines the analysis of the trends in water demand. This analysis is undertaken at four levels:

1. Abstraction – the recorded abstraction flows from the water sources (typically daily however some of the data was less frequent, e.g., Raglan and the three smaller schemes);
2. Treated water demand – for those water supply networks that also record the daily demands after the treatment plant;
3. Metered customer consumption – based on the customer meter billing records; and
4. Non-revenue water and leakage – based on annual water balance reports.

The results of the demand analysis are presented with the following parameters or trends:

- Abstraction demand trends (versus consent limit)
- Treated demand trends (versus treatment capacity)
- Annual average daily demand (AADD)
- Peak day demand (PDD) and Peak day ratio (PDD/AADD)
- Potential impact of water restrictions
- Historical water loss trends
- Benchmarking of demand and water loss
- Breakdown of total demand into sectors of use
- Breakdown of metered demand into sectors of metered customer use
- Metered customer demand trends

5.1.1 Water Restrictions

Water restrictions are applied during the summer months to reduce peak day demands. The alert levels are detailed in the Drought Management Plan in Appendix K and summarised in Table 5-1. The timing of historical water restrictions from 2015 to 2020 are summarised in Table 5-2. Summer restrictions were in place prior to 2010 with a blanket restriction allowing sprinkler systems on alternate days only, from 1 December to 1 March each summer.

The WDC alert levels are shown in Table 5-1.

Table 5-1: Alert levels for water restrictions

Alert level	Restriction
Level 1	Sprinkler systems permitted between 6-8am and 6-8pm only. No restriction on commercial/non-residential properties.
Level 2	Sprinkler systems permitted between 6-8am and 6-8pm on alternate days only. No restriction on commercial/non-residential properties.
Level 3	Total ban on domestic sprinklers – only handheld hosing permitted. Restriction on outdoor water use for commercial/non-residential properties.
Level 4	Total ban on all external non-essential use of water. Restriction on all external water use for commercial/non-residential properties.

Table 5-2 shows the history of water restrictions over the last 5 years.

This shows that the most severe water restrictions introduced since 2010 were during the 2019/20 summer, Alert level 4. The earliest date that water restrictions were introduced was 12 November, in 2010. The longest period that at least Alert level 2 was in place was from 14 January to 01 May during the 2019/2020 summer. At the time of writing this report (01 April 2021), Alert level 1 was still in place in Tuakau and Pokeno.

Table 5-2: Historical water restriction dates from 2015 to 2020

Date	Alert Level Change
Summer 2019/2020	
11 December 2019	Alert level 1
14 January 2020	Alert level 2
20 January 2020	Alert level 1
31 January 2020	Alert level 3
06 February 2020	Alert level 3
12 February 2020	Alert level 4
	Alert level 1
06 March 2020	Alert level 2
25 March 2020	Alert level 2
	Alert level lifted
01 May 2020	Alert level lifted
Summer 2018/2019	
01 December 2018	Alert level 1
11 January 2019	Alert level 4
13 January 2019	Back to alert level 1
29 January 2019	Alert level 2
25 March 2019	Alert level lifted
Summer 2017/2018	
1 December 2017	Alert level 1
7 December 2017	Alert level 2
20 December 2017	Alert level 3
25 January 2018	Alert level 2

Date	Alert Level Change
21 February 2018	Alert level 1
26 February 2018	Alert level lifted
27/3/18	Alert level lifted
Summer 2016/2017	
12 December 2016	Alert level 1
20 February 2017	Alert level lifted
Summer 2015/2016	
01 December 2015	Alert level 1
08 January 2016	Alert level 2
30 March 2016	Alert level lifted

5.1.2 Simplification of WDC Water Alert Levels

WDC operates under three different Water Alert level systems in the different areas. Southern and Western Districts follow the Hamilton City Council water alert system, Pokeno and Tuakau follow that of Watercare, and the WDC water alert system applies to all other schemes.

Pokeno and Tuakau are supplied from Watercare bulk mains which supplement the reservoirs forming the majority of Auckland's water supply. Use of water in Pokeno and Tuakau therefore affect supply to Auckland and retaining the Watercare alert system is therefore appropriate.

Similarly, Southern and Western Districts are supplied directly from Hamilton's network, which obtains water from the Waikato River. Issues affecting Hamilton supply therefore directly affect these areas as well and retaining the HCC alert system is therefore also appropriate.

With the exception of Raglan, the remaining WDC systems are also part of the Waikato River catchment. Any issues affecting Hamilton should therefore be affecting the WDC systems as well to some extent and adopting HCC's system would eliminate a lot of confusion and inconsistency.

Raglan remains an outlier. For simplicity and consistency, it may be better for Raglan to also adopt the HCC system, rather than developing a separate system for a single supply.

We therefore recommend that all WDC systems except Pokeno and Tuakau adopt HCC's water alert level system, and that Pokeno and Tuakau remain on the Watercare alert level system.

5.2 DATA ASSUMPTIONS AND LIMITATIONS

Extreme high and low anomalies were identified in the daily bulk demand data (for abstraction and treated water demand). Many of the anomalies were due to telemetry issues that occurred on a single day and the anomalous data was replaced with the average of the preceding and the following daily reading. Some of the anomalies were legitimate flows that had been identified by the operators and annotated on the operators' spreadsheets (for example, water leak in network). Legitimate flows were retained in the historical record and annotated on the graph where relevant.

5.3 DEMAND DRIVERS

A wide range of drivers have the potential to impact water demands, as shown in Figure 5-1. Improved understanding of the factors influencing demand allows more accurate demand forecasts and appreciation of the historic and future trends in water use.

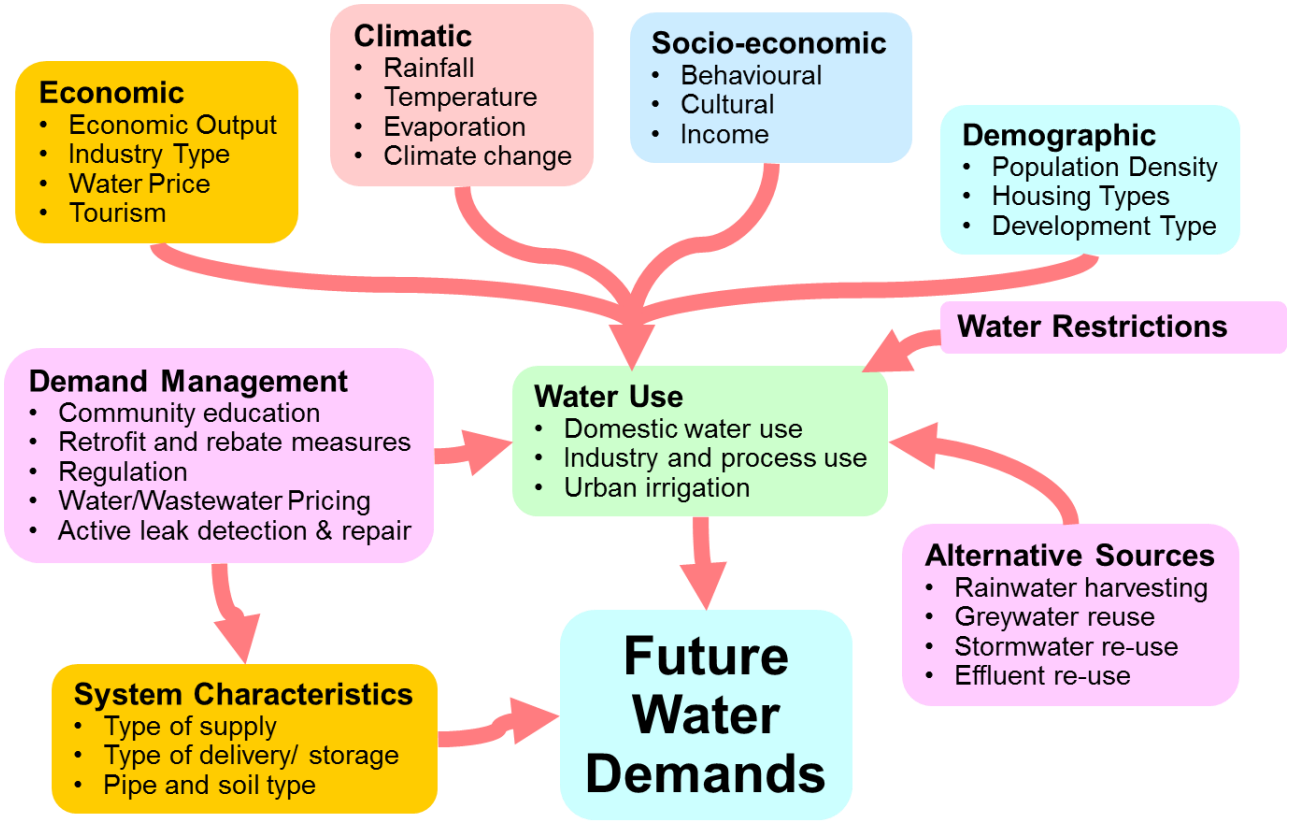

Figure 5-1: Water demand drivers

A high-level assessment of the expected change in demand drivers and corresponding influence on water demands for the Waikato District is shown in Table 5-3.

Table 5-3: Expected change in demand drivers and corresponding influence on water demands

Driver	Expected change	Change in water demand
Population	Increase	Increase
Household Size	Decrease (increased account formation)	Increase (residential)
Dwelling type mix	No change	No change
Vacancy rate	No change	No change
Non-residential growth	Increase	Increase
Use of efficient fixtures	Increase	Decrease
Lifestyle	Increase in discretionary water use	Increase
Tourism	No change	No change
Climate change	Potential influence	Potential influence

5.4 ANALYSIS OF BULK DEMAND RECORDS

5.4.1 Overview of the bulk demand analysis

These sections provide overview summaries of the bulk demand analysis for the 10 water supply schemes using tables and graphs.

The scheme specific appendices (Appendix A through H) include the scheme specific analysis and commentary. Table 5-4 presents an overview of the scheme characteristics and percentage of consent and treatment capacity utilised as derived from the scheme specific demand analysis.

Table 5-4: Overview of scheme characteristics and percentage of capacity utilised

Scheme	Urban or rural scheme	% of maximum day consent allocation utilised	Maximum historic % of water treatment capacity utilised in past four years
Pokeno	Urban	no limit	WTP also serves Auckland % of capacity used unknown
Tuakau	Urban	no limit	WTP also serves Auckland % of capacity used unknown
Mid Waikato	Mostly Rural	some capacity	56% of current agreement with TKWA
Huntly	Urban	ample capacity	55%
Central District	Urban	at capacity	95%
Southern & Western District	Mostly Rural	some capacity	80% of current agreement with HCC
Raglan	Mainly Urban	ample capacity	64%
Port Waikato	Rural	ample capacity	54%
Onewhero	Rural	ample capacity	23%
Te Akau	Urban	ample capacity	24%

5.4.2 Abstraction

The abstraction demand analysis was used to derive the average abstraction demand assumptions (per capita and per residential connection) for the water supply demand balance (SDB) forecasts, along with the peak day factor assumptions based on the historic demands.

The abstracted demands include water treatment plant process losses and raw water pipeline losses plus all residential and non-residential demand, system leakage and other non-revenue water loss.

Table 5-5 sets out the abstracted demand assumptions derived from the abstracted demand analysis in Appendices A to H. These demand assumptions were applied to the population and residential connection growth forecasts to obtain the average and peak day abstracted demand forecasts presented in Section 6.4. The demand assumptions on a per capita basis were used for the SDB forecasts for Huntly and Central District. All other schemes used the demand per residential connection assumptions (the demand per capita is shown as n/a for the other schemes). The peak day ratios are based on recent historic demands as discussed in the Appendices A to H.

Table 5-5: Baseline abstracted demand assumptions

Scheme	Abstraction annual average day (L/capita/day)	Abstraction - annual average day (L/connection/day)	Abstraction - peak day (L/capita/day)	Abstraction - peak day (L/connection/day)
Pokeno	237	569	370	888
Tuakau	270	649	442	1,061
Mid Waikato	604	1,450	827	1,984
Huntly	381	914	573	1,376
Central District	418	1,002	540	1,295
Southern & Western District	311	747	526	1,262
Raglan	332	796	515	1,236
Port Waikato	1,017	2,441	2,222	5,333
Onewhero	142	340	568	1,364
Te Akau	106	255	256	615

5.4.3 Total treated demand

The outcome of the treated demand analysis was to calculate the average treated demand assumptions (per capita and per residential connection), along with the peak day factor assumptions based on the historic demands.

The bulk treated demands include all residential and non-residential demand, system leakage and other non-revenue water loss. The difference between the abstracted demands and the bulk treated demands is the water treatment plant process loss and raw water pipeline leakage. For some schemes the bulk treated demands had to be estimated from the abstracted demands by subtracting an allowance for the process loss and raw water pipeline loss. Chlorination only schemes had no process losses.

Table 5-6 sets out the treated demand assumptions derived from the demand analysis in Appendices A to H. These treated demand assumptions were applied to the population and residential connection growth forecasts to obtain the average and peak day treated demand forecasts presented in Section 6.4. The demand assumptions per capita were only used for Huntly and Central District.

Table 5-6: Baseline treated demand assumptions

Scheme	Annual average day treated demand (L/residential connection/day)	Peak day ratio
Pokeno	371	1.9
Tuakau	476	1.9
Mid Waikato	414	2.3
Huntly	573	1.8
Central District	574	1.5
Southern & Western District	422	2.2
Raglan	427	2.0
Port Waikato	795	2.1
Onewhero	340	7.5
Te Akau	182	2.0

5.4.4 Conclusions on the bulk demand trends

The 2019/20 water production figures for the WDC schemes have been benchmarked against available data from other New Zealand councils (the Water NZ 2019/20 performance review results) as shown in Figure 5-2. The WDC schemes are shown in green in Figure 5-2.

The Water NZ performance review results are shown as aggregated results for each council rather than by individual water supply schemes.

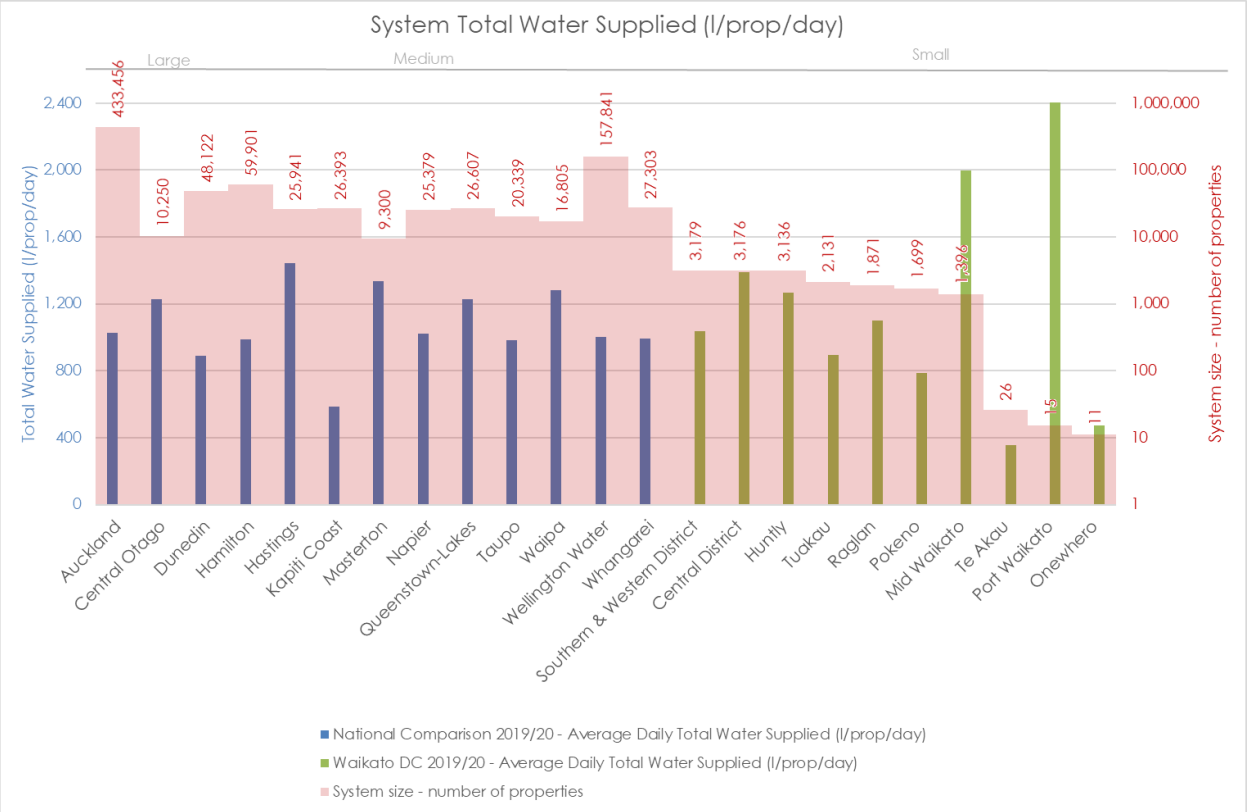

Figure 5-2: Benchmarking of WDC water consumption against other NZ data 2019/20

Figure 5-2 shows that the WDC schemes generally fit within the spread of values from the other NZ councils. Mid Waikato is the only significant scheme with an abnormally high per-property abstraction, due to the rural nature of this scheme with many non-residential customers, and higher water loss than similar size urban schemes. The extreme high and low figures in the very small schemes just reflect the impact the different use patterns of individual users can have on a small system.

As illustrated in Figure 5-1, there are many water demand drivers and the New Zealand councils benchmarked each have their own unique set of demand drivers. The mix of residential and non-residential demand also has a significant impact on the total water supplied per connection. The difference between the water supplied per connection and per capita figures is the population density. Table 5-7 presents a summary of the key parameters for the New Zealand councils benchmarked.

Table 5-7: Summary of key parameters for New Zealand councils benchmarked

Participant	Total Water Serviced Properties	% Non-residential meter connections	% Residential meter connections	Total Population	Average population/ connection
Ashburton	10,778	45%	7%	35,000	3.2
Auckland	433,456	100%	100%	1,680,500	3.9
Central Otago	10,250	100%	100%	23,100	2.3
Christchurch	156,130	98%	99%	387,700	2.5
Clutha	7,083	16%	12%	18,150	2.6
Dunedin	48,122	96%	0%	132,300	2.7
Gore	5,781	45%	2%	12,800	2.2
Hamilton	59,901	47%	0%	172,300	2.9
Hastings	25,941	67%	2%	86,100	3.3
Hauraki	7,308	100%	100%	21,000	2.9

Participant	Total Water Serviced Properties	% Non-residential meter connections	% Residential meter connections	Total Population	Average population/ connection
Horowhenua	13,151	100%	28%	35,300	2.7
Invercargill	20,992	82%	1%	56,600	2.7
Kapiti Coast	26,393	82%	90%	56,000	2.1
Mackenzie	3,583	42%	5%	5,270	1.5
Manawatu	9,062	34%	0%	31,600	3.5
Marlborough	15,944	68%	15%	49,400	3.1
Masterton	9,300	10%	2%	26,900	2.9
Napier	25,379	28%	3%	65,200	2.6
New Plymouth	31,038	73%	3%	84,600	2.7
Palmerston North	31,634	69%	0%	89,100	2.8
Queenstown-Lakes	26,607	3%	3%	63,795	2.4
Rangitikei	4,242	59%	12%	15,550	3.7
Rotorua	25,641	100%	14%	75,800	3.0
South Waikato	8,282	100%	1%	25,100	3.0
South Wairarapa	4,425	100%	81%	11,300	2.6
Southland	7,411	12%	0%	13,311	1.8
Stratford	2,945	100%	2%	9,810	3.3
Tararua	5,650	100%	0%	18,650	3.3
Tasman	13,505	100%	87%	55,100	4.1
Taupo	20,339	38%	5%	39,300	1.9
Tauranga	59,729	100%	100%	146,200	2.4
Timaru	21,373	11%	0%	47,900	2.2
Waimakariri	19,824	41%	12%	62,800	3.2
Waipa	16,805	82%	36%	56,300	3.4
Wellington Water	157,841	80%	1%	430,300	2.7
Western Bay of Plenty	17,233	100%	100%	54,800	3.2
Whakatane	13,028	89%	89%	37,600	2.9
Whanganui	19,987	46%	0%	47,300	2.4
Whangarei	27,303	100%	100%	98,300	3.6

5.5 ANALYSIS OF METERED CUSTOMER CONSUMPTION

5.5.1 Metered customer consumption

Watercare provided six-monthly customer meter readings from 2016 to 2020 for development of the metered customer demand volumes. Watercare also provided a GIS layer containing the customer connection locations.

The meter billing database was relatively complete and consistent, and there was a fair rate of match (>80%) between the 2020 billing data and the GIS layer.

5.5.1.1 System Assignment

The billing data did not indicate which water system customers were assigned to, but this information was available in the GIS layer and was therefore directly assigned for 80% of customers. The 20% of customers without a match in GIS were assigned to water systems based on the locality provided as part of the customer address. See Appendix I for details.

5.5.1.2 Customer Categorisation

Various methods for categorisation of customers were trialled but were unsuccessful. Details of the methods and outcomes are set out in Appendix I, but in summary the final assessment assumes only the largest 10 users in each system are commercial and makes no distinction between other customers.

- We recommend a full review of all data available relating to customers, to determine if the sufficient data is available for categorisation. As a minimum, customers must be able to be categorised as residential or non-residential.

5.5.1.3 Billing Cycles

Customers meters are read roughly every six months, but actual dates of meter reads vary between systems and between customers. This can cause problems when trying to match the period we have billing data for to system production information set out in Section 5.4.

Once customers were assigned to systems, the meter readings taken within the 2019/20 year within each system were reviewed to determine the billing period for each system.

Table 5-8 shows the outcomes. The green cells show the months where the most readings were taken for that system.

Table 5-8 : Meter Read Counts by System and by Month

System	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Huntly	36	2,966	36	9	16	24	2,615	414	20	28	14	17
Southern & Western District	34	14	8	2,713	84	23	16	19	503	2,547	31	22
Central District	3,034	32	24	5	18	825	134	63	26	27	24	19
Raglan	5	10	10	96	1,717	17	15	11	11	223	1,559	48
Tuakau	8	9	1,775	14	22	9	12	264	1,551	30	15	9
Pokeno	17	22	1,616	30	26	27	15	628	891	37	24	23
Mid Waikato	8	9	1,196	22	27	7	9	349	978	23	12	13
Te Akau				26						27		
Port Waikato		1	13					14		1		
Onewhero			9	1					11			

This table shows the billing periods are relatively consistent within systems. This allows us to pick our production data for each system to match the billing cycle, eliminating potential errors from mis-matched supply and demand periods.

The billing cycles used are set out in Table 5-9.

Table 5-9 : Billing Cycles by System

System	Billing cycle start	Billing cycle end
Huntly	1/03/2019	1/03/2020
Southern & Western District	1/05/2019	1/05/2020
Central District	30/06/2019	30/06/2020
Raglan	1/06/2019	1/06/2020
Tuakau	1/04/2019	1/04/2020
Pokeno	1/04/2019	1/04/2020
Mid Waikato	1/04/2019	1/04/2020
Te Akau	1/05/2019	1/05/2020
Port Waikato	1/04/2019	1/04/2020
Onewhero	1/04/2019	1/04/2020

5.5.1.4 Customer Volume Scaling

The billing data provided the date of each reading along with the number of days the reading covered. Due to variances in reading dates, the readings rarely provided information on exactly 365 days.

For example, some customers may have readings which just fell outside the 2019/20 year for which readings were obtained, and only had one reading covering around 200 days. Others may have missed readings prior to the 2019/20 year and had volumes covering over 400 or 500 days. One relatively large customer had readings all taken within the 2019/20 year covering 929 days.

To account for this, the volume associated with readings for each customer were scaled up or down linearly to represent 365 days of water use.

5.5.1.5 Lockdown Effects

During the lockdown of March/April 2020, the country-wide lockdown imposed meant meter reading was unable to be undertaken and estimates were used for billing. Table 5-10 shows this through the counts of estimated meter reads by month in the 2019/20 data reviewed.

Table 5-10 : Lockdown - Estimated Meter Read Counts by Month

Month	Estimated Readings	Total Readings
Jul 2019	11	2,816
Aug 2019	1	1,762
Sep 2019		3,991
Oct 2019	17	2,943
Nov 2019	1	1,679
Dec 2019	2	151
Jan 2020	23	3,142
Feb 2020	14	3,063
Mar 2020	2,120	4,687
Apr 2020	2,722	2,916
May 2020	41	1,910
Jun 2020	9	932
Grand Total	**4,961**	**29,992**

Concerns were raised that the estimates may introduce error into the water loss assessment.

Checks were carried out to determine if the estimates resulted in a change in apparent demand from the year before, and these showed a good match between annual consumption in 2018/19 from actual reads and 2019/20 consumption when estimated reads were used in March and April. However, these checks do not account for any genuine change in use which may have occurred due to the lockdown.

It might be assumed that commercial use would have dropped during this time, and there may have been a corresponding increase in residential use, as people worked from home more. However, the magnitude of these effects is unknown, nor is it known whether they would simply cancel each other out.

Once actual readings are available from all properties for the period following lockdown, it may be possible to confirm the existence and magnitude of these effects. For the purposes of this WDMP, we have assumed the estimated reads are accurate, but recognise that these effects add to the uncertainty in the water demand analysis.

- We recommend a separate study into the effects of lockdown on water use once actual readings for all properties are available for the period following the March / April 2020 lockdown.

With the billing cycles it was found systems most affected by this appear to be Mid Waikato, Raglan and Tuakau. Table 5-11 shows a summary of actual and estimated readings made in the lockdown period. This shows that although the Pokeno billing cycle is in March, it appears to have been largely unaffected.

Table 5-11 : Lockdown - Summary of Meter Reads in March and April 2020

System	Actual Reads	Estimated Reads
Central District	27	2
Huntly	45	0
Mid Waikato	70	1,148
Onewhero	1	9
Pokeno	1,628	18
Port Waikato	88	21
Raglan	15	2,708
Southern & Western District	29	5
Tuakau	858	931

5.5.2 Large customers

WDC has a list of large customers but does not consistently track large customer meter use. There are some large customers on monthly meter readings, but others are on six-monthly meter readings.

The customer billing records were reviewed by Stantec to identify any single industrial, commercial or agricultural customer that used more than 15 cubic metres of water per day (to address WMP requirement 15 under RPV6) and found a total of 51 large customers across the district.

These customers are listed in Table 5-12, along with the Property Type and Tariff information provided with the billing data. Average daily consumption is based on readings taken in the 12-month period to June 2020. Individual tables for each scheme are included in Appendices A to H.

Table 5-12: Large customers above 15 m³/day

System	MeterID	Ave m³/d	Tariff	Type
Mid Waikato	15741257	364.9	RurHamp	CrownLand
Pokeno	3K672018521069	108.9	UrbPok	Farmland
Southern & Western District	1534008191	107.5	RurRua	BusStdDwel
Huntly	15710983	107.2	RurHly	ComRur
Mid Waikato	110155129	62.3	UrbTeK	BusEldDwel
Huntly	31657848	60.9	RurHly	ComUrb

System	MeterID	Ave m^3/d	Tariff	Type
Tuakau	99A205472	43.0	UrbTuak	RsvPark
Huntly	15773854	42.0	ComHly	Farmland
Mid Waikato	15JU020164	40.3	RurHamp	ComRur
Tuakau	08A112612	37.1	UrbTuak	RsvPubRec
Southern & Western District	16JU014361	33.2	RurGor	Farmland
Raglan	06M251971	31.2	ComRag	ResUrbDwel
Southern & Western District	09A046715	30.3	RurTam	ResUrbDwel
Mid Waikato	16JU014829	29.5	RurMer	Farmland
Southern & Western District	15JU021705	28.7	RurNew	Farmland
Southern & Western District	16JU015038	27.9	RurEur	Farmland
Southern & Western District	15MC200557	27.2	RurNew	Farmland
Southern & Western District	16JU014903	27.2	RurEur	Farmland
Central District	02W028445	26.8	ComNga	BusStdLUnt
Central District	1334009268	26.8	RurNga	RelChurch
Central District	13A017413	26.2	RurNga	ResRurDwel
Tuakau	17A106991	25.3	ComTuak	BusStdDwel
Southern & Western District	16JU015042	25.2	RurPuke	Farmland
Central District	100031808	24.4	RurTau	ResRurDwel
Southern & Western District	16JU014822	23.9	RurGor	Farmland
Southern & Western District	16JU014453	23.8	RurGor	Farmland
Huntly	15MC201155	23.5	RurHly	Farmland
Huntly	18A167290	23.4	ComHly	BusStdDwel
Southern & Western District	16JU014259	22.7	RurPuke	Farmland
Huntly	143400741	22.3	RurHly	EduHigSch
Southern & Western District	31552298	22.1	RurMat	BusStdDwel
Tuakau	08W714686A	22.1	ComTuak	BusStdDwel
Central District	01A800952	22.0	ComNga	ResUrbDwel
Mid Waikato	08W712639	21.3	RurHamp	ComRur
Tuakau	16H763963	20.7	UrbTuak	BusStdSHdr
Pokeno	13S25175	20.7	UrbPok	0
Huntly	08W712636A	19.3	UrbHly	CommTitle
Southern & Western District	06M127588	19.3	RurPuke	Farmland
Huntly	98M180658	19.0	RurHly	ResRurDwel
Mid Waikato	49540291	19.0	ComPok	BusStdDwel
Raglan	13080993	18.6	UrbRag	ResUrbDwel
Raglan	M151383	18.0	UrbRag	EduPriSch
Huntly	13080988A	18.0	RurHly	MLFreehold
Central District	16JU014689	17.6	RurTau	ResRurDwel
Southern & Western District	15JU020411	17.6	RurGor	Farmland
Southern & Western District	15JU021650	16.5	RurGor	Farmland
Central District	14022071	16.1	RurNga	ResRurDwel

System	MeterID	Ave m³/d	Tariff	Type
Southern & Western District	C10EU001272	16.1	RurPuke	Farmland
Southern & Western District	15JU020112	16.0	RurGor	BusStdDwel
Southern & Western District	16M153780	15.9	RurPuke	Farmland
Central District	09M009495	15.7	UrbNga	ResUrbDwel

5.5.3 Conclusions on analysis of metered customer consumption

The billing data appears complete and consistent and has been used in water demand analysis with little adjustment.

There is a total of 51 industrial, commercial or agricultural customers across the District that have recently used more than 15 m³/day of water.

The 2019/20 water demand figures for the WDC schemes have been benchmarked against available data from other New Zealand councils (the Water NZ 2019/20 performance review results) as shown in Figure 5-3. The WDC schemes are shown in green in Figure 5-3.

The Water NZ performance review results are shown as aggregated results for each council rather than by individual water supply schemes.

Figure 5-3 shows that the WDC schemes are generally at the lower end of the spread of values from the other NZ councils, which likely reflects the fact almost all users are metered. Port Waikato is the only scheme with an abnormally high per-property consumption, but as a very small scheme this may simply show the impact the different use patterns of individual users can have on a small system.

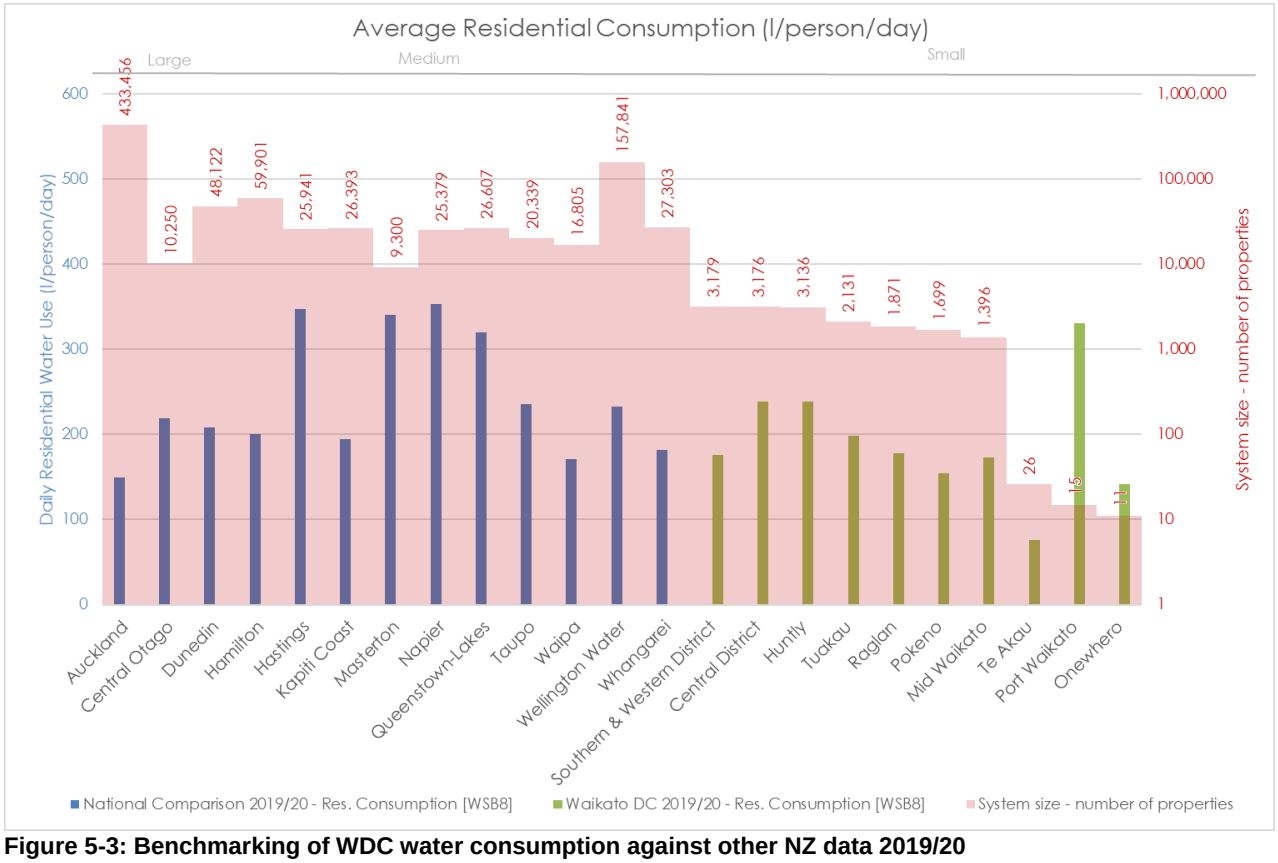

Figure 5-3: Benchmarking of WDC water consumption against other NZ data 2019/20

Key concerns and areas for improvement are as follows:

- The billing data does not appear to contain a reliable way to differentiate between residential and commercial customers. For the purposes of this WDMP the top ten users in each large system have been assumed to be commercial.
    - A separate study is recommended to investigate whether readily available data is sufficient for categorisation into residential and commercial, and to assess whether sub-categorisation of commercial properties is possible.
- Estimates were used for customers in the meter reading cycles affected by the March / April 2020 nationwide lockdown. Although the estimates are in line with the previous year's readings, any actual effects of the lockdown are unable to be determined at this stage and add uncertainty to the demand analysis. The most affected systems were found to be Mid Waikato, Raglan and Tuakau.
    - A separate study is recommended to investigate this when a full set of actual readings are available for the period following the lockdown.

Once categorisation of customers has been undertaken, demand assumptions can be developed for each customer category and the accuracy of demand forecasting will be improved.

Actions to improve demand data are included in Section 5.7.

5.6 ASSESSMENT OF WATER LOSSES

5.6.1 Introduction to the assessment of water losses

The industry standard tool for assessing the annual level of water loss is the International Water Association (IWA) Water Loss Task Force standard water balance. This water balance approach is shown in Table 5-3 below and has been adopted by Water New Zealand. Water New Zealand has developed a spreadsheet tool for undertaking the water balance called BenchlossNZ.

<table>
<tr><td rowspan="8">System Input Volume

(Corrected for Known Errors)</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption (including water exported)</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Un-metered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="6">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Un-metered Consumption</td></tr>
<tr><td rowspan="4">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorised Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Mains</td></tr>
<tr><td>Leakage on Overflows at Storage</td></tr>
<tr><td>Leakage on Service Connections Up to Point of Customer Metering</td></tr>
</table>

Figure 5-4: Standard Water Balance

The diagram above shows that there are three main categories of non-revenue water (NRW): unbilled authorised consumption; apparent losses; and real losses (leakage). Non-revenue water is the preferred term for what was previously referred to as "unaccounted for water".

The real losses represent the annual volume lost from the distribution system through all types of leaks and bursts on mains and service connections, up to the point of customer metering. Real losses are typically the most significant component of non-revenue water. Real losses can be assessed by any one of three different methods:

1. The 'top-down' approach of the annual standard water balance (as shown above);
2. The 'bottom-up' analysis of night flows; and
3. Component analysis.

It is best practice to assess real losses by a combination of at least two of these methods. The advantage of using more than one method is the ability to cross-check results against each other to confirm accuracy. Assessing losses from the "bottom-up" approach entails night flow monitoring in sub-zones within each scheme.

WDC have commissioned annual water balance reports covering the 9 larger water supply schemes for each year since 2011/12. The water balance results are presented in Section 5.6.2. Unfortunately, none of the supplies have metering required to produce minimum night flow data, so no minimum night flow analyses have been carried out to date.

We recommend installation of bulk flow metering on reservoir outlets in large schemes, to enable night flow monitoring in the larger supply zones. This will not only allow improved water loss estimates, but also allow faster identification and repair of water mains bursts.

It has been recognised for many years that percentages are unsuitable for assessing the management of real losses as they are strongly influenced by the consumption of water in each individual system and variations in that consumption. If a water utility reduces water loss, but the consumption reduces to a greater extent, then the water loss figure as percentage of production may increase rather than decrease.

However, it is still common for water utilities to present their water loss figures as a percentage of production which is a simple and easily understood performance measure.

There are two alternative performance measures for water loss promoted by the 2010 Water NZ Water Loss Guidelines.

- **The Infrastructure Leakage Index or ILI**
  This is a dimensionless metric comparing the current annual level of real water losses (CARL) against the theoretical unavoidable annual real losses (UARL).

  ILI = CARL (Litres/service connection/day) / UARL (Litres/service connection/day)

  The UARL is calculated from the number of connections, length of mains, and pressure on a water network. The formula is shown below.

  UARL (Litres/service connection/day) = (18 x Lm + 0.8 x Nc) x P
  where:
  Lm = Length of Mains (km)
  Nc = Number of Connections
  P = Average Network Pressure

  Internationally, this equation has been shown to be a good reflection of the minimum level of real losses that could reasonably be expected on a network in good condition.

  As the ILI ratio is based on UARL for that particular network, this is the recommended metric for benchmarking between different types of supplies. For example, the ILI for a rural network with long pipe lengths but few connections can be directly compared to the ILI for an urban network with a high density of connections, and the network with the higher ILI is where water loss efforts are likely to be more effective.

- **The water loss volume expressed in L/service connection/day or m³/km/day**
  This metric is a direct unitary measure of the level of leakage on a system. This is useful for comparing between similar systems but takes no account of differences in system type and often

shows high water losses for small or rural systems. This metric is useful for process benchmarking and target setting.

In this update of the WDMP, water loss has been expressed as a percentage to align with the Levels of Service set out in Section 3.3, but also in litres/connection/day.

In this update the ILI has not been calculated, but for reference the World Bank Institute have set guideline bands for the Infrastructure Leakage Index (ILI) in developed countries, from A (Excellent) through to D (Very Bad) as shown in Table 5-13.

Table 5-13: World Bank Institute banding system for ILI in developed countries

Band	ILI values	Operational performance in leakage management
A	< 2	Excellent – Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost effective improvement.
B	2 to < 4	Good – Potential for marked improvements; consider pressure management; better active leakage control practices and better network maintenance.
C	4 to < 8	Poor – Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyse level and nature of leakage and intensify leakage reduction efforts.
D	> 8	Very Bad – Very inefficient use of resources; leakage reduction programs imperative and high priority.

It is worth noting that the more general term “losses” include not just leakage but also “apparent losses” such as water theft and meter errors. It should be noted that apparent losses represent a direct loss of revenue through water theft or under-registration of customer meters (through meter over-sizing or meter deterioration due to age).

The cost of apparent losses is typically higher than the cost of leakage as they represent loss revenue for unmeasured water consumed by customers. The cost of apparent losses is estimated by multiplying the apparent loss volume by the unit rate of water charged to customers. The cost of leakage is measured by multiplying the leakage volume by the marginal cost of water production (pumping and treatment costs).

5.6.2 Scheme water losses

This section describes the historic water loss estimates for each scheme from the three Thomas Consultants’ annual water balance reports.

There will always be uncertainties in the calculation of leakage and other non-revenue water components due to the assumptions made (e.g., the assumption for customer meter under-registration) and the 2010 Water NZ Water Loss Guidelines recommends presenting leakage estimates from the water balances with 95% confidence intervals (which can easily be up to +30% and greater).

Figure 5-5 presents an overview of the 2019/20 water balance results as percentage of the total water supplied. The numerical value for the percent real loss is shown on the chart for each scheme. Individual graphs for each scheme are included in the scheme Appendices A to H.

The water loss for Onewhero is shown as 0% in Figure 5-5. This is due to an inconsistency between the billing data and the WTP bulk flow data, which indicated more water had been consumed than produced. We recommend a separate study to determine the cause of this inconsistency.

The water loss for Port Waikato is shown as 64% in Figure 5-5. This is an extreme level of water loss, and a high-level analysis has been undertaken to confirm this is not a new issue – the difference between water supplied and water billed in this network over the last four years has been high and inconsistent. The analysis is outlined in more detail in Appendix H. There is anecdotal evidence that showers and taps at public toilet blocks are left on for extended periods of time. These were not metered and are a likely cause of the high water loss. We recommend a separate study to investigate the issue.

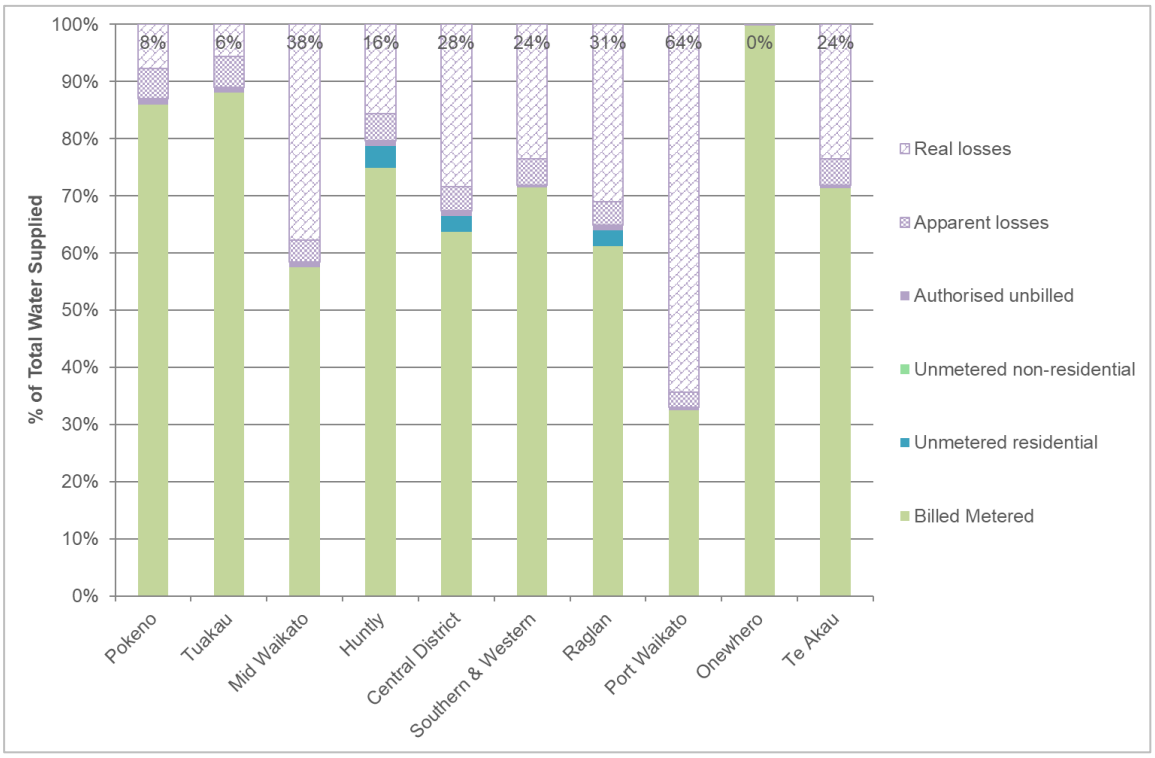

Figure 5-5: 2019/20 water balance breakdown by scheme

Table 5-14 presents a summary of the components and results of the 2019/20 water loss assessment.

Table 5-15 presents a summary of the historical water loss results from each of the annual water balances from 2016/17 to 2018/19.

Table 5-14: Summary of 2019/20 Water Losses

Area	System Input (Production) (m^3)	Billed Metered Consumption (m^3)	Billed Unmetered Consumption (m^3) (1)	Authorised unbilled Consumption (m^3) (2)	Unauthorised Unbilled Consumption (m^3) (3)	Apparent Losses (m^3) (4)	Real Losses (m^3)	Non-revenue Water (%)
Tuakau	502,227	442,069		7,479	7,008	27,126	28,037	12%
Pokeno	350,981	301,628		6,032	14,016	18,591	26,869	14%
Raglan	540,798	330,940	15,390	7,227	9,855	21,955	167,547	36%
Huntly	1,043,169	781,309	39,436	13,976	17,082	49,497	163,331	21%
Mid Waikato	733,367	421,619		9,775	12,921	28,415	276,613	43%
Central District	1,158,125	737,838	32,222	15,407	20,586	48,473	328,992	34%
Southern & Western District	864,226	617,246		4,321	438	39,505	203,154	29%
Te Akau	2,423	1,730		12		111	570	29%
Onewhero (5)	1,367 (5)	1,367		0		0	0	0%
Port Waikato	13,367	4,353		67		351	8,596	67%
Combined Systems	5,210,049	3,640,098	87,048	50,784	60,882	188,306	1,148,804	28%

(1) Water use of 600 litres/day for these unmetered connections has been assumed.
(2) Includes measured fire service use and 0.5% of Water Supplied to allow for maintenance use (such as network flushing)
(3) Consumption based on number of faulty meters multiplied by consumption per year
(4) Apparent Losses: Includes customer meter under-registration (5% of Billed Metered Consumption) and unauthorised consumption (1% of Water Supplied)
(5) Onewhero system input was lower than the billed metered consumption of 1,367 m^3. For calculations, the metered production value was replaced with the billed consumption.

Table 5-15: Summary of historic water loss results

Scheme	Units for Leakage measure	2016/17 Leakage	2017/18 Leakage	2018/19 Leakage	2018/19 Infrastructure Leakage Index	2018/19 real loss as % of supply	2018/19 Water loss recommendation
Pokeno	m³/km/day (2016/17 only) L/connection/day	3.3	253	212	2.0	38.8%	Rectify ongoing issues with the WDC SCADA data and check actual meter registration for data reliability
Tuakau	L/connection/day	103	67	107	1.9	16.1%	Rectify ongoing issues with the WDC SCADA data and check actual meter registration for data reliability
Mid Waikato	m³/km/day	6.2	5.6	7.5	6.7	37.8%	Implement initiatives and programme outlined in the Water Loss Strategy (December 2012) in order to reduce water losses to the target level (ILI 2.0)
Huntly	L/connection/day	320	190	162	2.6	18.9%	Implement initiatives and programme outlined in the Water Loss Strategy (December 2012) in order to reduce water losses to the target level (ILI 2.0)
Central District	L/connection/day	366	255	309	4.3	30.2%	Implement initiatives and programme outlined in the Water Loss Strategy (December 2012) in order to reduce water losses to the target level (ILI 2.0)
Southern & Western District	m³/km/day	1.1	1.1	1.4	1.5	17.8%	No change to the existing zones
Raglan	L/connection/day	260	230	243	3.3	32.4%	Implement initiatives and programme outlined in the Water Loss Strategy (December 2012) in order to reduce water losses to the target level (ILI 2.0)
Port Waikato		Not assessed				34.9%	Correct inconsistency between actual meter registration and SCADA data
Onewhero		Not assessed				8.0%	Replace the main system input meter with a suitably sized meter; Correct inconsistency between actual meter registration and SCADA data
Te Akau		Not assessed				14.6%	Not included in 2019 report

ILI = Real Losses (Litres/service connection/day) / UARL (Litres/service connection/day)
UARL (Litres/service connection/day) = (18 x Lm + 0.8 x Nc) x P
where: Lm = Length of Mains (km) Nc = Number of Connections P = Average Network Pressure (m)

Nearly all water connections are now metered, with only a small number of unmetered residential connections remaining in Huntly (105), Raglan (42) and Central District (83).

Thomas Consultants noted the same issues as became apparent in the current water loss assessment:

1. An unrealistically low result for real losses has been obtained for Onewhero; the flow meter at the treatment plant is clearly under-recording by a significant margin and this meter needs to be replaced.
2. The SCADA data for Onewhero and Port Waikato was incorrect, and the system input volumes were calculated from manual meter readings. This matter needs to be investigated.

In addition to the real losses described above, the apparent losses have also been evaluated. The estimated March 2018/19 apparent loss volume was provided by Thomas Consultants and is primarily from customer meter under-registration (assumed at 2% of the metered consumption) and unauthorised consumption.

By contrast, the 2019/20 water losses used an assumption of 5% of billed volume for meter under registration. Figure 5-5 shows that for most systems this component of NRW is small by comparison to other components, but also shows that in Pokeno and Tuakau the extremely low level of real losses could in part be due to an over-estimation of apparent losses in these systems.

For future assessments we recommend reverting to a 2% assumption for meter under-registration and setting up a testing regime for customer meters to verify this assumption.

5.6.3 Conclusions on water losses

The 2019/20 water loss results for the five urban schemes have been benchmarked against available data from other New Zealand councils (the Water NZ 2019/20 performance review results) as shown in Figure 5-6. The Water NZ performance review results are shown as aggregated results for each council rather than by individual water supply schemes. The ten WDC schemes are shown in green in Figure 5-6. This water loss as a percentage of total water supplied is one of the local government mandatory performance measures for demand management.

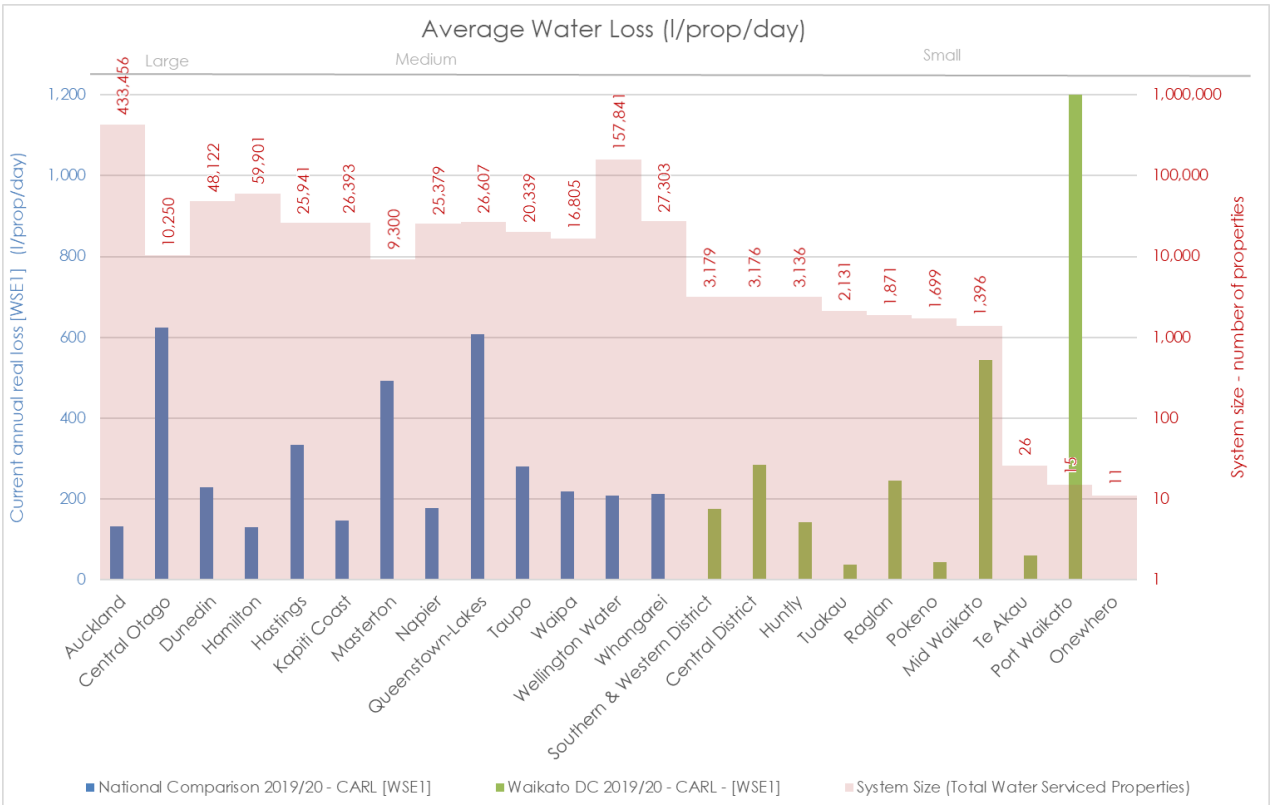

Figure 5-6: Benchmarking of 2019/20 WDC water loss against other NZ data 2019/20

Figure 5-6 shows that the 2019/20 water loss performance for Pokeno, Tuakau and Te Akau compared very well against the NZ data from the 2019/20 NPR. The Port Waikato and Onewhero results are likely erroneous due to faulty SCADA data, as discussed in Section 5.4. Mid Waikato is the only scheme where water loss appears high. Further investigation is recommended.

5.7 UNCERTAINTY IN THE DEMAND ANALYSIS

Table 5-16 summaries key areas of uncertainty identified through the demand analysis carried out for this WDMP, along with an assessment of significance and an associated recommended improvement action. The recommended improvement actions are carried forward to Table 8-1.

Table 5-16: Summary of uncertainty in the demand analysis

Area of uncertainty	Significance	Improvement action
Bulk meter accuracy for total water supplied volume	High	Bulk meters should be regularly calibrated to improve the water balance results.
There is no clear approach for categorisation of customer meters	Medium	WDC could consider adding a new field to the water billing database for customer categorisation (e.g., industrial, commercial, rural, residential, rural residential, institutional, Council etc.). WDC has begun an assessment of customer category by viewing a spatial map of the DP zones.
Anomalies in the daily bulk meter data (abstraction and treated demand)	High	Set up a process to review daily bulk meter data and remove unexplained anomalies
Assumptions for Apparent Losses (meter under-registration)	Medium	Study to determine likely level of meter under-registration through meter testing programme, literature review or review of supplier documentation.

6.0 FORECASTED WATER DEMANDS

6.1 WATER DEMAND FORECASTING METHODOLOGY

There are three primary methods used for water demand forecasting (Institute for Sustainable Futures, 2011):

1. The simple litres per capita per day method of analysing historical bulk water demand to determine an overall litres per capita per day figure, which is then multiplied by the projected population. It is interesting to note that the Australian best practice is for the historical demand to be corrected for the influence of climate and weather using regression techniques to obtain a "climate neutral" average litres per capita per day demand for forecasting.
2. A sector-based approach, which at a minimum investigates residential demand (single and multi-residential properties), non-residential demand (commercial, industrial and institutional sectors and subsectors) and non-revenue water (real and apparent losses). With a better understanding of how water is being used, demand is then projected according to population growth or other sector-specific base units (for example floor space), as deemed appropriate.
3. An end-use analysis, which uses a "bottom-up" approach to explain historical demand (predominantly in the residential sector) associated with typical end uses such as toilets, washing machines and evaporative air conditioners. The demand for that end-use is translated into aggregate demand by multiplying an individual end-use demand by frequency of usage, projected demographic growth (population, single and multi-residential dwelling numbers, and occupancy as appropriate), and functions that reflect changes in the efficiency of the technology and mix of stock over time.

WDC is now 99% metered, and the sector-based methodology should therefore be used for determination of future demands. However, as set out in Section 5.5 customer database does not contain the information required to effectively categorise customers. Although in theory the sector-based approach has been used for the baseline demand forecasts in this WDMP, this approach has been based on the simple assumption that the top ten customers in each system are non-residential, and all others are residential.

This approach has been applied to the six key urban schemes (Pokeno, Tuakau, Mid Waikato, Huntly, Central District, and Raglan). Although growth is anticipated in the very small schemes (Port Waikato, Onewhero & Te Akau), no demand growth forecasting has been undertaken. Discussions with Watercare have indicated no new water connections will be accepted in these schemes, so any growth will need to be self-sufficient in terms of water.

The adopted approach for the demand forecasts was generally as follows:

1. From growth projections, determine the number of additional residential properties in each system for each year.
2. From the demand analysis, take the existing residential per-property demand in each system and multiply it by number of additional properties to determine the additional residential demand in each system for each year.
3. From historic system production data, identify the average and peak day demands for each system in m^3/day
4. With the assumption that water loss and non-residential demand are non-seasonal, calculate the residential peaking factor in each system.
5. Apply the residential peaking factor to the residential growth calculated in Step 2 to determine peak day residential growth demand.
6. Add the peak day residential growth demand to the current peak day demand.
7. For some systems, commercial growth has been determined and provided in terms of population-equivalent. As this demand is non-seasonal, this should be added to the peak day total system demand without a scaling factor.

The adopted approach provides a base estimate of likely future demand, based on the following assumptions:

- Water loss will be managed at current levels (will not increase or decrease) into the future.
- Future residential growth will require the same per-property consumption as existing, and summer peaking factors for residential consumption will be unchanged.
- Any future non-residential demand will be non-seasonal.
- The potential future changes in demand drivers (e.g., the impact of major water demand management activities such as leakage reduction) are not considered.
- The only new major wet industrial customer allowed for is in Ohinewai. In the base scenario this has been shown as supplied from the Huntly water network.

This process provides us with a year-by-year estimate of demand for each system out to 2061.

While there is uncertainty in any of the assumptions set out above, the biggest uncertainty in any future demand calculation is when and how the expected development will occur. Although projections are provided out to 2061, these projections can be changed at any time and are subject to real-world factors out of our control such as the economy, immigration, government actions and legal factors.

In light of this, we recommend keeping the assumptions used for future demand calculation as broad and simple as possible to ensure new population projections can be incorporated relatively easily.

While the base scenario assumes no changes to the current systems, some alternative supply scenarios are considered in Section 6.5.

6.2 COMPARISON WITH DEMAND FORECASTING BEST PRACTICES

In 2009/2010, the Office of the Auditor General of New Zealand (OAG) carried out a performance audit of a representative sample of eight local authorities to form a view about how well prepared the country is to meet the likely future demand for drinking water. This is documented in the OAG 2010 report, “Local authorities: Planning to meet the forecast demand for drinking water”.

The OAG 2010 report concluded that best practice demand forecasting would include quantitative analysis using regression models based on historical trends in a number of factors that influence demand. A key finding in the OAG report was that demand forecasts are considered more reliable when prepared for separate classifications of use and sectors.

The OAG report also outlined their expectations for effective demand forecasting methodologies (page 29), as follows:

- Use relevant information and show an understanding of the main factors that influence demand.
- State assumptions about factors that might affect future water demand.
- Identify and document risks associated with the forecasts.
- Appropriate to the size of the community being supplied.

From this, we conclude the demand forecasting methodology outlined above is at a high level but is a step above a basic level as it is based on detailed residential population growth forecasts. The demand forecasts presented in this WDMP are baseline demand forecasts excluding the impact of proposed demand management activities. The current demand forecasting methodology is appropriate for the small communities served by WDC, particularly those with little or no growth.

6.3 RESIDENTIAL GROWTH FORECASTS

A number of growth studies have been carried out in recent times, some of which are more appropriate for some areas than others. Through discussion with Watercare a mixture of sources

has been used to develop the demand forecasts. The sources are summarised in Table 6-1, and discussed below.

Table 6-1: Growth Data Sources

System	Data set used for growth	Report section reference	Notes:
Tuakau	Household Projections (HIGH) incl. rural	6.3.2	Underestimated in Waikato2070
Pokeno	Household Projections (HIGH) incl. rural		Underestimated in Waikato2070
		6.3.2	No match for Pokeno masterplan (2018)
			"High" projections may not account for all approved developments
Raglan	Adjusted Waikato2070 numbers as used in current water and wastewater studies	6.3.4	Overestimated in Waikato2070
Huntly	Mid Waikato Servicing strategy	6.3.3	Overestimated in Waikato2070
			Significant non-residential growth - Servicing strategy may underestimate demand
Mid Waikato	Mid Waikato Servicing strategy	6.3.3	Overestimated in Waikato2070
			Significant non-residential growth - Servicing strategy may underestimate demand
Central District	Original Waikato2070 Projections in Water Supply Areas (2020v1.0)	6.3.1	Waikato2070 ok
Southern & Western District	Original Waikato2070 Projections in Water Supply Areas (2020v1.0)	6.3.1	Waikato2070 ok
Te Akau	No growth	N/A	No new connections to water system will be accepted.
Onewhero	No growth	N/A	No new connections to water system will be accepted.
Port Waikato	No growth	N/A	No new connections to water system will be accepted.

6.3.1 Waikato2070 Projections in Water Supply Areas (2020v1.0)

Waikato2070 population projections were supplied in a spreadsheet containing annual expectations for growth both by household and by population. The information page provided with this data is shown in Figure 6-1.

In this data set annual growth expectations are provided both for population and for households. The growth figures are presented in 12 different Waters Communities, which were easily grouped into the 10 systems we use for this WDMP.

No estimation of non-residential growth is provided in this data.

Where this data was used, the household projections were used to estimate demand.

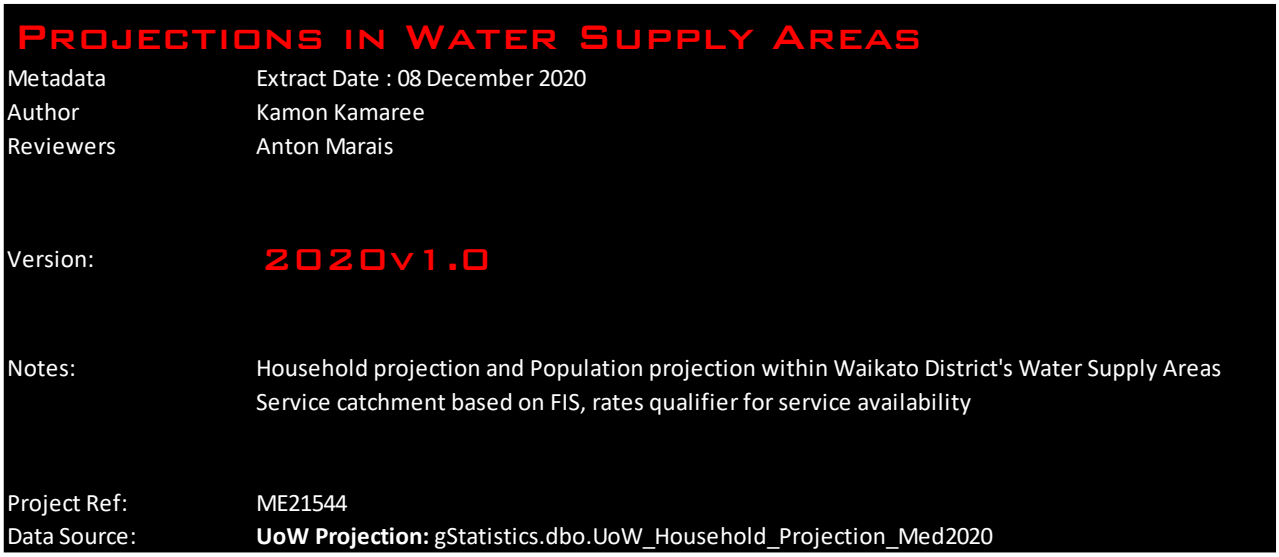

Figure 6-1: Waikato2070 Data Information Page

Through discussions with Watercare some concerns were raised about this data, and a number of alternative growth data sets were provided. Table 6-2 provides a summary of the data, and of the outcomes of the discussions with Watercare.

Table 6-2: Waikato2070 data summary

Waters Community	System	2020	2030	2040	2050	2061	Notes
Huntly	Huntly	2,897	3,282	3,491	3,610	3,991	May overestimate residential growth No estimate of non-residential
Mid Waikato	Mid Waikato	1,485	2,082	2,430	2,686	3,059	May overestimate residential growth No estimate of non-residential
Ngaruawahia	Central District	2,790	3,429	3,754	3,956	4,241	ok
Onewhero	Onewhero	18	18	19	23	23	no water network growth - not needed
Pokeno	Pokeno	1,368	2,633	3,568	3,928	4,310	May underestimate growth
Port Waikato	Port Waikato	74	83	85	92	99	no water network growth - not needed
Raglan	Raglan	1,575	1,884	1,929	2,019	2,101	May underestimate growth
Southern District	Southern & Western District	3,947	4,424	4,935	5,649	6,167	ok
Taupiri/Hopuhopu	Central District	377	460	585	751	822	ok
Te Akau	Te Akau	40	40	40	40	40	no water network growth - not needed
Tuakau	Tuakau	1,690	2,029	2,109	2,179	2,476	May underestimate growth
Western Districts	Southern & Western District	77	84	94	99	108	ok

6.3.2 Household Projections (HIGH)

In Tuakau and Pokeno systems, Watercare expressed concern that the Waikato2070 growth figures were not high enough. An alternative set of household projections were supplied in a spreadsheet – no metadata was supplied so the source of this is uncertain.

In a table titled "Household Projections (HIGH)", this spreadsheet provided a breakdown of household growth in Tuakau and Pokeno by year out to 2061, along with growth in "Pokeno Rural" and "Tuakau Rural".

For the purposes of the WDMP, all growth whether rural or not was included for calculation of future demand. The data as supplied is summarised in Table 6-3.

Table 6-3: Pokeno and Tuakau growth projections

Horizon	2020	2030	2040	2050	2060
Pokeno rural households	1,223	2,577	3,480	3,261	3,472
Pokeno urban households	613	1,948	2,941	2,802	3,029
Tuakau rural households	1,856	2,236	2,285	2,291	2,805
Tuakau urban households	683	1,612	3,595	4,461	4,712
Pokeno total households	1,836	4,525	6,421	6,063	6,501
Tuakau total households	2,539	3,848	5,880	6,752	7,517

6.3.3 Mid Waikato Servicing Strategy

Growth figures for Mid Waikato and Huntly were developed from the information in the Mid Waikato Water Supply and Wastewater Servicing Strategy. These figures were based on the Regional Infrastructure Technical Specification (RITS) and uses the concept of "Population-Equivalent" (PE) to define commercial and industrial demands.

RITS sets out a figure of 260 L/person/day for average future residential demand. It then sets out the demand in commercial and industrial areas in L/day/ha, with demand set out as equivalent to a certain number of residential people (at 260 L/person/day) per hectare.

As per RITS, Industrial demand is calculated assuming 45 PE/ha. At 260 L/PE/day, this gives us **0.14 L/s/hectare.**

Commercial demand is calculated assuming 30 PE/ha. At 260 L/PE/day, this gives us **0.09 L/s/hectare.**

Residential demand is calculated at between 45 and 120 PE/ha, depending on density of the expected development.

For peak summer demand, note that residential demand requires a peaking factor, but commercial and industrial demand are assumed non-seasonal and do not require a peaking factor.

The Mid Waikato work also split growth up into a number of different areas – these were retained in this WDMP so that the effects of various development areas could be observed.

Table 6-4: Huntly and Mid Waikato Populations and Population Equivalents

Area	Residential Population				
Horizon	**2020**	**2025**	**2030**	**2050**	**2061**
Huntly	8,035	8,526	8,759	9,278	9,278
Te Kauwhata	3,397	10,491	12,398	18,821	18,761
Meremere	638	674	704	824	884
Ohinewai	0	1,625	3,250	3,250	3,250
Rangiriri	78	85	92	140	150

Area	Commercial Population Equivalent				
Horizon	**2020**	**2025**	**2030**	**2050**	**2061**
Huntly	134	269	537	537	537
Te Kauwhata	0	261	522	522	522
Meremere	35	35	35	35	35
Ohinewai	0	130.5	261	261	261
Rangiriri	37	37	37	37	37
Total	206	732	1,392	1,392	1,392

Area	Industrial Population Equivalent				
Horizon	**2020**	**2025**	**2030**	**2050**	**2061**
Huntly	7,614	8,829	10,044	10,044	10,044
Te Kauwhata	0	0	558	1,116	1,116
Meremere	0	0	0	0	2,196
Ohinewai	0	1418	2835	9135	15435
Rangiriri	0	0	0	0	0
Total	**7,614**	**10,247**	**13,437**	**20,295**	**28,791**

6.3.4 Raglan – Adjusted Waikato2070 numbers

The growth numbers for Raglan as provided by Watercare are shown in were used in Table 6-5. These are a modification of the numbers in the Waikato2070 which seemed unrealistic.

These numbers are currently used for Raglan in water and wastewater studies.

Table 6-5: Raglan growth numbers

Increase in Raglan township households (current to 2030)	776
Residential households at 2030 within Raglan town /Whaanga Coast	2,571
Increase in Raglan households (current to 2050)	1,340
Residential households at 2050 within Raglan town /Whaanga Coast	3,135
Increase in Raglan households (current to 2060)	1,604
Residential households at 2060 within Raglan town /Whaanga Coast	3,399

6.3.5 Growth Forecast Summary

To summarise the information above, the growth used to determine future demands across the different networks is set out in Table 6-6 and Figure 6-2 below.

Table 6-6: Household growth by System as used for demand calculations

System	Data set used for growth	2020	2030	2040	2050	2061	Notes
Tuakau	Household Projections (HIGH)	1,690	2,999	5,031	5,903	6,744	Includes rural
Pokeno	Household Projections (HIGH)	1,368	4,057	5,953	5,595	6,088	Includes rural
Raglan	Adjusted Waikato2070 (W&WW studies)	1,575	2,571	2,633	3,135	3,399	
Huntly	Mid Waikato Servicing strategy	5,846	7,703	9,513	12,039	14,372	Includes non-residential PE occupancy 2.7 assumed
Mid Waikato	Mid Waikato Servicing strategy	1,550	4,290	5,313	7,961	8,778	Includes non-residential PE occupancy 2.7 assumed
Central District	Waikato2070	3,167	3,889	4,339	4,707	5,063	
Southern & Western District	Waikato2070	4,024	4,508	5,029	5,748	6,275	
Te Akau	No growth	40	40	40	40	40	
Onewhero	No growth	18	18	18	18	18	
Port Waikato	No growth	74	74	74	74	74	

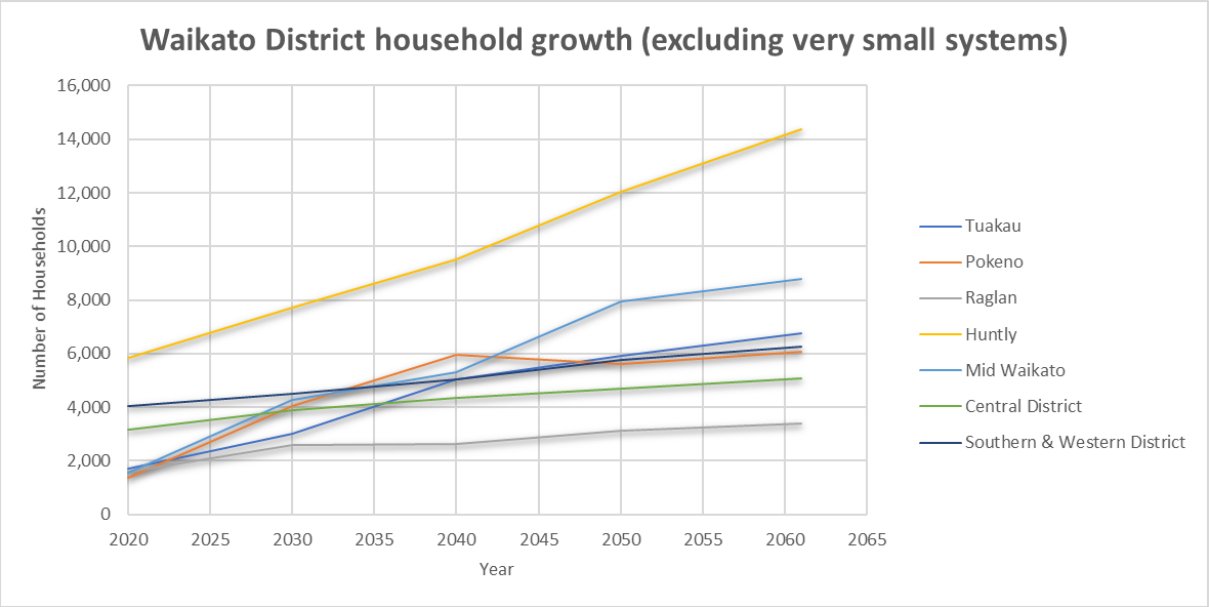

Figure 6-2: Household growth (excluding Te Akau, Onewhero and Port Waikato)

6.4 DEMAND FORECASTS

6.4.1 Demand Forecast Methodology and Assumptions

Demand forecasts have been created for estimation of peak summer demands for each system into the future. The methodology was as follows:

1. Determine the existing residential per-property demand in each system – set out in Section 5.5.
2. Determine the residential summer peaking factor in each system.
3. Determine the level of demand increase by multiplying the number of residential properties by the per-property demand and the summer peaking factor.
4. If there is non-residential demand described in terms of population equivalents, add this to the future demand **without** using a summer peaking factor.

Future demand estimates were developed form the growth estimates using the following assumptions:

- The existing peak summer day demand as used by existing customers is assumed to be unchanged into the future.
    - Although demand management efforts may reduce the water use of existing customers, it is not clear at this stage how much effect demand management might have. We have adopted a conservative assumption that demand will not go up or down.
- Water loss is assumed to remain the same into the future.
    - Water loss on existing pipework will likely be reduced in future, however most networks are growing in size. It is assumed water loss on the new networks will cancel out water loss reduction on existing pipework, and the overall volume over water loss on each network is unchanged.
- New residential properties in existing areas are assumed to use the same peak-day per-property demand as existing houses in the same area (with the exception of Huntly and Mid Waikato)

- This reflects an assumption that new houses will be of similar size and land area to the existing houses in each town.

- In Huntly and Mid Waikato systems only, an assumption of 260 L/person/day was used for both residential growth and commercial/industrial population-equivalent growth.
  - As these growth projections were developed using the RITS methodology, we have adopted the RITS assumptions for consistency with other studies.
- Non-residential demand is assumed non-seasonal.

6.4.2 Base Scenario Forecasts

The outcomes of the analysis are shown in detail in demand analysis breakdowns in the system descriptions in the Appendices, however a brief summary is also provided in Table 6-7 and Figure 6-3 below.

We note that the demand growth in Mid Waikato is higher than in Huntly, despite the more rapid apparent household growth in Huntly shown in Figure 6-2. This is due to the use of Population Equivalents - as commercial and industrial demands are not seasonal, the population equivalents for this type of growth does not increase in summer, while genuine residential population does. Huntly growth includes a significant amount of commercial and industrial growth, where most growth in Mid Waikato is residential.

Table 6-7 : Peak summer day demand estimates (m^3/day)

Year	2020	2030	2040	2050	2061
Tuakau Demand (m^3/day)	2,250	3,412	5,217	5,991	6,738
Pokeno Demand (m^3/day)	1,500	3,356	4,664	4,417	4,757
Raglan Demand (m^3/day)	2,300	2,972	3,217	3,461	3,690
Huntly Demand (m^3/day)	4,300	7,707	8,648	9,588	11,226
Mid Waikato Demand (m^3/day)	2,750	8,437	10,472	12,507	13,083
Central District Demand (m^3/day)	4,100	4,726	5,116	5,435	5,743
Southern & Western Demand (m^3/day)	4,000	4,453	4,941	5,615	6,109
Total	**21,200**	**35,063**	**42,275**	**47,014**	**51,346**
% of 2020 demand	**100%**	**165%**	**199%**	**222%**	**242%**

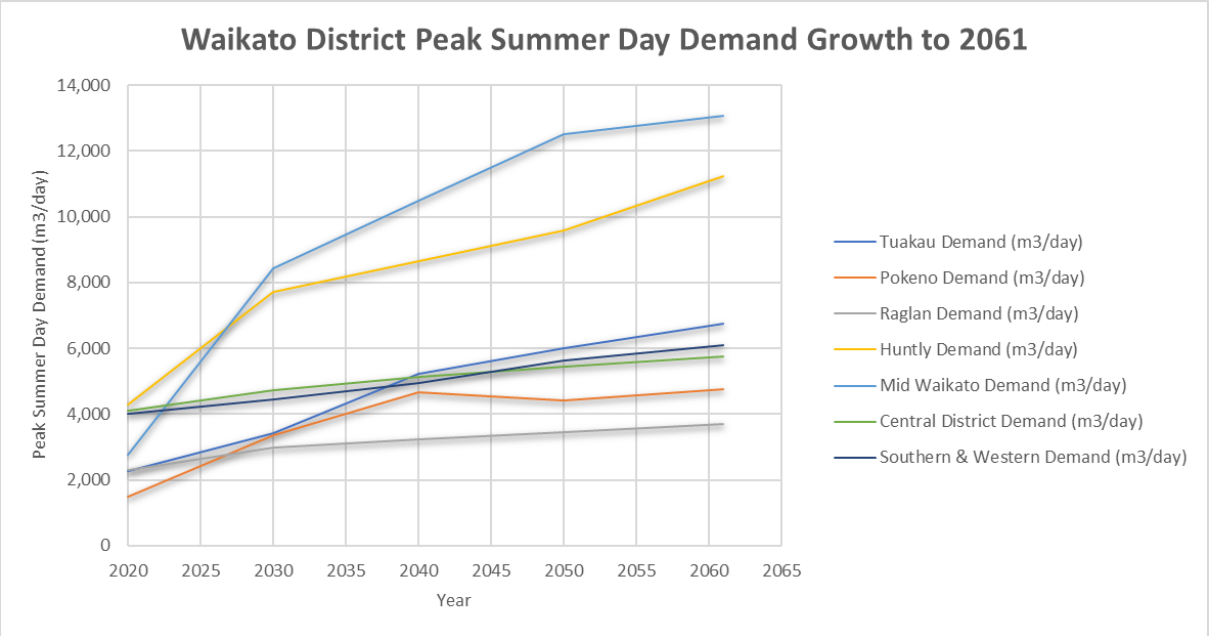

Figure 6-3: Peak summer day demand estimates (m^3/day)

6.5 DEMAND FORECAST UNCERTAINTIES AND ALTERNATIVE SCENARIOS

There are a number of areas where significant uncertainty remains in how and when development will occur. We have outlined the most significant uncertainties here.

6.5.1 Ohinewai Growth Uncertainty

The Huntly growth projections include a large amount of growth in the Ohinewai area. This hinges around a single large industrial development, with the residential development driven by the need for workers in the industrial area.

A decision on the development is expected soon, but it is currently unclear whether the industrial development will go ahead. In addition, if it does go ahead it is still unclear whether the proposed residential development will still be required, or if existing alternative residential development will be sufficient to support the industrial area.

The effects of this uncertainty have been set out in Appendix D.

6.5.2 Ohinewai Supply from Mid Waikato (Alternative One)

Assuming the Ohinewai development goes ahead, the development is supplied in the base scenario from Huntly. However, the location makes supply from Mid Waikato (Te Kauwhata) a viable option. With the currently anticipated level of growth in the Mid Waikato, a significant WTP upgrade will already be required, so design of the Te Kauwhata WTP upgrade could allow for supply to Ohinewai. This may eliminate the need for further upgrades at the Huntly WTP.

The effects of switching the supply for Ohinewai to Te Kauwhata have been set out in Appendix C and Appendix D.

6.5.3 Central District Supply from Huntly (Alternative Two)

2,000 m^3/day from the recent Huntly WTP upgrade has been earmarked for supply to Central District, thereby deferring any necessary upgrade to the Ngaruawahia WTP. A trunk main has recently been laid connecting the two systems, and a scenario has been developed to determine when this will be required.

Effectively, this trunk main gives the option to treat Huntly and Central District as one system, supplied by the two existing WTPs.

The effects of combining the supplies for Central District and Huntly have been set out in Appendix D and Appendix E.

6.5.4 Pokeno Developments Uncertainty

There is significant ongoing rapid development in the Pokeno system. There is some uncertainty around how up-to-date the growth numbers are, and exactly how much of the proposed development might have already occurred.

For this study we have taken a conservative assumption that none of the expected growth is included in the calculated existing demand.

6.5.5 Pokeno Drop in Growth Anomaly

It has been noted that in the numbers supplied by Watercare there is a drop in the number of houses in Pokeno after 2040. Around 400 less houses are predicted in 2050 than in 2040.

It is thought unlikely that the rate of development will become negative – this would imply people abandoning their houses and moving out of town.

It is therefore concluded that this is an error in the base data, potentially caused by combining two less developed sets of data. For example, accurate growth estimates may be available out to 2040, and these may have been combined with less accurate estimates for 2040-2060. If the 2040-2060 figures underestimate the starting growth at 2040, the inconsistency will appear in the combined data set as an expected drop in the number of houses after 2040.

It is recommended Watercare review the growth estimates for Pokeno.

At this point we have no visibility of the data sources for the growth estimates provided, and we have used this data unaltered for this study.

6.6 SUPPLY-DEMAND BALANCE - SUPPLY CONSTRAINTS

In order to determine the effects of the demand side growth projections set out in the preceding sections, the ability of the current systems to supply increased volumes must be ascertained. The factors considered in this document are:

- WTP total capacity
- WTP process losses
- Resource consents for abstraction

Factors unable to be considered in the base assessment, but which might affect future supply are:

- Demand Management
- Climate Change
- Social and cultural factors

6.6.1 WTP Capacities

WTP capacities were provided directly by Watercare and are set out in Table 6-8. Where supply is via a third party, the agreement conditions have been considered as the supply capacity. Notes have been included in Table 6-8 to clarify where this is the case.

Table 6-8 : WTP Capacities

System	Water Treatment Plant	Capacity (m^3/day)	Notes
Tuakau	No WTP – 3rd party supply		Supplied from Watercare Trig Road WTP via Watercare bulk main. Supply agreement has no volumetric limit.
Pokeno	No WTP – 3rd party supply		Supplied from Watercare Trig Road WTP via Watercare bulk main. Supply agreement has no volumetric limit.
Raglan	Raglan	3,600	Capacity stated is for spring only. A small groundwater bore is available to supplement but not used due to water quality concerns
Huntly	Huntly	8,000	
Mid Waikato	Te Kauwhata – 3rd party supply	4,500	A 3rd party agreement for supply of 4,000 m^3/day expired in 2016 and has not been considered here.
Central District	Ngaruawahia	4,300	
Southern & Western District	No WTP – 3rd party supply	5,000	Supplied from HCC WTP via HCC network. Supply agreement states HCC will supply a maximum of 5,000m^3/day
Te Akau	Te Akau	68	
Onewhero	Onewhero	65	
Port Waikato	Port Waikato	148	

6.6.2 WTP Efficiencies – Process Losses

With growth, the volume of water treated at existing WTPs will increase, and the process losses at these WTPs will also increase.

Bulk flow data since 2018 was analysed for both abstraction and WTP production to determine the losses within water treatment plants. Process losses can vary with the daily volume of water treated, so in order to keep the analysis consistent with the peak summer day demands used for growth projections, process losses were calculated from high-flow days only.

Table 6-9: WTP Process Losses

System	Water Treatment Plant	High-flow days above (m^3/day)	Process losses (%)	Notes
Tuakau	No WTP – 3rd party supply	N/A	0%	All of agreed volume assumed to be available
Pokeno	No WTP – 3rd party supply	N/A	0%	All of agreed volume assumed to be available
Raglan	Raglan	2,000	7%	Estimated demand increased by 7% to account for process losses
Huntly	Huntly	3,000	8%	Estimated demand increased by 8% to account for process losses
Mid Waikato	Te Kauwhata – 3rd party supply	N/A	0%	All of agreed volume assumed to be available

System	Water Treatment Plant	High-flow days above (m^3/day)	Process losses (%)	Notes
Central District	Ngaruawahia	3,000	1.5%	Estimated demand increased by 1.5% to account for process losses
Southern & Western District	No WTP – 3rd party supply	N/A	0%	All of agreed volume assumed to be available
Te Akau	Te Akau	N/A	0%	No WTP production flow data available
Onewhero	Onewhero	N/A	0%	No WTP production flow data available
Port Waikato	Port Waikato	N/A	0%	No WTP production flow data available

6.6.3 Resource Consent Limits

The consents for water abstraction were reviewed and are summarised in Table 6-10 below.

Table 6-10: WTP Abstraction Consent Limits

System	Water Treatment Plant	Abstraction consent limit (m^3/day)	Notes
Tuakau	No WTP – 3rd party supply	N/A	Third party supply
Pokeno	No WTP – 3rd party supply	N/A	Third party supply
Raglan	Raglan	3,100	Expires in 2035.
Huntly	Huntly	6,700, increasing gradually to 7,000 in 2039	Expires in 2046. Combined consent for volume of Huntly and Ngaruawahia = 11,800, rising to 12,800 in 2039
Mid Waikato	Te Kauwhata – 3rd party supply	N/A	Third party supply. Third Party abstraction has consent limit of 22,900 m^3/day but much of this is for supply to untreated irrigation 3rd party consent expires in 2024
Central District	Ngaruawahia	4,400, increasing gradually to 5,000 in 2039	Expires in 2046.
Southern & Western District	No WTP – 3rd party supply	N/A	Third party supply
Te Akau	Te Akau	68	Expires in 2025.
Onewhero	Onewhero	N/A	No consent required - permitted activity
Port Waikato	Port Waikato	80	Expires in 2051.

6.7 SUPPLY-DEMAND BALANCE - BASELINE FORECAST

The demand forecasts set out in the preceding section were then compared to both the regulatory limits for abstraction (in terms of resource consent limits) and the physical capacity limits of the water treatment plants, or agreements with third party suppliers.

The scheme specific baseline SDB forecast graphs are included in the Appendices A to H, but Table 6-11 contains a summary. The outcomes of comparison of the anticipated growth in demand against supplies are colour-coded in the constraints summary as follows:

- Red items are urgent problems which will need to be addressed in the next few years.
- Orange items are problems which will become more urgent over the next decade or so.
- Green items are not currently regarded as a problem.

Table 6-11: Supply Demand Balance Outcomes Summary

System	Growth Summary	Constraints Summary
Tuakau	From 2k to 7k m^3/day	No consent or limit through agreement with Watercare.
Pokeno	From 2k to 5k m^3/day Some uncertainty around whether the growth figures used include ongoing developments	No consent or limit through agreement with Watercare.
Raglan	From 2.5k to 4.0k m^3/day	Consent of 3.1k will be exceeded around 2029 WTP capacity of 3.6k exceeded around 2043.
Huntly	From 5k to 12k m^3/day. Around 4.5k of this is Ohinewai C/I growth - This may be supplied by Mid Waikato. It is uncertain whether this will go ahead	Consent of 7k exceeded by 2026. WTP capacity of 8k exceeded by 2029. Supply of up to 2 MLD to Central District also expected.
Mid Waikato	From 3.5k to 13k m^3/day	Te Kauwhata agreement of 4k (expired in 2016) exceeded by 2022. 3rd party consent expires in 2024 WTP capacity of 4.5k exceeded by 2023.
Central District	From 4k to 5.5k m^3/day	WTP capacity 4.3k exceeded around 2023. Consent rises from 4.3k to 5k over time, but may be exceeded around 2030
Southern & Western District	From 4k to 6k m^3/day	Agreement with HCC of 5k is exceeded around 2040.
Te Akau	All growth assumed self-sufficient for water	Consent expires in 2024. WTP capacity sufficient for existing demand.
Onewhero	All growth assumed self-sufficient for water	No consent required - permitted activity. WTP capacity sufficient for existing demand.
Port Waikato	All growth assumed self-sufficient for water	Consent expires in 2051. WTP capacity sufficient for existing demand.

6.8 SUPPLY DEMAND BALANCE UNCERTAINTY

Some specific uncertainties and anomalies in the demand forecasts have already been set out in Section 6.5. Table 6-12 presents a general summary of key areas of uncertainty in the supply-demand balance, along with an assessment of significance (minor, moderate or major), and a recommended improvement action.

Table 6-12: Summary of uncertainty in the demand forecasts

Area of uncertainty	Significance	Improvement action
Residential per-property consumption	Major	As set out in Section 5.7, improve classification of customers to allow identification of residential and non-residential customers. This is required to better assess water use and better estimate future demand. Further improvement of the classifications is recommended to allow the classification of different types of non-residential demand (e.g., wet industry, dry industry, commercial, retail etc).
Multiple data sets used for growth projections	Major	Check for consistency across the different growth projection data sets and consolidate into a single agreed growth plan.
Uncertainty in growth expectations	Moderate	Unpredictable external factors will always affect growth - this is an unavoidable uncertainty in estimating future growth. This uncertainty cannot be eliminated but must be kept in mind when using the growth forecasts.
Future demand management efforts are uncertain.	Minor	Update demand forecasts after future demand management efforts have been defined and funds committed.
The peak day SDB forecasts are highly dependent on the peak day factor assumption which may vary.	Minor	Dedicated study to confirm the peak days for each system as assessed in this study.

7.0 CURRENT AND FUTURE WATER DEMAND MANAGEMENT

7.1 OVERVIEW OF WATER DEMAND MANAGEMENT INTERVENTIONS

Table 7-1 presents an overview of the demand management interventions currently used by WDC and with potential for future use. The following sub-sections describe in more detail WDC's current and potential future approach to water demand management interventions.

Table 7-1: Summary of demand management interventions currently used and with potential for future use

Demand management interventions	Currently used	Potential to be used in the future	Comment on priority
Infrastructure Management			
Annual water balance assessments	✓	✓	High
Water loss reduction strategy	✓	✓	High
Implementation of water loss strategy recommendations	✓	✓	High
Reactive leakage repair	✓		High
Active leakage control programme		✓	High
Pressure management		✓	High
Customer meter replacement programme		✓	Medium
Customer meter testing (under review)		✓	High
Water system hydraulic modelling to improve system performance and leakage	✓	✓	High
Investigation into water treatment plant efficiency	✓		Medium
Advanced asset renewal planning to prioritise infrastructure replacement and reduce leakage	✓	✓	High
Community engagement (to be done internally)			
Community education	✓	✓	Low
Educational resources and programmes for schools		✓	Low
Targeted education programmes for specific users, e.g., rural properties, retirement villages	✓	✓	Low
Regulatory control			
Restricted connections (trickle feed) to rural properties	✓	✓	Low
Review the rural restricted policy (under review)			Medium
Water restrictions during peak summer periods (e.g., alternate day garden watering)	✓	✓	High
Active enforcement of water restrictions during peak summer periods	✓	✓	High
Mandatory water efficient fixtures in new construction e.g., mandatory dual-flush toilets in all new toilet installations		✓	Low
Requirement for large users to prepare demand management plans	✓	(needs review)	Medium
Review approach for bulk water withdrawals		✓	High

Demand management interventions	Currently used	Potential to be used in the future	Comment on priority
Water efficient technologies			
Rebate or subsidy or grant programme for retrofit of water efficient fixtures		✓	Low
Retrofit of water-efficient technologies into Council properties		✓	Low
Rebate or subsidy programme for automatic timers for irrigation systems		✓	Low
Mandatory rain/soil moisture sensors for properties with high garden watering		✓	Low
Metering and pricing			
Review customer meter reading and data processing procedures		✓	High
Review of potential to increase meter reading frequency		✓	Medium
Improve customer categorisation		✓	Medium
Improving understanding of demand patterns for high water use customers		✓	High
Develop a standard water supply agreement for high water use customers		✓	Medium
Installation of manifolds on all new domestic connections	✓		Low
Metering and pricing for non-residential connections	✓		High
Metering and pricing for residential connections (underway)		✓	High
Metering of Council facilities/buildings		✓	High
Metering of Council parks		✓	High
Metering of all new properties	✓		High
Increasing stepped volumetric charges for metered customers	✓	✓	High

7.2 INFRASTRUCTURE MANAGEMENT

7.2.1 Asset renewals

Council's asset renewal planning is currently based on pipe age and material. Similarly, asset valuation and depreciation are currently based on the age of the pipes, with limited consideration given to actual condition.

The Council uses Asset Finda which does not have the ability to capture performance issues. While there is the ability to include asset performance rating, this is only populated to some assets. There is still the need for more comprehensive condition assessment. This will:

- Identify pipes in imminent risk of failure, enabling proactive replacement before service is lost and/or the development of contingency measures.
- Result in more accurate prediction of renewal requirements.
- Provide more accurate asset valuations and rates of depreciation, which will enable revenue and debt requirements to be set in line with future renewal requirements.
- Focus limited funding to replacement of those assets that most need replacement, considering cost, risk and level of service issues.

Knowledge of the performance of the system is currently retained with the operational staff, when repeated issues arise the staff raise the request for the asset to be replaced. A work order process is currently being developed to capture this information into the asset management system.

In 2020, WDC approached Watercare to solicit interest in outsourcing the management of the Water and Wastewater assets under an operations and maintenance delivery model that would see Watercare undertake responsibility and operation of the WDC water and wastewater system for a minimum of ten years. Watercare undertook a condition assessment program with Jacobs to understand WDC's asset portfolio's condition.

To date Council have assigned criticalities to each individual asset in the water supply networks, and a prioritisation programme has been in place to either renew, replace or upgrade assets. Cast iron and galvanised pipes have been replaced with PE pipes and asbestos-cement pipes are currently being replaced and upgraded.

As detailed in Appendix G, there appears to be a high level of water loss in the Raglan raw water pipeline, in the order of 150m^3/day. We recommend an assessment of the condition of the Raglan raw water pipeline.

7.2.2 Water loss reduction

The key findings from the 2019/20 water balance carried out for this WDMP and the three historic water balances carried out by Thomas Consultants Ltd were summarised in Table 5-14 and Table 5-15. The move to full customer metering has assisted greatly in understanding and managing water use.

WDC currently have only reactive leakage repair and may undertake proactive leak detection surveys in future if district metered areas are established. Since the 2015 WDMP, several zone meters have been installed but are still to be connected to SCADA.

7.2.3 Reduction of apparent losses

The bylaw states that "it is the Customer's responsibility to detect and fix all leaks from taps and pipes, to stop overflows from cisterns, hot water cylinder exhausts or stock troughs."

Currently the WDC billing team check meter readings and associated consumption data for errors by reviewing demand trends and flagging anomalies.

The 2012 water loss reduction strategy recommended that Council increase the accuracy and volume of metered consumption by reviewing metering policies, including:

- Review metering for large consumers (meters 25mm and larger);
- Replace meters for large customers as required;
- Identify existing high water users and install water meters; and
- On-going review of list of large consumers - additions and deletions.

In addition to the water loss reduction strategy recommendations, we recommend the following improvements to the water meter reading and billing processes:

- Carry out a review on the customer meter data structure in the billing system and how it is stored and ability to extract and analyse data.
- Set up a process to review daily bulk meter data and remove unexplained anomalies

The review of the estimated apparent losses in Section 5.6.2 highlighted that it should be financially beneficial for WDC to improve their meter testing and replacement programme. WDC's current meter replacement programme is based on the age of the meter only. An improvement would be to adopt volumetric based meter replacement. WDC also need to identify the best size and meter type for each customer to ensure that low flows are captured. The top three priority schemes should be Huntly, Raglan, and Mid Waikato.

7.3 REGULATORY CONTROL

WDC's key regulatory control interventions are water restrictions during peak summer periods and restricted connections (trickle feed) to rural properties as described below.

The water Alert Levels and restrictions were previously described in Section 5.1 and are detailed in the Drought Management Plan in Appendix K. WDC view that active enforcement of water restrictions during peak summer periods would be difficult and have taken an approach of education first. Active enforcement of water restrictions would be more likely during Water Alert Level 4. The most severe water restrictions introduced recently were during the 2019/20 summer, Alert level 4.

It should be noted that water utilities that use some form of permanent restrictions or have implemented significant outdoor water efficiency programs may experience 'demand hardening'. This is when a proportion of discretionary demand, likely to be primarily associated with outdoor use, will have already been affected in the residential component of demand. Demand hardening will make it more difficult to achieve the previously assumed magnitude of reduction in demand at particular restrictions trigger levels. This will change the yield of the system and needs to be taken into consideration when setting the rules for a drought response strategy and the assumed demand reduction during restrictions.

Rural residential connections have restricted flow meters with a standard allocation of 1.8m³ per unit per 24 hours and are required to have onsite storage. Rural residential connections are typically lifestyle blocks and all have dwellings. WDC staff noted that the rural restricted policy is high level and lacking in details. It is recommended that WDC review this policy particularly whether rural properties that are grand-parented on full demand flow should have trickle feed installed when the property changes ownership or is subdivided.

WDC's current District Plan has a suggestion only for mandatory water efficient fixtures in new construction, e.g., mandatory dual-flush toilets in all new toilet installations.

Large users that consume more than 15 m³/day are considered extraordinary use in the water supply bylaw. WDC does not yet require these large users to prepare demand management plans but has identified the need to improve education for new connections for large users.

A full review of large users across the district is recommended. This could determine where water savings may be possible through efficient practices or reduction of water -intensive processes.

WDC recognise the need to improve water withdrawals from hydrants as the system currently relies on an honest system for payment. This could be managed better by providing a dedicated filling point with volumetric based charging in the key schemes. This has been highlighted as a priority by WDC and Watercare.

7.4 WATER EFFICIENT TECHNOLOGIES

WDC do not currently have a rebate, subsidy or grant programme for the retrofit of water efficient fixtures. WDC could consider this in the future to be targeted at residential properties, schools, and commercial properties and at specific fixtures e.g., showerheads or dual flush toilets.

A brief description of some of the types of technology solutions that could be considered is as follows:

- Reduced or low flow devices – Bathroom, kitchen and laundry taps can be exchanged or retrofitted with aerators to reduce water use. The average shower head with mains pressure delivers at least 12 litres of water a minute and often much more. Low flow shower heads have flow restrictors built into the showerhead. They reduce flow to about 5-7 litres a minute, saving water and energy.

- Dual Flush / low flush toilets – approximately 20-30% of a household's water use is by toilet flushing. The older single flush toilets use about 13 litres per flush vs. modern toilet use of 6 litres per flush. Other options include waterless urinals and composting toilets.

There are a variety of potential measures related to installation of water efficient technologies in residential and Council properties. These can range from providing free low-cost gadgets for reducing flush volumes in single flush toilets, to mandatory retrofits of water efficient fixtures in all properties.

It is useful to note that the Building Research Association of New Zealand investigated water end-uses in the Auckland area in 2008 and suggested that installation of dual-flush toilets is likely to achieve the highest benefit-cost ratio for reducing residential demands (this was due to many properties already having showerheads with low flow due to the low-pressure hot water systems).

WDC completed an audit of Council water use in facilities and in operations in August 2008, prior to preparation of the previous WDMP. WDC would like to create a facilities management policy to improve water efficiency in Council owned facilities. The Port Waikato toilets should be a priority as WDC staff identified that visitors to Port Waikato may be taking significant water volumes from a tap in the Council toilets.

The improvement of efficiency of irrigation systems in Council owned parks are a higher priority than residential for automatic timers and/or soil moisture sensors to improve efficiency.

The introduction of the Water Efficiency Labelling Scheme (WELS) in 2011 should result in a gradual increase of water efficient fixtures and appliances over time. WELS is designed to provide consumers with clear information on the water consumption and water efficiency of new water-using products. The WELS provides standardised labelling at the point of sale which will help consumers to compare products based on water efficiency.

7.5 METERING, PRICING AND OTHER FINANCIAL INCENTIVES

Metering and pricing were discussed previously in Section 3.2 and the numbers of metered connections tabled in Section 4.4. Currently most meters are read only every six months on a pattern of rolling meter reads which provides limited information for demand trends.

WDC should investigate high users, particularly those that have multiple meters per property. WDC will consider developing a standard water supply agreement for high water use customers.

For the 1% of customers who are still unmetered, WDC has a targeted rate for water supply based on the provision (connected to the supply) or availability (property situated within 100m of any part of the water supply system) of a water supply service to land.

7.6 WATER CAPTURE, REUSE AND RECYCLING

In the past WDC had a rainwater tank policy requiring installation of rainwater tanks on new properties but found enforcement to be difficult. WDC is currently preparing a rainwater tank strategy to encourage installation of rainwater tanks, particularly for new properties.

7.7 CONCLUSIONS ON WATER DEMAND MANAGEMENT INTERVENTIONS

WDC has a number of business-as-usual water demand management activities as shown in Table 7-2.

Table 7-2: Business as usual water demand management activities

#	**Business as usual water demand management activities**
1	Annual water balance reports and implementation of the 2012 water loss reduction strategy.
2	Restriction and metering of rural properties.
3	Asset management pipe renewals.
4	Comparison of performance with participation in the Water NZ annual benchmarking.

In addition to these business-as-usual activities, WDC has implemented universal metering and volumetric pricing in all schemes

Priorities for other future water demand management interventions are tabled in Section 7.0.

8.0 ACTION PLAN

A comprehensive Action Plan with timelines and responsibilities is a critical component of this WDMP.

WDC already has universal metering in place for all the schemes. In addition, WDC has a number of business-as-usual activities to improve water demand management as shown in Table 7-2.

Appendix J provides a summary table showing the demand management interventions currently used along with the proposed immediate and possible long-term actions.

Table 8-1 presents a prioritised short-term Stage 1 action plan for Council to improve understanding of water demands.

Table 8-1: Proposed short term actions to improve management of demand data

#	Action
1	Complete calibration of all bulk meters (abstraction and post treatment and reservoir). Review the calibration results and refine the water balance results where necessary.
2	Bulk metering should be installed on all reservoirs in large schemes. This will allow night flow monitoring for these larger supply zones, along with faster identification of water mains bursts or increasing leakage.
3	Carry out a review on the customer meter data structure in the billing system and how it is stored and ability to extract and analyse data. This should include a standard customer categorisation (e.g., industrial, commercial, rural, residential, rural residential, institutional, Council etc.).
4	Investigate the Onewhero abstraction flow meter to confirm and correct the erroneous measured flow.
5	Investigate the Port Waikato abstraction and post treatment flow meters to determine whether these are the cause of the high estimated water loss.
6	Investigate potential unauthorised water use in the Port Waikato network, including potential filling from hydrants and use of water from the public toilets.
7	Investigate potential demand in Central District exceeding supply from Ngaruawahia in the last three summers by reviewing reservoir levels under peak day demand, and determining if there was any water transfer between Huntly and Ngaruawahia.

Table 8-2 presents a prioritised Stage 1 action plan for Council to improve water demand management. This action plan includes an indicative timeline for implementing interventions.

Table 8-2: Proposed actions to improve water demand management

#	Action
1	Review critical triggers for water treatment plant production across the district and consider whether to change the timing for implementing water alert levels in the drought management plan (currently following HCC alert levels).
2	Implement recommendations from the 2012 Water Loss Reduction Strategy report including installation of bulk meters to ensure that minimum night flow monitoring can be carried out on a regular basis and pressure reduction in Pokeno.
3	Implement a meter testing and replacement programme based on volume.
4	Undertake a cost benefit analysis for increasing the frequency of customer meter reading (e.g., to 3 months).
5	Monitor high users, particularly those that have multiple meters per property.
6	Develop a standard water supply agreement for high water use customers.
7	Review approach for bulk water withdrawals, e.g., provide a dedicated point for water withdrawals in the key schemes to replace the current honesty system (where users make an application to have a registered standpipe with a meter but can withdraw from any fire hydrant).
8	Review the rural restricted policy particularly whether rural properties that are grand parented on full demand flow should have trickle feed installed when the property changes ownership or is subdivided.
9	Develop a facilities management policy to improve water efficiency in Council owned facilities.
10	A full review of large users (>15m^3/year) across the district is recommended.

Appendices

We design with community in mind

Appendix A POKENO

Pokeno scheme overview

Since 2016 water has been supplied to Pokeno from the Watercare water treatment plant off Trig Road at Tuakau. Water is supplied from the Watercare trunk main via a metered bulk main at 118F Barnaby Road. The plan below shows the key network features.

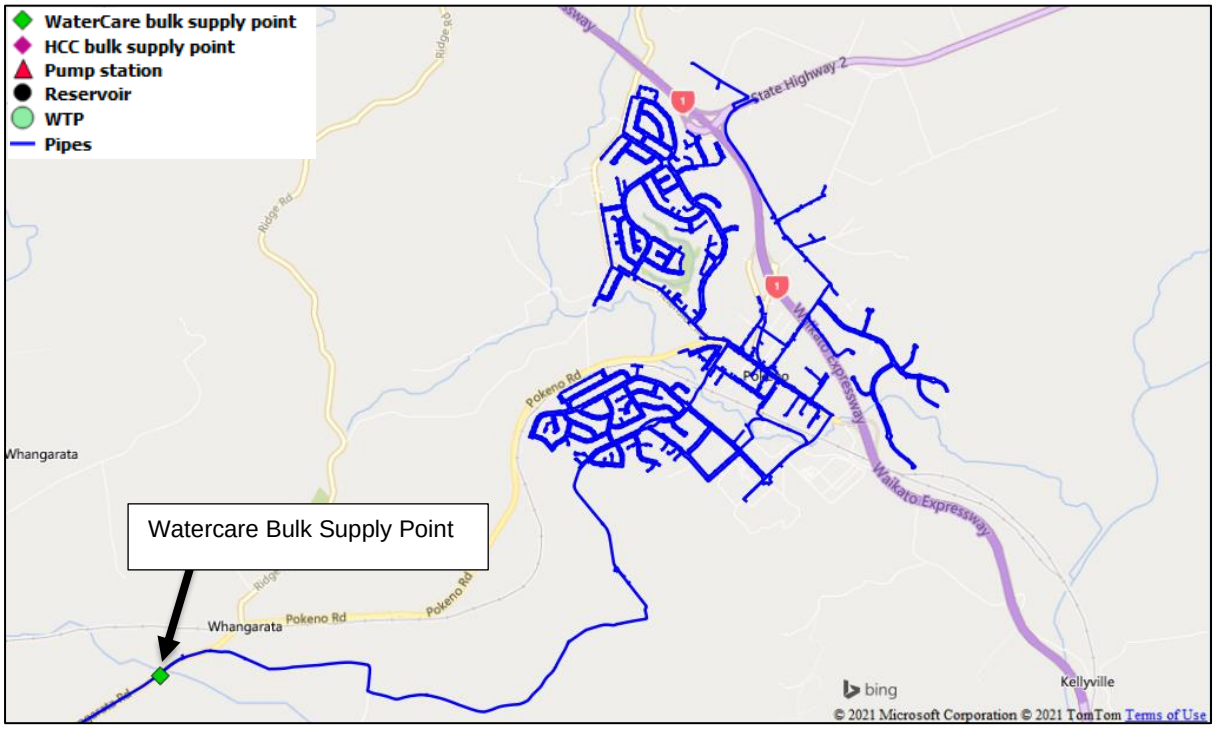

Figure A-1: Pokeno scheme schematic

The water treatment plant at Trig Road sources water from the Waikato River before treating it prior to distribution. A written agreement between Watercare and WDC is in place for the supply and acceptance of potable water. This agreement does not place limits on volume or duration of the agreement.

The Trig Road treatment process has the capacity to treat 175,000 m^3/day in a four-stage process: coagulation and clarification, membrane filtration, biological activated carbon filtration, and chlorine treatment. Only a fraction of this is used to supply Pokeno. An upgrade is currently underway to increase peak capacity to 200,000 m^3/day.

The following table includes details of the current Pokeno water source, treatment and storage capacity.

Appendix A Pokeno

Table A-1: Pokeno current water supply scheme characteristics

Pokeno	
Water source limit	A written agreement between Watercare and WDC is in place for the supply and acceptance of potable water. This agreement does not place limits on volume or duration of the agreement.
Existing WTP capacity	The Trig Road treatment process has the capacity to treat 175,000 m^3/day. An upgrade is currently underway to increase peak capacity to 200,000 m^3/day. Only a fraction of this is used to supply Pokeno.
Existing treatment process units	A four-stage process: coagulation and clarification, membrane filtration, biological activated carbon filtration, and chlorine treatment
Existing storage capacity	The treated water storage in Pokeno now includes the Hitchens Reservoir (2,400 m^3)

Pokeno supply and demand data provided

Daily metered Bulk Supply Point (BSP) flow data between July 2016 and August 2020.

Customer meter readings between July 2016 and June 2020.

Pokeno bulk supply analysis results

The historic water delivered to the system at the BSP has been graphed in Figure A-1. There is no regulatory limit on supply volume – the physical limit on supply is unknown.

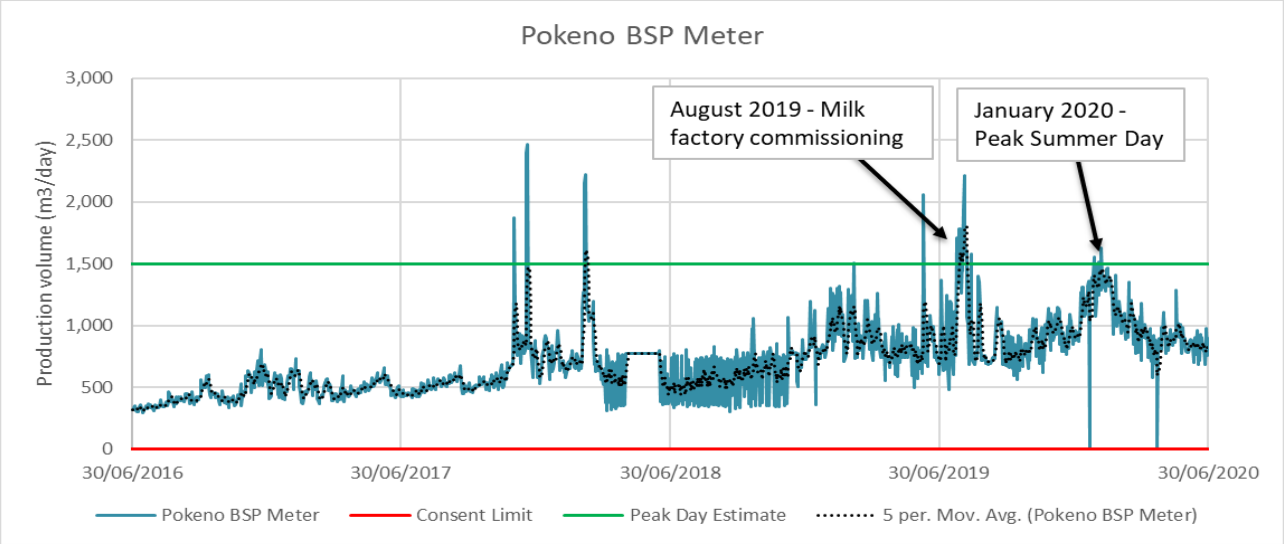

Figure A-2: Historic production trend for Pokeno

The graph above shows the system supply as reported and highlights recent anomalies. A milk factory was commissioned in August 2019, resulting in system demand higher than that seen in summer. Other than this, the highest consistent recent daily demand is around 1,500 m^3/day, observed for a period in January 2020.

The data appears to show an increasing level of demand, which is consistent with a high level of development in the area. However, metering data up to late 2018 appears suspect, as indicated by the flat line for around a month in June 2018 and the daily oscillation between around 300 and 600 m3/day observed in the second half of 2018. The data appears better in 2019, but peak day volume assessments have been made using a 5-day average rather than individual daily peaks, on the assumption any remaining daily oscillations will cancel out over a longer period.

The average and peak supply statistics derived from the water take abstraction and treated demand data are shown in the tables below.

Table A-2: Pokeno supply statistics (m³/day)

	Annual average daily abstraction (m³/day)	Peak day abstraction (m³/day)	Abstracted Peak day factor (m³/day)	Average day treated demand (m³/day)	Peak day treated demand (m³/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2016/17	N/A	N/A	N/A	464	incomplete		717	647
2017/18	N/A	N/A	N/A	666	incomplete		879	758
2018/19	N/A	N/A	N/A	737	incomplete		1,230	599
2019/20	N/A	N/A	N/A	962	1,500	1.56	1,699	566

This shows the rate of development in Pokeno over the last few years. Based on the available historic results, the peak day factor adopted for the Pokeno demand forecast is 1.56.

The historic average and peak day Pokeno bulk demands been graphed below, along with the number of residential connections.

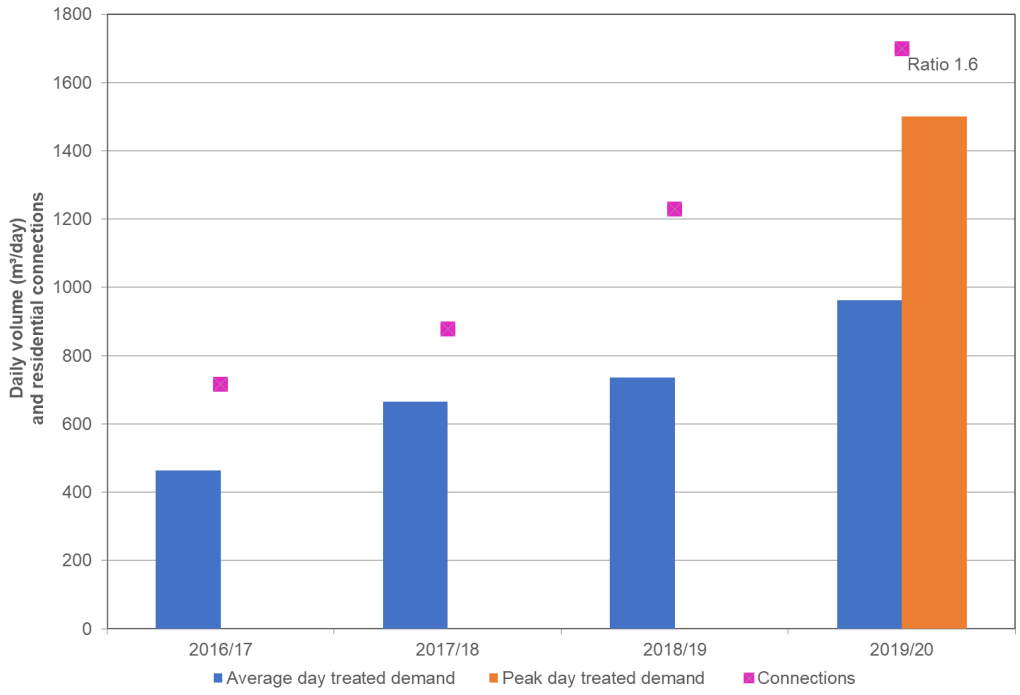

Figure A-3: Historic Pokeno average and peak day demand

The information in the graph above and Table A-2 shows that the increase in residential connections has outpaced the increase in demand, and the per-property. This may be due to increased urbanisation, with smaller land areas associated with new connections. Improved efficiency of new appliances in the new houses may also be a factor.

Pokeno 2019/20 water loss results

The pie chart below shows the results of the July 2019 to June 2020 water balance, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

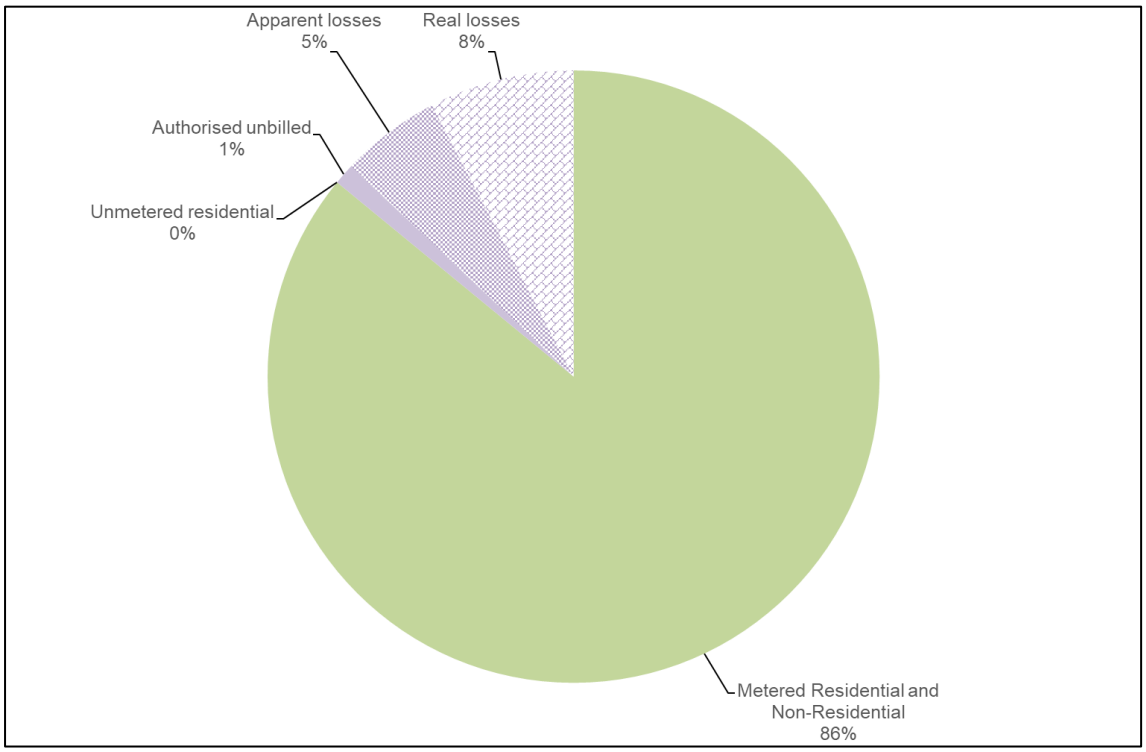

Figure A-4: Pokeno 2019/20 water balance results (% of total water supplied)

The metered demands (86% of water supplied) are primarily from residential customers. There are no unmetered customers in the Pokeno water supply scheme. Real losses were estimated at 8% of water supplied for 2019/20, equivalent to 43 L/connection/day.

As set out in Section 5.5.3, metered demands were split into residential and commercial through identification of the top 10 users, and assuming these customers are commercial. Although this is a rough approach, this does improve the estimate for residential water use, which forms the majority of growth in systems across the Waikato District.

Commercial and NRW demand are considered non-seasonal, so the table below shows the breakdown of both average day demand and peak day demand in Pokeno.

Table A-3: Pokeno demand breakdown and peaking factors

	System Total (m^3/day)	Per Connection (L/conn/day)
Total 2019-20 ADD	962	566
Total 2019-20 Peak Day	1,500	883
Overall peaking factor	**156%**	**156%**
Residential 2019-20 ADD	627	369
Commercial 2019-20	261	154
NRW 2019-20	73	43
Residential 2019-20 PDD	1,166	686
Residential Peaking Factor	**186%**	**186%**

Based on this analysis, the peak daily residential demand assumption adopted for the Pokeno supply demand forecast is 686 L/residential connection/day, reflecting use in 2019/20. As previously noted, demand is currently dropping. However, although further drops in per-property demand may occur in future these are not guaranteed. It is concluded that the assumption that demand will continue at current levels is appropriate for the current level of knowledge, although it may turn out in future to be conservative.

Pokeno Supply Demand Balance Forecasts

Growth in Pokeno has been calculated from household projections provided by Watercare. A summary is shown in the graph below.

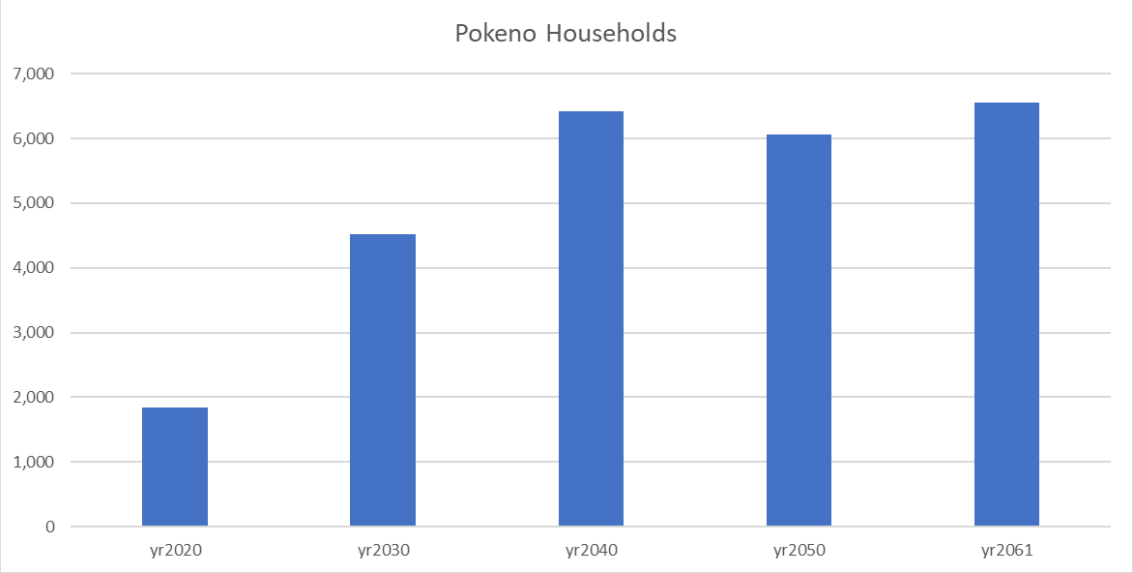

Figure A-5: Pokeno growth forecast to 2061, as supplied by Watercare

Around 300 new households a year are anticipated through to around 2030, when the rate of development slows to around 200 houses per year. This continues to around 2040.

After this the data provided shows growth stopping, and the number of households in Pokeno dropping by around 50 houses a year until 2050, when growth recovers to around 50 houses a year.

No additional commercial demand is anticipated in Pokeno, and NRW is assumed to remain at the current level of 49 m^3/day.

Based on these assumptions, The Pokeno SDB forecast graph is as shown below.

Appendix A Pokeno

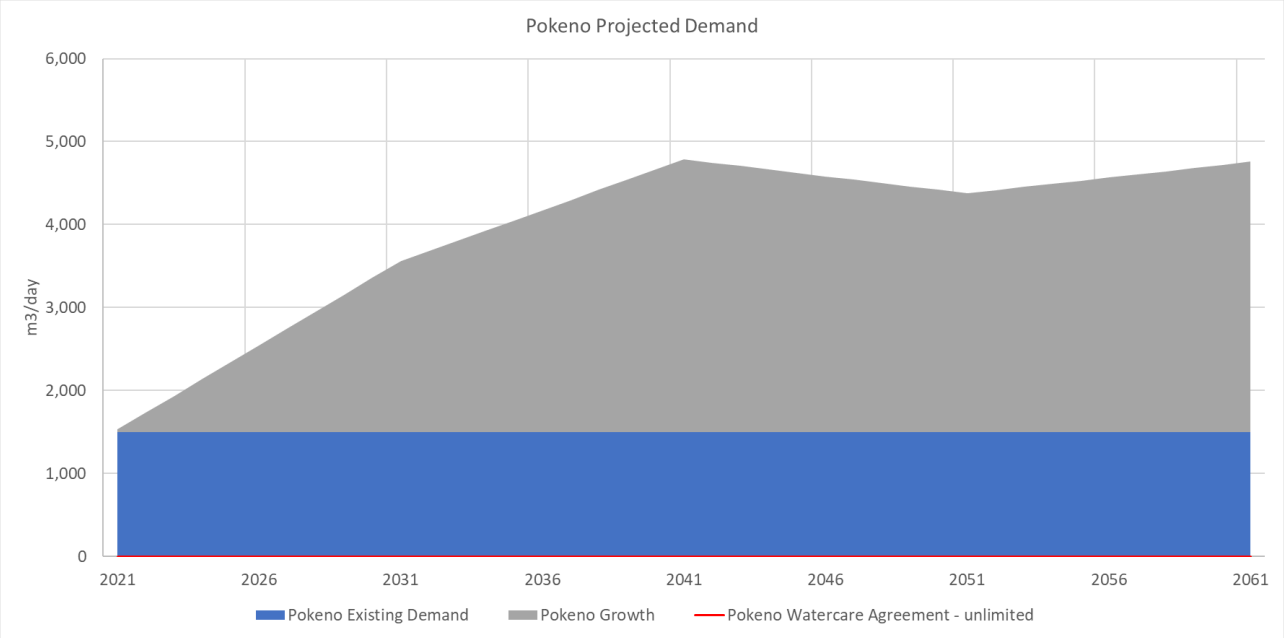

Figure A-6: Pokeno water source peak day SDB forecast to 2061

As there are no known supply-side constraints, the rate of growth does not trigger any supply-side concerns.

Appendix B TUAKAU

Tuakau scheme overview

Since 2016 water has been supplied to Tuakau from the Watercare water treatment plant off Trig Road at Tuakau. Water is supplied from the Watercare trunk main via a metered bulk main at 296a Whangarata Road.

The supply has two distribution zones, the South Zone and the North Zone. Water from the Watercare supply point is fed direct to the Harrisville Road reservoirs from where it gravitates to the South zone. The Railway Road booster pump station, supplied from the Harrisville Road reservoirs, boosts pressure to the North Zone. The plan below shows the key network features.

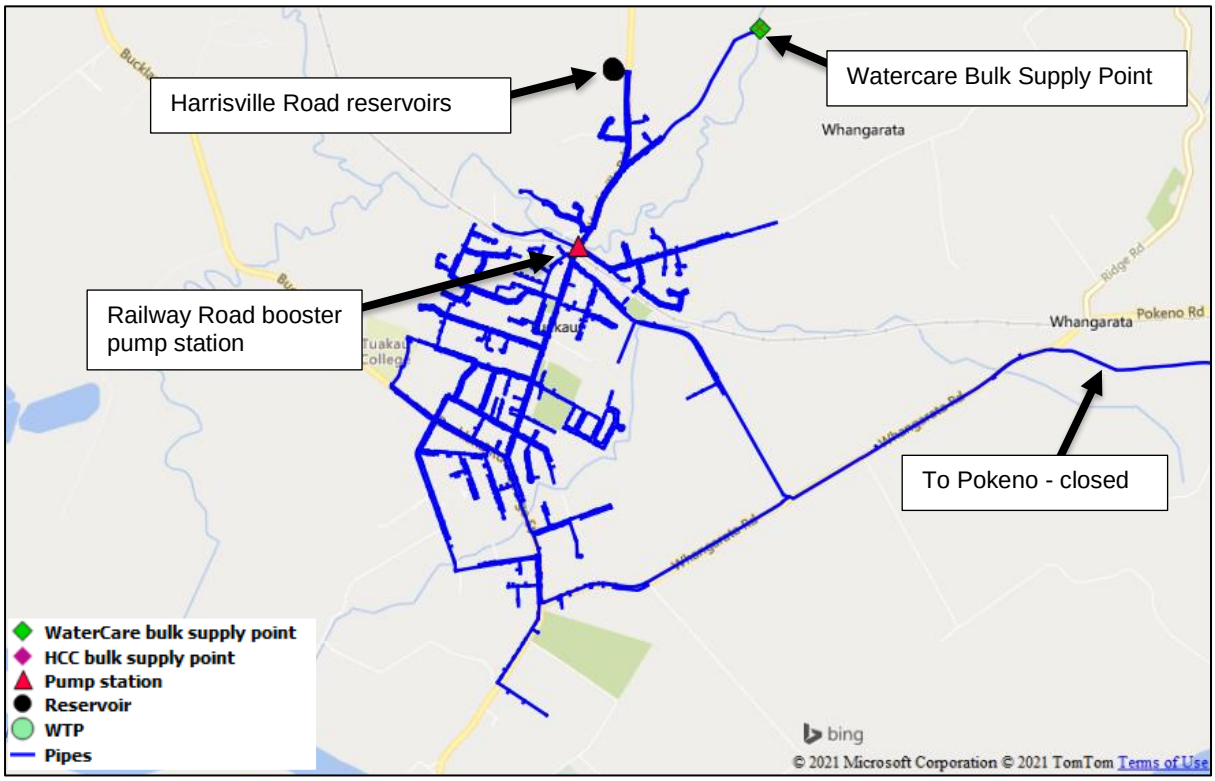

Figure B-7: Tuakau scheme schematic

The water treatment plant at Trig Road sources water from the Waikato River before treating it prior to distribution. A written agreement between Watercare and WDC is in place for the supply and acceptance of potable water. This agreement does not place limits on volume or duration of the agreement.

The Trig Road treatment process has the capacity to treat 175,000 m^3/day in a four-stage process: coagulation and clarification, membrane filtration, biological activated carbon filtration, and chlorine treatment. Only a fraction of this is used to supply Tuakau. An upgrade is currently underway to increase peak capacity to 200,000 m^3/day.

The following table includes details of the current Tuakau water source, treatment and storage capacity.

Table B-4: Tuakau current water supply scheme characteristics

Tuakau	
Water source limit	A written agreement between Watercare and WDC is in place for the supply and acceptance of potable water. This agreement does not place limits on volume or duration of the agreement.
Existing WTP capacity	The Trig Road treatment process has the capacity to treat 175,000 m^3/day. An upgrade is currently underway to increase peak capacity to 200,000 m^3/day. Only a fraction of this is used to supply Tuakau.
Existing treatment process units	A four-stage process: coagulation and clarification, membrane filtration, biological activated carbon filtration, and chlorine treatment
Existing storage capacity	The treated water storage at Harrisville Road includes two reservoirs, a 2,145 m^3 above ground circular steel reservoir and a 260 m^3 above ground circular timber reservoir (total capacity of 2,405 m^3).

Tuakau supply and demand data provided

Daily metered Bulk Supply Point (BSP) flow data between July 2016 and August 2020.

Customer meter readings between July 2016 and June 2020.

Tuakau bulk supply analysis results

The historic water delivered to the system at the BSP has been graphed in Figure B-1. There is no regulatory limit on supply volume – the physical limit on supply is unknown.

The graph below shows the system supply as reported and highlights recent anomalies. The highest consistent recent daily demand is around 2,250 m^3/day, observed for a period in January 2019.

Metering data across the whole period appears suspect, as indicated by flat lines for around a month before June 2018 and after June 2019. Additionally, daily oscillations in demand between around 1,200 and 1,500 m3/day are observed in much of the recent data, with oscillations changing to between 1,500 and 1,800 m^3/day over summer periods.

The database for the bulk metering flow data is structured in a way where data extracts can be summarised in different ways for different purposes. Discussions with Watercare indicate a better data set may be available if the database is queried in a different way. Unfortunately, this was not possible in the course of this project but further investigation is recommended.

However, from the data the 5-day rolling average appears to track expected seasonal demand increases, so peak day volume assessments have been made using this 5-day average rather than individual daily peaks. The assumption is the daily oscillations cancel out over longer periods.

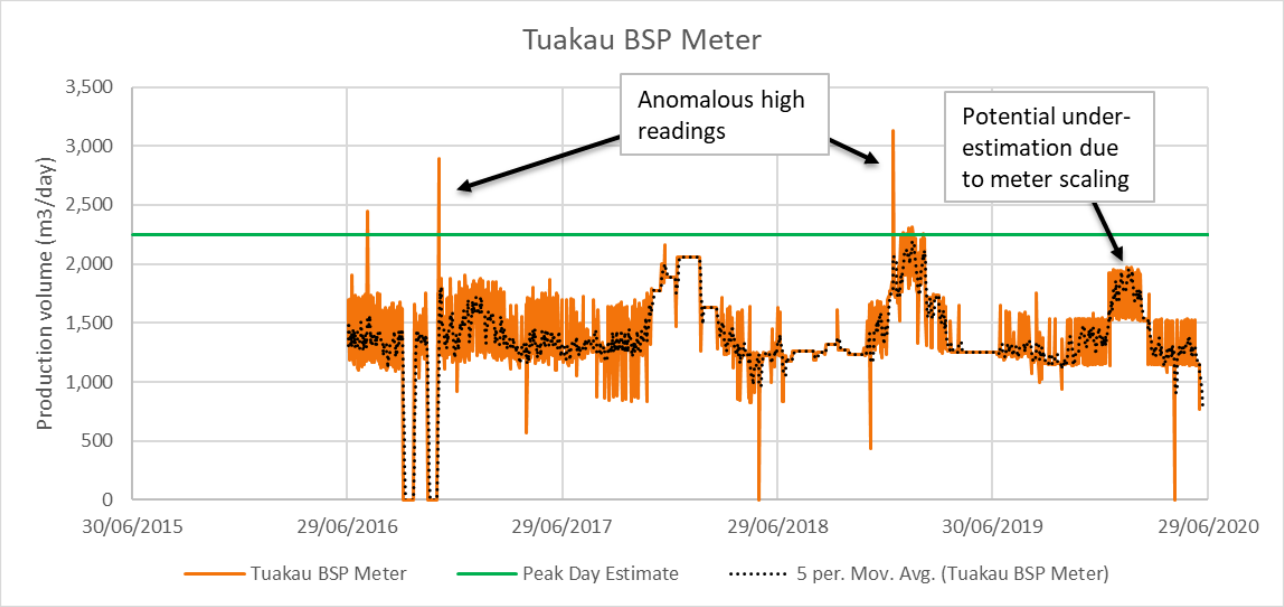

Figure B-8: Historic water take abstraction for Tuakau

The average and peak supply statistics derived from the water take abstraction and treated demand data are shown in the tables below. Note that due to uncertainty over the metering it has been assumed that the peak day in 2019/20 was as high as the previous year.

Table B-5: Tuakau supply statistics (m³/day)

	Annual average daily abstraction (m³/day)	Peak day abstraction (m³/day)	Abstracted Peak day factor (m³/day)	Average day treated demand (m³/day)	Peak day treated demand (m³/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2016/17	N/A	N/A	N/A	1,258	incomplete		2,046	615
2017/18	N/A	N/A	N/A	1,467	incomplete		2,078	706
2018/19	N/A	N/A	N/A	1,426	2,250	1.58	2,128	670
2019/20	N/A	N/A	N/A	1,357	2,250 (assumed)	1.64	2,138	635

This shows the size of the Tuakau network has remained relatively static over the last few years. Based on the difficulty in interpreting the daily flow data from the BSP, a conservative estimate of peaking factor has been derived from the available historic results, the peak day factor adopted for the Tuakau demand forecast is 1.64.

The historic average and peak day Tuakau abstracted demands been graphed below, along with the number of residential connections.

Appendix B Tuakau

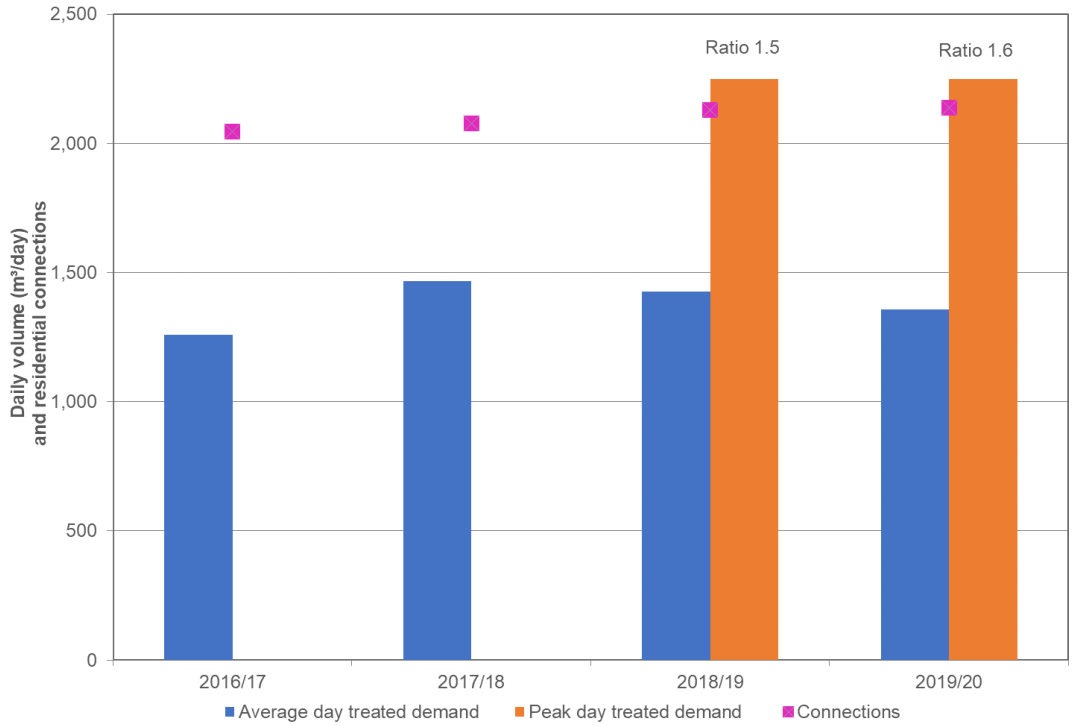

Figure B-9: Historic Tuakau average and peak day abstracted demand

The information in the graph above and Table B-5 shows that there has only been a small increase in number of properties over the last 5 years. Average demand has remained fairly constant, and the summer peaking factors do not appear excessive.

Tuakau 2019/20 water loss results

The pie chart below shows the results of the July 2019 to June 2020 water balance, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

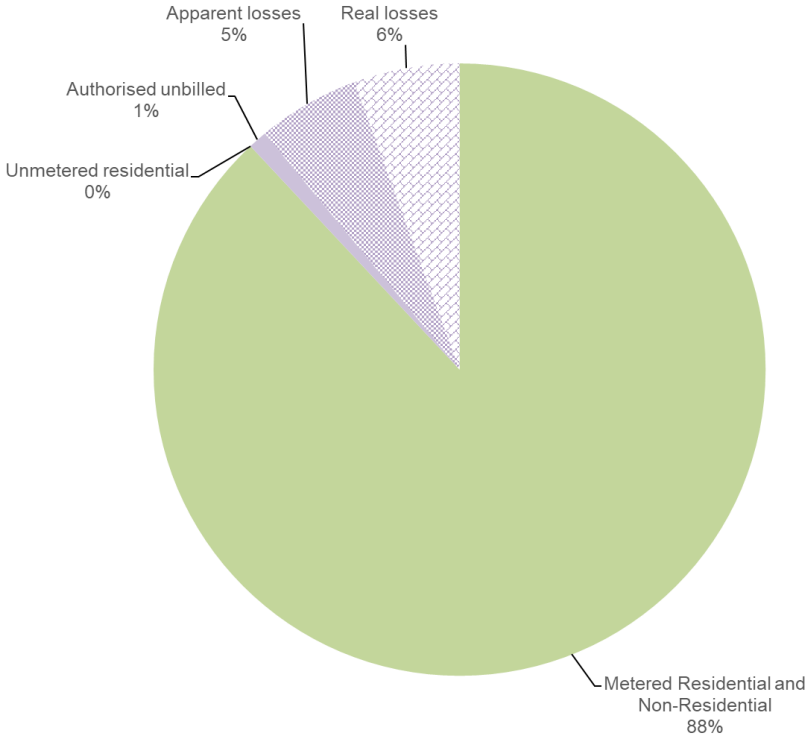

Figure B-10: Tuakau 2019/20 water balance results (% of total water supplied)

The metered demands (88% of water supplied) are primarily from residential customers. There are no unmetered customers in the Tuakau water supply scheme. Real losses were estimated at 6% of water supplied for 2019/20, equivalent to 36 L/connection/day.

As set out in Section 5.5.3, metered demands were split into residential and commercial through identification of the top 10 users, and assuming these customers are commercial. Although this is a rough approach, this does improve the estimate for residential water use, which forms the majority of growth in systems across the Waikato District.

Commercial and NRW demand are considered non-seasonal, so the table below shows the breakdown of both average day demand and peak day demand in Tuakau.

Table B-6: Tuakau demand breakdown and peaking factors

	System Total (m^3/day)	Per Connection (L/conn/day)
Total 2019-20 ADD	1,376	644
Total 2019-20 Peak Day	2,250	1,052
Overall peaking factor	**164%**	**164%**
Residential 2019-20 ADD	1,009	472
Commercial 2019-20	707	331
NRW 2019-20	77	36
Residential 2019-20 PDD	1,883	881
Residential Peaking Factor	**187%**	**187%**

Based on this analysis, the peak daily residential demand assumption adopted for the Tuakau supply demand forecast is 881 L/residential connection/day, reflecting use in 2019/20.

Tuakau Supply Demand Balance Forecasts

Growth in Tuakau has been calculated from household projections provided by Watercare. A summary is shown in the graph below.

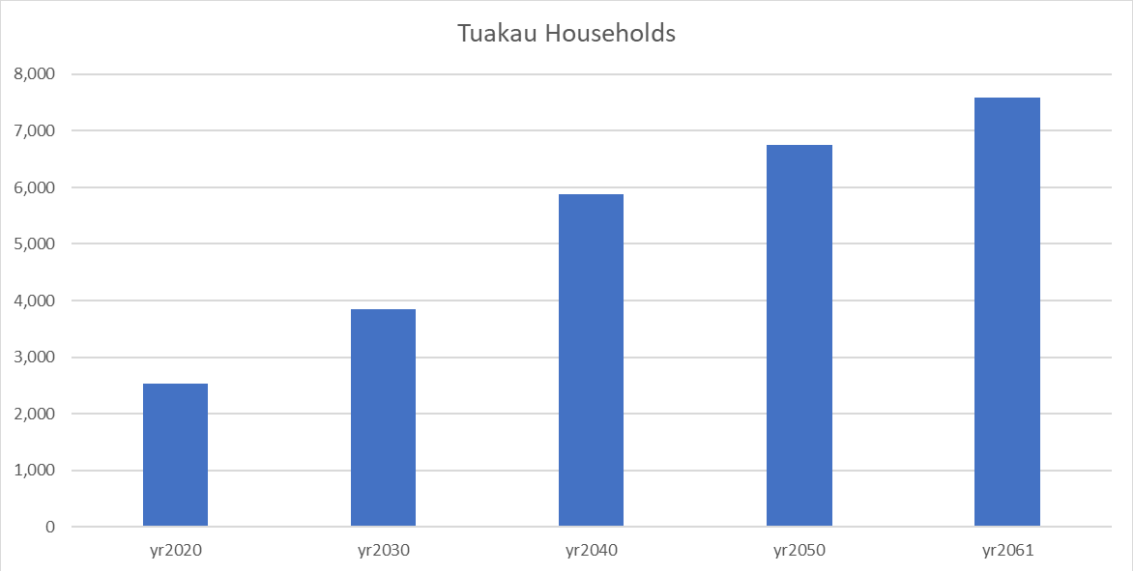

Figure B-11: Tuakau growth forecast to 2061, as supplied by Watercare

Around 130 new households a year are anticipated in Tuakau through to around 2030, when the rate of development increases to around 220 houses per year. This continues to around 2040. After this, the number of additional households in Tuakau slows to around 70 houses a year right through to 2061.

No additional commercial demand is anticipated in Tuakau, and NRW is assumed to remain at the current level of 61 m3/day.

Based on these assumptions, The Tuakau SDB forecast graph is as shown below.

Appendix B Tuakau

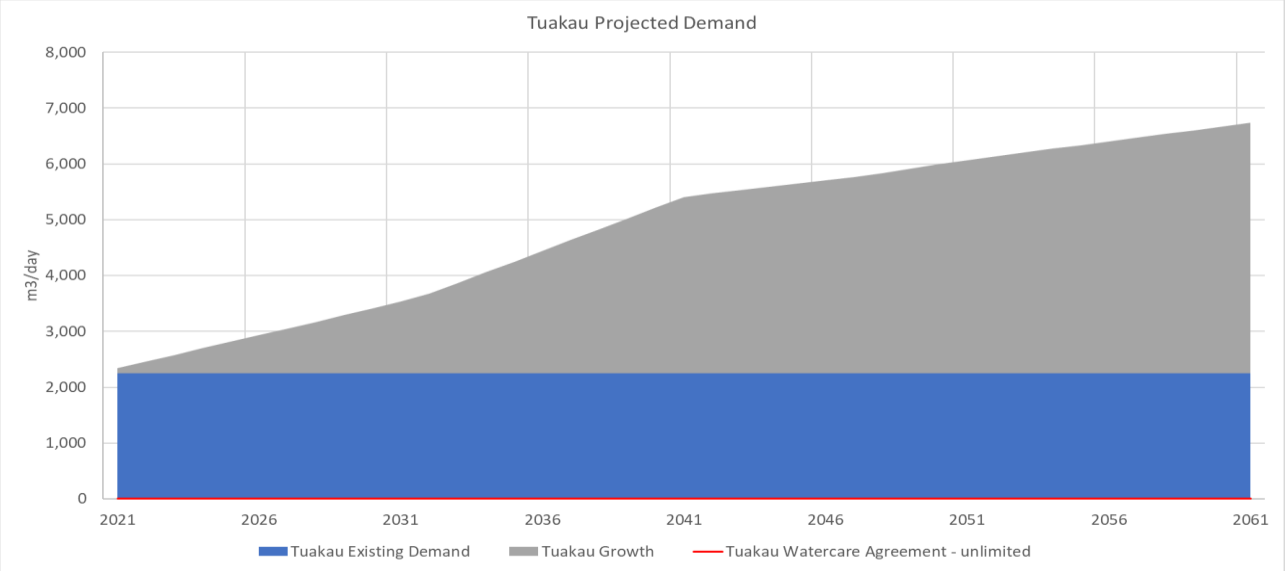

Figure B-12: Tuakau water source peak day SDB forecast to 2061

As there are no known supply-side constraints, the rate of growth does not trigger any supply-side concerns.

Appendix C MID WAIKATO

Mid Waikato scheme overview

The Mid Waikato scheme supplies water to Te Kauwhata, Te Kauwhata Rural, Rangiriri, Whangamarino and Meremere. The plan below shows the key network features.

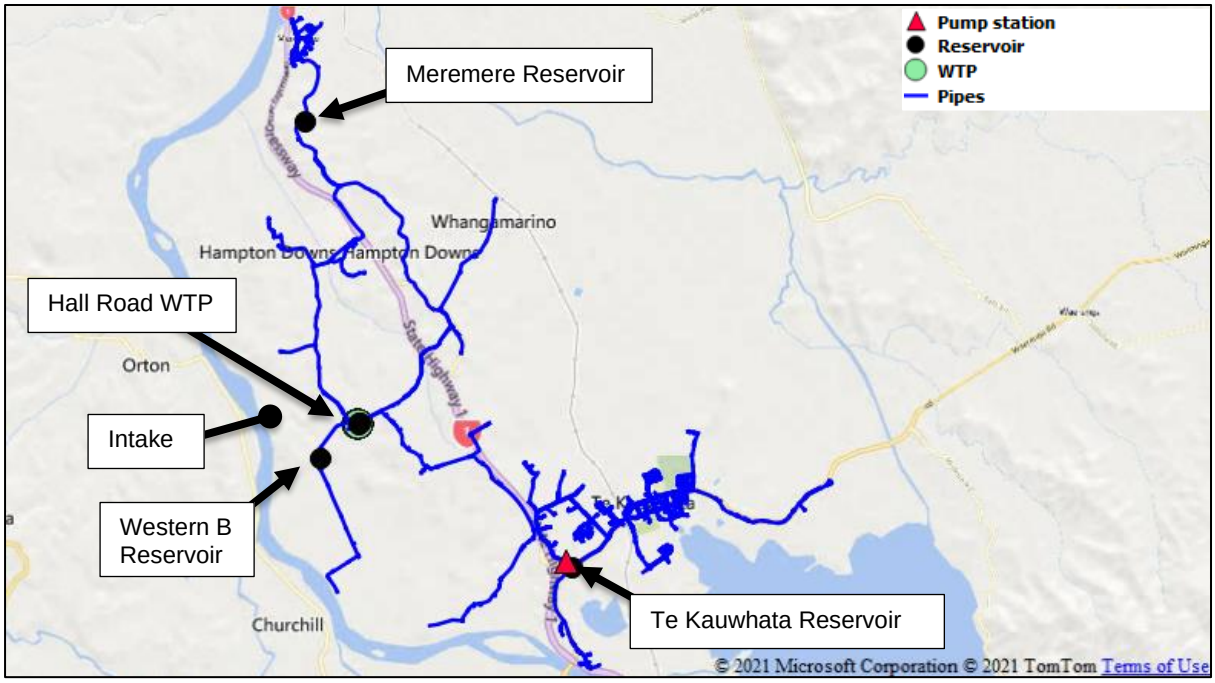

Figure C-13: Mid Waikato scheme schematic

The Mid Waikato scheme receives raw water from a storage reservoir owned by the Te Kauwhata Water Association (TKWA). The TKWA draws water from the Waikato River and Council treats the water at a treatment plant in Hall Road.

The Hall Road WTP provides water for the domestic, commercial and industrial needs of the Te Kauwhata, Meremere and Hampton Downs communities. Two set of pumps provide the treated water supply to the Western B (360 m^3), Meremere (250 m^3) and Te Kauwhata (500 m^3) reservoirs.

The supply has two distribution zones; Te Kauwhata / Rangiriri and Whangamarino Rural / Meremere. The Te Kauwhata / Rangiriri zone serves the town of Te Kauwhata whilst the Whangamarino Rural / Meremere zone serves the communities of Hampton Downs and Meremere.

The zones have a mix of on-demand and restricted supplies, with on-demand connections only in the Meremere and Te Kauwhata townships.

The table below includes details of the current Mid Waikato water source, treatment and storage capacity.

Table C-7: Mid Waikato current water supply scheme characteristics

Mid Waikato	
Water source limit	4,000 m^3/day (agreement limit with TKWA, expired 2016)
Existing WTP capacity	3,080 m^3/day (upgrade to 4,500 m^3/day under way)
Existing treatment process units	2 clarifiers 2 filters UV reactors
Existing storage capacity	3,000 m^3

Mid Waikato supply and demand data provided

Daily metered Te Kauwhata WTP water production flow data between July 2015 and June 2020.

Customer meter readings between July 2016 and June 2020.

Mid Waikato bulk supply analysis

The historic water production for the WDC Mid Waikato scheme has been graphed against the current WDC water supply agreement limit, and against the current and future WTP capacity in Figure B-1.

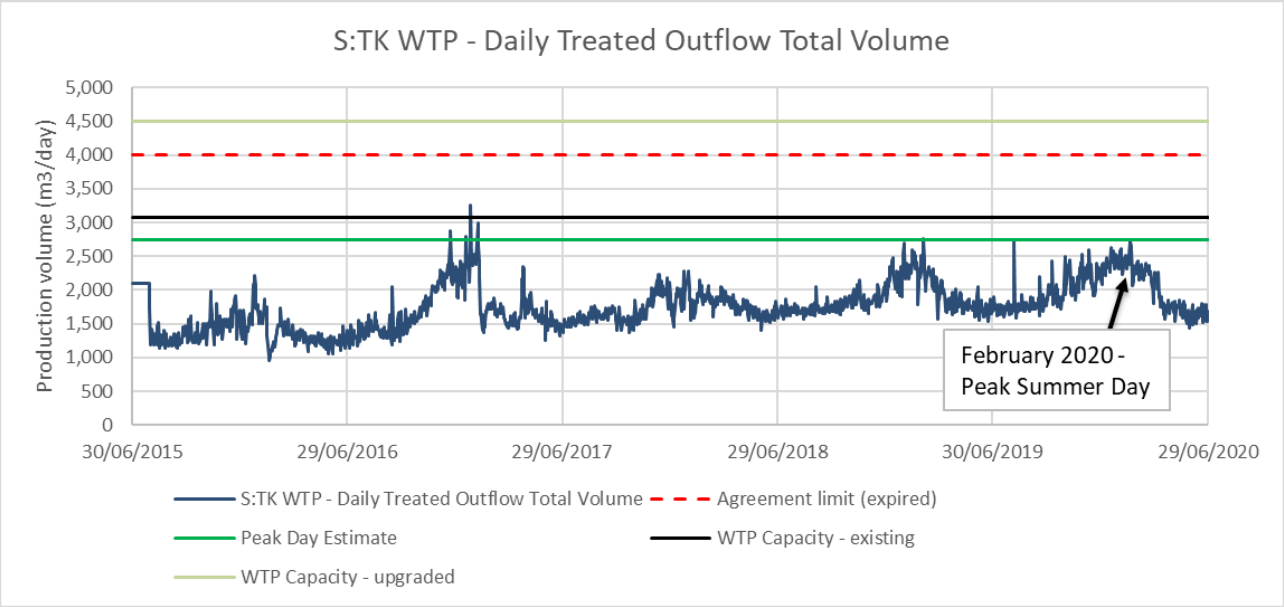

Figure C-14: Historic water production trend for Mid Waikato

The graph above shows a relatively stable pattern across the last 2-3 years. Peak summer demand has consistently reached around 2,700 m^3/day, and use through the winter now consistently sits above 1,500 m^3/day.

The existing WTP capacity of 3,080 m^3/day is sufficient for now, but there is little ability to support growth until the WTP is upgraded.

The average and peak supply statistics derived from the water take abstraction and treated demand data are shown in the tables below.

Table C-8: Mid Waikato supply statistics (m³/day)

	Annual average daily abstraction (m³/day)	Peak day abstraction (m³/day)	Abstracted Peak day factor (m³/day)	Average day treated demand (m³/day)	Peak day treated demand (m³/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2015/16	N/A	N/A	N/A	1,437	incomplete		Incomplete	
2016/17	N/A	N/A	N/A	1,713	3,000	1.75	Incomplete	
2017/18	N/A	N/A	N/A	1,729	2,250	1.30	Incomplete	
2018/19	N/A	N/A	N/A	1,890	2,750	1.45	Incomplete	
2019/20	N/A	N/A	N/A	1,983	2,750	1.39	1,398	1,418

The customer metering data prior to 2019 is patchy for Mid Waikato, and a clear idea of the number of connections before 2019 is not available. However, the 2019/20 data shows a high per-property consumption, likely driven by a small number of large commercial customers, and by high water loss. The peak day factor adopted for the Mid Waikato demand forecast is 1.39.

The historic average and peak day Mid Waikato WTP production has been graphed below, along with the number of residential connections.

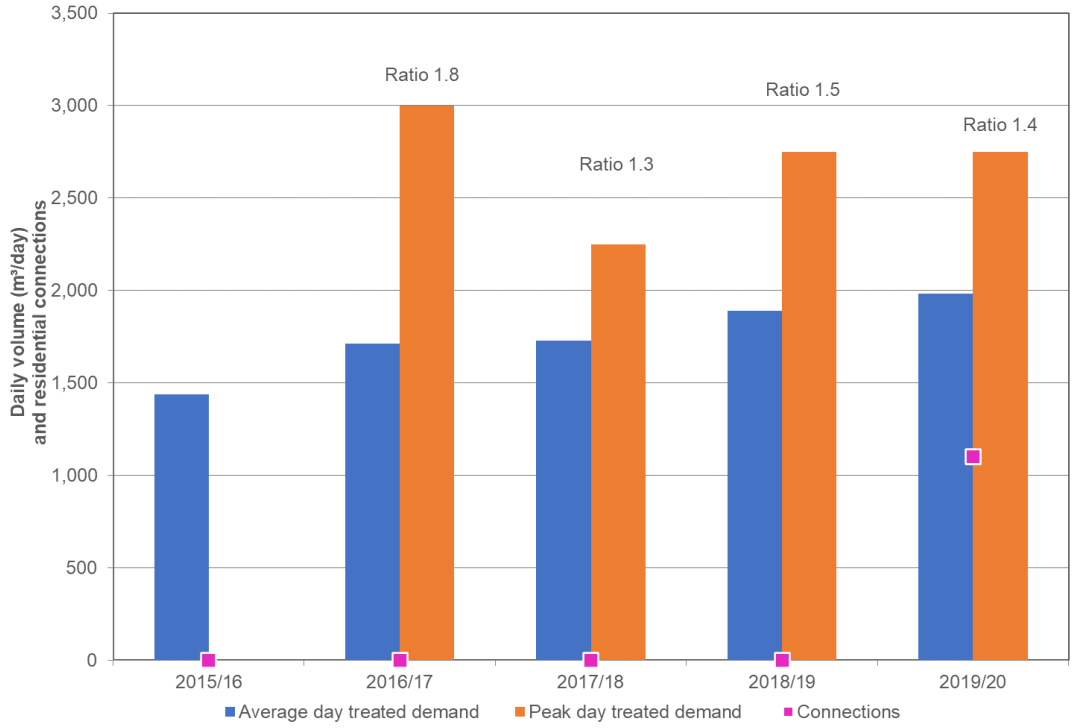

Figure C-15: Historic Mid Waikato average and peak day demand

The graph above emphasizes the low number of connections relative to the overall supply volume, and also the relatively low overall system seasonality. These factors together reflect the highly commercial nature of the network and the relatively high level of water loss.

Mid Waikato water loss results

The pie chart below shows the results of the July 2019 to June 2020 water balance, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

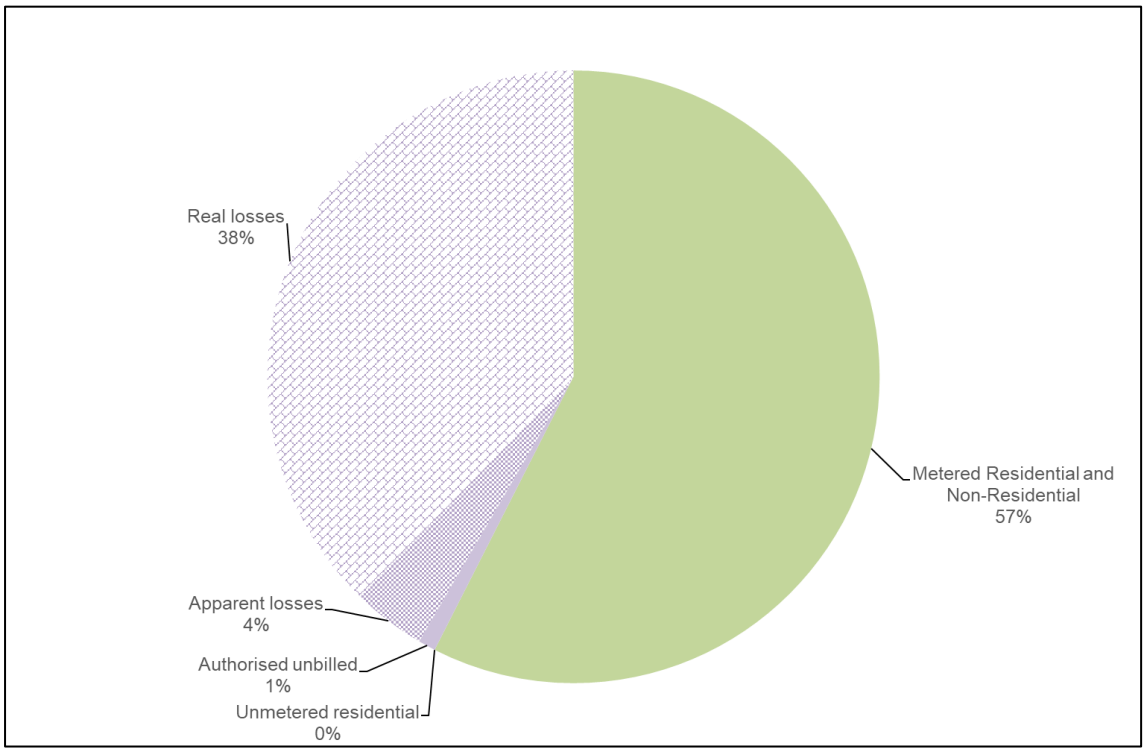

Figure C-16: Mid Waikato 2019/20 water balance results (% of total water supplied)

The metered demands (57% of water supplied) are both commercial and residential customers. There are no unmetered customers in the Mid Waikato water supply scheme. Real losses were estimated at 38% of water supplied for 2019/20, equivalent to 543 L/connection/day.

Although this is a high rate of loss, this should be taken in the context that this network is largely rural, with long stretches of pipe between properties. There may be room for improvement, but this network is unlikely to reach the low rates of loss seen in newer urban networks such as Pokeno and Tuakau.

As set out in Section 5.5.3, metered demands were split into residential and commercial through identification of the top 10 users, and assuming these customers are commercial. Although this is a rough approach, this does improve the estimate for residential water use, which forms the majority of growth in systems across the Waikato District.

Commercial and NRW demand are considered non-seasonal, so the table below shows the breakdown of both average day demand and peak day demand in Mid Waikato.

Table C-9: Mid Waikato demand breakdown and peaking factors

	System Total (m^3/day)	Per Connection (L/conn/day)
Total 2019-20 ADD	2,009	1,828
Total 2019-20 Peak Day	2,750	2,502
Overall peaking factor	**137%**	**137%**
Residential 2019-20 ADD	574	522
Commercial 2019-20	581	529
NRW 2019-20	854	777
Residential 2019-20 PDD	1,315	1,197
Residential Peaking Factor	**229%**	**229%**

Based on this analysis, the peak daily residential demand assumption adopted for the Mid Waikato supply demand forecast is 1,197 L/residential connection/day, reflecting use in 2019/20.

This is a relatively high residential water use, possibly reflecting the rural nature of much of the network. It is possible that the significant growth in this system may result in a more urbanised pattern of use, with lower per-property demand, however, this cannot be confirmed with the current data. The assumption that demand will continue at current levels is appropriate for the current level of knowledge, although it may turn out in future to be conservative.

Mid Waikato supply demand balance forecasts

Growth in Mid Waikato has been calculated from population projections developed for the Mid Waikato Water and Wastewater Servicing Strategy, provided by Watercare. These projections include some commercial and industrial growth (expressed as Population Equivalents), but for Mid Waikato the majority of the expected growth is residential.

A summary of the rate of growth is shown in the graph below.

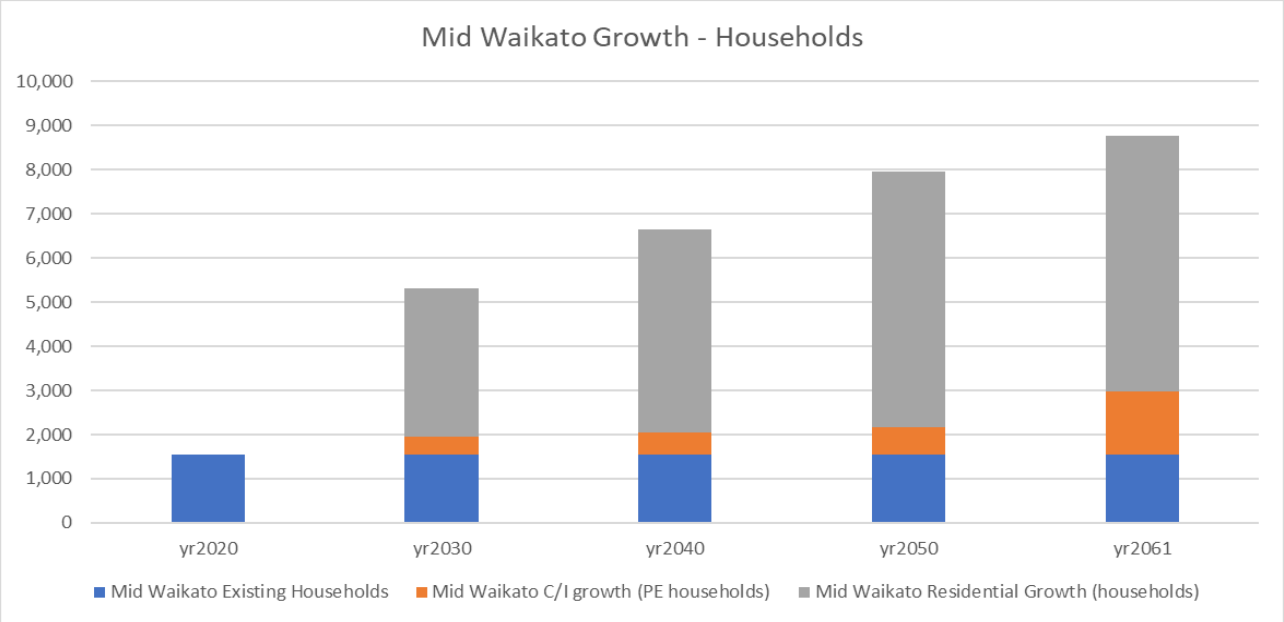

Figure C-17: Mid Waikato growth forecast to 2061, derived from RITS

A very high rate of residential growth is anticipated in the next 5 years with over 500 new dwellings per year expected. A modest amount of commercial and industrial growth is also expected. After this the annual rate of growth slows to around 140 dwellings per year out to 2030, then to 120 per year to 2050. After this residential growth stops, and only some commercial and industrial development is expected to occur.

For the purposes of demand estimation, NRW is assumed to remain at the current level of 854 m^3/day.

Based on these assumptions, the Mid Waikato SDB forecast graph is as shown below. This shows the split between the expected areas of development, as well as the volumes supported by the expired TKWA agreement and the WTP capacity (once upgraded).

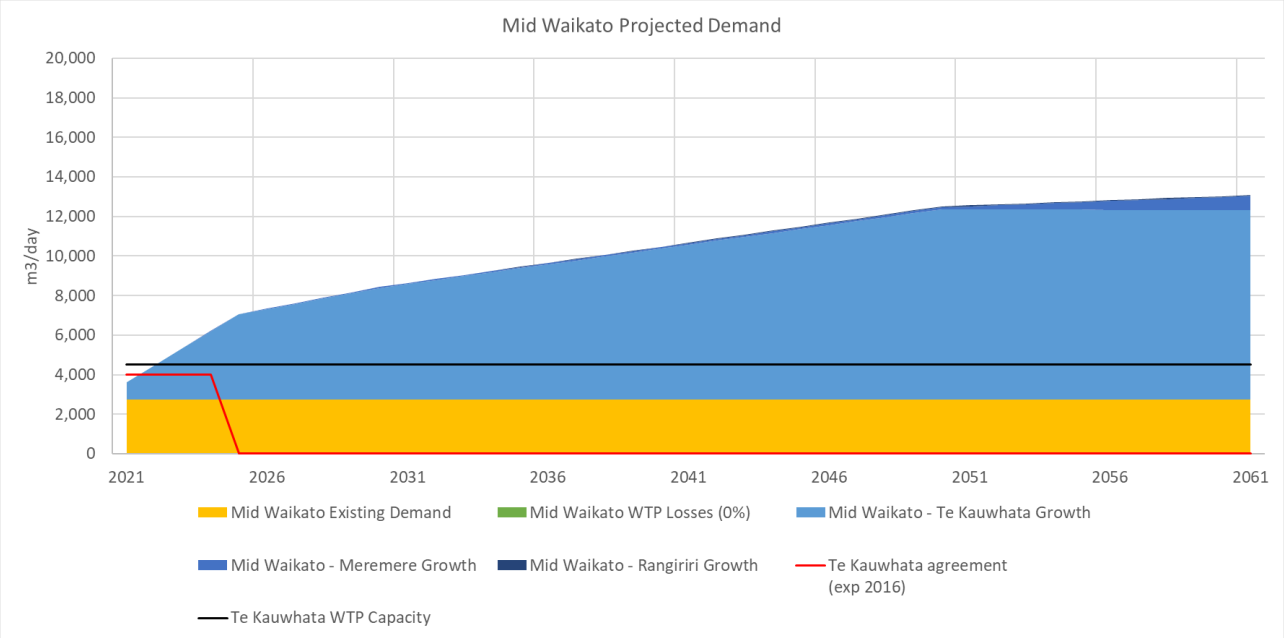

Figure C-18: Mid Waikato water source peak day SDB forecast to 2061

This shows there are serious supply-side constraints to the anticipated growth unless the WTP is further upgraded.

Until the TKWA consent is due to expire in 2024, there may be some scope to increase the volume TKWA can supply to WDC, depending on the volume required for irrigation. However, if the proposed growth is to be supported after this a new consent will need to provide for supply of up to 12,000 m^3/day for WDC use alone, plus TKWA irrigation requirements.

Alternative Scenario One - Ohinewai supplied from Mid Waikato

Significant growth is anticipated in Ohinewai, south of the existing Mid Waikato system between Te Kauwhata and Huntly. In the base scenario this growth is supplied from Huntly, but as set out in Section 6.5.2 one option to support this potential growth is to supply it from Mid Waikato instead of Huntly.

If this were to be undertaken, the volume of water required in Mid Waikato would increase significantly, to just over 18,000 m^3/day in 2061. The graph below shows how the demand would increase over time, assuming supply to Ohinewai was transferred from Huntly to Mid Waikato around 2027.

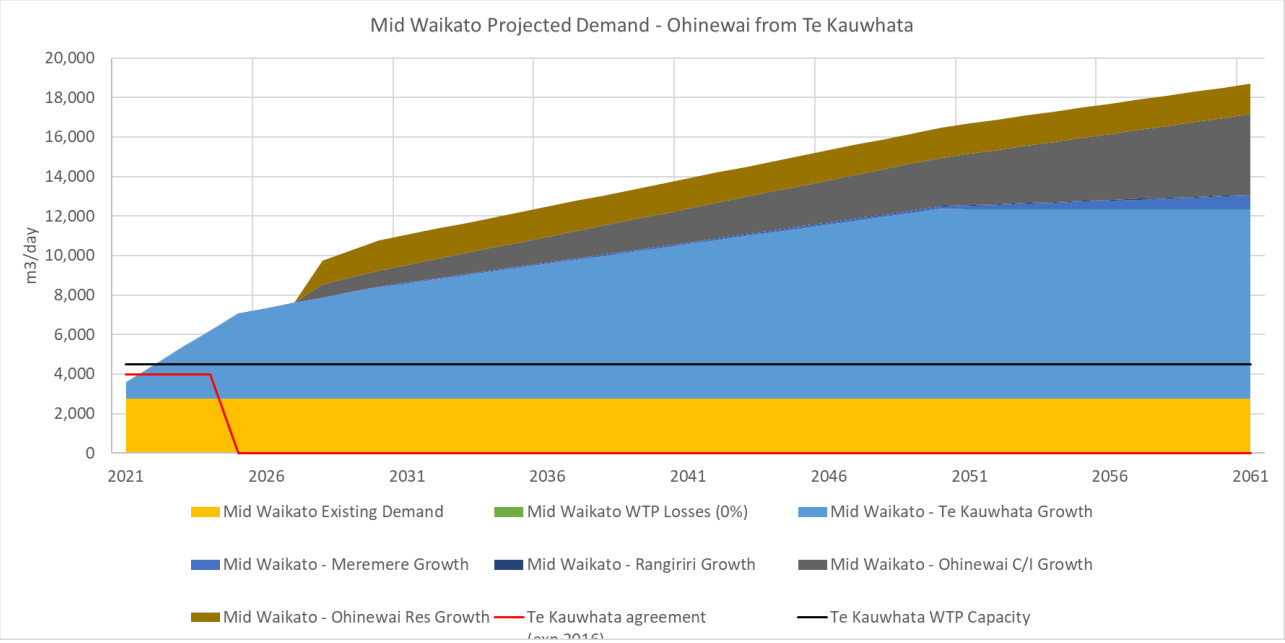

Figure C-19: Alternative Scenario - Mid Waikato supplying Ohinewai - peak day SDB forecast to 2061

Appendix D HUNTLY

Huntly scheme overview

The Huntly scheme supplies the Huntly township, including the Genesis Huntly Power Station and the Solid Energy Mine, plus surrounding rural areas. The plan below shows the key network features.

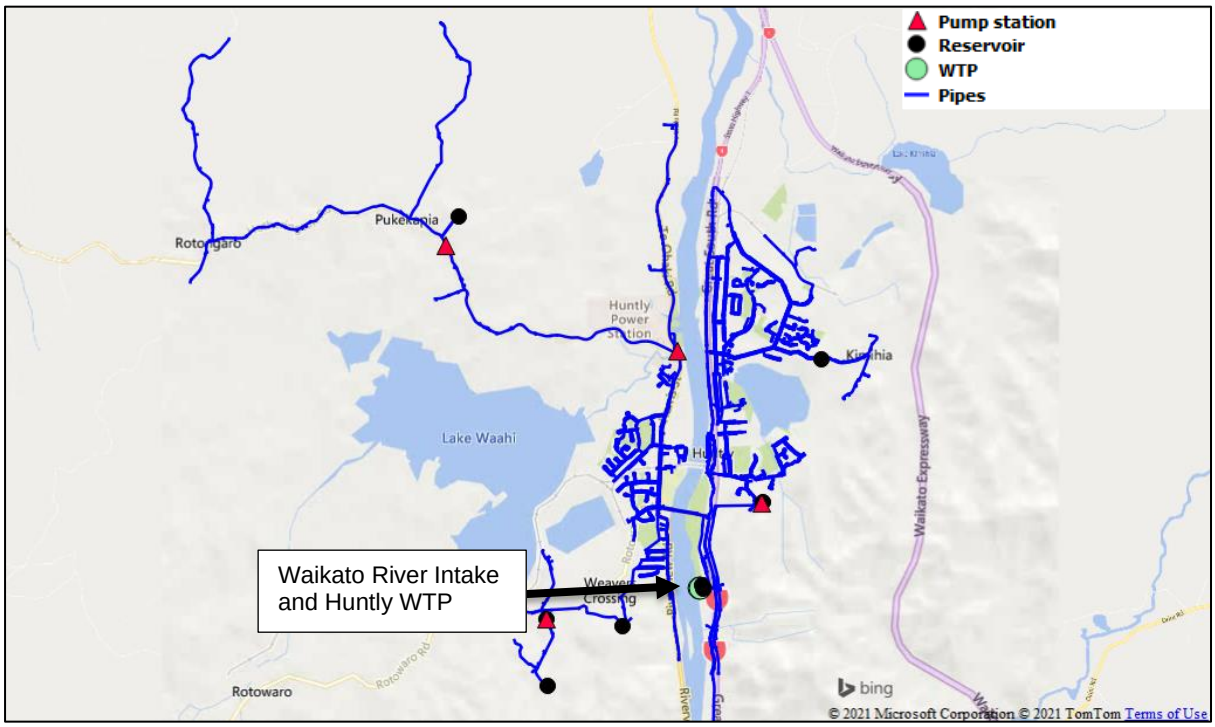

Figure D-20: Huntly scheme schematic

Water for the Huntly scheme is drawn from the Waikato River at an intake located towards the southern end of the town. From there water is pumped to the treatment plant in Jackson Road. After treatment the water is pumped to the town reticulation system and five reservoirs. Some parts of Huntly are directly fed from the treatment plant and other parts are reliant on the reservoirs.

In 2019 the Huntly network was connected to Ngaruawahia via a link pipeline to ensure resilience and to allow summer peak demands to be met.

The table below includes details of the current Huntly water source, treatment and storage capacity.

Table D-10: Huntly current water supply scheme characteristics

Huntly	
Water source limit	6,700 m³/day until 2021 with a stepped increase in water take limits to a maximum of 7,000 m³/day at consent expiry in January 2046.
Existing WTP capacity	8,000 m³/day
Existing treatment process units	5 clarifiers 5 filters
Treatment upgrade for quality	UV reactor
Existing storage capacity	6,222 m³

Huntly supply and demand data provided

Daily metered Huntly WTP abstraction flow between July 2015 and June 2020.

Daily metered Huntly WTP production flow between July 2015 and June 2020.

Customer meter readings between July 2016 and June 2020.

Huntly bulk supply analysis

The historic water abstraction and production for the Huntly scheme has been graphed against the current water abstraction consent limit and against the current WTP capacity in the graph below. This figure also shows the normal peak day flow which was used for assessment of future demand.

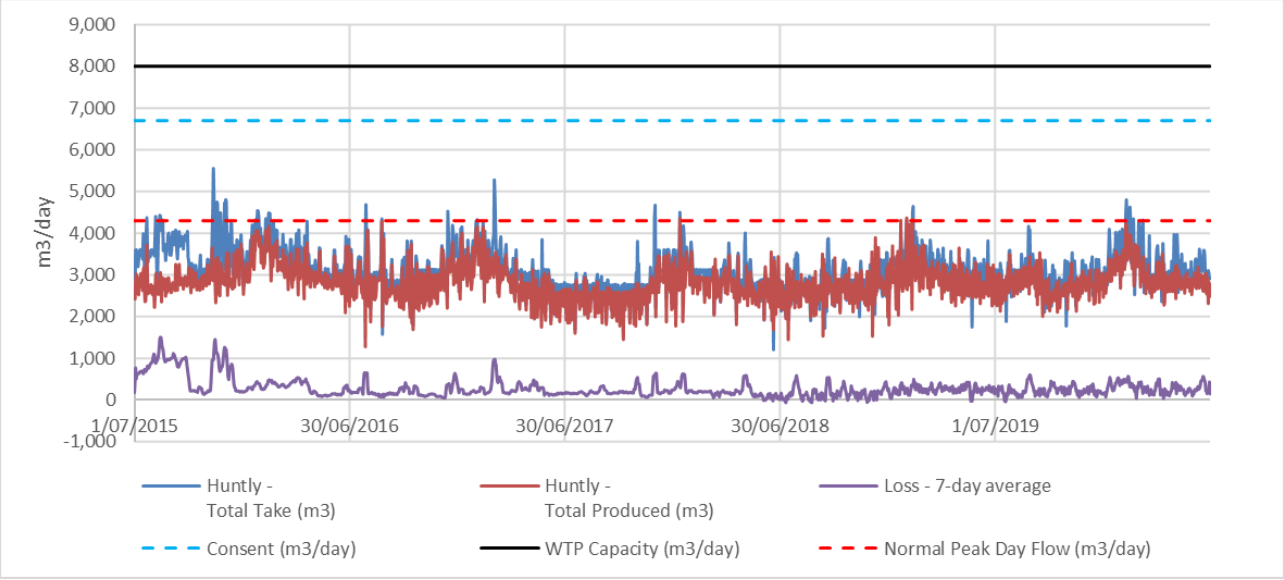

Figure D-21: Historic water take abstraction and production for Huntly

The graph above shows a relatively stable peak day demand over the last five years, and that there have been no historic exceedances of the Huntly water take consent. There is some room to support development on this network before the WTP capacity or current consent limit are exceeded, although we note 2,000 m³/day from the recent WTP upgrade was earmarked for supply to the Central District system.

The graph above also shows process losses in the WTP – on high-demand days these account for around 8% of the water abstracted.

The abstraction and production statistics are tabled below and illustrated in the following graph.

Table D-11: Huntly supply statistics (m³/day)

	Annual average daily abstraction (m³/day)	Peak day abstraction (m³/day)	Abstracted Peak day factor (m³/day)	Average day treated demand (m³/day)	Peak day treated demand (m³/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2015/16	3,513	5,552	1.58	3,011	4,161	1.38	Incomplete	
2016/17	3,068	5,277	1.72	2,833	4,280	1.51	2,772	1,022
2017/18	2,855	4,672	1.64	2,653	4,351	1.64	2,923	908
2018/19	2,979	4,642	1.56	2,773	4,364	1.57	2,999	925
2019/20	3,120	4,800	1.54	2,862	4,227	1.48	3,059	936

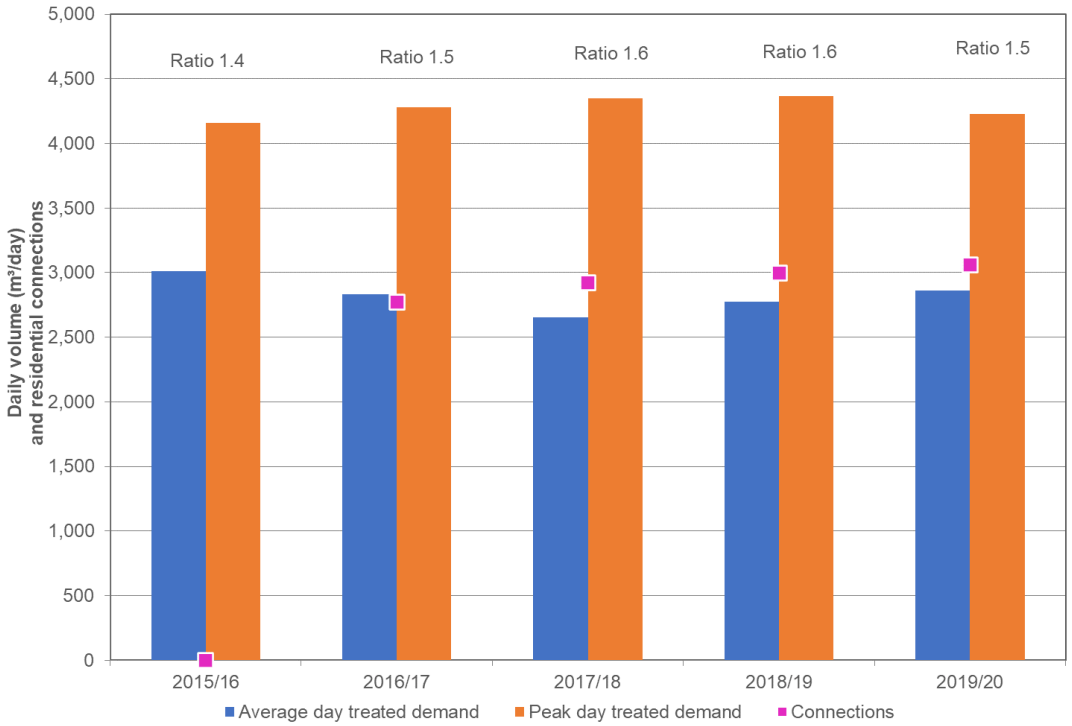

Figure D-22: Huntly historic annual average daily abstraction and peak day abstraction

The graph above reflects a relatively stable system, with a low level of growth and moderate seasonality. A peaking factor of 1.5 is not unusual for urban systems in New Zealand.

Huntly water loss results

The pie chart below shows the results of the July 2019 to June 2020 water balance, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

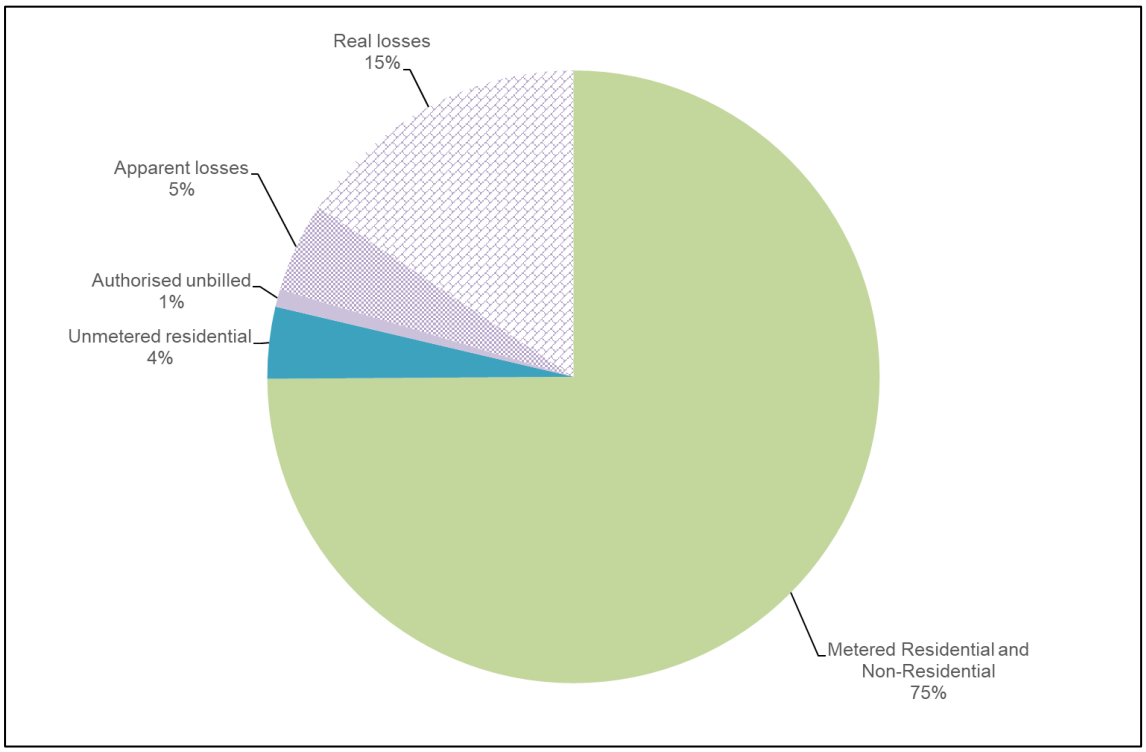

Figure D-23: Huntly March 2019/20 water balance results (% of total water supplied)

The metered demands (75% of water supplied) are both commercial and residential customers. There are a small number of unmetered residential customers in the Huntly water supply scheme, accounting for an estimated 4% of total volume supplied.

Although total NRW was 21%, Real losses were estimated at 15% of water supplied for 2019/20, once apparent losses and authorised unbilled consumption were subtracted. This is equivalent to 143 L/connection/day real losses.

This is a low rate of loss by New Zealand standards. The AMP describes how a replacement programme has been in place for a while to replace AC and galvanised iron pipework in problem areas, and that while the system has a substantial amount of AC in the network, anecdotal information from the operations team suggest that the AC seems to be lasting longer than expected. These factors may be contributing to the low level of water loss in the network.

As set out in Section 5.5.3, metered demands were split into residential and commercial through identification of the top 10 users, and assuming these customers are commercial. Although this is a rough approach, this does improve the estimate for residential water use, which forms the majority of growth in systems across the Waikato District.

Commercial and NRW demand are considered non-seasonal, so the table below shows the breakdown of both average day demand and peak day demand in Huntly.

Table D-12: Huntly demand breakdown and peaking factors

	System Total (m^3/day)	Per Connection (L/conn/day)
Total 2019-20 ADD	2,858	934
Total 2019-20 Peak Day	4,300	1,406
Overall peaking factor	**150%**	**150%**
Residential 2019-20 ADD	1,791	585
Commercial 2019-20	350	114
NRW 2019-20	717	235
Residential 2019-20 PDD	3,233	1,057
Residential Peaking Factor	**181%**	**181%**

Based on this analysis, the peak daily residential demand assumption adopted for the Huntly supply demand forecast is 1,057 L/residential connection/day, reflecting use in 2019/20. This is a relatively high residential water use, but not out of line with other New Zealand urban schemes.

Huntly supply demand balance forecasts

Growth in Huntly has been calculated from population projections developed for the Mid Waikato Water and Wastewater Servicing Strategy, provided by Watercare. These projections include a large amount of commercial and industrial growth (expressed as Population Equivalents), as set out in the graph below.

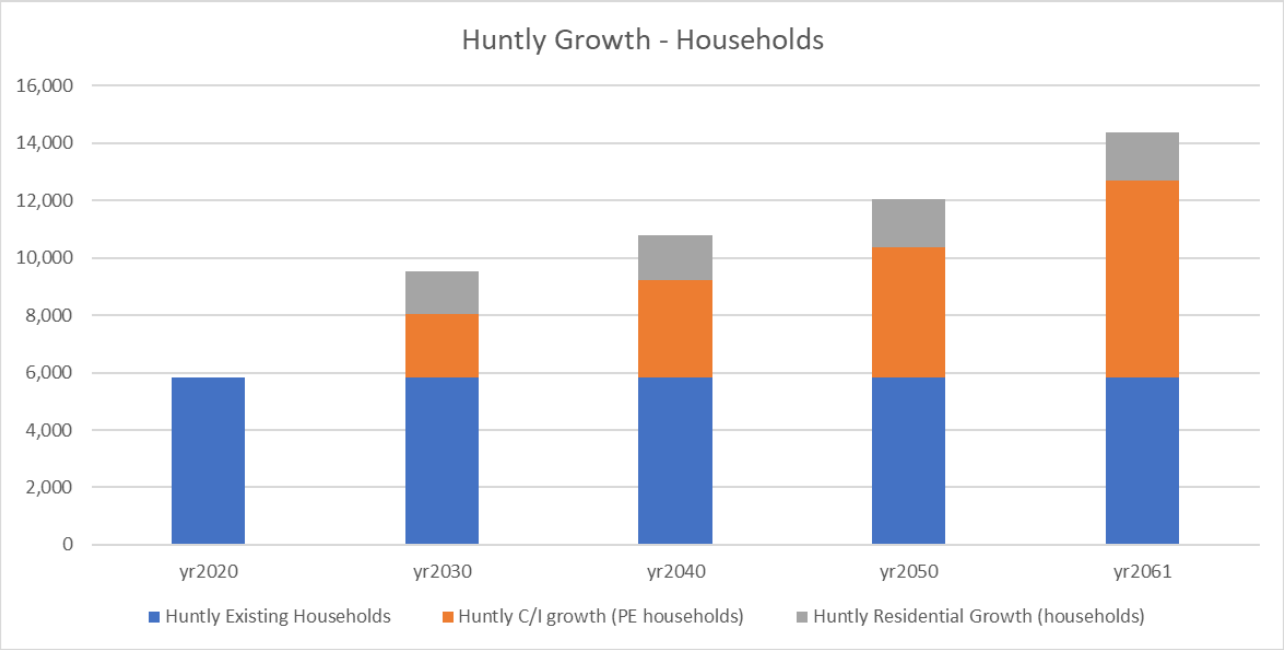

Figure D-24: Huntly growth forecast to 2061, derived from RITS

A high rate of residential growth is anticipated in the next 10 years, with an average of around 300 new dwellings per year expected, split between Huntly and Ohinewai. At the same time significant commercial and industrial growth is anticipated in the Ohinewai. After this the residential growth all but stops, whilst commercial and industrial growth continues right out to 2061.

For the purposes of demand estimation, NRW is assumed to remain at the current level of 609 m^3/day.

Based on these assumptions, the Huntly SDB forecast graph is as shown below. This shows the split between the expected areas of development, as well as the volumes supported by the current resource consent until it's expiry in 2051, and the WTP capacity.

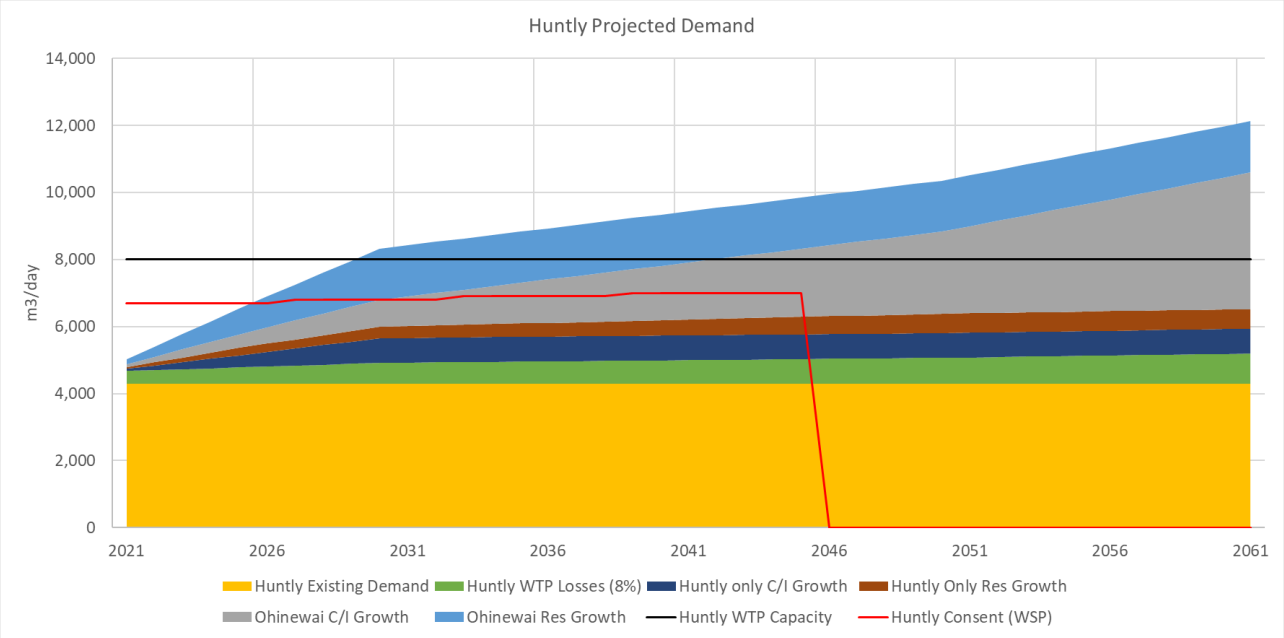

Figure D-25: Huntly water source peak day SDB forecast to 2061

This shows that the rapid rate of development in Ohinewai will cause problems in the next few years due to serious supply-side constraints. If the Ohinewai development proceeds, options to supplement Huntly supply or to find alternative means for water supply to Ohinewai will be required. One option for this is set out in Alternative Scenario One below.

If the Ohinewai development does not go ahead, the graph above shows no supply-side constraints.

We also note that the Huntly WTP upgrade was designed with the intention to supply up to 2,000 m^3/day to Central District, and a new main has been constructed to allow this water transfer. However, if this volume of water is exported from Huntly then the WTP capacity will be exceeded earlier. Alternative Scenario Two set out below looks at the effects of combining the Huntly and Central District supply areas.

Alternative Scenario One - Ohinewai supplied from Mid Waikato

Significant growth is anticipated in Ohinewai, north of the Huntly system between Te Kauwhata and Huntly. In the base scenario this growth is supplied from Huntly, but as set out in Section 6.5.2 one option to support this potential growth is to supply it from Mid Waikato instead of Huntly.

If this were to be undertaken, the volume of water required from Huntly would reduce significantly, to around 6,000 m^3/day in 2061. The graph below shows how the demand would change over time, assuming supply to Ohinewai was transferred from Huntly to Mid Waikato around 2027.

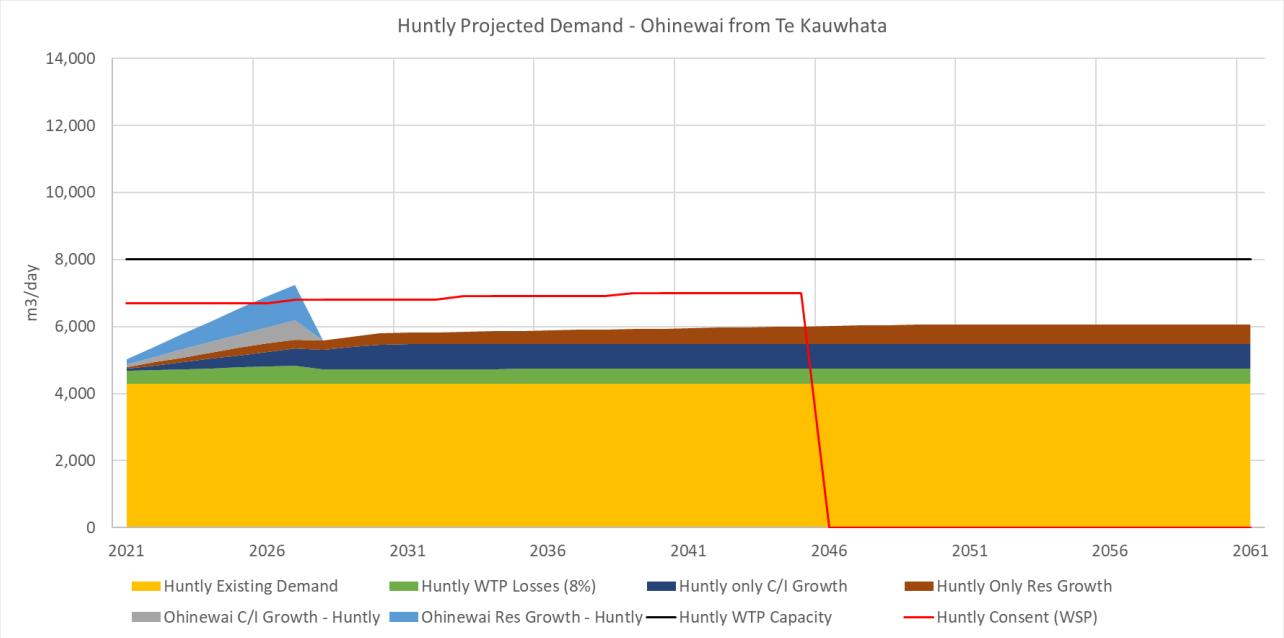

Figure D-26: Alternative Scenario - Mid Waikato supplying Ohinewai - peak day SDB forecast to 2061

Alternative Scenario Two – Huntly and Central District combined into one supply area

The recent Huntly WTP upgrade was designed with the intention to deliver extra water to Central District. A new main has been constructed to allow this water transfer. This ability to transfer water between supply zones means the supplies of both WTPs can be balanced against the combined demand. The graph below compares the combined supply capacity of Huntly and Ngaruawahia WTPs against the combined demand for Huntly and Central District.

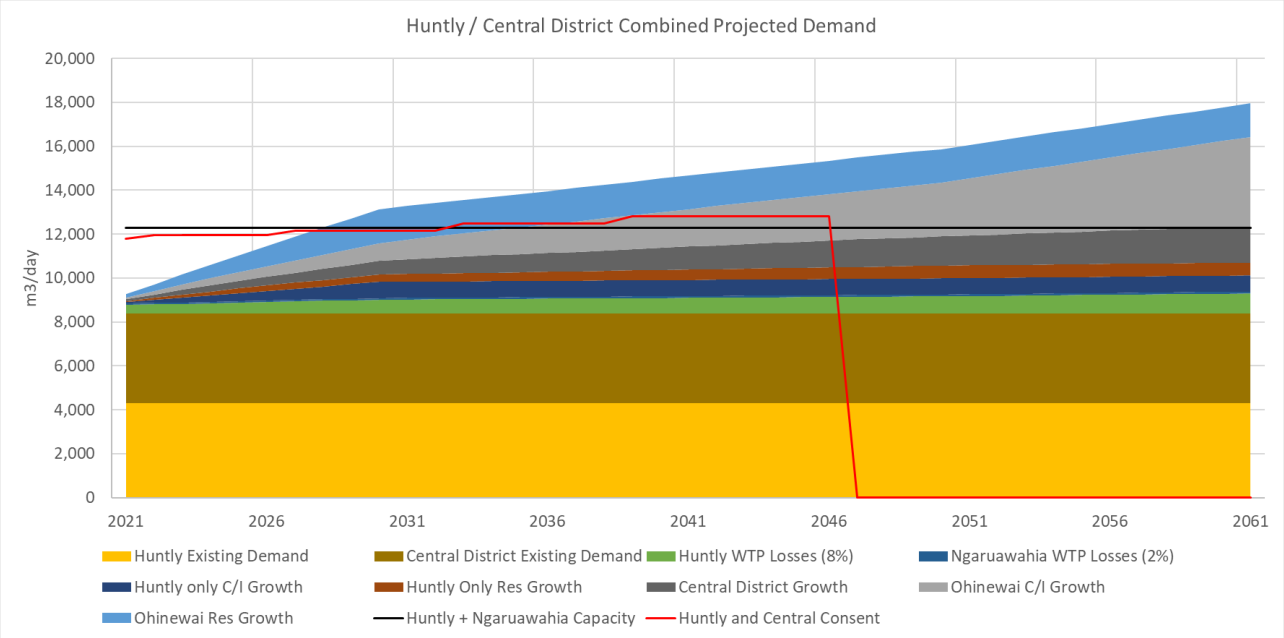

Figure D-27: Alternative Scenario – Huntly and Central District combined - peak day SDB forecast to 2061

This shows that even with the systems combined, the combined WTP capacity at Ngaruawahia and Huntly will be exceeded by around 2028. However, it also shows that if the Ohinewai demand can be supplied instead from Mid Waikato, the Huntly and Ngaruawahia WTPs have the capacity to meet all other future expected demand out to 2061.

Appendix E CENTRAL DISTRICT

Central District scheme overview

The Central District scheme supplies water to Ngaruawahia, and since 2016 has also supplied Hopuhopu / Taupiri. The plan below shows the key network features.

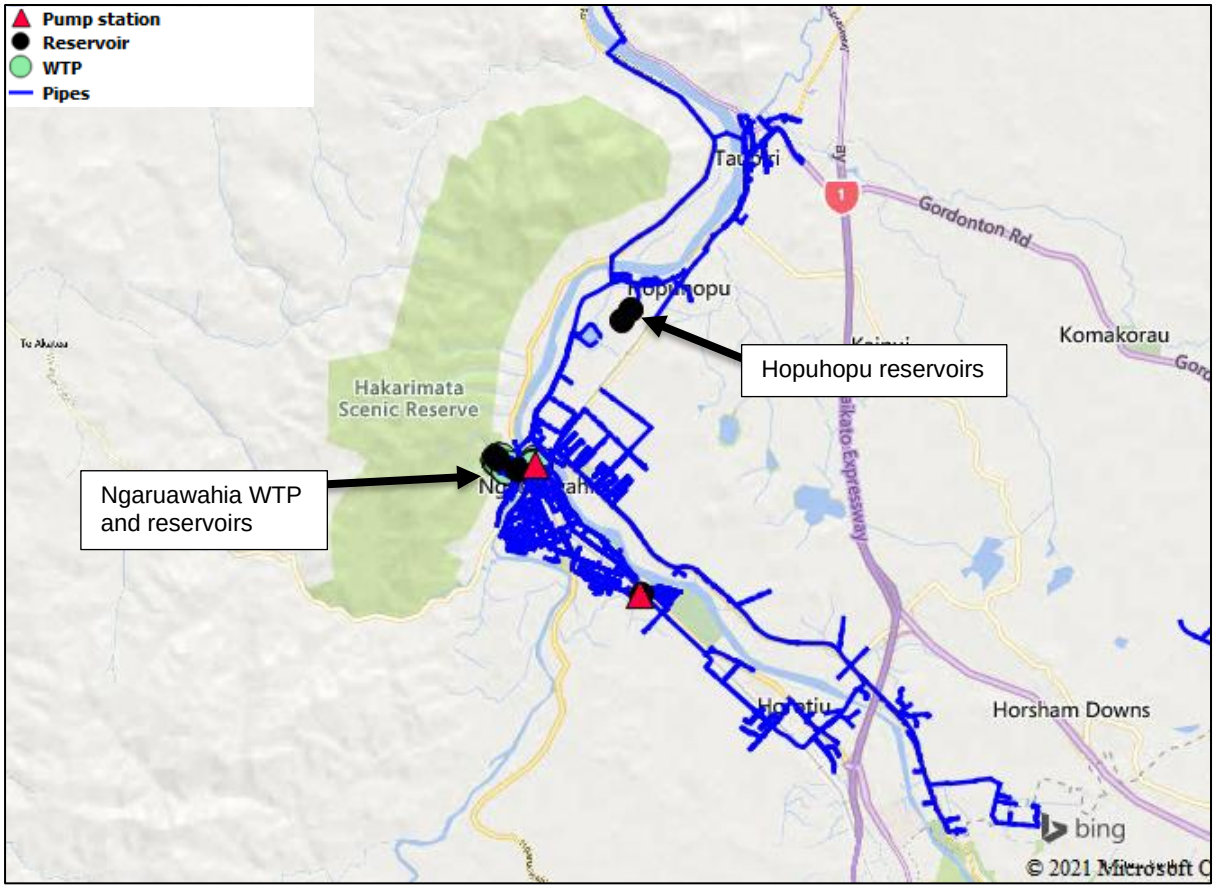

Figure E-28: Ngaruawahia scheme schematic

The water for the scheme is sourced via one 300mm diameter intake pipe from the Waikato River at the northern edge of the township known as The Point to the treatment plant on Brownlee Avenue, located to the west of the Waipa River.

The two reservoirs (2,273 m^3) at the treatment plant act as storage and provide a head source for gravity feed into the town reticulation. The treated water gravitates to the reticulation and Hopuhopu reservoir (1,134 m^3 capacity).

The table below includes details of the current Ngaruawahia water source, treatment and storage capacity.

Table E-13: Ngaruawahia current water supply scheme characteristics

Central District	
Water source limit	4,400 m³/day until July 2021, with a stepped increase in water take limits to a maximum of 5,000m³/day at consent expiry in January 2046.
Existing WTP capacity	4,300 m³/day
Existing treatment process units	2 clarifiers 6 filters
Treatment upgrade for quality	Currently has plans to install UV treatment
Existing storage capacity	4,500 m³

Central District supply and demand data provided

Daily metered Ngaruawahia WTP abstraction flow between July 2015 and June 2020.

Daily metered Ngaruawahia WTP production flow between July 2015 and June 2020.

Customer meter readings between July 2016 and June 2020.

Central District bulk supply analysis

The historic water abstraction and production for the Ngaruawahia WTP has been graphed against the current water abstraction consent limit and against the current WTP capacity in the graph below.

This figure also shows the normal peak day flow which was used for assessment of future demand, and the process losses at the WTP.

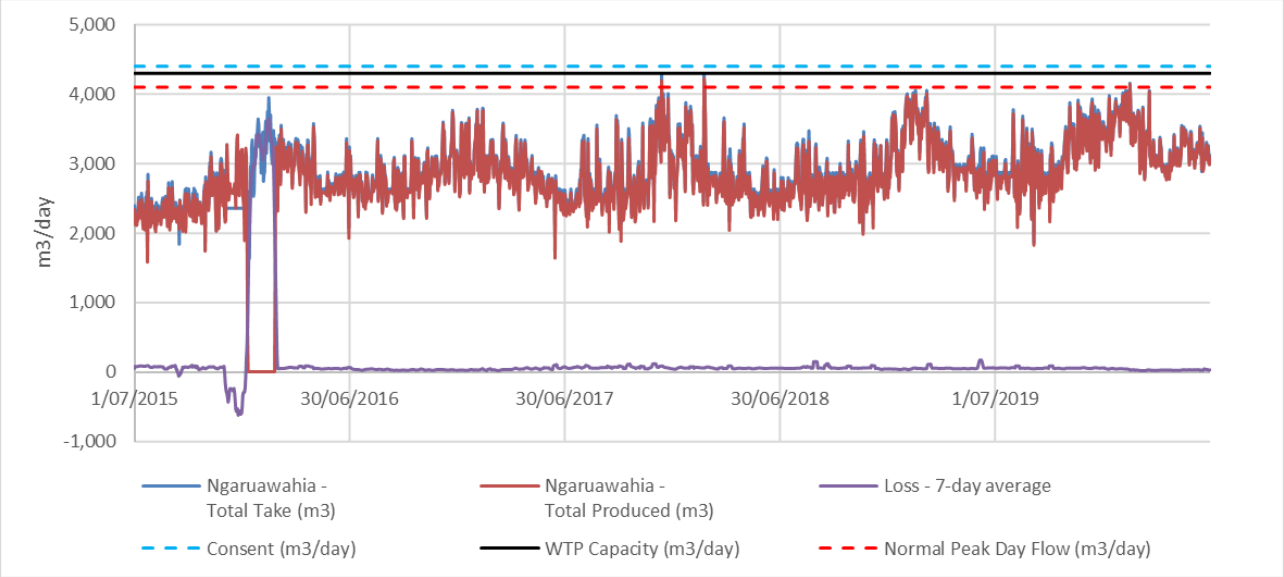

Figure E-29: Historic water take abstraction and demand for Ngaruawahia

The figure above shows that on peak days in the 2017/18 summer the WTP was operating at full capacity. The peak summer demand appears steady over the last few years, but at this point there is little capacity remaining in the WTP to support any growth.

The graph above also shows process losses in the WTP. These appear low - on high-demand days these account for around 1.5% of the water abstracted.

The abstraction statistics are tabled below along with WTP production volumes, and key values are illustrated in the following graph.

Table E-14: Central District supply statistics (m³/day)

	Annual average daily abstraction (m³/day)	Peak day abstraction (m³/day)	Abstracted Peak day factor (m³/day)	Average day treated demand (m³/day)	Peak day treated demand (m³/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2015/16	2,675	3,949	1.48	2,265	3,526	1.56	Incomplete	
2016/17	2,865	3,798	1.33	2,824	3,761	1.33	2,515	1,123
2017/18	2,833	4,291	1.51	2,767	4,222	1.53	2,840	974
2018/19	2,988	4,054	1.36	2,926	4,006	1.37	3,054	958
2019/20	3,203	4,158	1.30	3,156	4,143	1.31	3,116	1,013

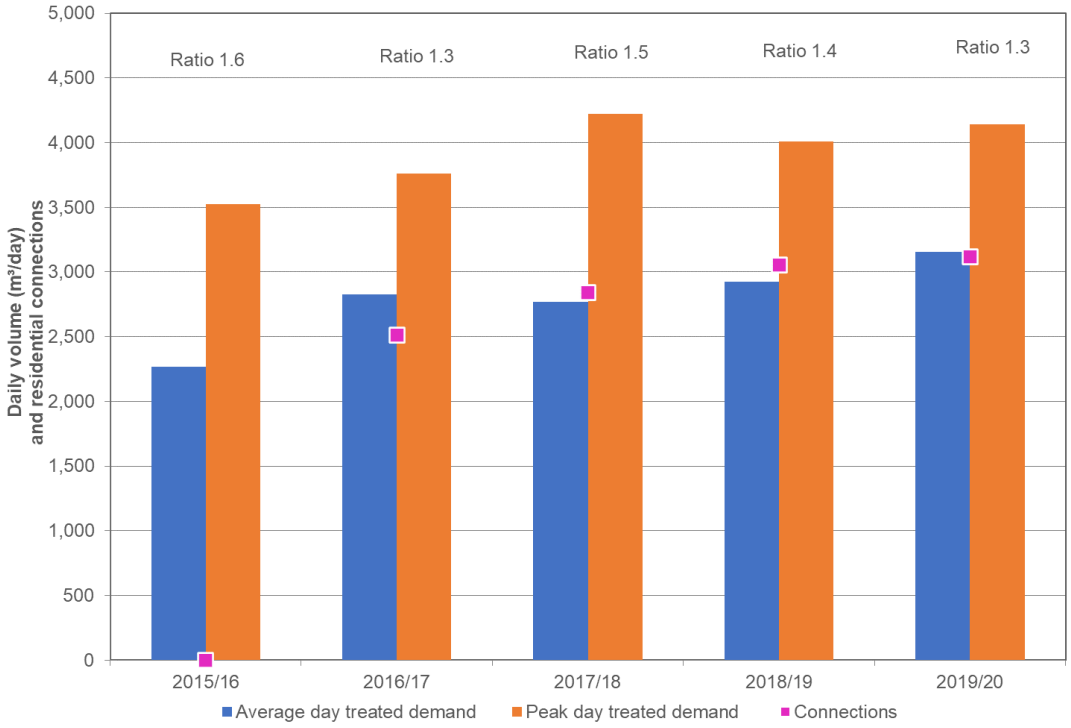

Figure E-30: Ngaruawahia historic annual average daily abstraction and peak day abstraction

The graph above shows an increasing average demand, more or less in line with an increase in population. However, the peak day WTP production does not increase – it is possible that demand on the highest days exceeds the WTP production capacity, and the demand is met instead by reservoirs on the system. On such abnormally high-demand days the reservoirs may therefore not fully replenish.

Reservoir levels were not assessed as part of this update, but an assessment of storage is recommended in order to better understand the peak day demand in this system.

Central District water loss results

The pie chart below shows the results of the July 2019 to June 2020 water balance, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

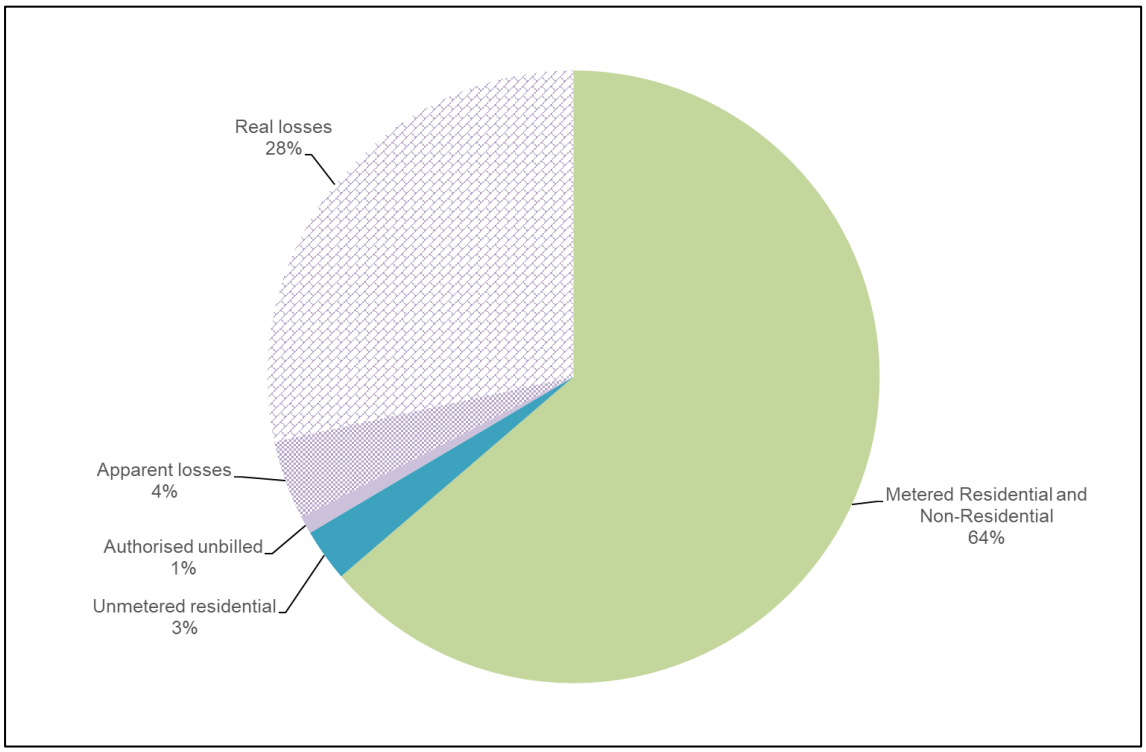

Figure E-31: Central District water balance results (% of total water supplied)

The metered demands (64% of water supplied) include both commercial and residential customers. There are a small number of unmetered residential customers in the Central District, accounting for an estimated 3% of total volume supplied.

Real losses were estimated at 28% of water supplied for 2019/20. This is equivalent to 284 L/connection/day real losses. This is a little high by New Zealand standards, but not out of the ordinary.

As set out in Section 5.5.3, metered demands were split into residential and commercial through identification of the top 10 users, and assuming these customers are commercial. Although this is a rough approach, this does improve the estimate for residential water use, which forms the majority of growth in systems across the Waikato District.

Commercial and NRW demand are considered non-seasonal, so the table below shows the breakdown of both average day demand and peak day demand in Central District.

Table E-15: Central District demand breakdown and peaking factor

	System Total (m^3/day)	Per Connection (L/conn/day)
Total 2019-20 ADD	3,173	1,037
Total 2019-20 Peak Day	4,100	1,340
Overall peaking factor	**129%**	**129%**
Residential 2019-20 ADD	1,817	594
Commercial 2019-20	204	67
NRW 2019-20	1,151	376
Residential 2019-20 PDD	2,744	897
Residential Peaking Factor	**151%**	**151%**

Based on this analysis, the peak daily residential demand assumption adopted for the Central District demand forecast is 897 L/connection/day, reflecting use in 2019/20.

Central District supply demand balance forecasts

Growth in Central District has been calculated from the Waikato2070 population projections, provided by Watercare. These projections do not include any commercial or industrial growth.

A summary of the rate of growth is shown in the graph below.

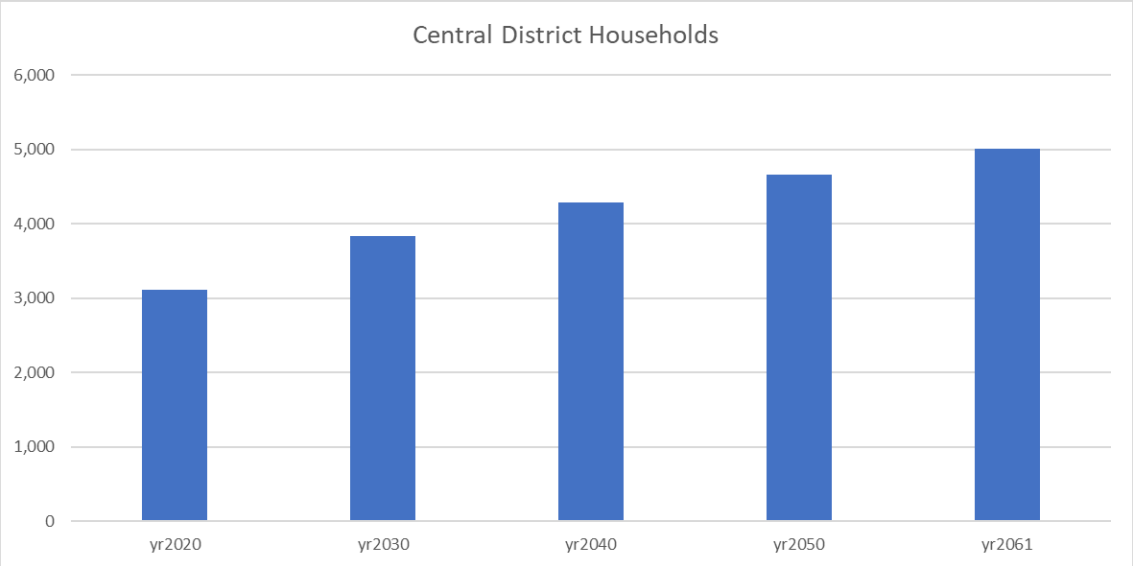

Figure E-32: Central District growth forecast to 2061, as per Waikato2070

This shows a relatively consistent rate of growth over the next 50 years, up to a total of 5,000 households.

NRW is assumed to remain at the current level of 854 m^3/day.

Based on these assumptions, the Central District SDB forecast graph is as shown below. This shows the growth alongside the volumes supported by the existing resource consent and the WTP capacity. WTP losses are also shown.

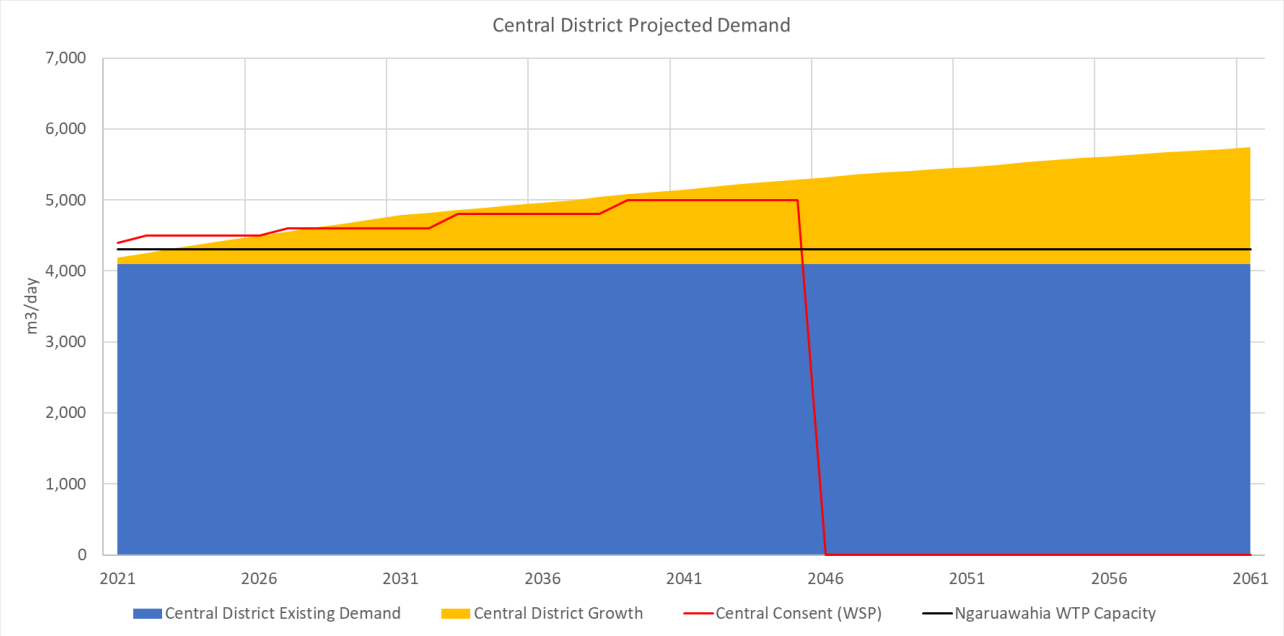

Figure E-33: Central District water source peak day SDB forecast to 2061

The graph shows the demand growth will slightly outpace the gradual increase in the consented water take at Ngaruawahia. A larger problem is that the WTP is already at capacity, and the growth from around 4,000 to around 6,000 m^3/day peak day demand will cause serious supply issues unless additional water can be supplied from elsewhere.

However, we note that the recent Huntly WTP upgrade was designed with the intention to supply up to 2,000 m^3/day to Central District, and a new main has been constructed to allow this water transfer. If this volume of water is imported from Huntly then the growth can be supported, however the additional load on Huntly must be considered. Alternative Scenario Two set out below looks at the effects of combining the Huntly and Central District supply areas.

Alternative Scenario Two – Huntly and Central District combined into one supply area

A new main has recently been constructed to allow water transfer from Huntly to Central District. This ability to transfer water between supply zones means the supplies of both WTPs can be balanced against the combined demand. The graph below compares the combined supply capacity of Huntly and Ngaruawahia WTPs against the combined demand for Huntly and Central District.

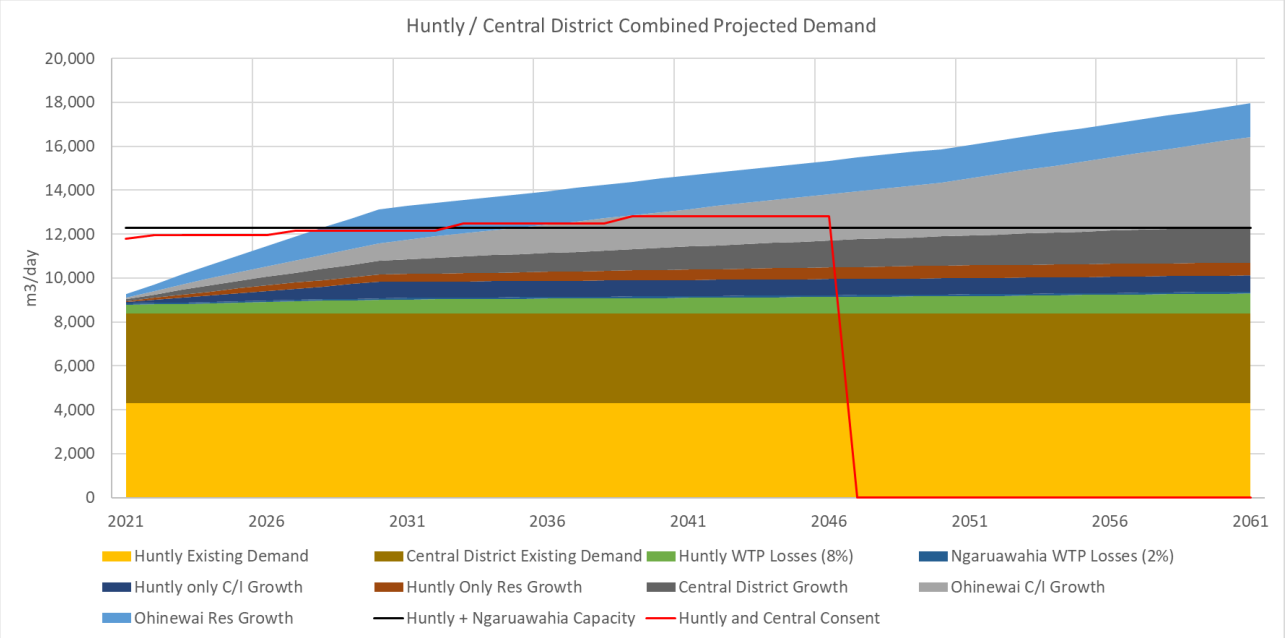

Figure E-34: Alternative Scenario – Huntly and Central District combined - peak day SDB forecast to 2061

This shows that even with the systems combined, the combined WTP capacity at Ngaruawahia and Huntly will be exceeded by around 2028. However, it also shows that if the Ohinewai demand (currently planned to be supported by Huntly) can be supplied instead from Mid Waikato, the Huntly and Ngaruawahia WTPs have the capacity to meet all other future expected demand out to 2061.

Appendix F SOUTHERN AND WESTERN DISTRICTS

Southern and Western Districts scheme overview

The Southern Districts scheme commenced in 1989 with a supply to Matangi. Since then, the scheme has extended to include supply to Eureka, Gordonton, Puketaha, Newstead and Matangi. The Western Districts scheme supplies water to two areas – Stonebridge and Te Kowhai Road.

Hamilton City Council (HCC) supplies the scheme with treated water (from the HCC water treatment plant which is sourced from the Waikato River) via eight bulk water meters that are invoiced on a monthly basis to Waikato District Council.

All of the customer connections are metered with a restricted trickle supply and customers are invoiced six-monthly by Council for measured consumption. The communities of Matangi, Gordonton and Tauwhare Pa have historically been on full flow and continue to receive this service.

The plans below show the key network features.

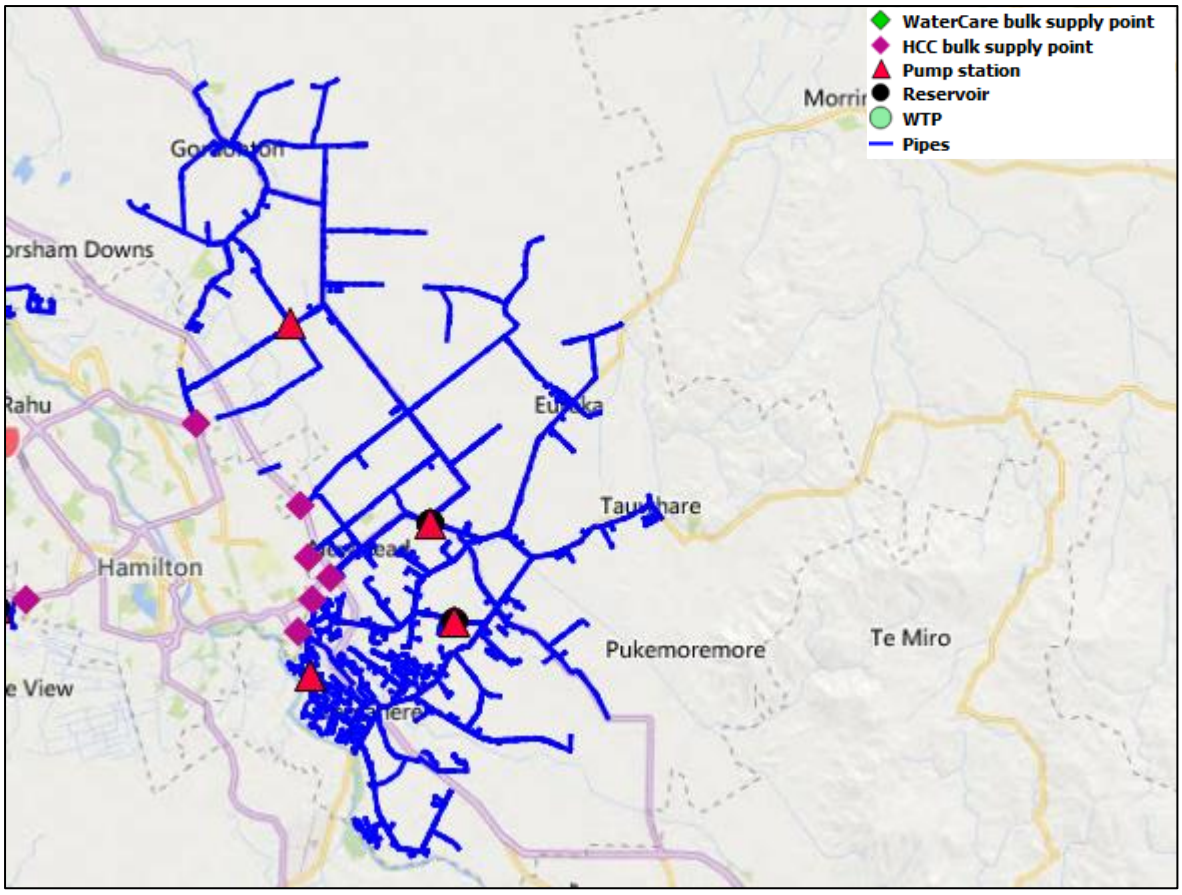

Figure F-35: Southern Districts scheme schematic

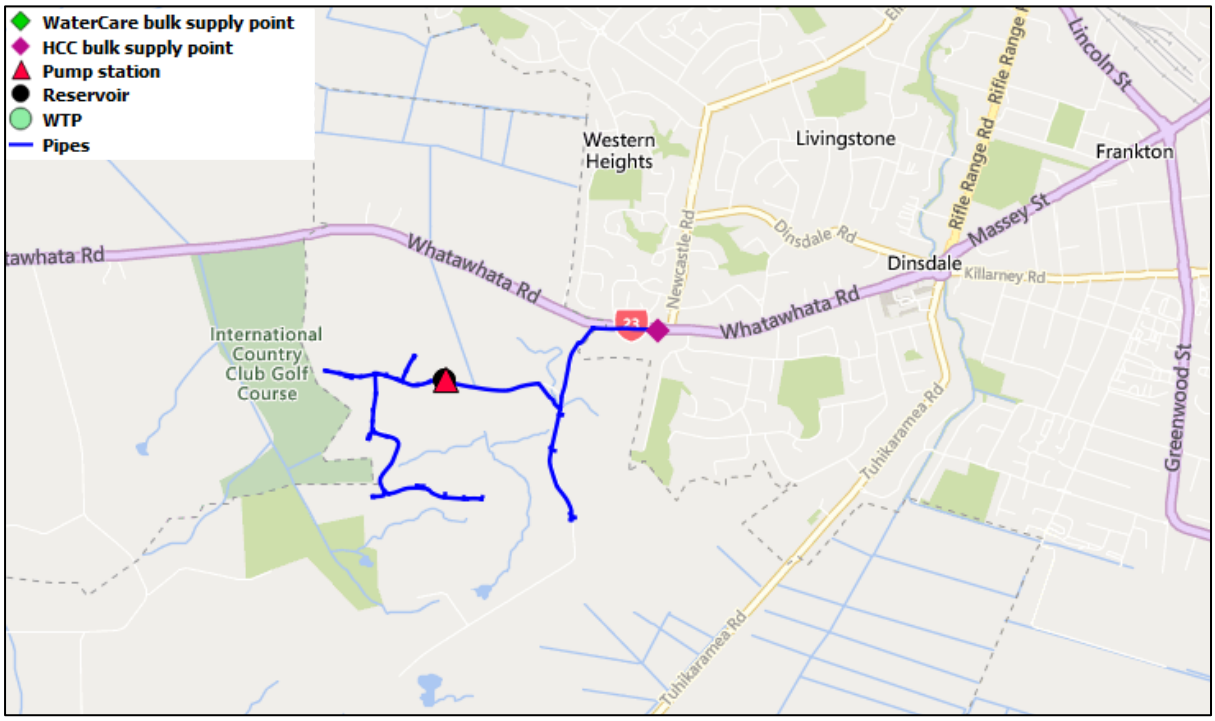

Figure F-36: Western Districts scheme schematic

The table below includes details of the current Southern and Western Districts water source, treatment and storage capacity.

Table F-16: Southern and Western Districts current water supply scheme characteristics

Southern & Western Districts	
Water source limit	5,000 m³/day for both schemes until 2016 (It is WDC's expectation that this agreement will be renewed with a maximum day limit increasing over time to 12,000 m³/day as per agreement with HCC after WDC handed over their 12,000 m³/day water take consent for a take in the Southern District area to HCC).
Existing WTP capacity	HCC water treatment plant
Existing treatment process units	HCC water treatment plant
Treatment upgrade for quality	None required
Existing storage capacity	750 m³ in Southern Districts and 0.5 m³ in Western Districts

Southern and Western Districts Demand Data Provided

Daily HCC bulk metered supply for each bulk supply point between July 2015 and June 2020.

Customer meter readings between July 2016 and June 2020.

Southern and Western Districts Bulk Demand Analysis Results

The historic water delivered to the system at the BSP has been graphed below. Although there is no consent limit on supply volume, the agreement with HCC for 5,000 m³/day is shown. The physical limit on supply is unknown.

The graph below shows the system supply summed across the bulk supply points. The peak day demand has increased over the 5-year period, with the highest peak around 4,000 m³/day, observed in February 2020.

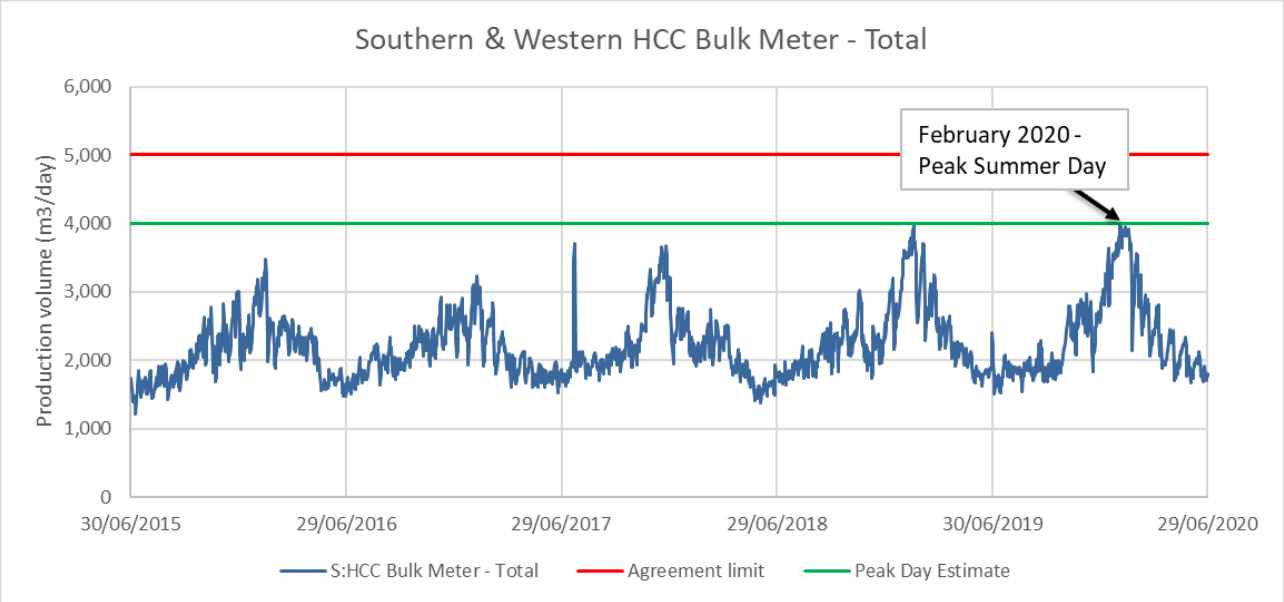

Figure F-37: Historic demand through HCC bulk meters

The graph above shows that the historic summer demands are below the combined third-party water supply limit of 5,000 m³/day. The average and peak demand statistics derived from the demand records are shown in the table below, and are shown graphically below the table

Table F-17: Southern and Western Districts supply statistics (m³/day)

	Annual average daily abstraction (m³/day)	Peak day abstraction (m³/day)	Abstracted Peak day factor (m³/day)	Average day treated demand (m³/day)	Peak day treated demand (m³/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2015/16	N/A	N/A	N/A	2,109	3200	1.52	Incomplete	
2016/17	N/A	N/A	N/A	2,118	3100	1.46	2,822	750
2017/18	N/A	N/A	N/A	2,183	3500	1.60	2,926	746
2018/19	N/A	N/A	N/A	2,340	4000	1.71	2,970	788
2019/20	N/A	N/A	N/A	2,356	4000	1.70	3,169	743

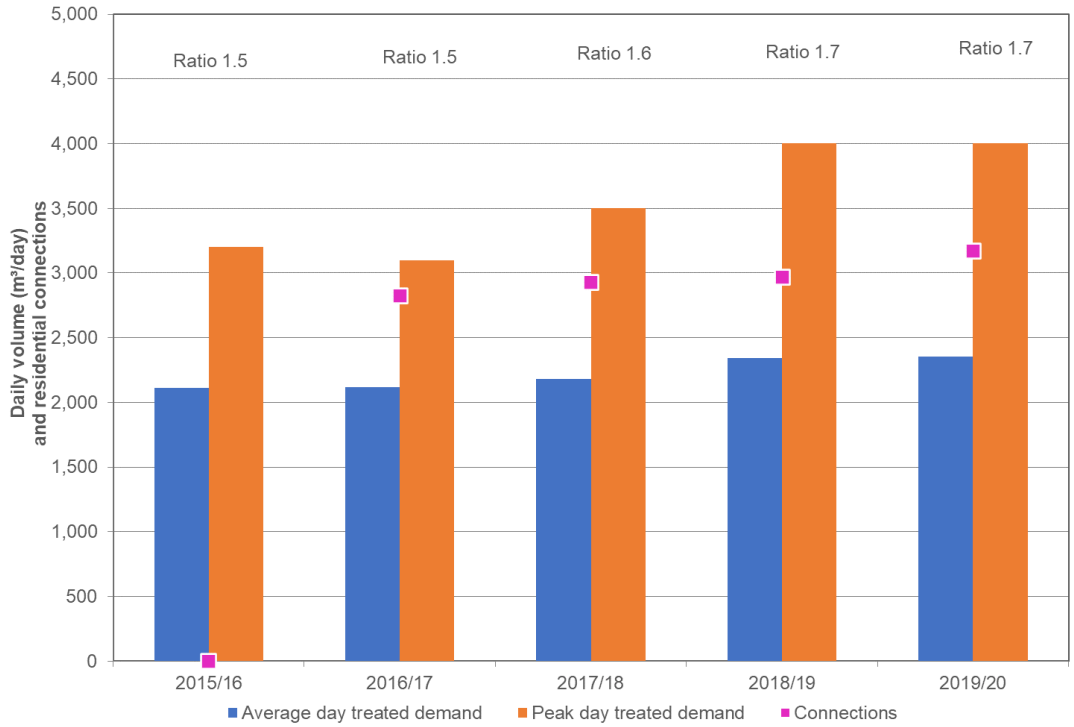

Figure F-38: Historic Southern + Western Districts average and peak day demand

The table and graph above show the Southern & Western network gradually increasing in size over the last few years, with a corresponding increase in average and peak day demand. The peak day factor of 1.70 is higher than some other WDC systems but is not out of the ordinary.

Southern and Western Districts water loss results

The pie chart below shows the results of the July 2019 to June 2020 water balance, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

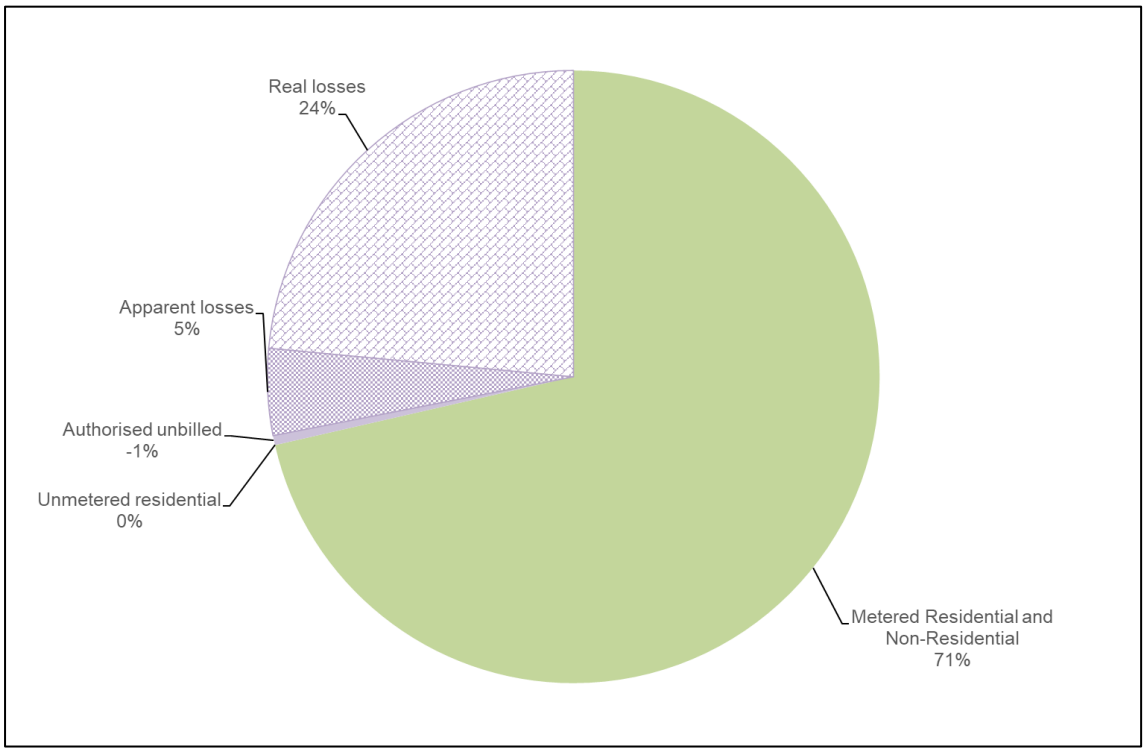

Figure F-39: Southern and Western Districts 2019/20 water balance results (% of total water supplied)

The metered demands (71% of water supplied) are primarily from residential customers. There are no unmetered customers in the Southern & Western Districts supply schemes. Real losses were estimated at 24% of water supplied for 2019/20, equivalent to 175 L/connection/day.

This rate of water loss is higher than some other WDC systems but considering the rural nature of the network with long stretches of main between houses, reducing the rate of leakage may be more effort and expense than it is worth.

As set out in Section 5.5.3, metered demands were split into residential and commercial through identification of the top 10 users, and assuming these customers are commercial. Although this is a rough approach, this does improve the estimate for residential water use, which forms the majority of growth in systems across the Waikato District.

Commercial and NRW demand are considered non-seasonal, so the table below shows the breakdown of both average day demand and peak day demand in the Southern & Western Districts.

Table F-18: Southern & Western Districts demand breakdown and peaking factors

	System Total (m^3/day)	Per Connection (L/conn/day)
Total 2019-20 ADD	2,368	774
Total 2019-20 Peak Day	4,000	1,308
Overall peaking factor	**169%**	**169%**
Residential 2019-20 ADD	1,336	437
Commercial 2019-20	355	116
NRW 2019-20	677	221
Residential 2019-20 PDD	2,968	970
Residential Peaking Factor	**222%**	**222%**

Based on this analysis, the peak daily residential demand assumption adopted for the Southern & Western Districts demand forecast is 970 L/connection/day, reflecting use in 2019/20.

Southern & Western Districts supply demand balance forecasts

Growth in Southern & Western Districts has been calculated from the Waikato2070 population projections, provided by Watercare. These projections do not include any commercial or industrial growth.

A summary of the rate of growth is shown in the graph below.

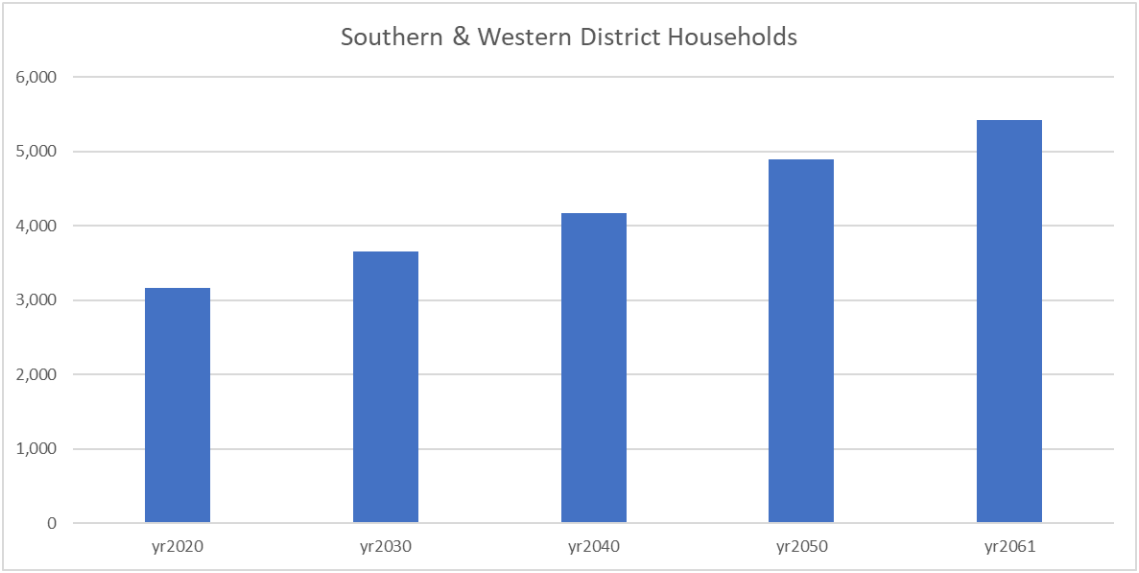

Figure F-40: Southern & Western Districts growth forecast to 2061, as supplied by Watercare

This shows a relatively consistent rate of growth over the next 50 years, from just over 3,000 houses now up to a total of around 5,500 households.

NRW is assumed to remain at the current level of 677 m^3/day.

Based on these assumptions, the Southern & Western Districts SDB forecast graph is as shown below. This shows the growth alongside the limit of the current agreement with HCC.

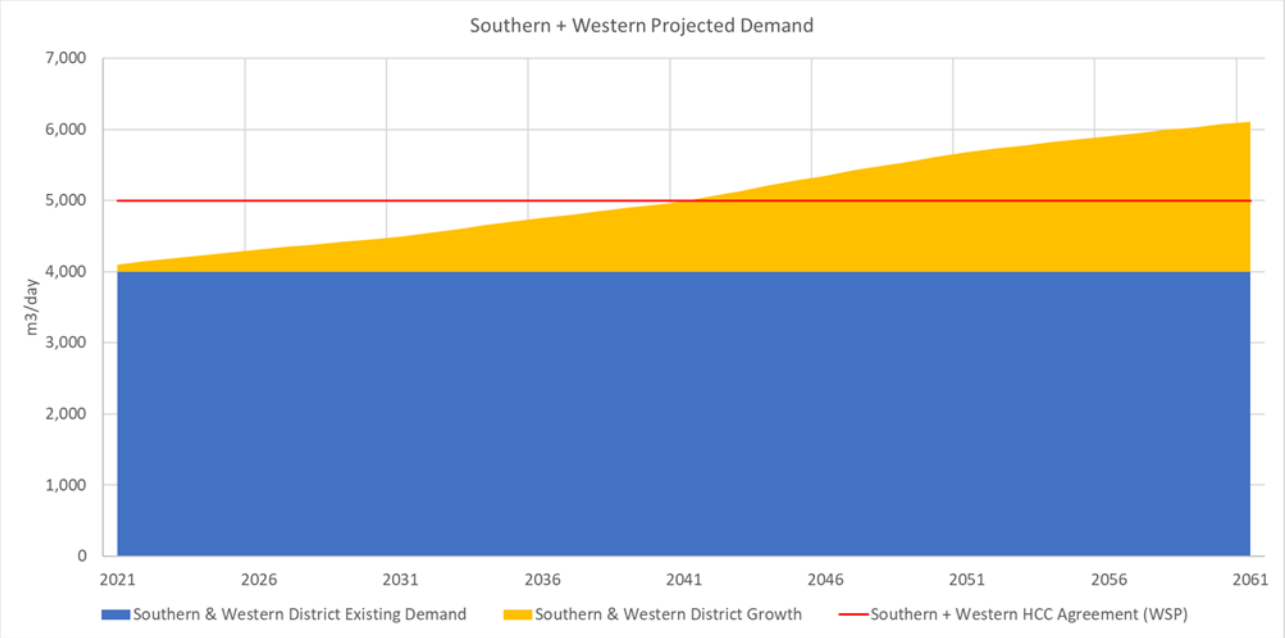

Figure F-41: Southern & Western Districts water source peak day SDB forecast to 2061

The graph shows the demand growth will exceed the daily limit set out in the current agreement with HCC by around 2040. Assuming no change in water use into the future, the total required volume of water by 2061 will be just over 6,000 m^3/day.

Appendix G RAGLAN

Raglan scheme overview

The Raglan water supply scheme supplies Raglan township as shown in the schematic below.

Water is sourced and treated at the Omahina Spring and delivered to the Springs Reservoir. A groundwater bore has also been drilled but has never been used due to water quality issues. From the reservoir, water gravitates to the distribution system, including two reservoirs at Bow Street and Hills Road.

The plan below shows the key network features.

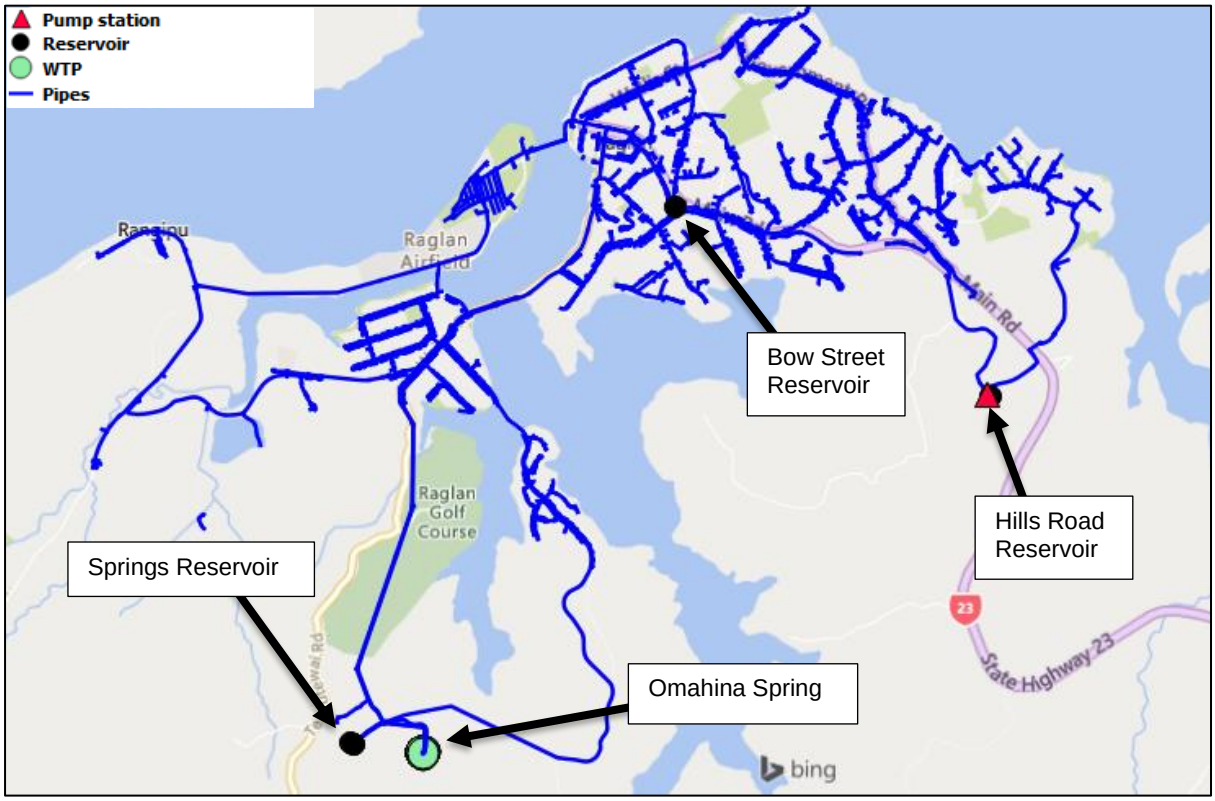

Figure G-42: Raglan scheme schematic

The table below includes details of the current Raglan water source, treatment and storage capacity.

Table G-19: Raglan current water supply scheme characteristics

Raglan	
Water source limit	3,100 m³/day maximum day consent limit until 2034
Existing WTP capacity	3,600 m³/day
Existing treatment process units	Chlorine dosing UV treatment
Existing storage capacity	3,386 m³

Raglan demand data provided

Daily metered Raglan WTP abstraction flow between July 2015 and June 2020.

Daily metered Raglan WTP production flow between July 2015 and June 2020.

Customer meter readings between July 2016 and June 2020.

Raglan bulk demand analysis results

The historic water abstraction and production for the Raglan WTP has been graphed against the current water abstraction consent limit and against the current WTP capacity in the graph below.

This figure also shows the normal peak day flow which was used for assessment of future demand, and the process losses at the WTP.

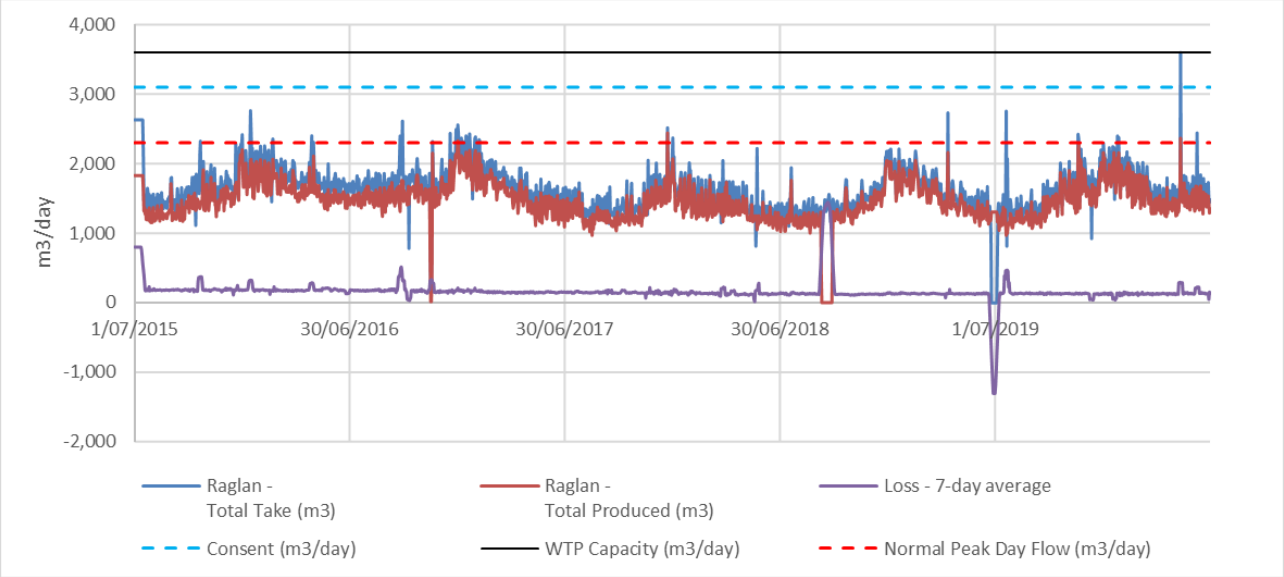

Figure G-43: Historic water take abstraction and demand for Raglan

The figure above shows that peak summer days in Raglan are currently sitting well below the WTP capacity, and the current consent limit is sufficient for the current level of demand. The peak summer demand appears steady over the last few years, and although Raglan is seen as a summer beach destination, the seasonality of the demand is low and does not appear to reflect increased demand in summer.

The graph above also shows process losses in the WTP. These losses appear to be consistent across the year, regardless of daily flow. This finding would be consistent with raw water pipeline losses, which would be governed by pipeline pressure and would be independent of flow. On high-demand days these losses account for around 7% of the water abstracted.

The abstraction statistics are tabled below along with WTP production volumes, and key values are illustrated in the following graph.

Table G-20: Raglan supply statistics (m³/day)

	Annual average daily abstraction (m³/day)	Peak day abstraction (m³/day)	Abstracted Peak day factor (m³/day)	Average day treated demand (m³/day)	Peak day treated demand (m³/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2015/16	1,771	2,762	1.56	1,556	2,202	1.41	Incomplete	
2016/17	1,744	2,612	1.50	1,574	2,330	1.48	1,711	920
2017/18	1,471	2,516	1.71	1,330	2,442	1.84	1,799	739
2018/19	1,515	2,732	1.80	1,349	2,162	1.60	1,812	744
2019/20	1,609	3,599	2.24	1,488	2,366	1.59	1,840	809

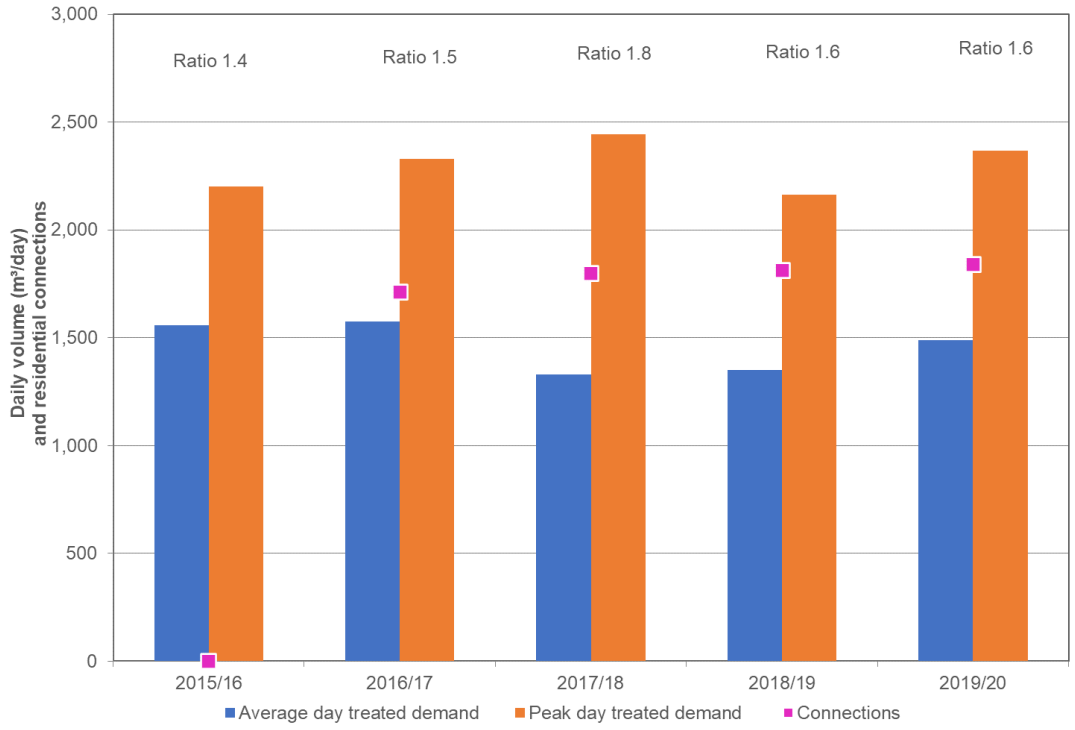

Figure G-44: Raglan historic annual average daily abstraction and peak day abstraction

The data above shows that the number of properties in Raglan has increased slightly, but the annual variance in supply volumes shows no clear trend up or down.

Raglan water loss results

The pie chart below shows the results of the July 2019 to June 2020 water balance, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

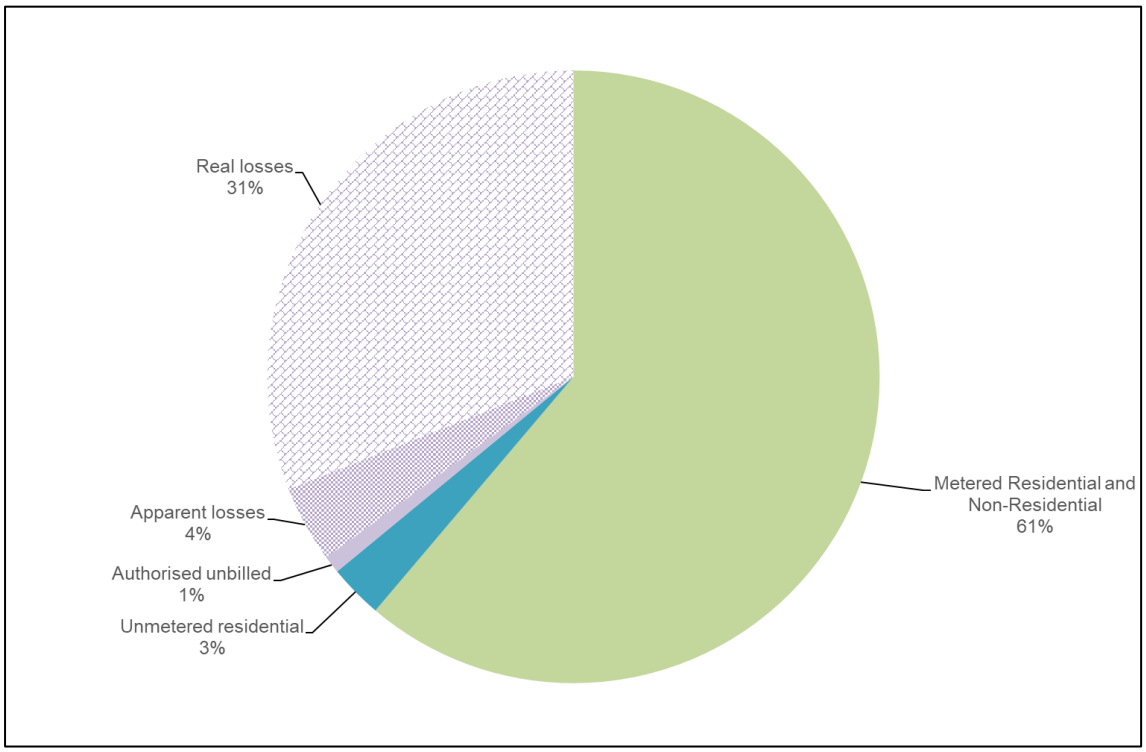

Figure G-45: Raglan water balance results (% of total water supplied)

The metered demands (61% of water supplied) include both commercial and residential customers. There are a small number of unmetered residential customers in Raglan, accounting for an estimated 3% of total volume supplied.

Real losses were estimated at 31% of water supplied for 2019/20. This is equivalent to 245 L/connection/day real losses. This is a little high by New Zealand standards, but not out of the ordinary.

As set out in Section 5.5.3, metered demands were split into residential and commercial through identification of the top 10 users, and assuming these customers are commercial. Although this is a rough approach, this does improve the estimate for residential water use, which forms the majority of growth in systems across the Waikato District.

Commercial and NRW demand are considered non-seasonal, so the table below shows the breakdown of both average day demand and peak day demand in Raglan.

Table G-21: Raglan demand breakdown and peaking factor

	System Total (m^3/day)	Per Connection (L/conn/day)
Total 2019-20 ADD	1,482	805
Total 2019-20 Peak Day	2,300	1,250
Overall peaking factor	**155%**	**155%**
Residential 2019-20 ADD	794	431
Commercial 2019-20	113	61
NRW 2019-20	575	312
Residential 2019-20 PDD	1,612	876
Residential Peaking Factor	**203%**	**203%**

Based on this analysis, the peak daily residential demand assumption adopted for the Raglan supply demand forecast is 876 L/connection/day, reflecting use in 2019/20.

Raglan supply demand balance forecasts

As set out in Section 6.3.4, growth in Raglan has been calculated from numbers which were adapted from the Waikto2070 growth projections for use in water and wastewater planning studies. These numbers have been used unchanged as provided by Watercare.

A summary of the rate of growth is shown in the graph below.

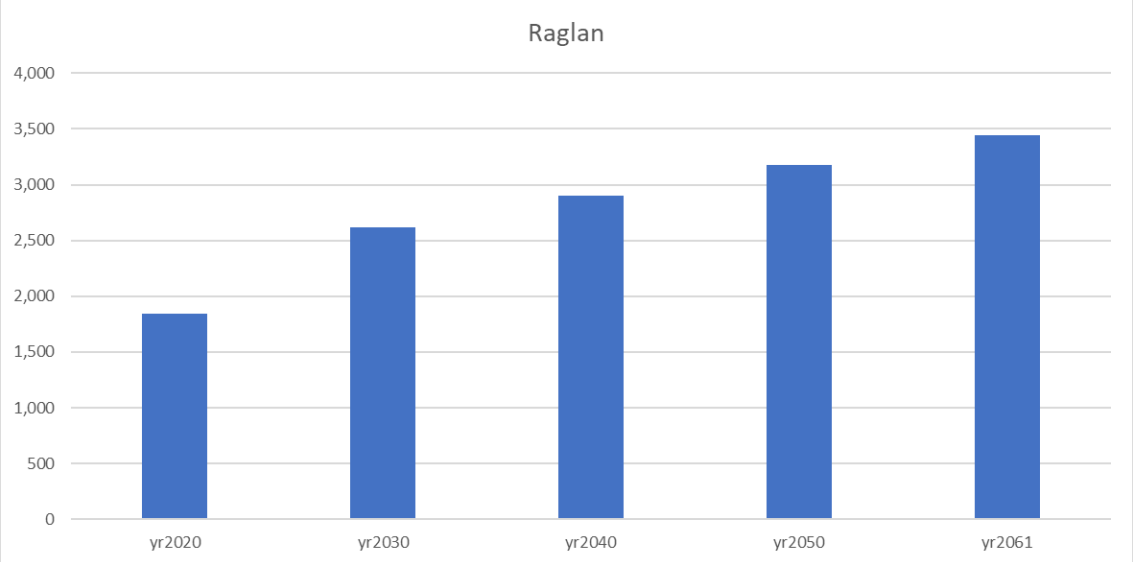

Figure G-46: Raglan growth forecast to 2061, as supplied by Watercare

This shows a relatively high rate of growth over the next 10 years, with the rate slowing after this. By 2061, the total number of households will have grown from around 1,800 to just over 2,500.

NRW is assumed to remain at the current level of 575 m^3/day.

Based on these assumptions, the Raglan SDB forecast graph is as shown below. This shows the growth alongside the volumes supported by the existing resource consent and the WTP capacity. WTP losses are also shown.

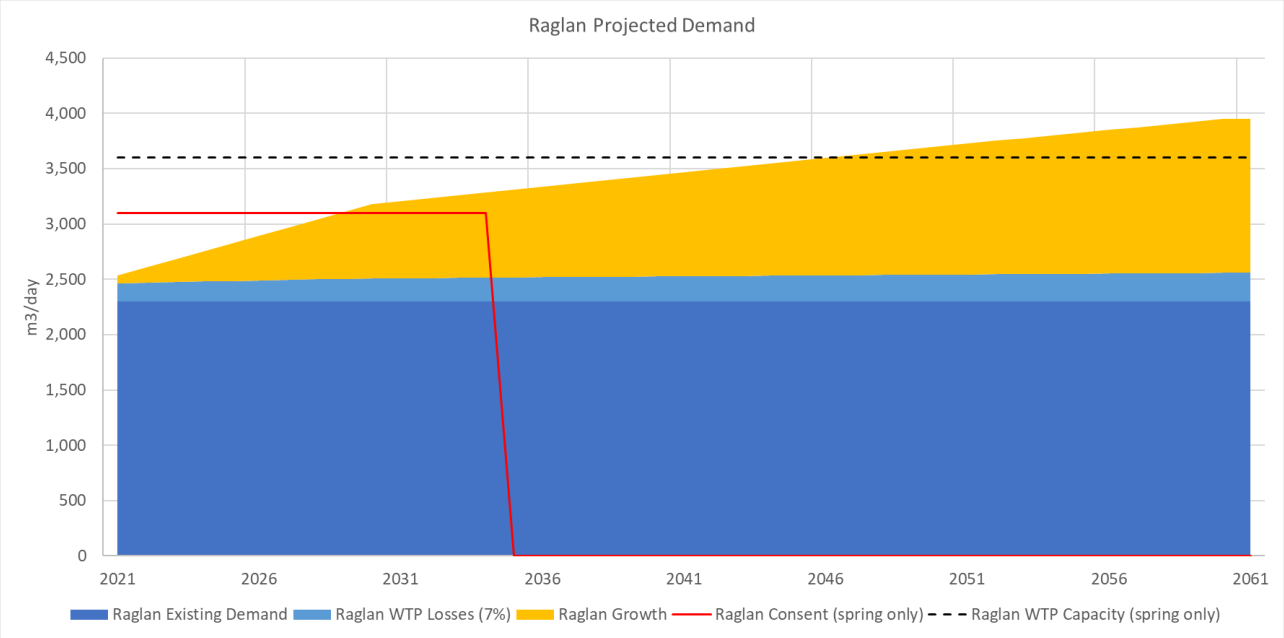

Figure G-47: Raglan water source peak day SDB forecast to 2061

This shows the anticipated growth can be supported by the existing WTP and consent until after 2050. After this work may be needed to reduce water losses, reduce customer consumption or increase capacity at the WTP.

Appendix H VERY SMALL SCHEMES (PORT WAIKATO, ONEWHERO AND TE AKAU)

Very small schemes overview

Port Waikato, Onewhero and Te Akau are three small water supply schemes of less than 100 houses, maintained and operated by WDC. Locations are shown in the plan below.

Figure H-48: Locations of the three small water supply schemes

Port Waikato sits at the mouth of the Waikato River. From aerial photography the village appears to contain around 100 houses, however the water supply network supplies less than 20 properties, most of which appear from aerial photography to be non-residential. It is assumed the residential properties are self-sufficient.

Onewhero is a small rural village around seven km south-west from Tuakau, across the Waikato River. The water system supplies only 13 properties.

Te Akau is a small village on the northern side of the Raglan Harbour (Whāingaroa), across from Raglan itself. The water system supplies 26 properties.

The three plans below show the key network features of each system.

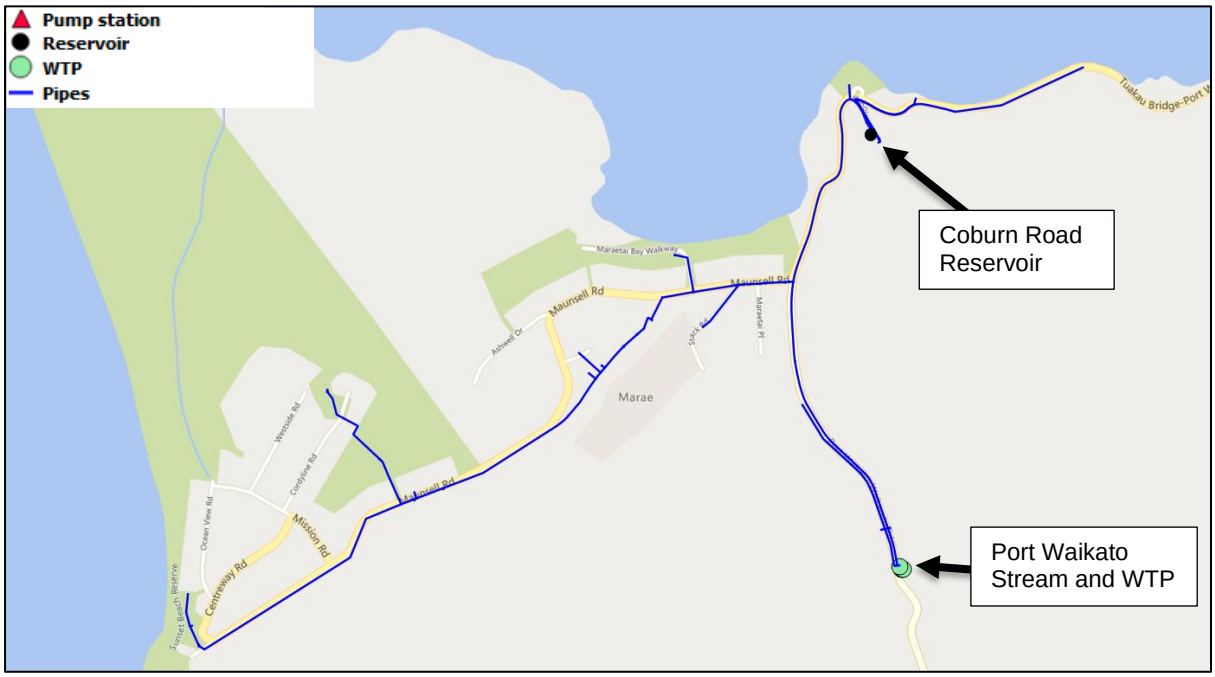

Figure H-49: Port Waikato system layout

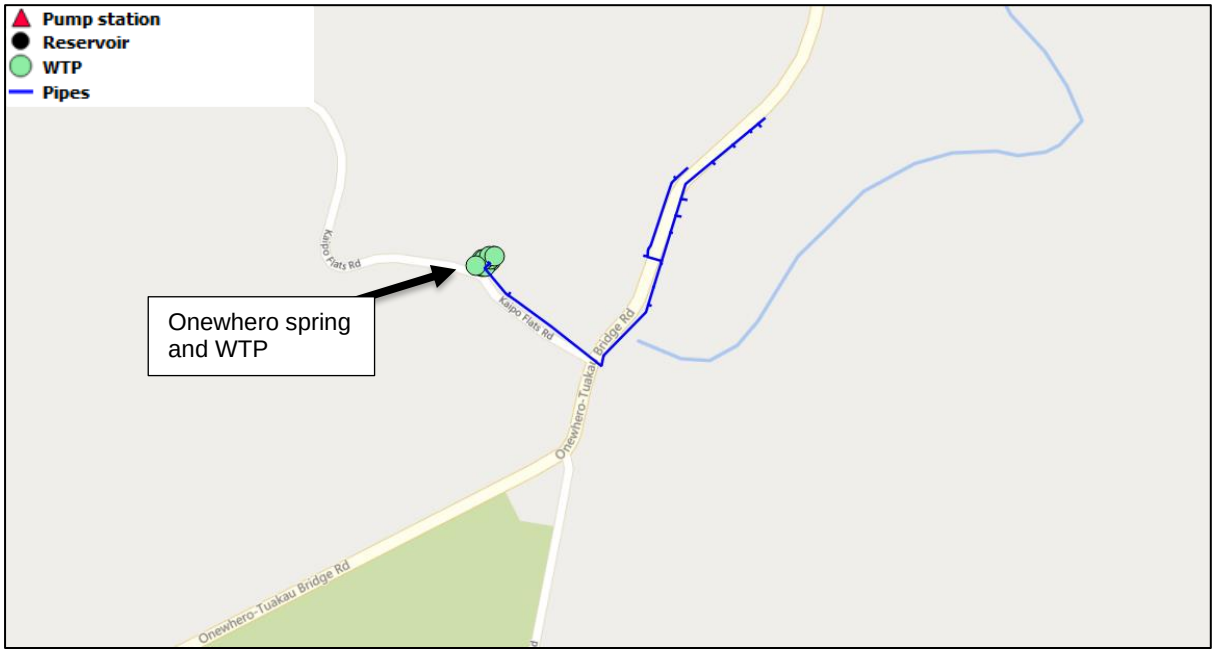

Figure H-50: Onewhero system layout

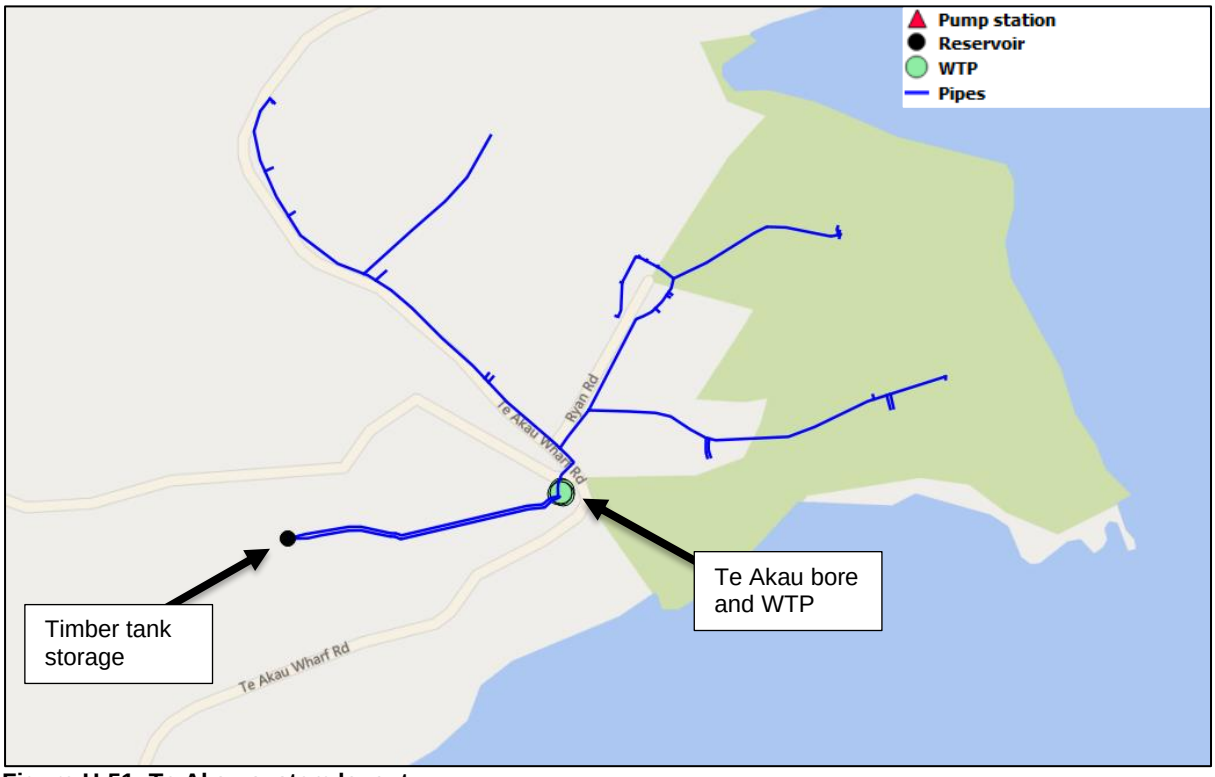

Figure H-51: Te Akau system layout

The table below includes details of the current Very Small Schemes (Port Waikato, Onewhero and Te Akau) water source, treatment and storage capacity.

Table H-22: Port Waikato, Onewhero and Te Akau current water supply scheme characteristics

Very Small Schemes	**Port Waikato**	**Onewhero**	**Te Akau**
Water source limit	200 m³/day until June 2016	No consent	68 m³/day until 2024
Existing WTP capacity	148 m³/day	65 m³/day	68 m³/day
Existing treatment process units	Chemical dosing, clarification, filtration and UV disinfection.	Cartridge filter, Media Filter (Akdolit), Chlorination	Cartridge Filtration, Chlorination.
Treatment upgrade for quality	Requires upgrades to comply with new DWSNZ standards	Requires upgrades to comply with new DWSNZ standards	Requires upgrades to comply with new DWSNZ standards
Existing storage capacity	46 m³	0 m³	45 m³

Port Waikato, Onewhero and Te Akau Demand Data Provided

Daily metered Port Waikato WTP abstraction flow between July 2015 and June 2020.

Daily metered Onewhero WTP abstraction flow between July 2015 and June 2020.

Manual meter readings from the Te Akau WTP abstraction flow meter, between July 2015 and June 2020. On average, readings are around a week apart over this period.

Customer meter readings between July 2016 and June 2020.

Port Waikato, Onewhero and Te Akau Bulk Demand Analysis Results

The historic Port Waikato water take abstraction data has been graphed against the current consent limit below. No data is available on process losses for the Port Waikato WTP.

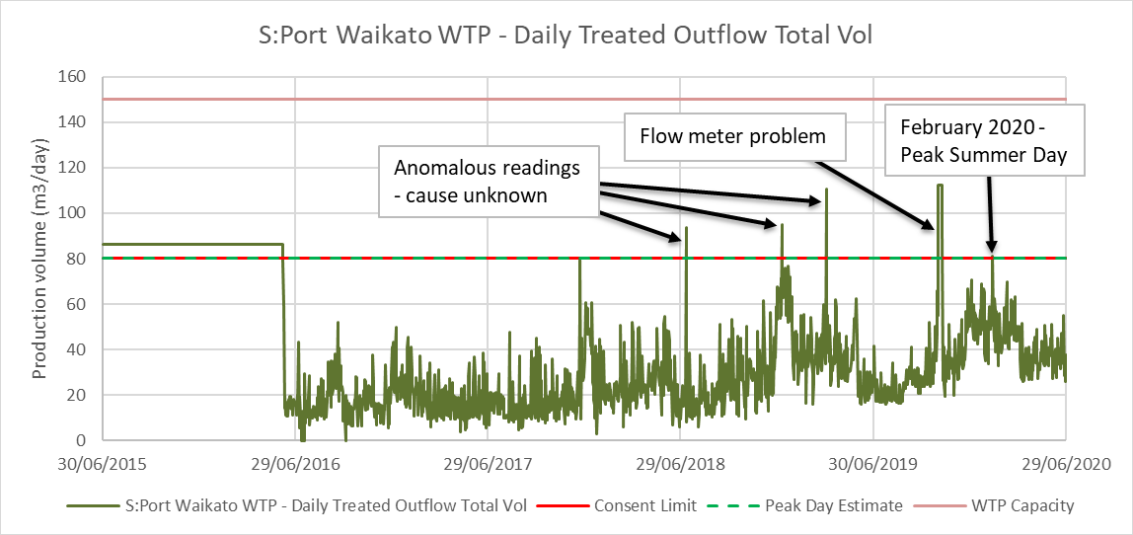

Figure H-52: Historic water take abstraction for Port Waikato

For Port Waikato, flow data before June 2016 is not reliable. Data since then shows demand usually sits between around 20 and 50 m^3/day. There was a flow meter problem in October 2019, but other than this the trend appears to show peak summer demand around 80 m^3/day. This is significantly below the WTP capacity but matches the consent limit. There is therefore no room for growth on the Port Waikato system.

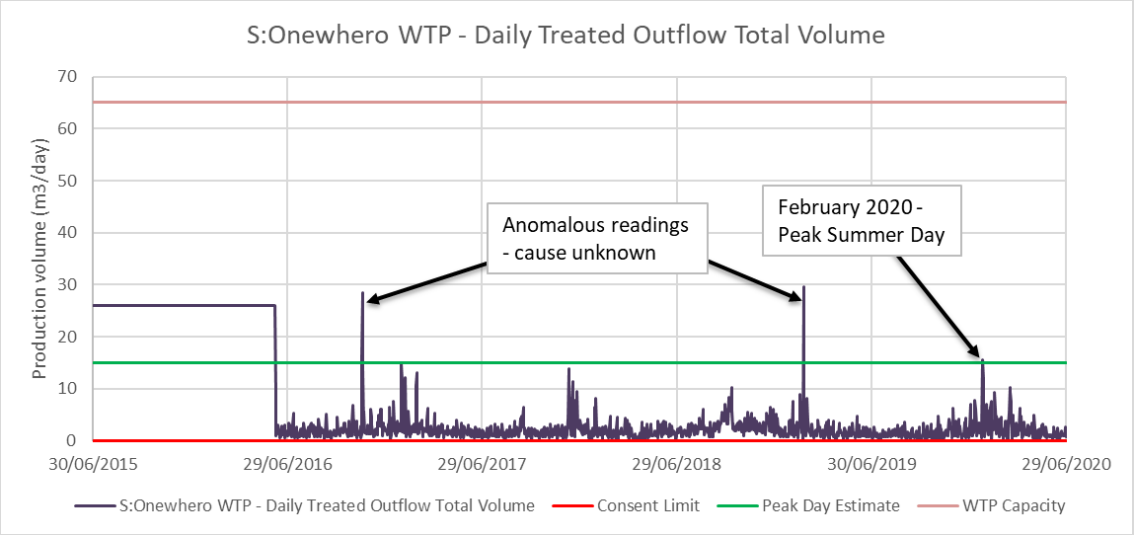

Figure H-53: Historic water take abstraction for Onewhero

For Onewhero, flow data before June 2016 is not reliable. Data since then shows demand usually well below 5 m^3/day. There are occasional anomalous readings which may reflect pipe bursts or abnormal; use – these have been ignored for the purposes of determining a peak summer demand for this system. For this system peak summer demand has been assessed as 15 m^3/day.

There is no consented limit on the abstraction at Onewhero, and the WTP capacity is well above the peak summer day demand volume.

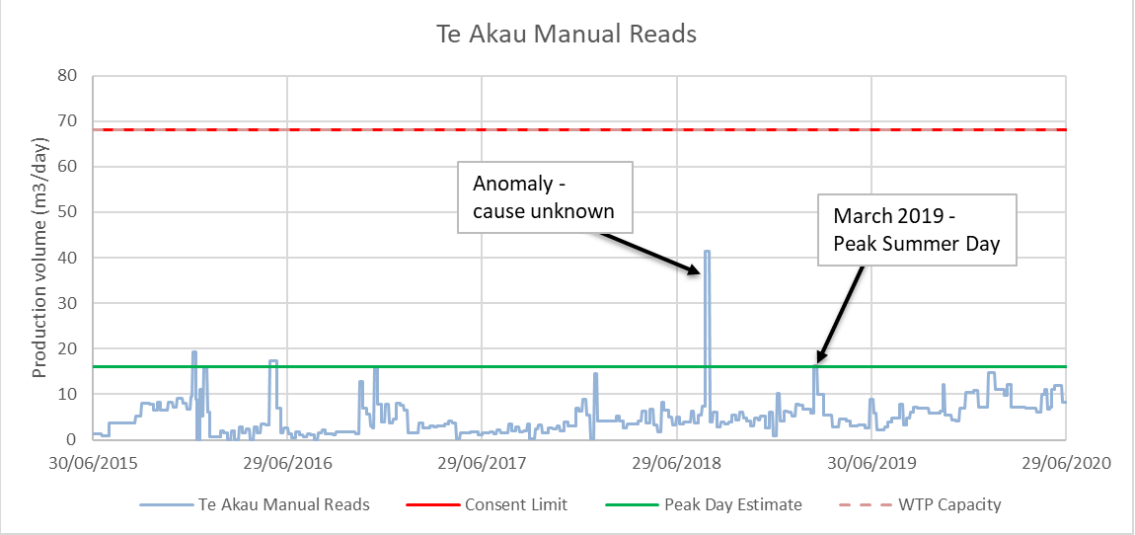

Figure H-54: Historic water take abstraction for Te Akau

For Te Akau, the graph above shows that abstraction has been significantly below both the consent limit and the WTP capacity. For this system peak summer demand has been assessed as 16 m^3/day.

The average day and peak day demand statistics derived from the water take data are shown in the tables below.

These all show much higher peaking factors than in the larger systems – this is a common feature of small water schemes as the chances of everyone turning the tap on at once are much higher.

Table H-23: Port Waikato supply statistics (m^3/day)

	Annual average daily abstraction (m^3/day)	Peak day abstraction (m^3/day)	Abstracted Peak day factor (m^3/day)	Average day treated demand (m^3/day)	Peak day treated demand (m^3/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2016/17	N/A	N/A	N/A	18	50	2.78	17	1,084
2017/18	N/A	N/A	N/A	22	60	2.73	17	1,323
2018/19	N/A	N/A	N/A	33	80	2.42	17	1,924
2019/20	N/A	N/A	N/A	38	80	2.11	17	2,264

Table H-24: Onewhero supply statistics (m^3/day)

	Annual average daily abstraction (m^3/day)	Peak day abstraction (m^3/day)	Abstracted Peak day factor (m^3/day)	Average day treated demand (m^3/day)	Peak day treated demand (m^3/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2016/17	N/A	N/A	N/A	2.3	15	6.52	12	194
2017/18	N/A	N/A	N/A	1.9	15	7.89	12	157
2018/19	N/A	N/A	N/A	2.4	10	4.17	12	202
2019/20	N/A	N/A	N/A	2.0	15	7.50	13	152

Table H-25: Te Akau supply statistics (m^3/day)

	Annual average daily abstraction (m^3/day)	Peak day abstraction (m^3/day)	Abstracted Peak day factor (m^3/day)	Average day treated demand (m^3/day)	Peak day treated demand (m^3/day)	Treated Peak day factor	Connections	Average demand (L/conn/day)
2015/16	N/A	N/A	N/A	5.1	20	3.92	Incomplete	
2016/17	N/A	N/A	N/A	3.2	16	5.00	23	138
2017/18	N/A	N/A	N/A	3.6	15	4.17	26	140
2018/19	N/A	N/A	N/A	5.9	16	2.71	26	228
2019/20	N/A	N/A	N/A	7.5	15	2.00	26	287

Onewhero water loss – unable to be calculated

The water loss process compares consumption volumes from billing data to the annual average supply volumes set out above. For the Onewhero scheme, there is a significant anomaly where the sum of the billed volume in each year is significantly higher than the sum volume of water delivered to the system. Water loss cannot therefore be calculated.

In the 2019/20 year for example, billing data shows that 1,367 m^3 of water was consumed in Onewhero, but over the same period the WTP flow data shows that only 719 m^3 was put into the system.

We recommend investigation of this anomaly though flow testing of the meter and cross-referencing the billing data against customer connection locations.

Port Waikato water loss results

The graph below shows the results of the July 2019 to June 2020 water balance for the Port Waikato scheme, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

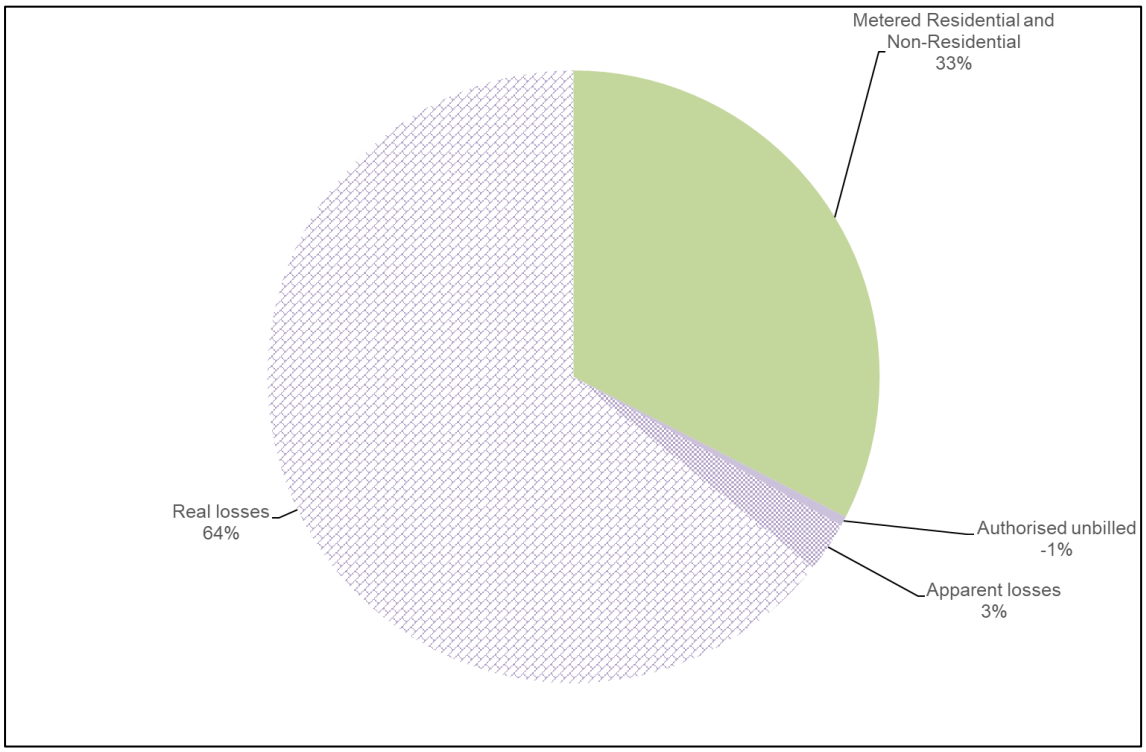

Figure H-55: Port Waikato 2019/20 water balance results (% of total water supplied)

The graph above shows that billed volume only accounts for 33% of water supplied to Port Waikato, and the majority of water supplied to the system was lost before reaching the customer. Although this is a small system, this level of water loss is not sustainable and requires explanation.

In light of these findings, water balance assessments were carried out for the previous four years. The outcomes of this are shown in the graph below.

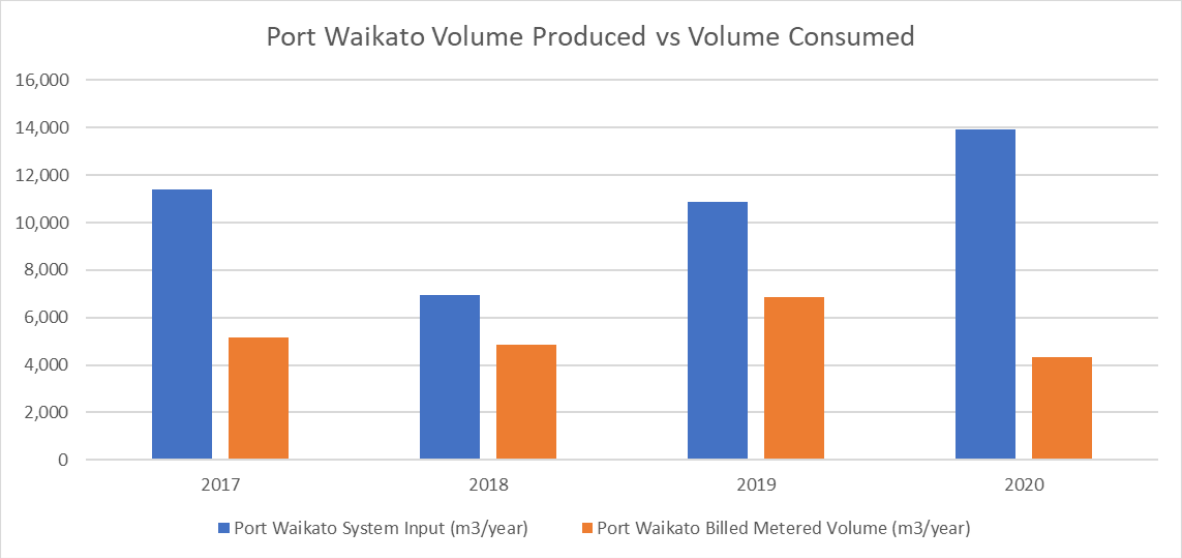

Figure H-56: Port Waikato 2019/20 water balance results (% of total water supplied)

This shows that although the 2020 assessment shows the biggest divergence between supply and consumption, large divergences also appear in 2017 and 2019. However, in 2018 it appears most of the water suppled was in fact consumed.

This finding indicates the issue is not genuine water loss, in which case we would see the lost volume staying the same or increasing year on year.

Potential causes of the discrepancy include:

- Large volumes of water taken from hydrants or public toilets in summer to supplement rainwater tanks.
- Large unknown and unbilled connections to the water network (either authorised but not recorded, or unauthorised).
- Bulk metering fault at the WTP.
- Customer metering fault on one or more large users.

We recommend a separate investigation into this anomaly, which might include flow testing of the bulk meter, checks on customer meters, and review of use at hydrants and public toilets.

Te Akau water loss results

The graph below shows the results of the July 2019 to June 2020 water balance for the Te Akau scheme, showing Non-Revenue Water categorised into real losses, apparent losses and water use which is authorised but unbilled.

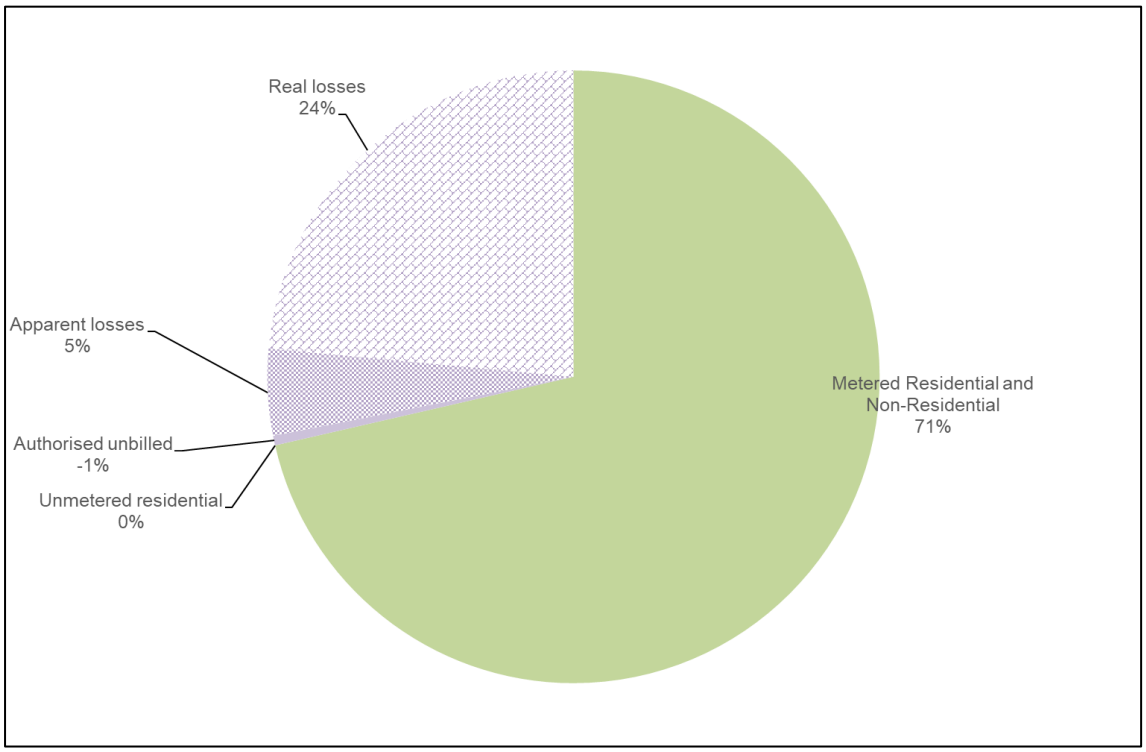

Figure H-57: Te Akau 2019/20 water balance results (% of total water supplied)

The metered demands (71% of water supplied) include both commercial and residential customers. There are no unmetered residential customers in the Te Akau. Real losses were estimated at 24% of water supplied for 2019/20.

As a percentage this figure appears high, but this is misleading. The average demand of customers in Te Akau is low, so the real losses were found to be equivalent to 60 L/connection/day. This is low by New Zealand standards.

Very Small Schemes supply demand balance forecasts – not undertaken

Watercare has advised that even where growth is anticipated, no new connections to these schemes will be allowed, so supply demand balance forecasts for the very small schemes have not been included in this WDMP.

The existing water take consents for Port Waikato (expiry 2051) and Te Akau (expiry 2024) are significantly higher than historic demands. Onewhero does not have a water take consent as it falls within the allowable volume.

The existing water treatment infrastructure for all three schemes have sufficient design capacity to meet existing peak day demands, Port Waikato water treatment plant is currently operating at around 50% of the design capacity and both Onewhero and Te Akau are currently operating at around 35% and 20% respectively of the design capacity.

Te Akau bore is out of commission due to failure of the bore pump. Treated water is currently transported from Raglan by tanker and delivered to the Te Akau Reservoir for distribution to Te Akau residents. Options for repair or replacement of the bore pump are currently under review.

Appendix I CUSTOMER LOCATION AND CATEGORISATION

The key customer information provided by WDC in the water meter billing data is listed below.

Meter ID – the serial number of each meter

Property Address - this includes a town, or locality

Tariff – this includes a code for the town, and the type (urban, rural and commercial)

PropertyType - contains a number of categorisations for property use but does not seem accurate

Water system allocation

For customers not found in GIS, the locality provide in the property address was used to assign properties to a system. The table below notes the localities assigned to each water supply scheme.

Table I-1: Localities and water supply schemes

Locality	Water supply scheme
DINSDALE	Western Districts
EUREKA	Southern Districts
GORDONTON	Southern Districts
HAMILTON	Southern Districts
HAMPTON DOWNS	Mid Waikato
HOPUHOPU	Central District
HOROTIU	Central District
HORSHAM DOWNS	Central District
HUNTLY	Huntly
MATANGI	Southern Districts
MEREMERE	Mid Waikato
NEWSTEAD	Southern Districts
NGARUAWAHIA	Central District
POKENO	Pokeno
PUKEKOHE	Tuakau
PUKEMIRO	Huntly
PUKETAHA	Southern Districts
RAGLAN	Raglan
RANGIRIRI	Mid Waikato
ROTOKAURI	Western Districts
ROTONGARO	Huntly
ROTOTUNA	Southern Districts
ROTOWARO	Huntly
RUAKURA	Southern Districts
TAMAHERE	Southern Districts
TAUPIRI	Central District

Locality	Water supply scheme
TAUWHARE	Southern Districts
TE AKAU SOUTH	Te Akau
TE HUTEWAI	Raglan
TE KAUWHATA	Mid Waikato
TE KOWHAI	Western Districts
TUAKAU	Tuakau
WAERENGA	Mid Waikato

Customer Categorisation

Three methods were trailed for assigning customers to various residential or commercial categories:

a. Use of the PropertyType field
b. Use of the Tariff field
c. Assume the top ten customers in each system are commercial

In the end, options a and b were not found to be reliable, so in line with the methodology used in recent water loss analyses the top 10 customers were simply assumed commercial.

The findings of the trials are set out below.

PropertyType

On analysis, it was found that the PropertyType field included the following types, likely to relate to residential customers.

- ResRurDwel
- ResRurVacL
- ResRurXLse
- ResUrbDwel
- ResUrbSUnt
- ResUrbVacL
- ResUrbXLse

However, Watercare confirmed that this field was not updated so this analysis was not taken any further.

Tariff

The tariff field contains a number of codes relating to both the tariff type and location, for example:

- RurHly = rural property in Huntly
- UrbTuak = urban residential property in Tuakau
- ComRag = commercial property in Raglan

Watercare confirmed this field is regularly updated. This field therefore appears to have the detail need to separate out residential from commercial meters.

However, on analysis the following was found:

- Out of the top 50 users by volume only 6 have a tariff starting with “Com”. The tariff field therefore implies that the other 44 are residential. It seems unlikely residential customers would be averaging up to 370 m^3/day water use.
- The top 6 users by volume were all located in aerial photography, and none appeared to be residential. However, all have either “rur” or “urb” in the tariff field.

These checks are not comprehensive but were sufficient to raise doubt that the "Tariff" field does not seem to relate to commercial / residential nature of the property.

Top Ten Users

In previous water loss studies (Thomas Consultants, 2017, 2018, 2019) no differentiation has been made at all between commercial and residential customers. It is assumed this is because of the issues set out above. This approach does not affect water loss assessments. However, in this WDMP we need a means to estimate how much water demand will grow due to population growth.

Residential household water use is all relatively small-scale, and therefore there are limits to how much a household will use. However commercial water use varies far more - some industries use water only for staff needs, where other wet industry customers can have processes requiring huge amounts of water. When we take an average for water use, these wet industries can have a disproportionate effect on the average.

Although we do not have a way to separate out all commercial customers, we can still minimize the disproportionate effect the large commercial users have by removing the largest of them.

If we do not remove enough, some large commercial users may still have a disproportionate effect on residential demand estimates.

If we remove too many, then we risk removing too many genuine residential customers and our estimate for future demand will be too low.

With consideration for the size of the systems (all but the very small systems between around 1,500 and 3,000 properties), it was decided that removal of the top 10 customers from each system would best achieve the needs of the study.

A system of 3,000 properties would be unlikely to have more than 10 commercial wet industry customers.

If there were no large commercial users in a system, removing only 10 residential customers would have little effect on the overall average.

No split between residential and non-residential consumption was calculated for the very small systems of Te Akau, Onewhero and Port Waikato, as no water demand growth is anticipated for these systems and there is no requirement for an estimate of residential water demand.

The table below shows the outcomes of the top-ten assessment for non-residential demand. These figures were taken forward into the water balance to determine residential household water use.

Table I-2: Localities and water supply schemes

System	Top ten customers consumption (m^3/day)
Tuakau	202
Pokeno	199
Raglan	113
Huntly	350
Mid Waikato	581
Central District	204
Southern & Western District	355
Te Akau	0
Onewhero	0
Port Waikato	0
Total	**2,004**

Appendix J SUMMARY OF ACTIONS

Table J-26: Summary of demand management interventions currently used, immediate and possible long-term actions

Demand management interventions	Currently used (business as usual)	Immediate actions	Possible long-term actions
Infrastructure Management			
Annual water balance assessments (in-house)	✓		
Water loss reduction strategy	✓		
Implementation of water loss strategy recommendations	✓	✓	✓
Reactive leakage repair	✓		
Active leakage control programme		✓	✓
Pressure management		✓	✓
Customer Meter replacement programme			
Customer meter testing		✓ (review)	
Water system hydraulic modelling to improve system performance and leakage	✓		
Investigation into water treatment plant efficiency	✓		
Advanced asset renewal planning to prioritise infrastructure replacement and reduce leakage	✓		✓
Community engagement (to be done internally)			
Community education	✓		
Educational resources and programmes for schools		✓	
Targeted education programmes for specific users, e.g., rural properties, retirement villages	✓	✓	
Regulatory control			
Restricted connections (trickle feed) to rural properties	✓		
Review the rural restricted “policy” (under review)			
Water restrictions during peak summer periods (e.g., alternate day garden watering)	✓		
Active enforcement of water restrictions during peak summer periods	✓		✓
Mandatory water efficient fixtures in new construction e.g., mandatory dual-flush toilets in all new toilet installations			✓
Requirement for large users to prepare demand management plans	✓	(needs review)	
Review approach for bulk water withdrawals (under review)			
Water efficient technologies			
Rebate or subsidy or grant programme for retrofit of water efficient fixtures			✓
Retrofit of water-efficient technologies into Council properties			✓
Rebate or subsidy programme for automatic timers for irrigation systems			✓

Appendix J Summary of Actions

Demand management interventions	Currently used (business as usual)	Immediate actions	Possible long-term actions
Mandatory rain/soil moisture sensors for properties with high garden watering			✓
Metering and pricing			
Review customer meter reading and data processing procedures		✓	
Review of potential to increase meter reading frequency			
Improve customer categorisation		✓	
Improving understanding of demand patterns for high water use customers		✓	
Develop a standard water supply agreement for high water use customers		✓	
Installation of manifolds on all new domestic connections	✓		
Metering and pricing for non-residential connections	✓		
Metering and pricing for residential connections in remaining three schemes (underway)		✓	
Metering of Council facilities/buildings		✓	
Metering of Council parks		✓	
Metering of all new properties	✓		
Increasing stepped volumetric charges for metered customers (fixed rate)	✓		

Appendix K DROUGHT MANAGEMENT PLAN

Drought Management Plan 2021 Update

PREPARED FOR WAIKATO DISTRICT COUNCIL | May 2021

We design with community in mind

Stantec

Quality Statement

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
1	11/05/2021	Final	J Villaflor B Davies	B Davies	B Davies	B Davies

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1.0 INTRODUCTION

Over recent years it has become clear that current water usage philosophy in the Waikato District is becoming unsustainable. Water resources are under increasing pressure as a result of climate change, population growth and increasing customer demand. Waikato District Council (WDC) is taking steps to ensure that there are sustainable water supply systems for future generations.

In 2007, a policy change implemented by Waikato Regional Council was introduced and includes a requirement for all Water Service Providers in the region to prepare, and submit for registration, a Drought Management Plan (DP) for each service area/authority area in which the service provider supplies water. The DP is a requirement of the Water Demand Management Plan (WDMP), which in turn is a requirement of the Waikato River water take resource consents.

The drought management provisions detail the restrictions and actions to be implemented during various stages of drought events, which are withdrawn or incrementally lifted as the drought recedes. The first edition of the WDC Drought Management Plan was finalised in May 2009. A revised edition was issued in 2015, for inclusion with the 2015 WDC Water Demand Management Plan.

In 2021, the WDC Drought Management Plan has been reviewed for inclusion with the 2021 WDC Water Demand Management Plan.

The updated sections include the following:

- Section 3.1 updated to describe ten water supply schemes.
- Section 3.2 updated to describe population growth forecasts used for the WDMP.
- Section 4.1 updated with source data information
- Section 4.2 updated to reflect Pokeno and Tuakau adherence to Watercare restrictions.

2.0 PURPOSE

The purpose of this Plan is:

- To outline the WDC approved plan for regulating the use of water from the WDC water supply systems during periods of water shortage;
- To identify other water sources and actions that WDC will consider during periods of extreme drought to maintain essential water services sufficient to ensure minimum health requirements; and
- To comply with the Regional Policy requirements and proposed water take consent conditions.

3.0 SERVICES AND SYSTEMS OVERVIEW

3.1 REGISTERED WATER SERVICE

WDC is the registered Water Service Provider to an estimated population of 44,900 people (16,640 properties). This DP applies to WDC Services of Bulk and Retail Water Supplies.

The main water source for the Waikato District is the Waikato River. This accounts for approximately two thirds of the annual water production for the Waikato District. The isolated communities of Raglan and Onewhero draw water from springs, Tuakau and Pokeno draw water from bores, and Port Waikato draws from a stream. Te Akau bore is out of commission due to failure of the bore pump. Treated water is currently transported from Raglan by tanker and delivered to the Te Akau Reservoir for distribution to Te Akau residents. Options for repair or replacement of the bore pump are currently under review. The water sources for Raglan, Onewhero and Te Akau are outside of the Waikato River catchment.

Table 3-1 presents an overview summary of the water sources and take consent limits for the 12 water supply schemes.

Table 3-1: Summary of water sources and consent limits

Scheme	Water source	Current water take consent limit	Water take consent expiry
Pokeno	Bore and spring	387 m³/day and 998 m³/day	October 2022 and July 2030
Tuakau	Bore and spring	No limit	N/A
Mid-Waikato	Waikato River (third party supply of raw water from the Te Kauwhata Water Association (TKWA))	22,900 m³/day (expired agreement 4,000 m³/day)	June 2024
Huntly	Waikato River	6,700 m³/day with a stepped increase over time to a maximum of 7,000 m³/day	2046
Ngaruawahia	Waikato River	4,400 m³/day with a stepped increase over time to a maximum of 5,000 m³/day	2046
Ngaruawahia, Hopuhopu, and Huntly combined	Waikato River	11,800 m3/day with a stepped increase over time to a maximum of 12,800 m3/day	2046
Southern & Western	Waikato River (third party supply of treated water from Hamilton City Council)	5,000 m³/day (consent transferred to Hamilton City Council).	2046
Raglan	Te Hutewai Road Omahina Spring outside of Waikato River catchment	500 m³/day (groundwater bore) 3,100 m3/day (Omahina Spring)	January 2034
Port Waikato	Maraetai Stream	80 m³/day	April 2051
Onewhero	Spring outside of Waikato River catchment	No consent required as take is a permitted activity due to low volumes.	n/a
Te Akau	Bore outside of Waikato River catchment. Currently out of commission - supplied by tankers from Raglan.	68 m³/day	January 2024

Table 3-2 presents a summary of bulk measurement and influencing management for each scheme

Table 3-2: Scheme management

Water Service	Measurement	Influencing Management
Pokeno	Bulk meter at plant, all users metered.	Watercare
Tuakau	Bulk meter at plant, all users metered.	Watercare
Mid Waikato	Bulk meter at plant, all users metered.	
Huntly	Bulk meter at plant, all users metered.	
Central District	Bulk meter at plant, all users metered.	
Southern and Western Districts	Bulk meters at WDC connections to the HCC network, all users metered.	HCC Drought Management Plan and Water Management Plan.
Raglan	Bulk meter at plant, all users metered.	Peak summer demand due to tourism.
Port Waikato	All users metered.	
Onewhero	All users metered.	

Water Service	Measurement	Influencing Management
Te Akau	All users metered.	

As per the agreement with Hamilton City Council, supply to the Southern and Western districts must comply with HCC's drought management plan, water management plan and water supply bylaws. Similary for Pokeno and Tuakau, these schemes must comply with Watercare's alert system.

3.2 POPULATION GROWTH

A number of growth studies have been carried out in recent times, some of which are more appropriate for some areas than others. Through discussion with Water Care a mixture of sources has been used to develop the demand forecasts in the WDMP. The sources are summarised in Table 3-3. For further detail on these please refer to the WDMP.

Table 3-3: Growth Data Sources

System	Data set used for growth	Notes:
Tuakau	Household Projections (HIGH) incl. rural	Underestimated in Waikato2070
Pokeno	Household Projections (HIGH) incl. rural	Underestimated in Waikato2070
		No match for Pokeno masterplan (2018)
		"High" projections may not account for all approved developments
Raglan	Adjusted Waikato2070 numbers as used in current water and wastewater studies	Overestimated in Waikato2070
Huntly	Mid-Waikato Servicing strategy	Overestimated in Waikato2070
		Significant non-residential growth - Servicing strategy may underestimate demand
Mid Waikato	Mid-Waikato Servicing strategy	Overestimated in Waikato2070
		Significant non-residential growth - Servicing strategy may underestimate demand
Central District	Original Waikato2070 Projections in Water Supply Areas (2020v1.0)	Waikato2070 ok
Southern & Western District	Original Waikato2070 Projections in Water Supply Areas (2020v1.0)	Waikato2070 ok
Te Akau	No growth	No new connections to water system will be accepted.
Onewhero	No growth	No new connections to water system will be accepted.
Port Waikato	No growth	No new connections to water system will be accepted.

The growth used to determine future demands across the different networks in the WDMP is set out in Table 3-4 and Figure 3-1 below.

Table 3-4: Household growth by System as used for demand calculations

System	Data set used for growth	2020	2030	2040	2050	2061	Notes
Tuakau	Household Projections (HIGH)	1,690	2,999	5,031	5,903	6,744	Includes rural
Pokeno	Household Projections (HIGH)	1,368	4,057	5,953	5,595	6,088	Includes rural
Raglan	Adjusted Waikato2070 (W&WW studies)	1,575	2,571	2,633	3,135	3,399	
Huntly	Mid-Waikato Servicing strategy	5,846	7,703	9,513	12,039	14,372	Includes non-residential PE occupancy 2.7 assumed
Mid Waikato	Mid-Waikato Servicing strategy	1,550	4,290	5,313	7,961	8,778	Includes non-residential PE occupancy 2.7 assumed
Central District	Waikato2070	3,167	3,889	4,339	4,707	5,063	
Southern & Western District	Waikato2070	4,024	4,508	5,029	5,748	6,275	
Te Akau	No growth	40	40	40	40	40	
Onewhero	No growth	18	18	18	18	18	
Port Waikato	No growth	74	74	74	74	74	
Total (includes non-residential population equivalents)		19,352	29,498	37,369	44,283	50,851	

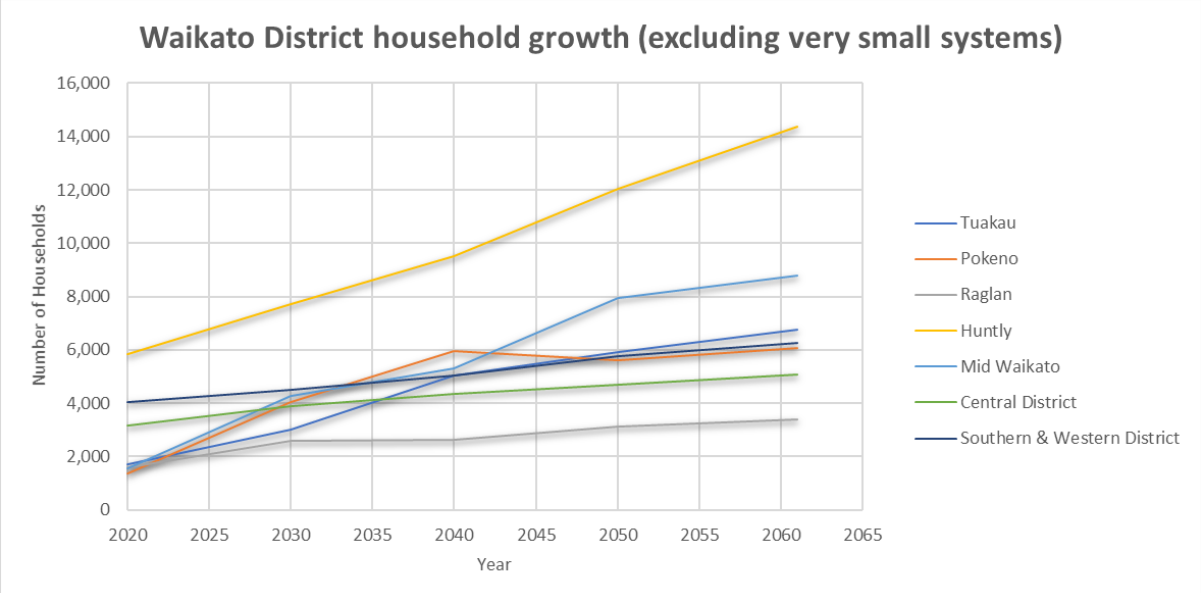

Figure 3-1: Household growth (excluding Te Akau, Onewhero and Port Waikato)

4.0 DROUGHT MANAGEMENT PLANNING

This DP addresses two key aspects:

- Source Management and
- Peak Demand Management.

Source Management is influenced by the climate's direct effect on the Waikato River level and the regions aquifers. The Waikato River is also influenced by upstream source management by Mercury. Mercury regulates the discharge from Lake Taupo into the Waikato River to maintain water reserves through dry periods to ensure continual power supply and comply with their resource consent. These influences dictate the abstraction rate and volumes that the WDC water schemes can draw from the Waikato River.

Peak Demand Management influences how customers use water through seasonal dry periods and their daily usage characteristics. The purpose is to maintain Council's customer service levels and remain within the abstraction limits from the Waikato River and other water sources used by WDC.

Pokeno, Tuakau, Raglan, Onewhero and Te Akau water supplies are sourced from bores and springs.

4.1 SOURCE MANAGEMENT

Waikato District Council proposes to manage the risk of low river levels in the Waikato River in conjunction with Hamilton City Council's Drought Management plan. The reasons for this are:

a) Supply to the Western and Southern Districts needs to be managed in conjunction with HCC's Plans and Bylaws.
b) All residents are subjected to the same media broadcasts, i.e., local radio, Waikato Times.
c) Waikato District Council Resolution to follow Hamilton City Council with regards to water restrictions.

4.1.1 Reason for Issues

4.1.1.1 Waikato River

A gradual decrease in average river levels combined with extreme lack of rainfall over extended periods may result in the Ngaruawahia, Huntly and Te Kauwhata intakes becoming inoperable due to low water levels at the intake structures.

4.1.1.2 Bores and Springs

Pokeno, Tuakau, Raglan, Onewhero and Te Akau water supplies are sourced from bores and springs. There is no evidence to date to suggest that these sources are influenced by drought. The constraints in these areas relate to peak demand and infrastructure.

4.1.2 Warning Indicators

4.1.2.1 Waikato River

Due to the size of the Waikato River catchment and the significant volume of water stored within Lake Taupo, conditions required to cause issues at the various intakes will take several months to develop. The following is a list of warning indicators in order of occurrence:

a) Negligible rainfall within the Taupo catchment for a period upwards of 2 months with no significant rain forecast.
b) Forecast reduction in the level of Lake Taupo to less than 0.5 m above consented low level indicating that outflows are greater than inflows.
c) Indication by Mercury that river flows will be restricted in order to maintain lake levels.

All intakes are at the minimum operating levels as defined by Mercury, therefore contingency planning is not necessary except in times of extreme drought which will adversely affect the management of the Karapiro Dam.

4.1.2.2 Bores and springs

The abstractions from bores and springs are monitored through bulk flow meters.

4.1.3 Data Sources

Data is sourced primarily from Waikato Regional Council through their website.

http://www.waikatoregion.govt.nz/

Further information can be sourced from the Operations Manager at Hamilton City Council.

4.1.4 Annual Review

During each summer period, Hamilton City Council organises and facilitates a meeting between Waikato Regional Council and Mercury. Waikato District Council will also attend this meeting.

The meeting will address but not be limited to the following:

- Key staff introduced, staff changes highlighted.
- Contact details collated and distributed.
- Climate outlook.
- Statutory requirements (changes or additions highlighted).
- General expectations of all parties.

In conjunction with this meeting the Operations Manager will carry out an assessment of the availability and location of suitable equipment to be sought if contingency measures are required to be implemented (extreme conditions only).

4.1.5 Monitoring

As WDC will be following the lead of HCC in relation to drought management the Operations Manager of WDC will contact the Operations Manager at HCC on a weekly basis regarding potential flow restrictions.

If indicators 4.1.2.1(a) and 4.1.2.1(b) are observed the Operations Manager will commence monitoring of the river levels at the intakes at a minimum frequency as follows:

Stage 1: Monitoring – Weekly river level observations, fortnightly communication with Mercury.

Stage 2: Mobilisation – Daily river level observation, daily communication with Mercury.

Stage 3: Implementation – Continuous monitoring at 2-hourly intervals until contingency pumping begins (extreme conditions only).

Waikato District Council do not envisage reaching Stage 3 as the intake levels are all below the minimum river operating levels as managed by Mercury.

4.2 PEAK DEMAND MANAGEMENT

This DP addresses both WDC's ongoing water conservation as part of the Water Demand Management Action Plan and how WDC responds to drought conditions. It is important that the community understands the difference between the two. Low level restrictions, which are part of the water conservation strategy, are ongoing and intended to ensure that we adopt sustainable water use practices as part of our normal way of life. Restrictions, which are introduced in response to a drought or other temporary water shortage event, will only be implemented to various levels during the drought or event and will be lifted when conditions return to normal.

In summer Raglan experiences high water demand during the school holidays and long weekends from beach visitors. The trigger levels and restrictions indicated below reflect this unique situation.

4.2.1 Trigger Levels and Restrictions

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 last longer under a variety of usage and drought scenarios taking into account future population growth.

Under the Water Supply Bylaw 2009, Section 10.7.4, 11.1 and 11.4, WDC has the legal power to determine, implement and enforce water restrictions. Restrictions will apply to the Waikato District area including rural restricted areas and commercial and industrial water users.

4.2.1.1 Trigger levels

The trigger levels will be those as issued by Hamilton City Council for all supplies including those at Raglan and Te Akau as all users will be subjected to the same media broadcasts.

4.2.1.2 Restrictions

The restrictions put in place in all locations excepting Pokeno and Tuakau are as per Hamilton City Council and are presented in Table 4-1.

Pokeno and Tuakau will comply with the water restrictions set out by Watercare.

Table 4-1: Alert Levels and Restrictions

Stages	Restriction on Water Use	
Water Alert Level 1	Water alert level 1 constitutes the lowest level of water conservational measures initiated by WDC. It restricts residential sprinkler use to between 6-8am & 6-8pm and is promoted via a media campaign and enforced via education on the bylaw reactive to complaints from the community.	**Restrictions** Sprinkler systems will be permitted to be used between the hours of 6-8am and 6-8pm only. No restriction on commercial/non-residential properties. Council to moderate its own water usage. **Actions** • Media campaign. • Public notices. • Media release • Print and radio advertorials. • Waikato District Council website and social media outlets • Road and pedestrian signage • Online advertising • Newsletters for schools • WDC staff email footer • Posters up in council and community venues • Alert levels and weekly water use on www.smartwater.org.nz • Council ceases hydrant testing and flushing programs once water restrictions are in place
Water Alert Level 2	Water alert level 2 constitutes the next level of water conservational measures initiated by WDC. It restricts residential sprinklers to 6-8am & 6-8pm on alternate days only and is promoted via a media campaign and enforced via education on the bylaw reactive to complaints from the community.	**Restrictions** Sprinkler systems are allowed to be used between the hours of 6-8am and 6-8pm on alternate days only. No restriction on commercial/non-residential properties. Moderate irrigation to non-essential Council assets. • Flushing programme suspended. **Actions** Up-date media campaign as to new restrictions all same avenues as Alert Level 1. • Electronic variable message sign (VMS) deployed to most at risk schemes • Flyers distributed to households when needed (scheme by scheme basis)
Water Alert Level 3	Water Alert Level 3 marks a significant elevation in the levels of water consumption and is therefore paralleled by an elevation in water restriction response. There is a total ban on domestic sprinklers and	**Restrictions** Total ban on domestic sprinklers – hand-held hosing only. Restriction on outdoor water use for commercial/non-residential properties. Council to increase water conservation measures. • Cessation of irrigation to all non-essential Council assets • Council vehicle washing stops

Stages	Restriction on Water Use	
	restrictions begin on outdoor water use for commercial/non-residential properties.	• Council looks at providing raw water collection points for non-potable uses (dust suppression) where possible **Actions** Up-date media campaign as to new restrictions all same avenues as Alert Level 1 with increased frequency and these extra measures may be utilised as needed: • Public notice in all local newspapers in addition to the Waikato Times • Extra advertising taken up in local newspapers • Electronic variable message sign (VMS) deployed to most at risk schemes • Flyers distributed to households when needed (scheme by scheme basis)
Water Alert Level 4	Water Alert Level 4 marks the highest level of water restriction and is in response to continuous and unremitting pressure on the water treatment stations ability to produce potable water.	**Restrictions** Total ban on all external non-essential use of water. Restriction on all external water use for commercial/non-residential properties. Council to increase water conservation measures. • Cessation of irrigation to all Council assets • Cessation of any abstraction of water from Waikato District water supply networks (construction companies/domestic water carriers, all hydrant abstraction banned, water maintenance involving excessive water loss will be cancelled, unplanned emergency work only). **Actions** Up-date media campaign as to new restrictions all same avenues as Alert Level 3 with increased frequency and these extra measures.

5.0 IMPLEMENTATION

5.1 DROUGHT MANAGEMENT RESPONSE TEAM

WDC will establish a Drought Management Response Team to be convened by the Operations Manager on an "as needs" basis to oversee the implementation of restrictions, review performance, conduct post event reviews and recommend any changes to the DP.

5.2 AUTHORISING PROVISIONS

In emergency situations WDC may impose water restrictions in accordance with the Water Supply Bylaw 2009 and the provisions of the Local Government Act 2002 upon advice from the Community Assets Manager.

5.3 ENFORCEMENT

WDC will enforce the Water Restrictions under the Water Supply Bylaw 2008 under -

- Section 11.1, Breaches of Conditions of Supply
- Section 11.4, Penalties

5.4 COMMUNICATIONS PLAN

WDC, as part of its Water Demand Management Plan, will actively promote permanent water conservation measures and, when required, the introduction of water restrictions.

The Communication Plan will –

- Inform the community of the current water supply situation and the reasons for introducing water restrictions
- Provide an explanation of the water restriction requirements
- Provide an explanation of the enforcement procedures
- Include an educational campaign to encourage water conservation practices
- Provide ongoing feedback to the community on the water supply situation

It is anticipated that the Communication Plan would include –

- Advertising the restrictions in the local newspapers
- Advertising the restrictions on local radio
- Direct mail
- Notices sent out with rates notices
- Media releases
- Water Conservation Notice Board on Wainui Road opposite the Museum.

Examples of advertisements and notices suitable for publishing are provided in Appendix A.

5.5 MONITORING PLAN

The DP must be responsive, effective and flexible. In order to achieve this, it is critical to monitor the water supply systems on a regular basis to allow proper implementation of the plan.

The following monitoring is proposed utilising existing telemetry installations:

- Daily monitoring of demands on all systems
- Daily monitoring of water supply source
- The impact of restrictions on consumption.

Appendix

We design with community in mind

Appendix A EXAMPLE ADVERTISEMENTS AND NOTICES

MEDIA RELEASE

Sprinkler ban to continue

27 MARCH 2022

Immediate release

The total ban on sprinkler use in Waikato District will continue indefinitely due to the persistent drought conditions in the region.

The ban has been subject to a formal assessment each fortnight for the last six weeks. Drought conditions have not eased in this time and subsequently the ban will continue beyond the earlier anticipated end date of March 31.

XXXX manager XXXXX says that while the domestic sprinkler ban put in place in January resulted in an excellent response from residents, recent usage has started to creep up again.

“With the commencement of the autumn season there may be a sense that the water crisis is over. Unfortunately there is just as much need for water conservation now as there was in January due to fact that we have seen no significant rainfall in four months. The medium term forecast does not include sustained rainfall which is what the region desperately needs to return to normal conditions. “

Recent rainfall still only represents a fraction of what should be expected at this time of year. Rainfall from 1 December to date has been less than a third of the five year average.

The sprinkler ban will remain in place as long as the drought persists. A fortnightly review remains in place to monitor conditions. Council remains in close communication with Waikato Regional Council regarding drought management for the wider region.

The continuation of the sprinkler ban will be communicated via street signage, radio advertisements and XXXXX.

CREATING COMMUNITIES

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of belonging. That's why at Stantec, we always **design with community in mind**.

We care about the communities we serve—because they're our communities too. We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

New Zealand offices:
Alexandra, Auckland, Balclutha, Christchurch, Dunedin, Gisborne, Greymouth, Hamilton, Hastings, Napier, Nelson, Palmerston North, Queenstown, Tauranga, Wellington, Whangārei

Stantec
Level 15, 10 Brandon Street, Wellington 6011,
New Zealand
PO Box 13-052, Armagh, Christchurch, 8141
New Zealand: +64 04 3815700 | www.stantec.com