NATIONAL PERFORMANCE REVIEW

2015-2016

water
NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

Version	Date	Updates
1	17/2/2017	Issued for publication
2	14/3/2017	Sludge volumes in Table 6.2-2 updated to correct reporting error
3	28/3/2017	Executive Summary and Resilience introduction have been amended to correct data interpretation error, which had data for primary listed as data for secondary networks and vice versa.

FURTHER INFORMATION ON THIS REPORT IS AVAILABLE FROM:
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Foreword

Water New Zealand's annual benchmarking exercise of District, City Council, and Council-Controlled Organisation performance in 3 Waters administration is one of our key publications. It is used to assist the design of our annual work plan where we identify areas for improvement in-service delivery.

Of course the report is not possible without the significant contribution of the 50 participants included in the review. Your support is appreciated.

The report preparation was largely done by team member Lesley Smith with guidance from an industry advisory group. I would like to thank both Lesley and the Advisory Group who provided oversight of the review:

- Mike Schruer, Utilities Manager at Tasman District Council
- Emily Botje, (formerly) Asset Manager at Hamilton City Council
- Steve Burton, General Manager City Waters at Tauranga City Council
- Jamie Cox, Engineering Manager at Wairoa District Council
- Ted Anderson, Group Manager, Assets at South Waikato District Council
- Martyn Cole, Water & Wastewater Asset Manager at Kapiti Coast District Council
- Stacey Hayward, Senior Policy Analyst at Department of Internal Affairs
- David Barnes, Senior Policy Analyst at Department of Internal Affairs

Many thanks to Stacey and Emily for their contribution, both of whom leave the advisory group to join new roles next year.

I'd also like to welcome new advisory group members Rob Blakemore from Wellington Water, and Sue-Ellen Fenelon from Ministry for the Environment, who join the group to assist us with the development of the 2016/17 review.

John Pfahlert
Chief Executive
Water New Zealand

EXECUTIVE SUMMARY

The National Performance Review (NPR) is an annual benchmarking exercise of New Zealand's drinking water, wastewater, and stormwater service delivery. Data collected in the NPR underscores that, in addition to the essential role of supporting life and all sectors of the economy, the 3 Waters industry is a significant economic sector in its own right.

In 2015/16 NPR participants employed 2,045 staff, were responsible for the safe delivery of 231,350 Olympic pools worth of drinking water, the safe disposal of 183,315 Olympic pools worth of wastewater, and maintaining a stormwater network to prevent flooding of our homes and businesses that is over 17,000 km long. Participants collected $1.7 billion in revenue to operate and maintain these services, supported by assets with a total worth of $31 billion.

The NPR provides New Zealand's only ongoing collation of data on the performance of our 3 Waters services. Since 2007, New Zealand's water suppliers have voluntarily contributed data and finances to undertake the exercise. NPR benchmarks are used by participants and their service providers to identify opportunities to improve service delivery. The report also provides decision-makers and the public with a transparent picture of the sector's performance.

This year the NPR report not only includes quantitative data, but also case studies that highlight examples of good practice. These case studies provide a small glimpse of participants' work the behind the scenes, and aim to facilitate sharing of good practices – one of the key aims of the NPR.

The report groups performance indicators into areas of key importance in the delivery of 3 Waters assets. At its core. the water industry exists to protect public health and the environment, and this constitutes the first section of the report. Other elements of 3 Waters service addressed in subsequent sections are: customer focus, resilience, reliability, economic sustainability, and resource efficiency.

For detailed performance comparisons and trends, refer to the relevant sections of the report. A summary of some of the standout themes from this year's data set are presented here.

There has been an increase in the collection of customer-focused data

The percentage of participants providing reliable or highly reliable callout data rose from 59% in 2014/15 to 85% in 2015/16. Reporting of complaints data for drinking water, wastewater, and stormwater faults rose from 72% to 76% in the same period. Response, attendance times, and complaints data are a mandatory reporting requirement of the DIA Non-Financial Performance Measure Rules (Department of Internal Affairs, 2015). In 2015/16 local authorities were required to incorporate reporting against the rules in their annual reports for the first time. It is likely the rise is attributable (at least in part) to these rules.

The highest proportion of household income spent on 3 Waters services occurs amongst regions with the lowest average household incomes

The three regions with the highest proportion of household incomes spent on 3 Waters services are amongst the four regions with the lowest average household income. The collective bill for water, wastewater, and stormwater services were greater than three percent of the average household income in these areas. An additional four participants also had

3 Waters charges exceeding the three percent threshold, including the participant with the lowest average household income.

Cash flow related to 3 Waters assets is concentrated in the Auckland Region

In 2015/16 combined expenditure on 3 services in the Auckland region (at Auckland Council and Watercare) accounted for 45% of 3 Waters-related expenditure, and 38% of revenue, nationally. This proportion was slightly higher than the proportion of the New Zealand population living in Auckland which was 33% of the 2013 census night population count (Statistics New Zealand, 2013).

Condition grading approaches are too variable to make national comparisons of pipeline condition

Five different guidance documents were referred to for conducting pipeline gradings. These consisted of guidance material produced by IPWEA, Water New Zealand, and NAMS. Water New Zealand is currently working with IPWEA and the University of Canterbury Quake Centre to revise asset condition guidance material used for conducting pipeline inspections. A separate metadata (shared data) standards project led by LINZ has been undertaken to develop national standards for how we capture, describe, and store a range of data, including pipeline condition.

Flooding standards are generally consistent across New Zealand, but are not supported by consistent guidance to implement them

Eighteen of the 36 respondents who provided data on stormwater systems design their secondary stormwater networks (typically the overland flow paths) to have an annual exceedance probability of 1%, and a further 13 design for an exceedance probability of 2%. For primary networks (typically piped networks) 19 of the 36 respondents designed for exceedance probabilities of 10%, and 13 for 20%. However there is currently no consistent approach for modelling rainfall and runoff volumes. Water New Zealand is lobbying central government to support the development of national guidance, to reduce large differences in the interpretation of these design standards.

Climate change is generally given consideration in the management of 3 Water assets, but approaches vary significantly

Thirty-six of the 50 respondents provided some account of how climate change considerations had been factored into 3 Waters management. The approaches and reported changes accounted for were different for each participant. The only standardised guidance referred to was the "Climate Change Effects & Impacts in New Zealand - A Guidance Manual for Local Government in NZ" (May 2004).

Many wastewater treatment plants are operating on expired discharge consents

Forty-six out of 252 wastewater treatment plants (approximately one in five) included in the review were operating under expired consents. This figure has increased from the 2014-15 National Review (Water New Zealand, 2015) when 26 of 190 (approximately one in seven) of wastewater treatment plants were operating under expired consents.

The average number of dry weather wastewater overflows being recorded is increasing

In 2015/16, 1,209 dry weather overflows were reported. The median number of dry weather overflows per 10,000 properties increased from 5.1 in 2012/13 to 9.5 in 2015/16. Dry weather overflows result from power outages, equipment failures, or network blockages. Blockages can be caused by tree root intrusion or incorrect disposal of household items into the sewer. Anecdotally, wastewater operators report that many network blockages result from wet wipes being incorrectly disposed of into the sewer. Improved data reporting may also be a factor in the increase.

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1 INTRODUCTION

1.1 About the review

The National Performance Review (NPR) is an annual benchmarking exercise of drinking water, wastewater, and stormwater (the 3 Waters) provision in New Zealand.

Councils and Council-Controlled Organisations responsible for water service provision have voluntarily provided data and finances to produce the NPR since 2007-08, over which time participation has steadily increased. This year the NPR benchmarks data from 50 participants whose jurisdictions cover over 90% of New Zealand's population.

The NPR is undertaken by Water New Zealand, a national independent not-for-profit organisation representing water professionals and organisations throughout New Zealand.

Every year Water New Zealand collates data, produces this report, and co-ordinates workshops and webinars to facilitate continuous improvement initiatives based on reported benchmarks. Current activities and associated resources are updated on the project web page: www.waternz.org.nz/NationalPerformanceReview

1.1.1 Objectives

The exercise provides comparative performance information to:

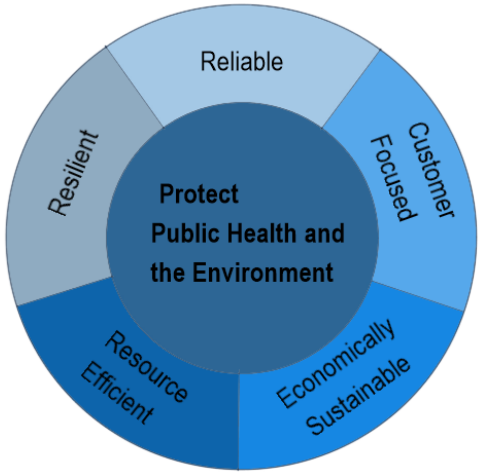
a) Assist 3 Waters service managers identify opportunities for improvement and fast track developments through the learning of others.
b) Provide transparent sector performance.
c) Reduce the number of requests for information to councils by making performance information readily available.

1.1.2 Information covered

The report aims to provide indicators that reflect the core elements of 3 Waters service provision shown in Figure 1.1-1.

This year our advisory group has introduced new indicators addressing staffing numbers, occupational health and safety, back up generation, climate change, and over allocation of drinking water supplies.

Figure 1.1-1: Aspects of 3 Waters service provision addressed by the NPR



The NPR aims to support, rather than duplicate, other public reporting on water. For this reason, neither the quality of drinking water nor freshwater bodies are included. For drinking water quality for all registered supplies, refer to the Annual Report on Drinking Water Quality (Ministry of Health, 2016). For reporting on freshwater, see the freshwater chapter of Environment Aotearoa 2015 (Ministry for the Environment, 2015).

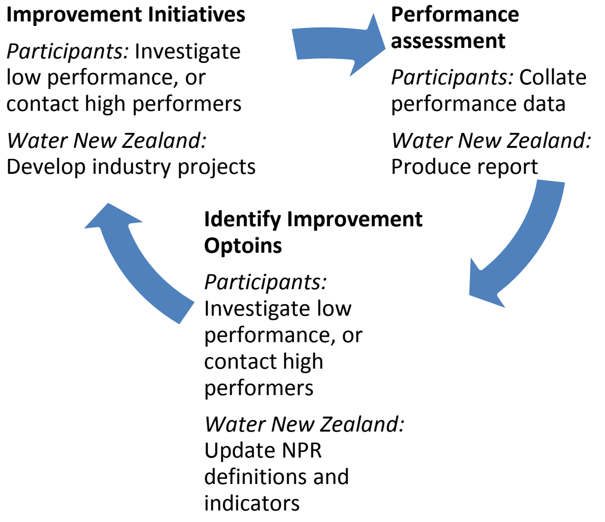
1.1.3 The performance review process

The NPR is an annual continuous improvement exercise that consists of three consecutive steps: performance assessment, identification of improvement opportunities, and improvement initiatives.

Water New Zealand facilitates a number of steps in the process, illustrated in Figure 1.1-2. Performance assessment and improvement identification activities are overseen by a project advisory group consisting of representatives from a cross-section of participating entities. Water New Zealand Special Interest Groups, Water Services Managers Group, and Water Utilities Association deliver industry-wide improvement initiatives.

Participants are encouraged to utilise the NPR to improve 3 Waters performance by undertaking activities, also illustrated in Figure 1.1-2.

Figure 1.1-2: Continuous Improvement Steps in the National Performance Review



1.2 Using data in the report

1.2.1 Accessing data online

Selected measures in this report are available in an online interactive web tool at the following link:
http://www.waternz.org.nz/NationalPerformanceReview

1.2.2 International comparisons

New Zealand data may be compared with international benchmarks using the World Banks IBNET (International Benchmarking Network) database. This data set includes over 1,400 utilities around the world. Data may be accessed online at:
https://database.ib-net.org/Default.aspx

FAQ's on the New Zealand data included on IBNET can be found at the following link: http://www.waternz.org.nz/NationalPerformanceReview

1.2.3 Data verification measures

Data in the report is manually entered by participants, who typically extract it from internal reporting systems. Systems in use are listed in Appendix III. Data provided to Water New Zealand then undergoes the following four step audit process:

1. Desktop review of selected measures
2. Onsite audits at 20% of participant sites
3. Participant review of reported values
4. Water New Zealand final check of outliers

Water New Zealand has contracted experienced asset management consultants from AECOM to conduct the first two steps in this process. Measures audited in this year's desktop reviews are shown in Appendix II: Audit questions. An audit report documenting audits and outcomes is available on the project website:
www.waternz.org.nz/NationalPerformanceReview

1.2.4 Data confidence

Participants have rated the confidence level of data they provided using a 5 to 1 descending scale, with 5 being very high confidence, and 1 being very low. The definition of each data confidence level is provided in Appendix I.

Where data confidence is low, highly variable, or showing a noteworthy trend, data confidence has been included in the report.

1.2.5 Data definitions

Definitions for each of the data collection points included in the review are available for download from the project webpage:
http://www.waternz.org.nz/NationalPerformanceReview

Cross references to the definition guidelines are provided in reported figures and tables. Indicator codes are delineated using square brackets. For example, the reference [WSB4] can be used to cross check the performance indicator for water serviced properties within the definition guidelines.

1.2.6 Interpreting figures

The majority of figures in the report relate to participants' water, wastewater, and stormwater systems. The figures in the report are colour coded based on the systems they refer to, using the key shown in Figure 1.2-1.

Figure 1.2-1: Colour coding used in report figures

Water   Wastewater   Stormwater

1.3 Coverage of the report

The report covers data for participants listed in Table 1.3-1. Unless stated otherwise, participants have reported 3 Waters data for the entire council jurisdiction.

Exceptions are:

- **Auckland Council:** provides stormwater services only
- **Buller District Council:** provided some data on its water and wastewater assets, but did not provide financial data or information for the stormwater system
- **Greater Wellington Regional Council:** provides bulk water services only
- **Kaipara District Council:** data for water supply schemes cover Dargaville and Baylys Beach only
- **Waimate District Council:** data for Waimate township only
- **Watercare: provides water and wastewater services only**

1.3.1 Participant classifications

Participants have been classified as small, medium, or large, based on the cumulative number of water and wastewater properties they service. The exception is Auckland Council which has been classified as large based on stormwater properties serviced (as Auckland Council does not provide drinking water and wastewater services).

Previous years' benchmarks classified participants based on the population in the jurisdiction, in alignment with Local Government New Zealand (LGNZ) sector groupings. The alternative classification system has been adopted as a result of feedback from participants with low water and wastewater coverage. These participants found the LGNZ sector groupings did not effectively pair them with councils providing similar-sized water and wastewater systems. For example, Southland has a population of 40,000 in the jurisdiction, but only 20,000 connected properties.

The cut off limits for small, medium, and large were determined using percentiles based on data available at the time of categorisation. These figures where then adjusted to provide classifications that more intuitively grouped similar-sized councils.

Table 1.3-1: Participants in the 2015-16 NPR classified by size[1]

Large Participants	Medium Participants		Small Participants
Auckland Council	Ashburton District Council	Taupo District Council	Buller District Council
Christchurch City Council	Far North District Council	Thames-Coromandel District Council	Central Otago District Council
Dunedin City Council	Hastings District Council	Timaru District Council	Gore District Council
Hamilton City Council	Horowhenua District Council	Waikato District Council	Grey District Council
Hutt City Council	Invercargill City Council	Waimakariri District Council	Hauraki District Council
Palmerston North City Council	Kapiti Coast District Council	Waipa District Council	Kaikoura District Council
Tauranga City Council	Marlborough District Council	Upper Hutt City Council	Kaipara District Council
Watercare	Nelson City Council	Western Bay District Council	Mackenzie District Council
Wellington City Council	New Plymouth District Council	Whakatane District Council	Ruapehu District Council
Greater Wellington Regional Council	Porirua City Council	Whangarei District Council	South Taranaki District Council
	Queenstown Lakes District Council		South Waikato District Council
	Rotorua District Council		South Wairarapa District Council
	Selwyn District Council		Southland District Council
	Tasman District Council		Stratford District Council
			Waimate District Council
			Wairoa District Council

[1] Watercare's figures are based on the number of accounts (not properties) in their service district

1.3.2 Value of assets covered by the report

Table 1.3-2 shows the closing book value of 3 Waters assets.

Table 1.3-2: Value of 3 Water assets covered by the report

Participant	Assets Value
Water treatment facility value at end of reporting year [WSF23a]	$1,941,646,363
Other water supply asset value [WSF23b]	$7,599,607,924
Wastewater facility value at end of reporting year [WWF24a]	$2,711,067,742
Other wastewater asset value [WWF24b]	$9,240,156,141
Stormwater asset value at end of reporting year [SWF20]	$9,564,752,900
Total 3 Waters asset value	***$31,057,231,070***

1.3.3 Quantity of assets covered by the report

Table 1.3-3: Assets under management

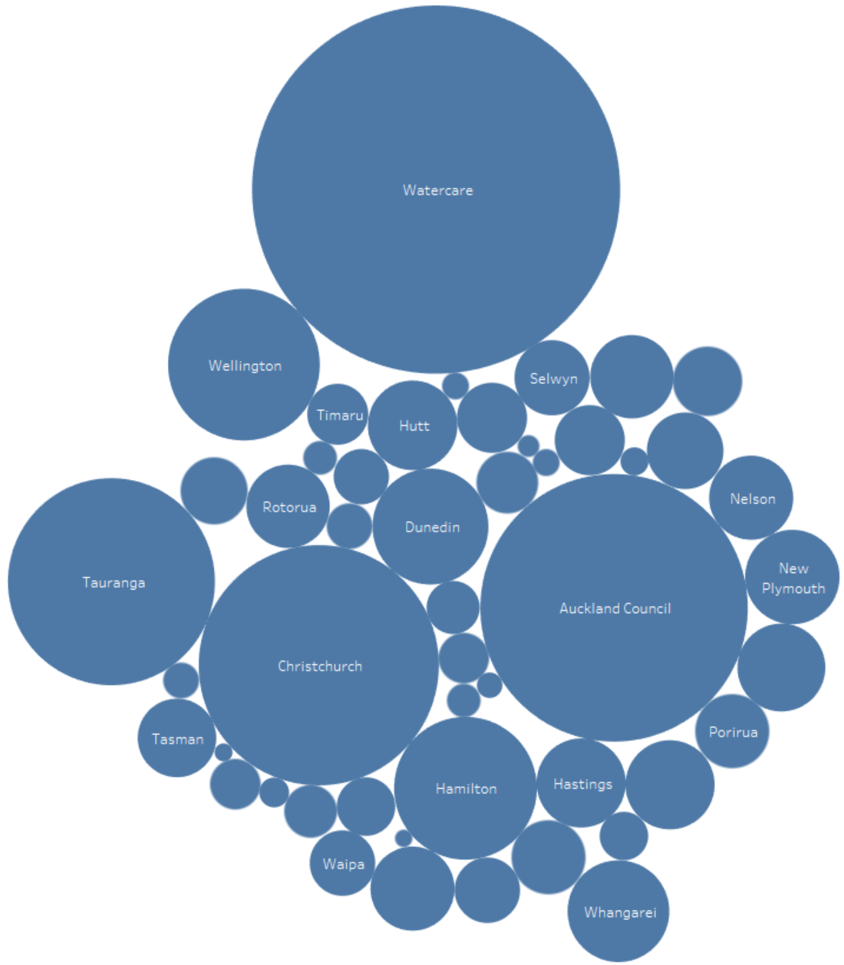
Participant	Total
Water Supply Assets	
Length of Water Supply Network [WSA1a] (km)	37,201
Water Treatment Plants [WSA4]	321
Water Pump Stations [WSA5]	868
Water Supply Reservoirs [WSA6]	1,581
Wastewater Assets	
Length of Public Wastewater Network [WWA1a] (km)	24,554
Wastewater Pump Stations [WWA5]	3,052
Wastewater Treatment Plants [WWA7]	205
Combined Wastewater and Stormwater Pipelines [WWA8] (km)	446
Stormwater Assets	
Length of Public Stormwater Network [SWA1a] (km)	17,136

Participants with combined stormwater and sewer pipelines are shown in Table 1.3-4.

Table 1.3-4: Total km of combined wastewater and stormwater pipelines [WWA8]

Gore	Grey	Wairoa	Watercare
153	17.1	76.58	199

Figure 1.3-1: Value of 3 Waters assets by participant



1.3.4 Sector staffing levels

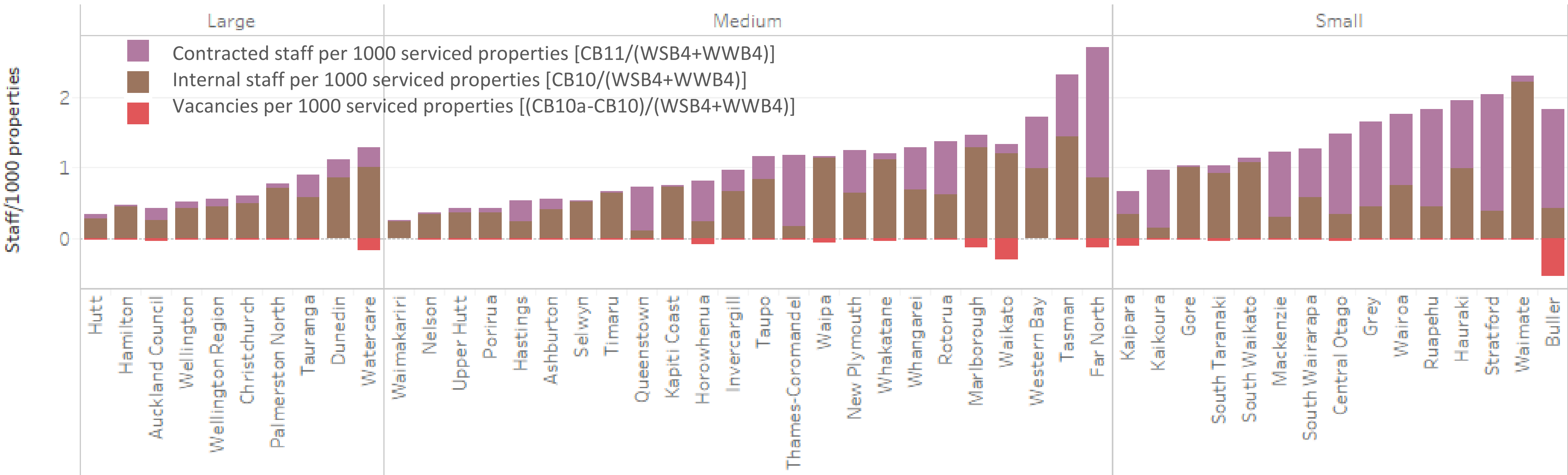
In 2015/16, participants employed a total of 2,045, had 289 staffing vacancies, and 857 staff were contracted into ongoing water sector roles, which in some instances will be filling vacant positions.

For comparative purposes, staffing levels in Figure 1.3-2 are normalised by the number of water- and wastewater-serviced properties, with the exception of Auckland Council figures which are normalised by stormwater properties serviced. This was a new measure introduced into the review in 2015/16. Further years' data collection may be required to ensure all participants consistently report contractor numbers.

In interpreting this figures it should be taken into account that:

- Hutt, Upper Hutt, Wellington, Porirua City, and Wellington Regional councils all have staff provided by Wellington Water
- It is likely that stormwater requires fewer staff per property (given lower average expenditure per property on stormwater systems), so the average number of internal staff for Auckland Council may be lower than others
- Staff numbers for back office or shared services functions (such as HR, finance, IT etc.) are only included if their involvement in 3 Waters services consumes greater than 50% of their time

Figure 1.3-2: Water industry internal employers, permanent contractors, and vacancies normalised by properties serviced



1.3.5 Population coverage

Benchmarks for water and wastewater coverage levels are derived using a combination of census and participant-supplied data. The total number of residential properties (CB3) is drawn from 2013 census figures for the total number of occupied and unoccupied dwellings[2] (Statistics New Zealand, 2016). The number of residential water-serviced properties is supplied from participant records[3].

Coverage levels are determined using the following formulae[4]:

$$Drinking\ Water\ Service\ Coverage = \frac{Water\ Serviced\ Properties: Residential\ [WSB2]}{Total\ occupied\ and\ unoccupied\ dwellings}$$

$$Wastewater\ Service\ Coverage = \frac{Wastewater\ Serviced\ Properties: Residential\ [WWB2]}{Total\ occupied\ and\ unoccupied\ dwellings}$$

No benchmarks are provided for stormwater coverage. This is because properties benefit from stormwater systems regardless of whether they are directly connected to a reticulated stormwater system. For example, properties with soakage pits often have stormwater systems used to drain flooding from access roads.

[2] Note: this figure differs to that supplied on participant data sheets. This figure was for occupied dwellings only. The figure has been retrospectively changed to provide a more accurate representation of regions with large proportions of holiday homes. Previous years' coverage levels were also based on occupied dwelling data.

[3]The number of properties listed in Queenstown as being connected to the wastewater system exceeds statistics New Zealand figures of the total dwellings. Queenstown determines wastewater connections based on rating database information. The total number of residential properties in Gore and Tauranga listed as being connected to the water system exceeds Statistics New Zealand figures of total dwellings. The exceedance in Tauranga is likely due to growth since the 2013 census.

[4]Watercare has provided the number of accounts with water services or wastewater services as a de-facto for serviced properties for each measure. The number of properties serviced by an account is not always apparent; for example, a multi-owned apartment block may have a single body-corp connection or, conversely, a single owned property may have multi tenancies each with their own separately-billed connection. The Watercare-provided values have been used in the standard formulae.

Figure 1.3-3: Drinking water service coverage

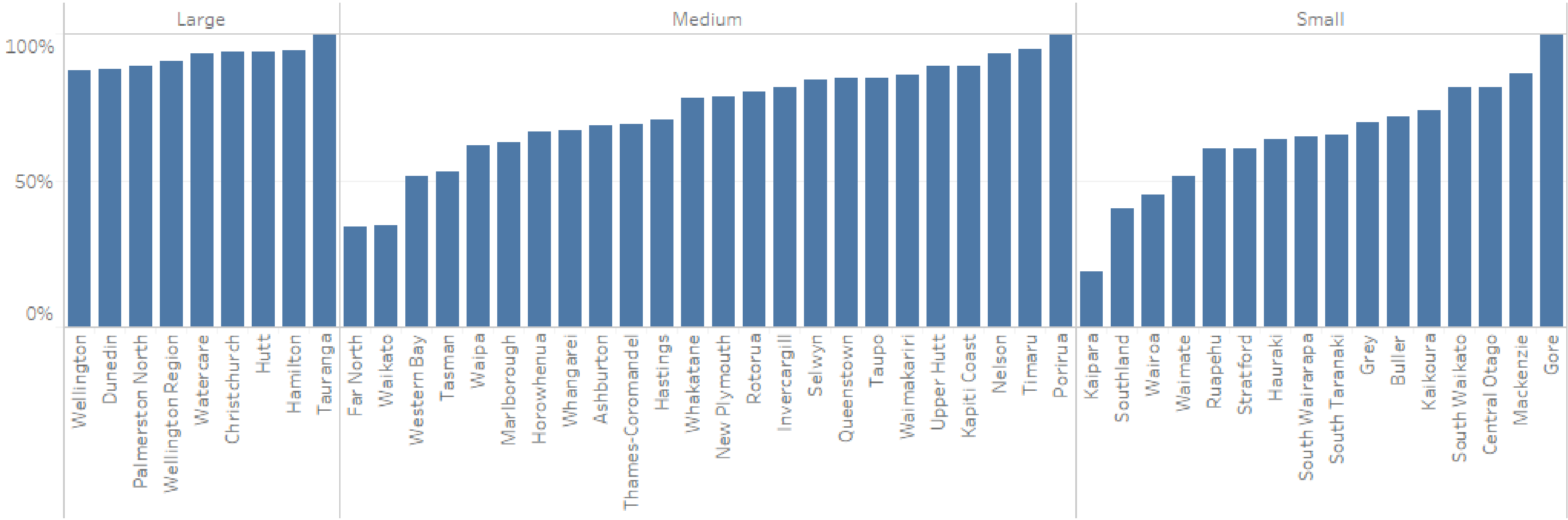
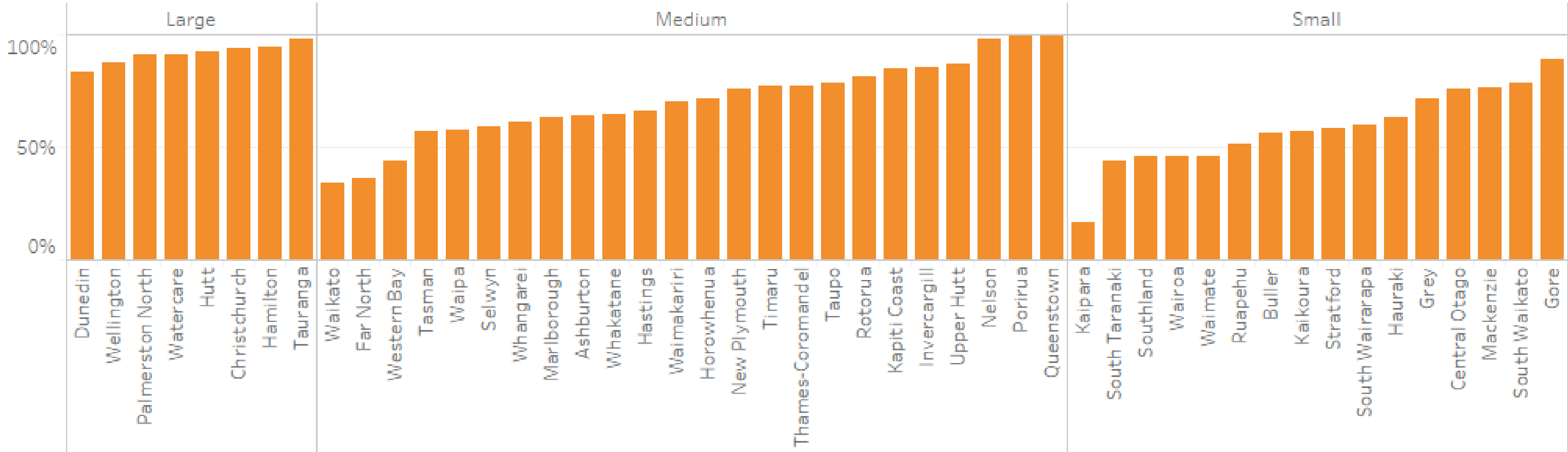


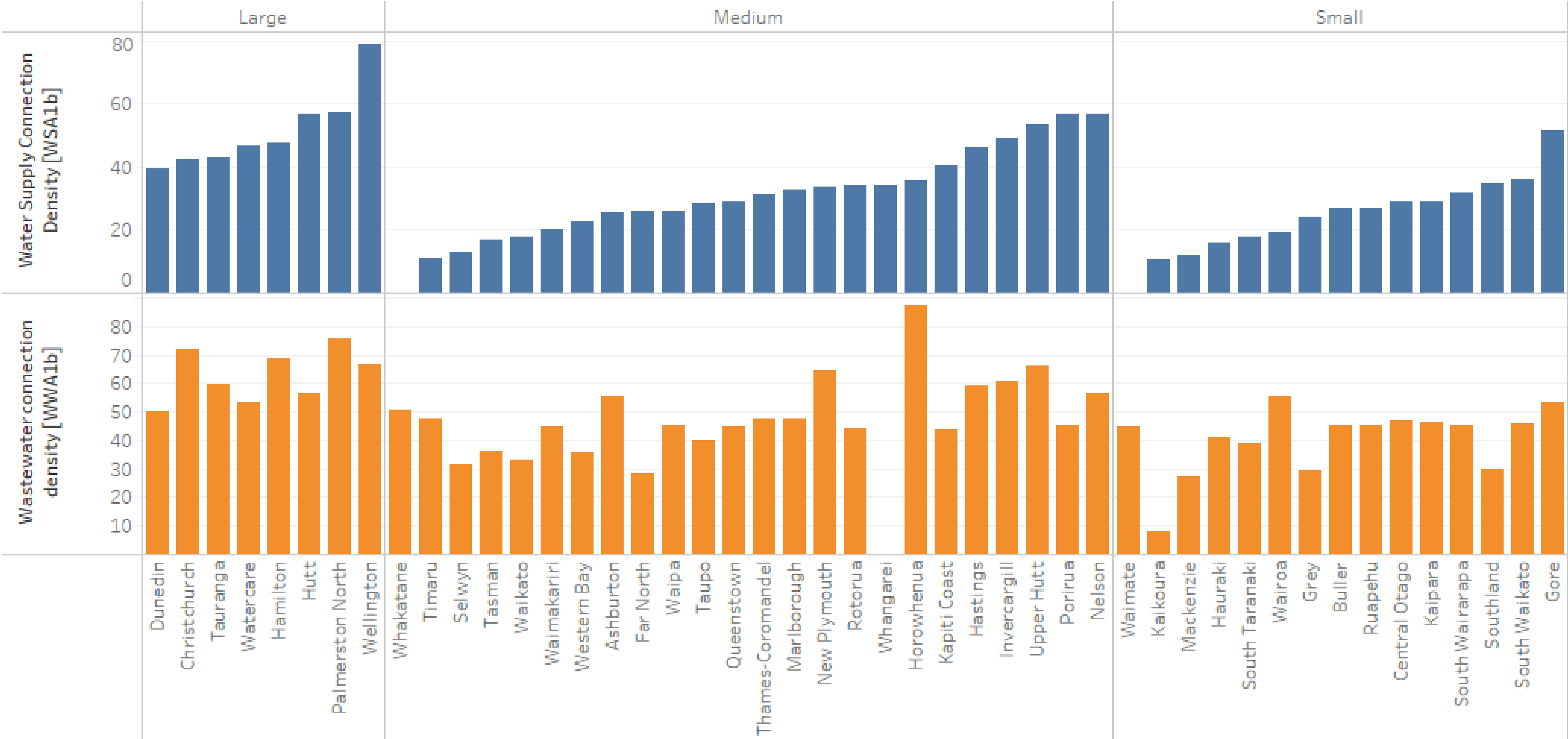
Figure 1.3-4: Wastewater service coverage



1.3.6 Connection density

Connection density has not been provided for properties connected to the stormwater network. This is because properties benefit from stormwater systems regardless of whether they are directly connected to a reticulated stormwater system.

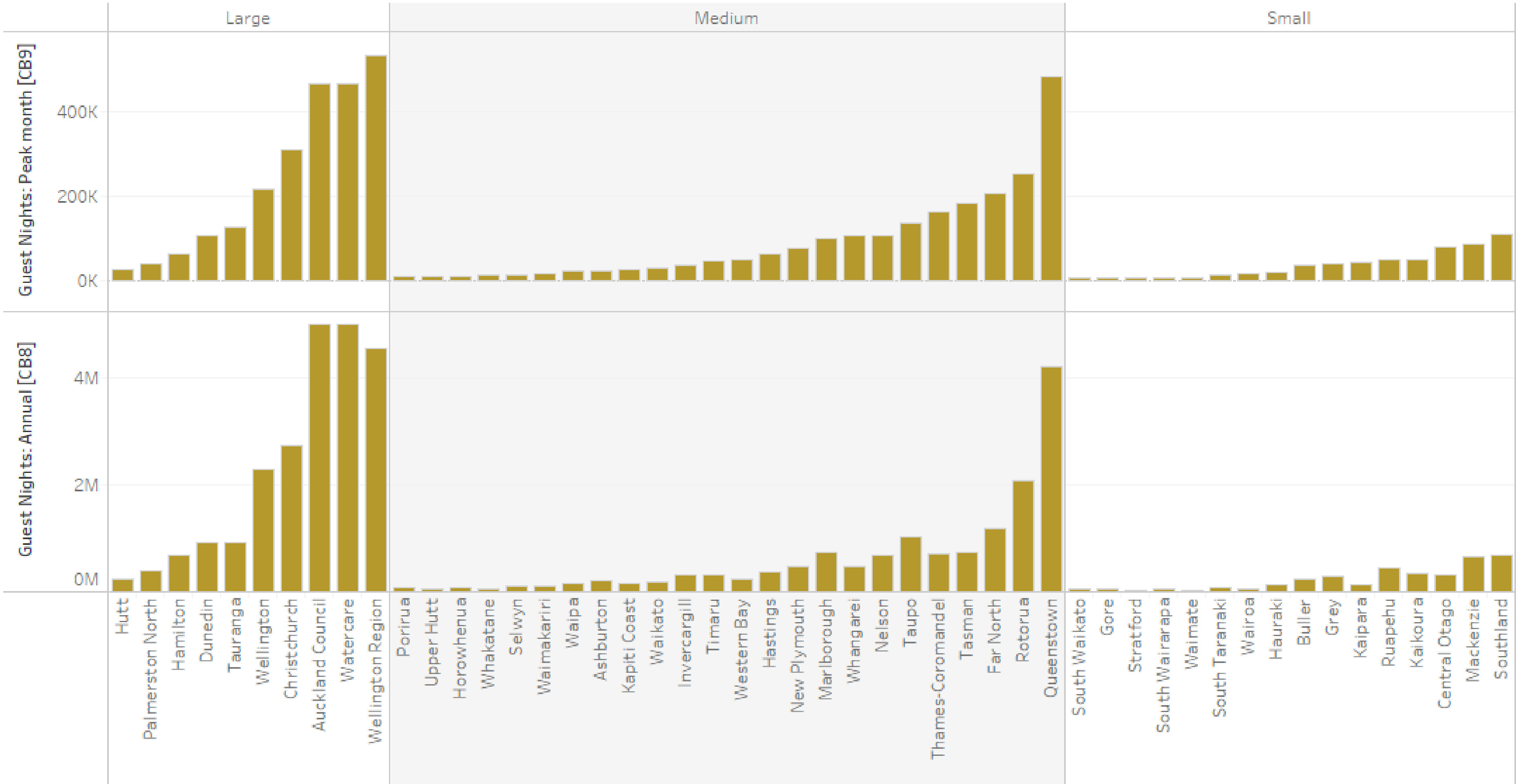
Figure 1.3-5: Water, wastewater, and service connection density (properties/km)



1.3.7 Tourist numbers

Tourist numbers are a driver of water and wastewater performance outcomes. Accordingly, information here is to be used to provide context for other measures in the report. Data for annual and peak guest nights has been sourced using 2015-16 data from the Statistics New Zealand Accommodation Survey (Statistics New Zealand, 2016).

Figure 1.3-6: Peak and average number of guest nights



2 PUBLIC HEALTH AND ENVIRONMENTAL PROTECTION

CASE STUDY: WAIROA DISTRICT COUNCIL
Wastewater treatment plant leads to enhanced river quality and community relationship

In 2012, the Whangawehi stream in northern Hawkes Bay had some challenging ecological problems. There were no riparian margins planted, stock from adjacent farms grazed in the stream, and the freshwater fisheries were depleted.

That all changed after the development of a new wastewater treatment plant in the stream catchment, along with a commitment by the Wairoa District Council to bring the community onside and work with landowners including local farmers, tangata whenua, and the Department of Conservation to enhance the quality of the awa.

The plan involved setting up the Whangawehi Catchment Management Group to help create a coherent management plan for the entire catchment, and then forming an incorporated society to ensure the objectives of the plan were met.

“We entered into a relationship with tangata whenua, which included not only a provision to monitor the quality of the water near the treatment plant, but also to enhance the awa,” says Wairoa District Council Engineering Manager, Jamie Cox.

This involved retiring farmland, and building fencing to keep stock out of the river along with planting 200,000 plants in riparian margins to create habitats for birdlife and help improve water quality.

“The council provided initial funding and expertise to facilitate the group coming together, and the result has been a win-win for everyone.”

He says the Whangawehi catchment is something that the community can be proud of, and it’s a model that can show just how water infrastructure development can be included in collaborative projects that benefit everyone.

Another positive spinoff is the improved relationship between the council and the community.

Key Observations

Many wastewater treatment plants are operating on expired discharge consents

Forty-six out of 252 wastewater treatment plants (approximately one in five) included in the review were operating under expired consents. This figure has increased from the 2014-15 National Review (Water New Zealand, 2015) when 26 of 190 (approximately one in seven) of wastewater treatment plants were operating under expired consents.

The majority of participants employ some form of stormwater treatment

Treatment devices in use include gross pollutant traps, vegetative filters, bio-filtration, rain gardens, infiltration and filtration, rainwater detention/retention tanks, wetlands, and water quality ponds. Only six participants did not have any of the aforementioned devices as part of their stormwater networks.

The average number of dry weather wastewater overflows being recorded is increasing

In 2015/16, 1,209 dry weather overflows were reported. The median number of dry weather overflows per 10,000 properties increased from 5.1 in 2012/13 to 9.5 in 2015/16. Dry weather overflows result from power outages, equipment failures, or network blockages. Blockages can be caused by tree root intrusion or incorrect disposal of household items into the sewer. Anecdotally, wastewater operators report that many network blockages result from wipes incorrectly disposed of into the sewer. Improved data reporting may also be a factor in the increase. Mandatory reporting of dry weather overflows is a requirement of the DIA non-financial performance measure rules which became mandatory in 2015/16.

25 participants had no record, or recorded no near-miss health and safety events occurring in their 3 Waters operations

This suggests there is room to improve health and safety reporting in the sector. Recommended reporting measures and health and safety systems will be included in an update to the National Guideline for Occupational Health and Safety in the NZ Water Industry (Sinclair Knight Merz Limited, 2001). The revised guide will be published on the Water New Zealand website in 2017.

Only nine wastewater discharge, and no stormwater discharge, non-compliances were measured by DIA indicators

This indicates that the threshold for measuring compliance obligations in the DIA non-financial performance measure rules is high. Some councils report on non-compliance with individual consent conditions to regional bodies. The absence of stormwater consent non-compliances additionally suggests that monitoring of such consents is more lax than wastewater discharge consents. In addition, not all stormwater discharges are consented.

2.1 Wastewater treatment plants

Information collected through the National Performance Review is used to populate New Zealand's Wastewater Treatment Plant Inventory. The Inventory records data on locations, consents, treatment levels, and volume of 252 of New Zealand's publicly-owned wastewater treatment plants. This section of the report provides a summary of data included in the Inventory. The full set of data is available online at: http://www.waternz.org.nz/WWTPInventory

Figure 2.1-1: Wastewater discharged to receiving environments by treatment level

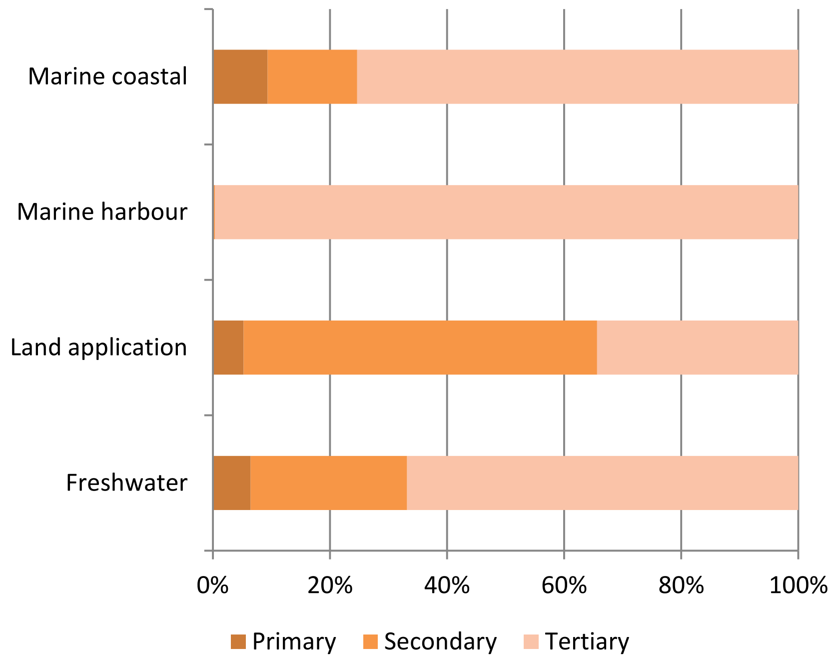


Figure 2.1-2: Wastewater treatment plant receiving environment by volume (m^3)

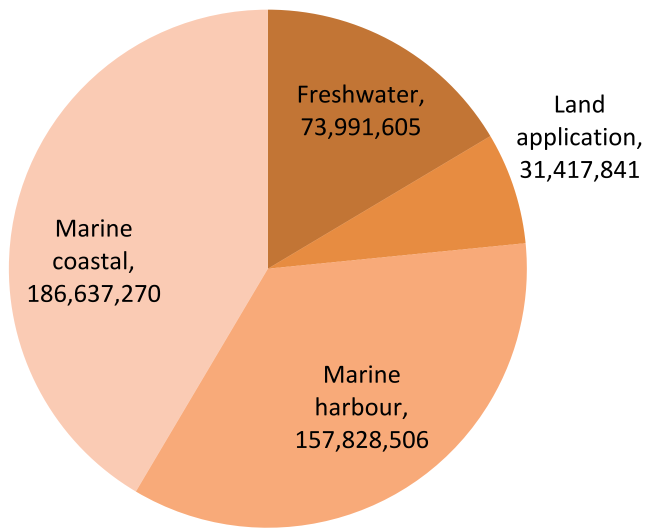


Figure 2.1-3: Wastewater effluent discharge consent expiry dates

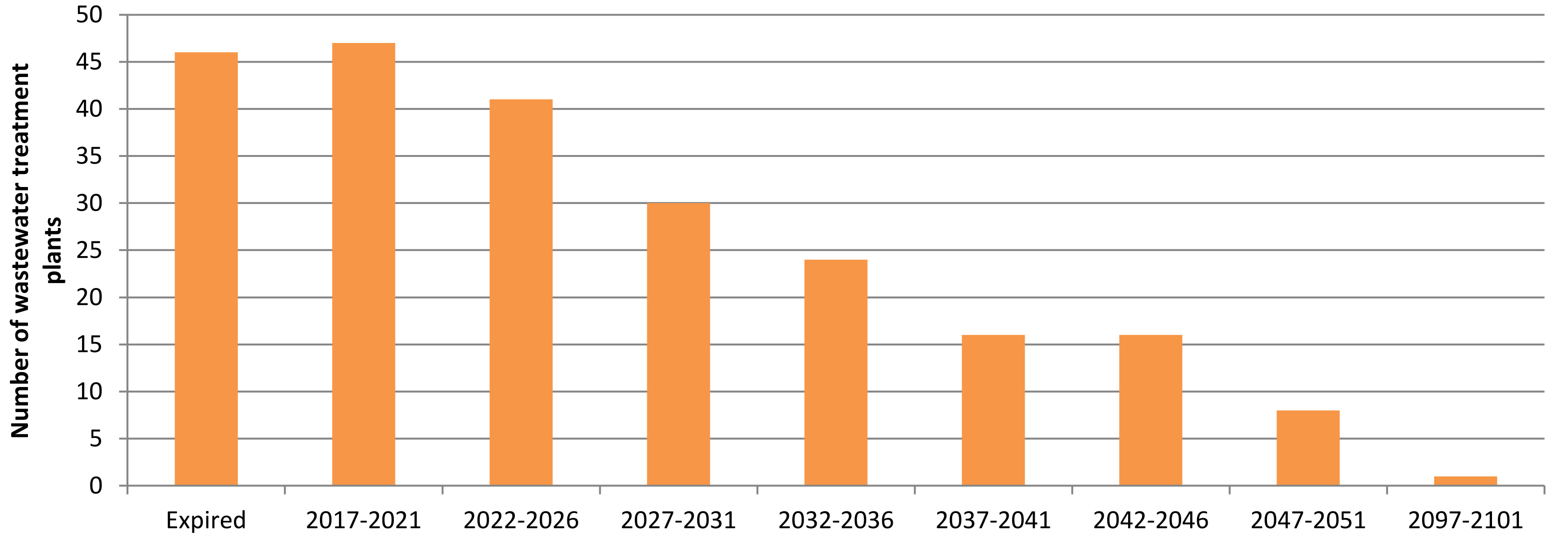
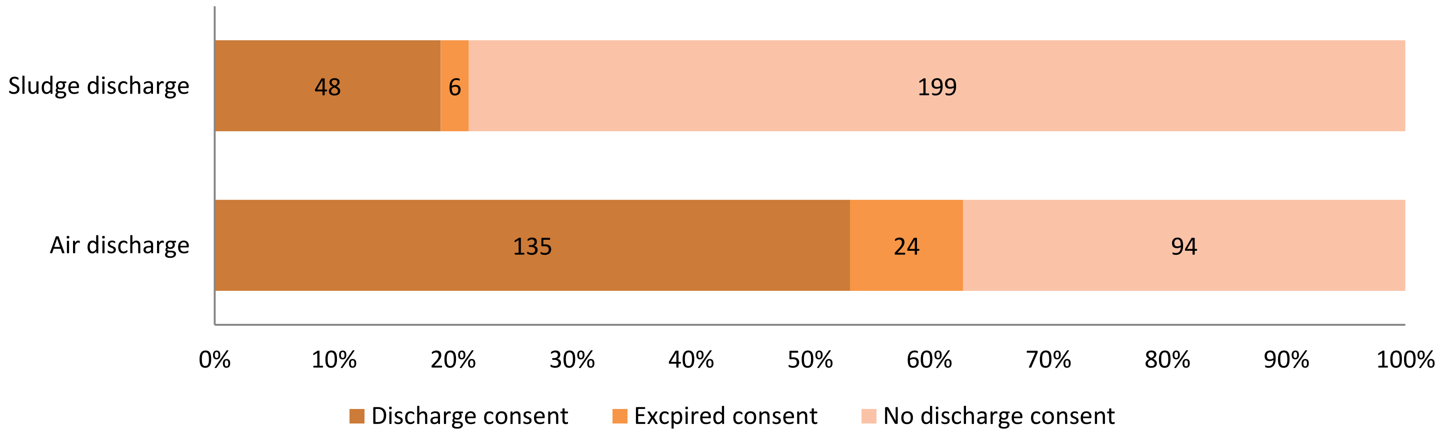


Figure 2.1-4: Discharge consent requirements for air and sludge from wastewater treatment plants



2.2 Consent non-compliance

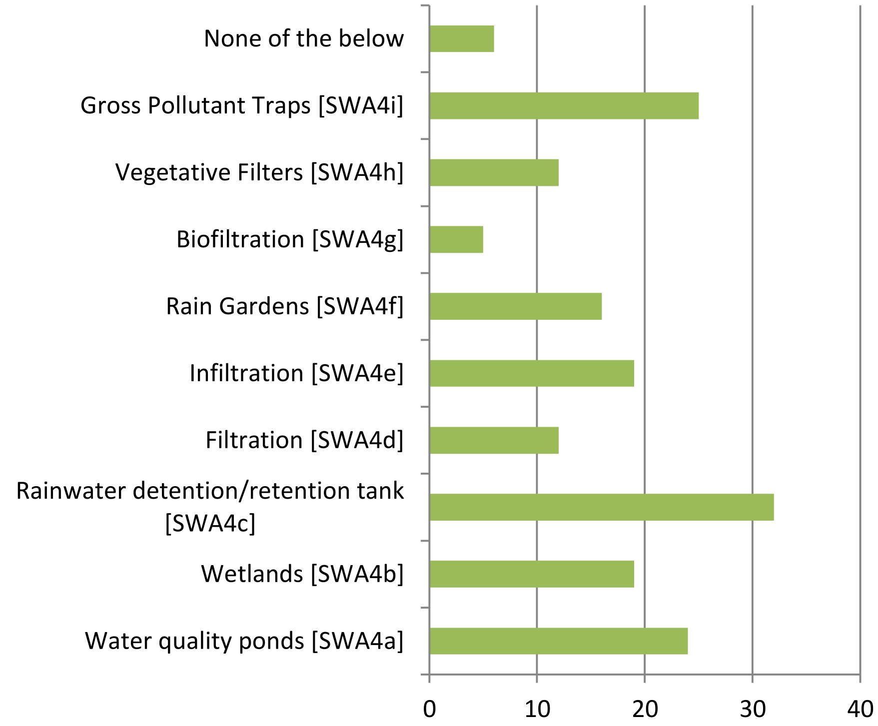
This question is aligned with the DIA Non-financial Performance Measure Rules (Department of Internal Affairs, 2015) performance indicators.

Table 2.2-1: Compliance with resource consents for wastewater and stormwater systems

Non-compliance with Discharge Consents	Total
Wastewater:	
abatement notices [WWE4a]	7
infringement notices [WWE4b]	2
enforcement orders [WWE4c]	0
successful prosecutions [WWE4d]	0
Stormwater:	
abatement notices [SWE1a]	0
infringement notices [SWE1b]	0
enforcement orders [SWE1c]	0
successful prosecutions [SWE1d]	0

2.3 Stormwater treatment

Figure 2.3-1: Number of authorities using various stormwater treatment devices



2.4 Overflows

An overflow is when untreated sewage spills, surcharges, discharges, or otherwise escapes from the wastewater network into the external environment. Wet weather overflows include both contained and uncontained spills from pump stations, pipes, manholes, and designed overflow structures, that occur as a result of wet weather events. Wet weather overflows typically result from excessive stormwater infiltration and may be permitted by network discharge consents. Dry weather overflows result from events such as blockages or extended power outages, and may occur at pump stations, manholes, etc.

Figure 2.4-2 shows both wet and dry weather overflows for councils that recorded data. In 2015/16, 438 wet weather overflows and 1,209 dry weather overflows occurred at participant networks. These figures include Whakatane, Nelson, Palmerston North, and Rotorua, which were able to supply data for dry weather overflows but not wet weather overflows. Watercare recorded dry weather overflows on its bulk transmission and local networks, but wet weather overflows on its bulk transmission network only.

Figure 2.4-1 shows changes in the median number of wet and dry weather spills recorded across all participants over time.

Figure 2.4-1: Changes in the median number of wet and dry weather overflows

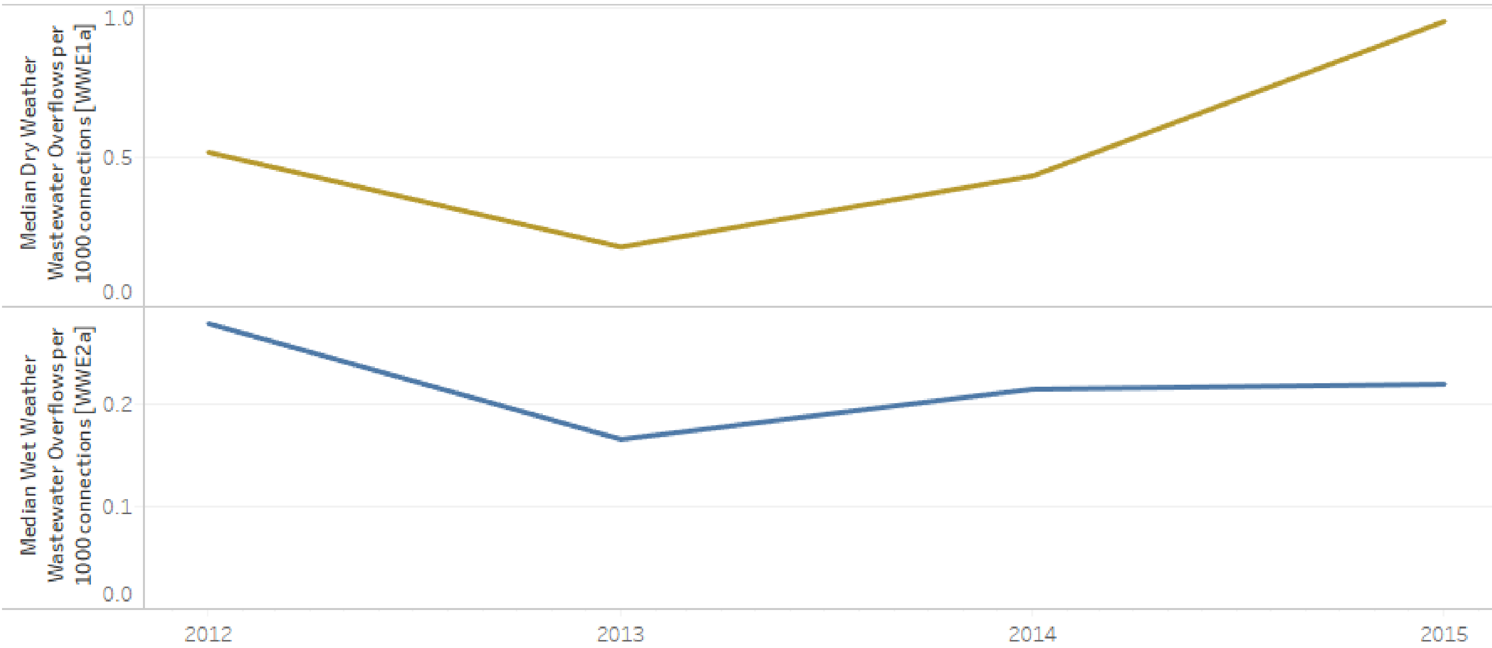


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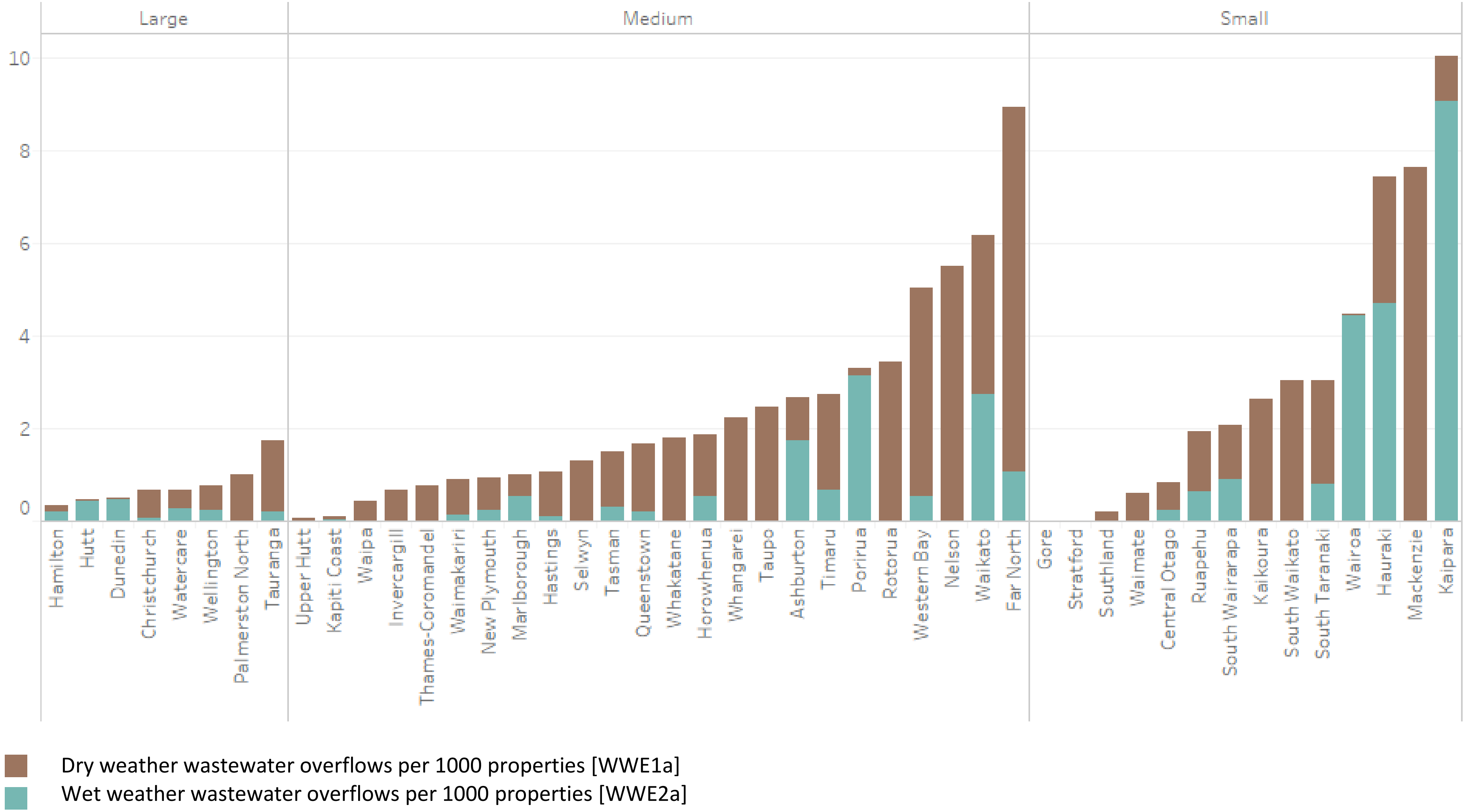
Figure 2.4-2: Wet and dry weather overflows per 1000 properties[5]



[5] Whakatane recorded only dry weather, not wet weather overflows. Nelson and Rotorua were unable to distinguish between dry and wet weather overflows. Buller, Grey, and Hastings did not provide a record of data.

2.5 Staff health and safety

A total of 1,330 near misses and 155 days of lost time injuries were reported in this year's review. Buller, Nelson, and Rotorua provided no record of near misses or lost time injuries. The following councils reported no lost time injuries or near miss incidents: Ashburton, Gore, Horowhenua, Kaikoura, Mackenzie, Marlborough, Southland, Stratford, Waimate, and Wairoa District Councils, and Palmerston North City Council.

Figure 2.5-1: Days of lost time injuries per staff member (internal and contracted)

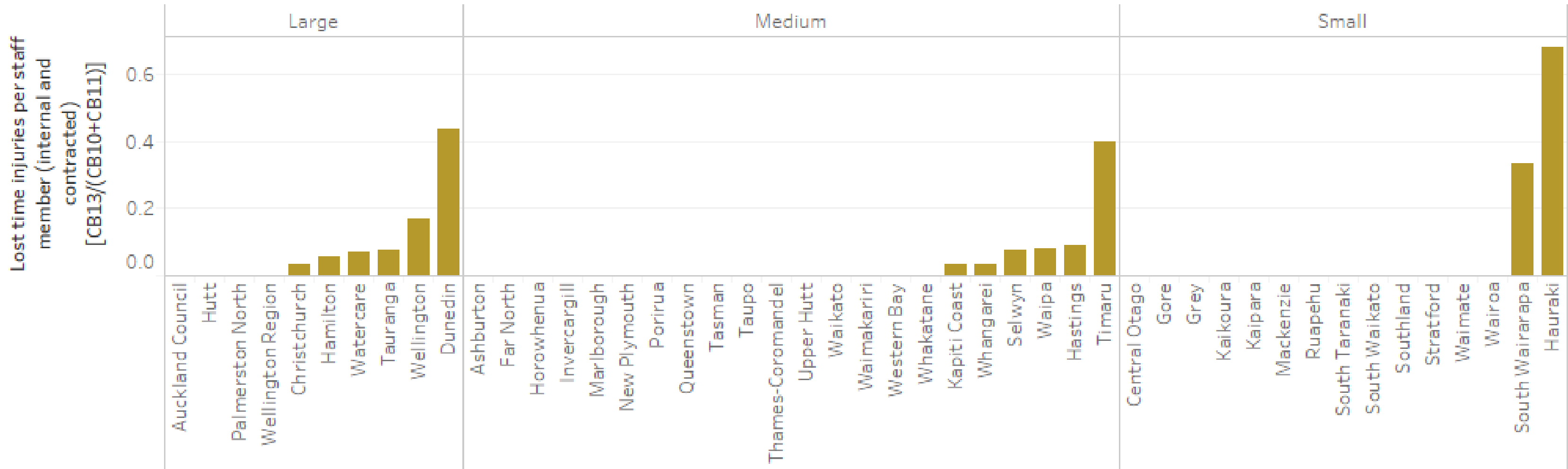
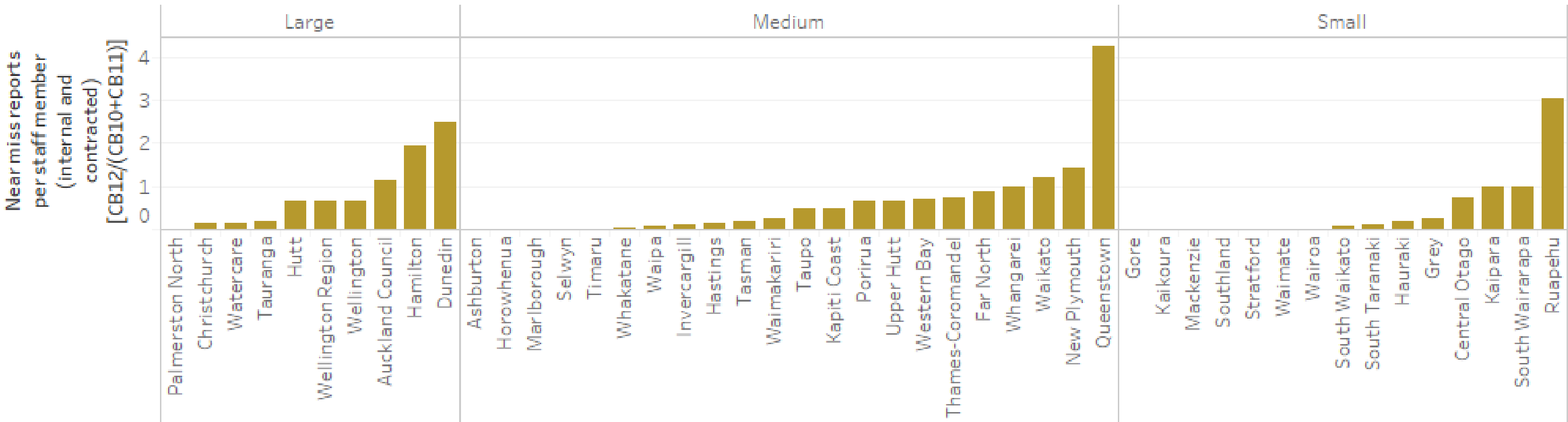


Figure 2.5-2: Number of near miss reports filed per staff member (internal and contracted)



3 CUSTOMER FOCUS

CASE STUDY: WAIKATO DISTRICT COUNCIL
Putting the customer back into the heart of business

A journey to firmly embed a customer-centric philosophy in everything it does has already started to pay dividends for the Waikato District Council. There has been a big improvement in response times and, as a result, customer satisfaction.

As part of the philosophy, the Council set itself a challenge to have the "most engaged community in New Zealand by 2020". It is an ambitious target, especially on the back of findings in 2013 that the Council wasn't meeting customers' needs in terms of response times, nor working quickly enough over community concerns.

General Manager, Service Delivery, Tim Harty says the first stage of the plan was to empower frontline staff so they could answer questions, and customers didn't feel they were getting the run-around.

To achieve this, there was a need for better information-sharing between technical and frontline staff though means such as ensuring the "knowledge tree" was well updated about issues. "We streamlined the online process and reduced the levels of bureaucracy, reducing the number of categories for service agreements from around 200 categories to 20. "

The streamlined process also meant changing the way the council worked with contractors. "For instance, when a call comes in about a leaky toby, the information will now be directed straight to our contractors for action, rather than delaying the process as we had in the past by one of our staff turning up to inspect the toby first." Other initiatives include electronic logging for requests for service.

The results have been positive. Feedback is showing an increase in customer satisfaction, and surveys show improved metrics around questions like how easy it is to do business with the Council. Tim Harty acknowledges this has been a big mind-set change for the Council, but one that was needed because "without customers, we don't exist – there's no other reason for this business".

The change at Waikato is an exemplar of a broader trend in this year's National Performance Review, which shows a growing number of participants keeping track of data focused on their customers, such as response times and complaints.

Key Observations

There has been an increase in the collection of customer-focused data

The percentage of participants providing reliable or highly reliable response and attendance time data rose from 59% in 2014/15 to 85% in 2015/16. The percentage of customers providing complaints data associated with different drinking water, wastewater, and stormwater faults rose from 72% to 76% in the same period. The percentage of participants not providing data fell from 28% to 14% across response data metrics, and from 13% to 10% for complaint metrics.

Reporting of response, attendance times, and complaints data is a mandatory requirement of the *DIA Non-Financial Performance Measure Rules* (Department of Internal Affairs, 2015). Local authorities were required to incorporate the performance measures in their 2015/2016 annual reports for the first time. It is likely the rise is attributable (at least in part) to the introduction of the rules.

There is a large variation in charging approaches for 3 Waters services

There are a number of charging mechanisms that vary across regions and within districts. Mechanisms for volumetric schemes include free water allowances, and ascending and descending charges. Fixed price charges can vary based on property type, value, or scheme. This has the following impacts:

- It is difficult to make accurate price comparisons between councils, and sometimes within districts
- There is an opportunity for participants to share experiences around the effectiveness of different charge types

The highest proportion of income spent on 3 Waters services occurs amongst regions with the lowest incomes

The three regions with the highest proportion of household incomes spent on 3 Waters services are amongst the four regions with the lowest average household income. The collective bill for water, wastewater, and stormwater services were greater than three percent of the average household income in these areas. An additional four participants also had 3 Waters charges exceeding the three percent threshold, including the participant with the lowest average household income.

3.1 Response Times

Reporting of response and attendance times benchmarked in this section is a mandatory requirement of the *DIA Non-Financial Performance Measure Rules* (Department of Internal Affairs, 2015). The rules came into force on 30 July 2014. Local authorities were required to incorporate the performance measures in the development of their new 2015-2025 long-term plans, and report against the measures for the first time in the 2015/2016 annual reports.

In addition to raw data, the National Performance Review collects the confidence participants have in supplied data (refer to *Section 1.2.4 Data confidence*). A marked increase of the data confidence of response data shows that the quality of response-recording data has improved markedly since the 2014/15 reporting period.

Figure 3.1-1: Changes in data confidence for network response (attendance and resolution times)

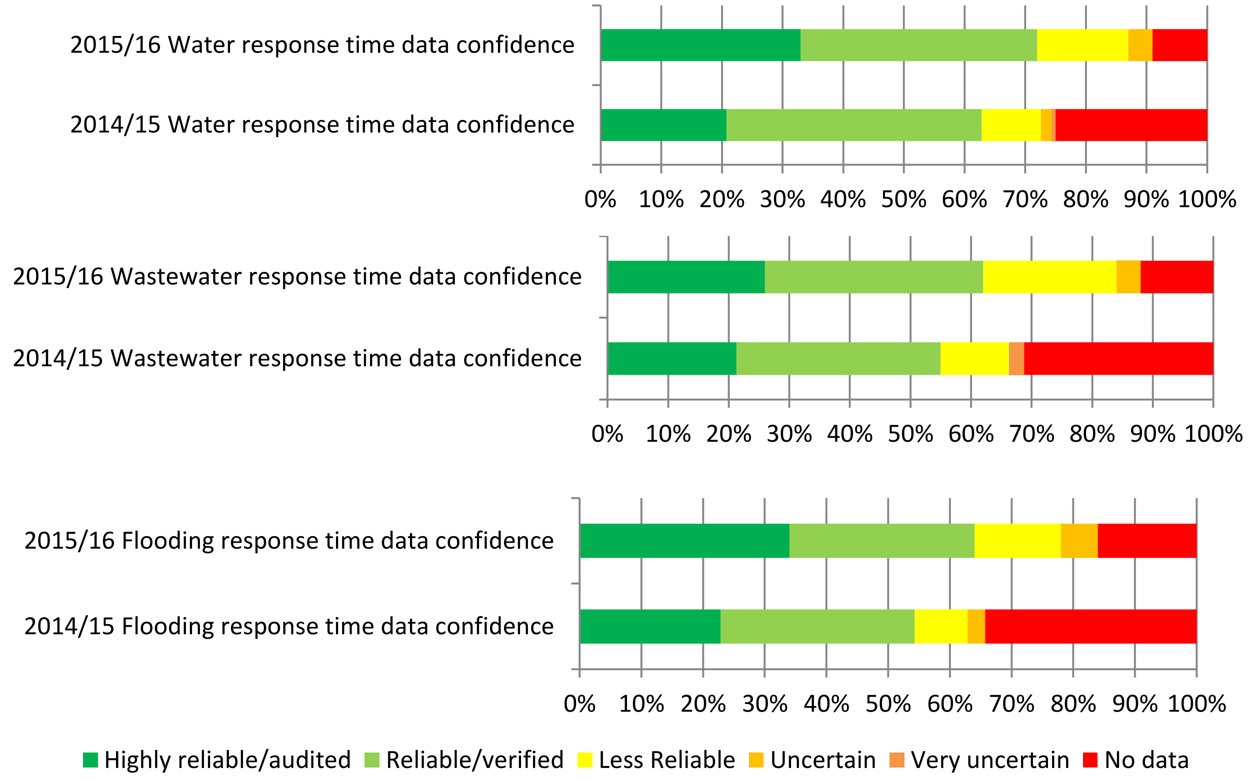
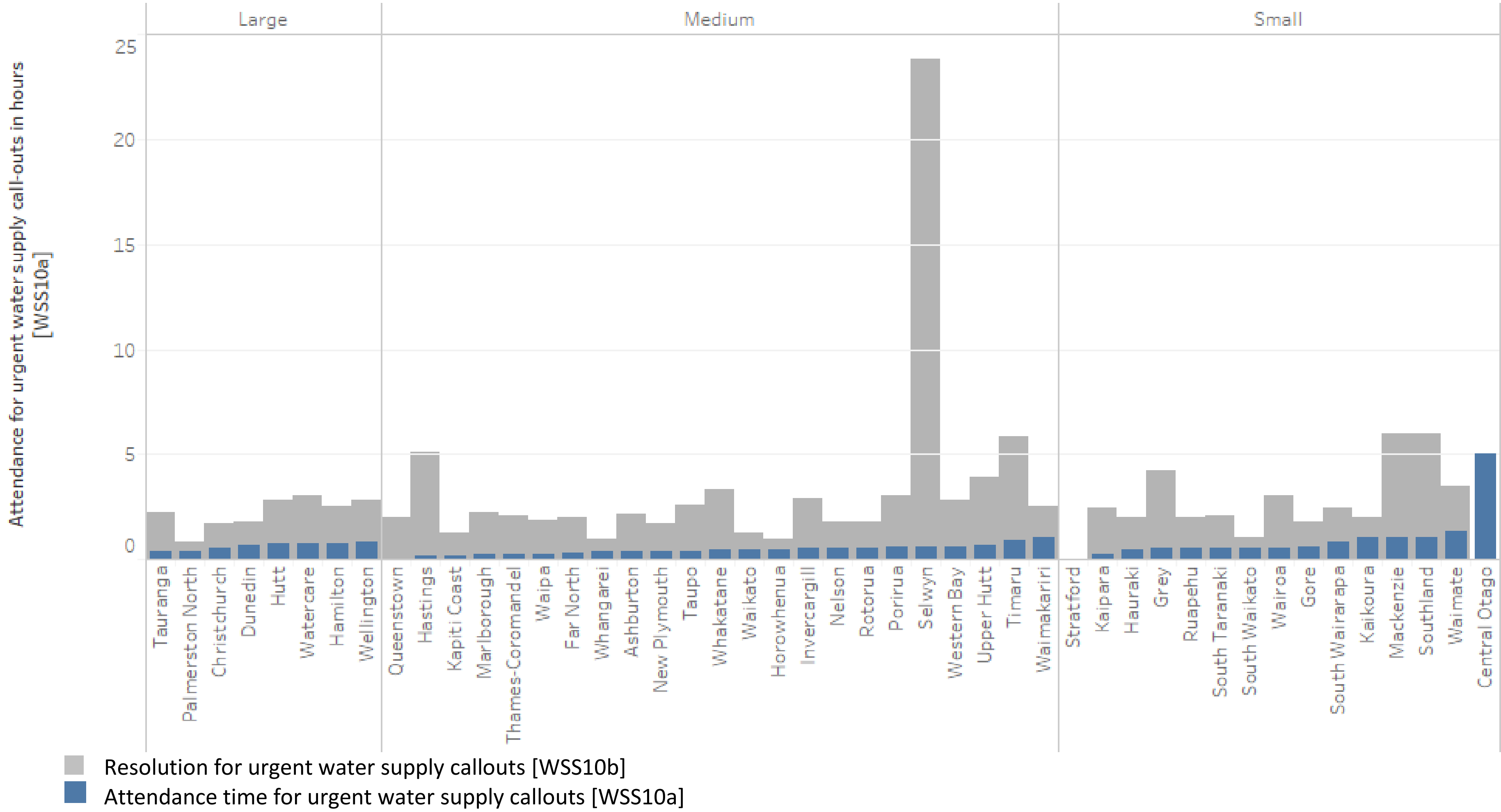
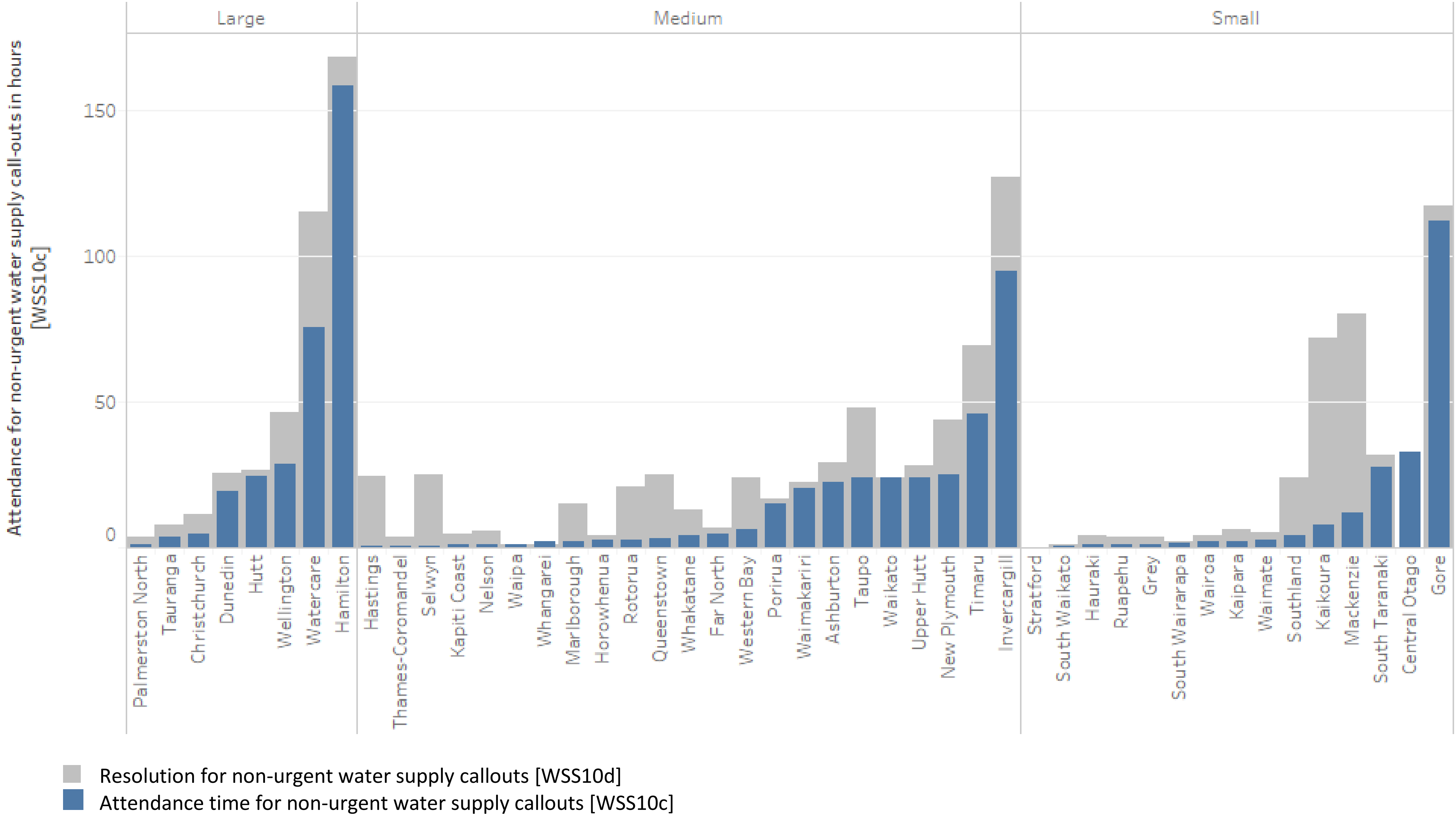


Figure 3.1-2: Median attendance and resolution times for urgent call-outs to water supply system faults in hours[6]



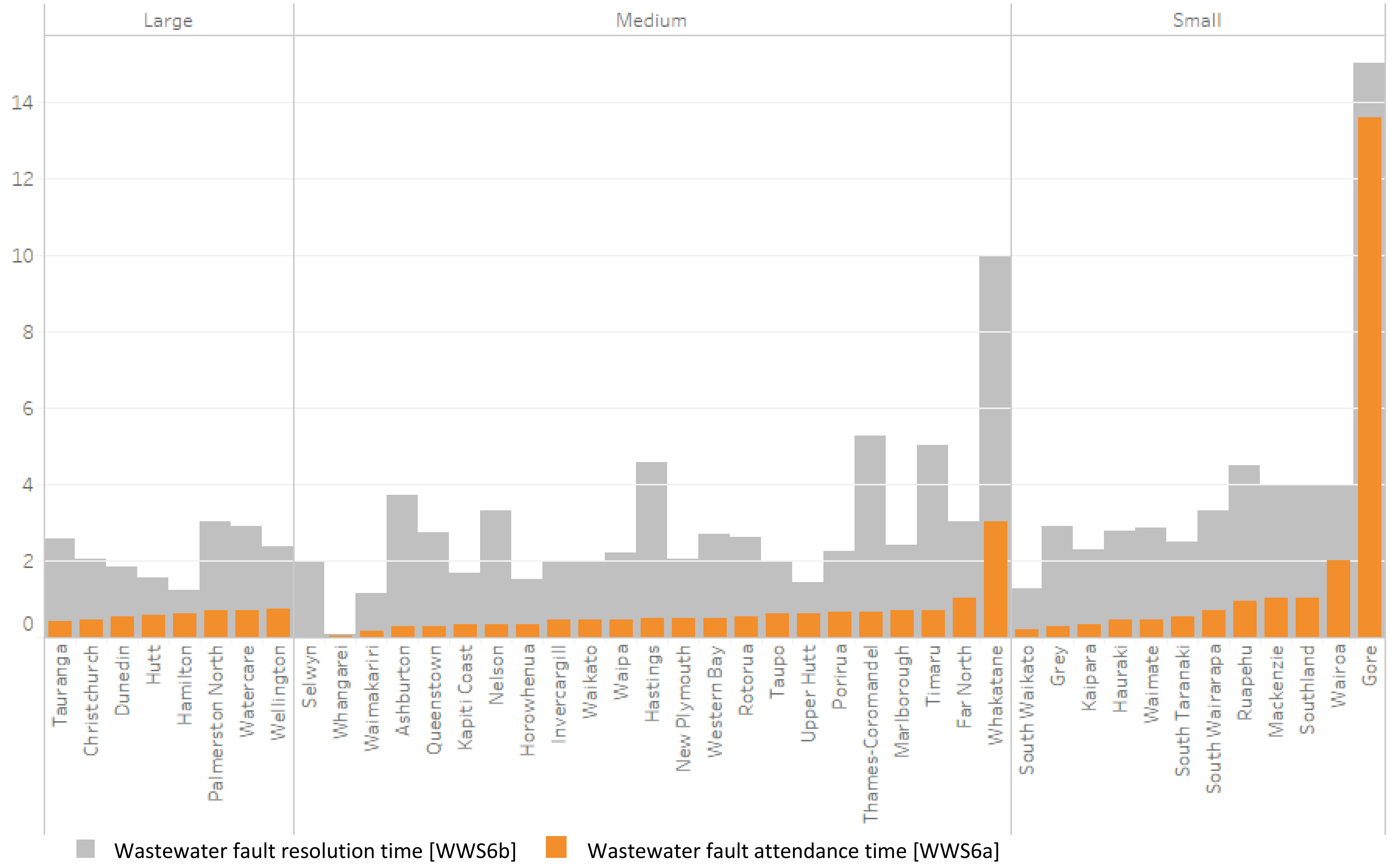
[6] The Greater Wellington Regional Council did not have any urgent water supply call-outs in 2015-16. Buller, Stratford, and Tasman did not provide response time data. Tasman noted it was developing a system to record response times. Central Otago did not provide resolution times. Whakatane did not provide non-urgent resolution times.

Figure 3.1-3: Median attendance and resolution times for non-urgent call-outs to water supply system faults in hours[7]



[7] Buller, Central Otago, and Kaikoura did not provide data on wastewater fault attendance and resolution times.

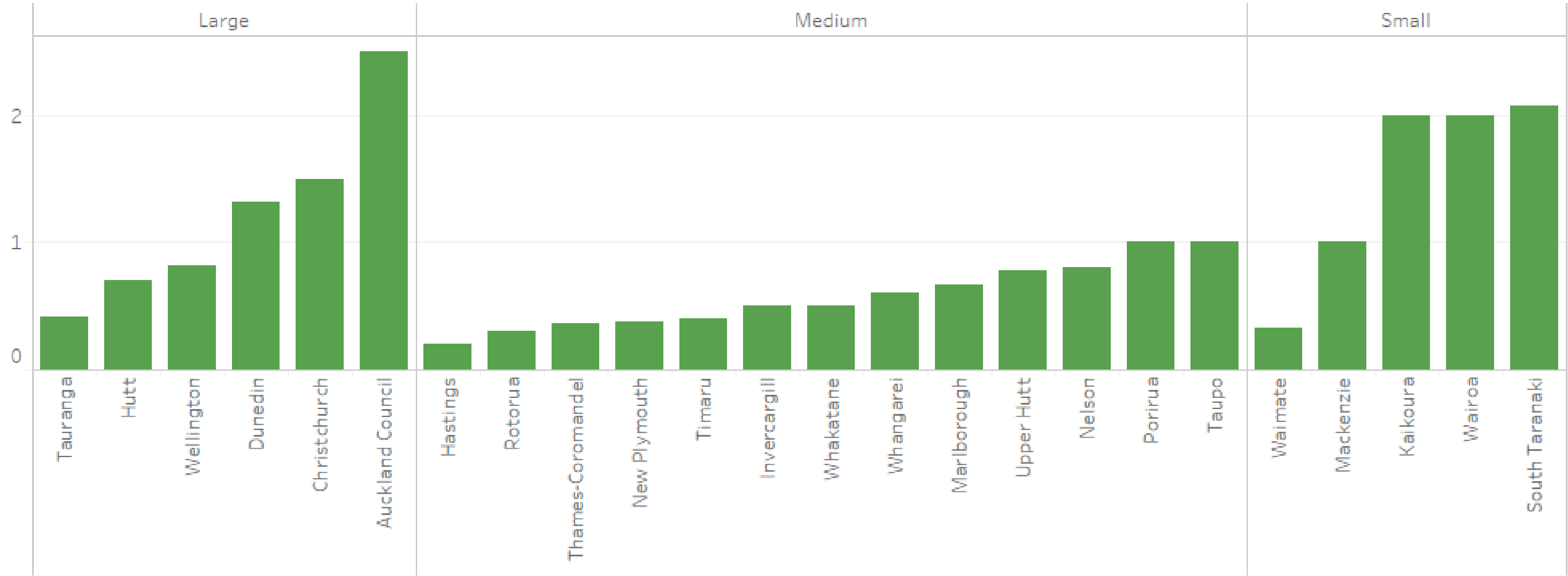
Figure 3.1-4: Median attendance and resolution times for call-outs to wastewater faults in hours



Hauraki and Kapiti were both outliers, and so have been excluded from Figure 3.1-5. Hauraki's response time was 140 hours. This related to a single "flooded habitable floor" event, where a basement of an uninhabited house was flooded due to a blocked stormwater outlet late on a Friday afternoon. The fire service attended and pumped out the basement. Council staff determined there was no urgent need to attend and sent a suitably qualified representative to the site after the weekend. The other outlier, Kapiti, recorded flooding response times for urgent and non-urgent call-outs separately. Response times were 24 hours and 48 hours respectively.

The definition provided for a flooding event follows that outlined in the *DIA Non-financial Performance Measure Rules* (Department of Internal Affairs, 2015). It measures responses to situations where water from a stormwater affects habitable floors. One participant noted they had experienced many instances of flooding to transport corridors and public spaces that had not impacted on habitable floors. This is likely the case for a number of other participants who recorded 0 or null data values against this performance measure. Participants who listed their response time as 0 hours were Ashburton, Far North, Hamilton, Kaipara, Queenstown, Ruapehu, Selwyn, South Waikato, Stratford, Waipa, Western Bay, Waikato, and Waimakariri District Councils.

Figure 3.1-5: Median response time for call-outs to flooding events in hours



3.2 Complaints

Individual councils' performance in relation to complaints is not provided here, as complaints benchmarks can be misleading. High numbers of complaints may indicate a positive complaints reporting culture, while a low number may indicate poor complaints recording systems. Instead, this section shows the range of complaints numbers across all participants, as shown using the box and whisker plots in Figure 3.2-2 to Figure 3.2-4.

A general positive trend is evident in the number of participants reporting complaints data using segregations outlined in the *DIA Non-financial Performance Measure Rules* **(Department of Internal Affairs, 2015)**. Data rated as high or very high confidence across all complaint categories in 2015/16 has increased to 76%, from 72% in the 2014/15 NPR **(Water New Zealand, 2015)**. Data confidence collated for each system is shown in Figure 3.2-1.

Figure 3.2-1: Changes in data confidence for complaints data

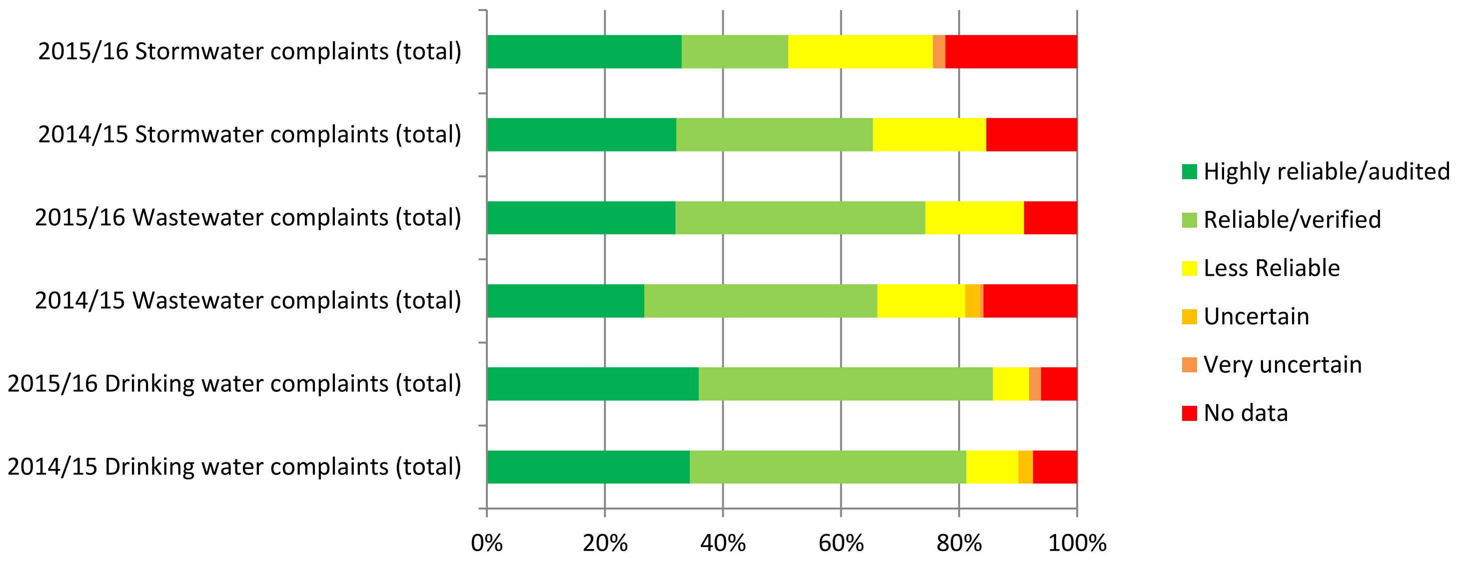


Figure 3.2-2: Stormwater complaints per 1000 properties

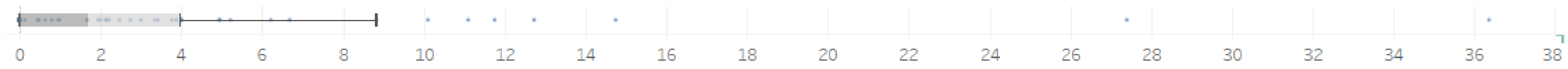


Figure 3.2-3: Wastewater complaints per 1000 properties

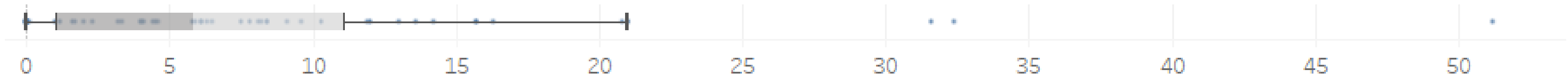
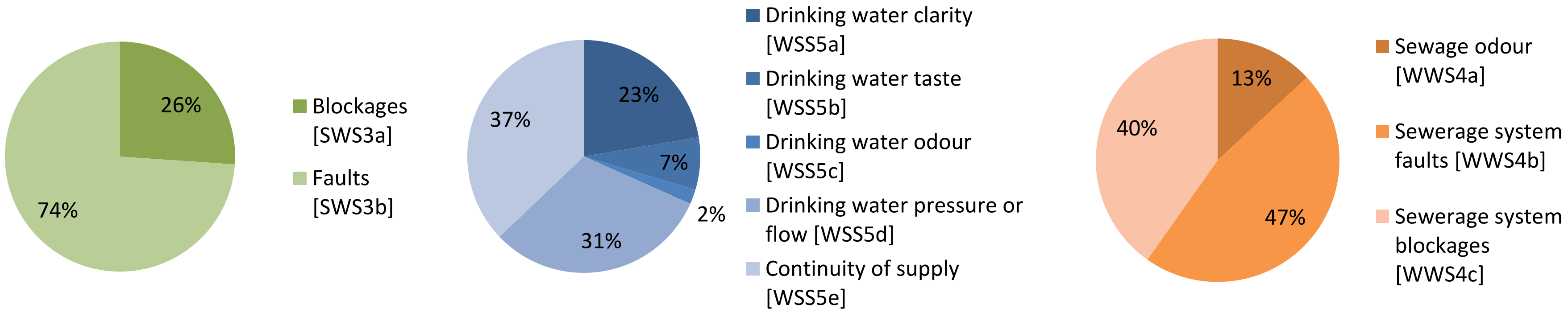


Figure 3.2-4: Water complaints per 1000 properties

Figure 3.2-5: Proportion of stormwater, water, and wastewater complaints by complaint type



3.3 Charges

All monetary values associated with charges are shown inclusive of GST.

As a bulk water supplier, Greater Wellington's charges are apportioned amongst serviced councils (Upper Hutt, Hutt, Porirua, and Wellington City). Auckland Council does not supply water and wastewater services, and did not provide data on stormwater rates. Buller has not provided data on the water supply system.

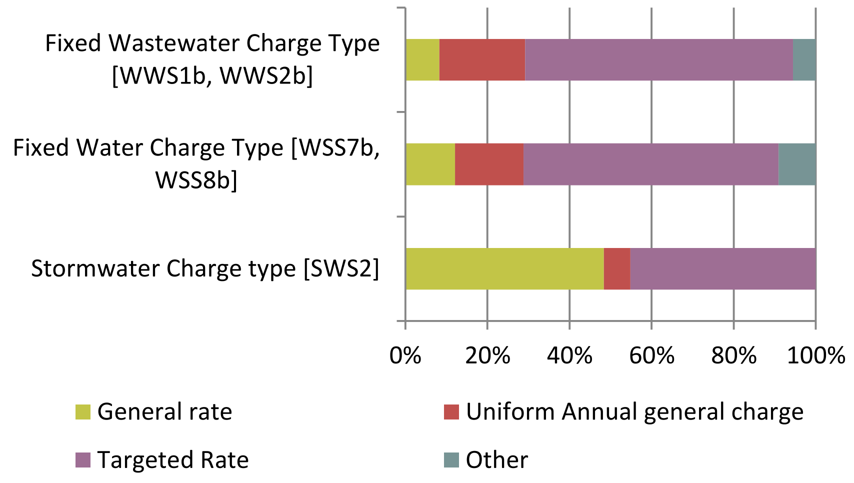
3.3.1 Types of charging mechanisms

Water, wastewater, and stormwater services are charged for in a number of different ways. Rating tools used include:

- **Uniform Annual General Charge (UAGC)**: a fixed charge applied to each separately-used or inhabited part of a property, such as a shop that has a flat above, or an apartment. The UAGC is a fixed rate that is used to fund general council activities, to ensure that every ratepayer makes a minimum contribution to council services.
- **General rates**: used to fund general council activities on which user-pays charges are not applied. Council is required to assess general rates on capital value. The value-based general rate is assessed by multiplying the capital value of a property by the rate per dollar that applies to that ratepayer group. General (and targeted rates) can be charged on a differential basis, so some ratepayers may pay more or less than others with the same value property. The main reasons for applying a rates differential are to reflect differences in the level of services received or the ability of groups of ratepayers to pay.
- **Targeted rates**: used to fund specific council activities, mainly where there is a clearly identifiable group benefiting from a specific council activity, such as use of the water or wastewater system.

Participants have indicated which charging mechanism they use to fund 3 Waters infrastructure, shown in Figure 3.3-1. The "Other" category was selected by some participants who applied charges based on connection sizes, volumetric use, or number of toilet pans. Watercare, which is a Council-Controlled Organisation funded by user charges and not rates, is not included in this data set.

Figure 3.3-1: Charging mechanisms used for water and wastewater



3.3.2 Stormwater charges

Fewer than half the participants who provided data on stormwater charges did not charge a separate rate for stormwater. Ashburton commented this was because stormwater charges were included in an urban amenity rate. Gore and Dunedin commented this was part of a combined drainage rate that includes both stormwater and wastewater.

Figure 3.3-2: Proportion of participants with a separate stormwater charge

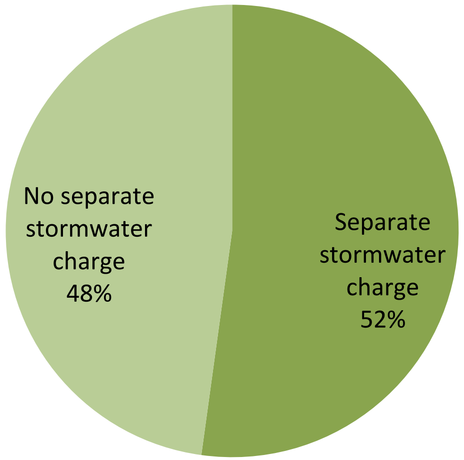
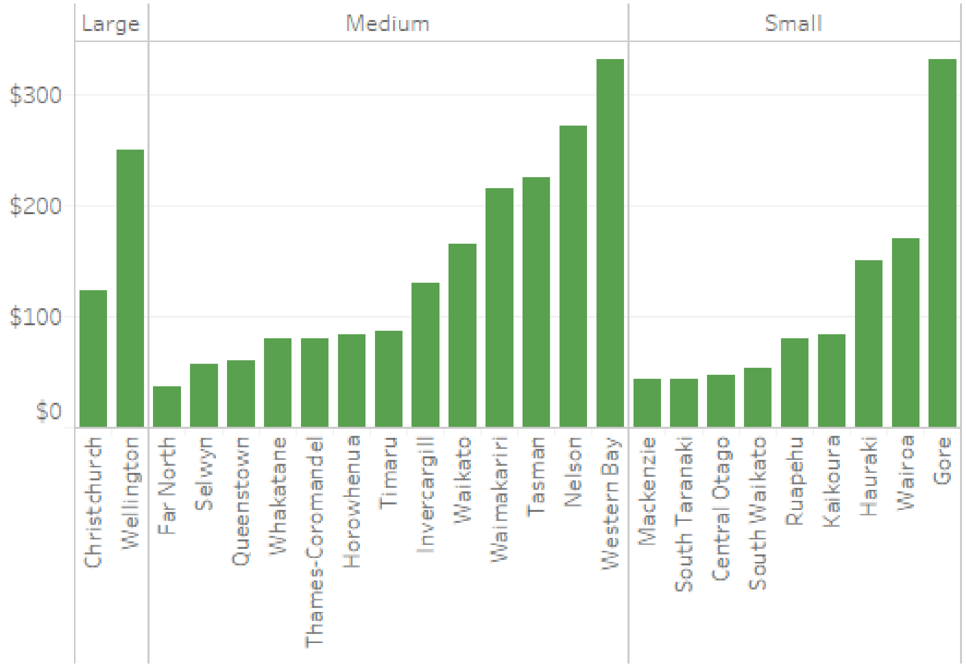


Figure 3.3-3: Stormwater charges per property (for participants with a separate charge)



3.3.3 Non-residential water and wastewater charges

Nearly half of all participants (46%) charged the same for non-residential water as for residential water. Conversely, it was common to have some form of separate charging for non-residential wastewater (70%). In many cases non-residential wastewater tariffs only apply to trade waste customers. Where charges differ for residential and non-residential customers, charging regimes are listed in *Appendix IV: Non-residential water and wastewater charging mechanisms*.

Figure 3.3-4: The number of councils employing different residential and non-residential charges

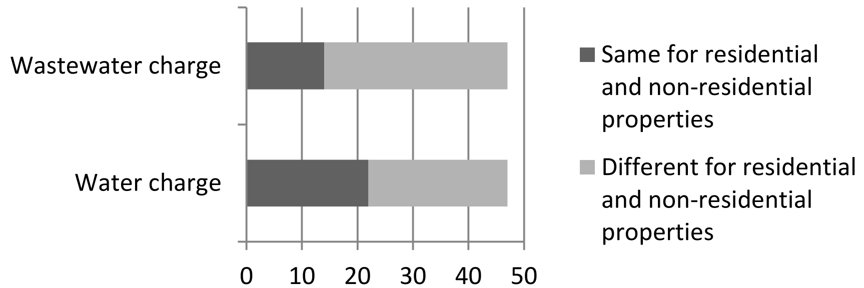


Figure 3.3-5: Proportion of participants with some form of non-residential volumetric charging for water

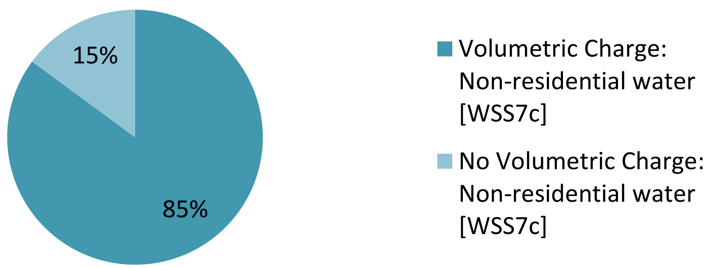
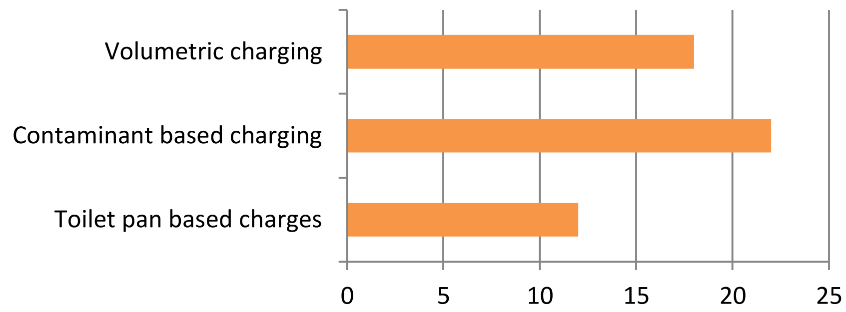


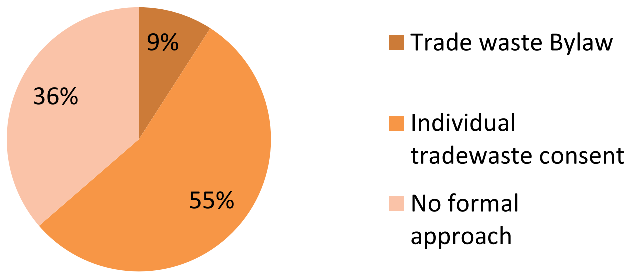
Figure 3.3-6: Number of councils employing different charging approaches for non-residential wastewater discharges



3.3.4 Trade waste management approaches

Trade waste bylaws are used by 33 participants to manage trade waste. A number of participants with trade waste bylaws also use individual trade waste consent agreements concurrently. Individual trade waste agreements only are used at the following councils: Buller, Hauraki, Kaipara, South Taranaki (which has a trade waste bylaw under development), and Timaru. Horowhenua, Mackenzie, Southland, and Stratford do not have formal trade waste management approaches.

Figure 3.3-7: Trade waste management approaches



3.3.5 Residential water and wastewater charges

Benchmarks apply to a water use volume of 200m^3 (to align with international metrics and previous years' National Performance Reviews). Where there are multiple schemes in a jurisdiction, the figure shows the average charge, weighted by properties where possible and median values where not.

A number of jurisdictions operate multiple charging regimes in their district. In these instances, not all charging approaches apply to all schemes. Where a volumetric charge is listed in Table 3.3-1, but no associated cells are highlighted, the volumetric charge applies to all water used.

Waipa is gradually rolling out meters to properties. The benchmarked figure shows only charges for properties without meters. Charges for metered properties in Waipa are shown in Table 3.3-1. Waikato also has a mix of metered and non-metered charges. Non-metered charges are benchmarked in this figure, and metered charges are shown in Table 3.3-1.

Figure 3.3-8: Water charges for a connection using 200m^3 a year

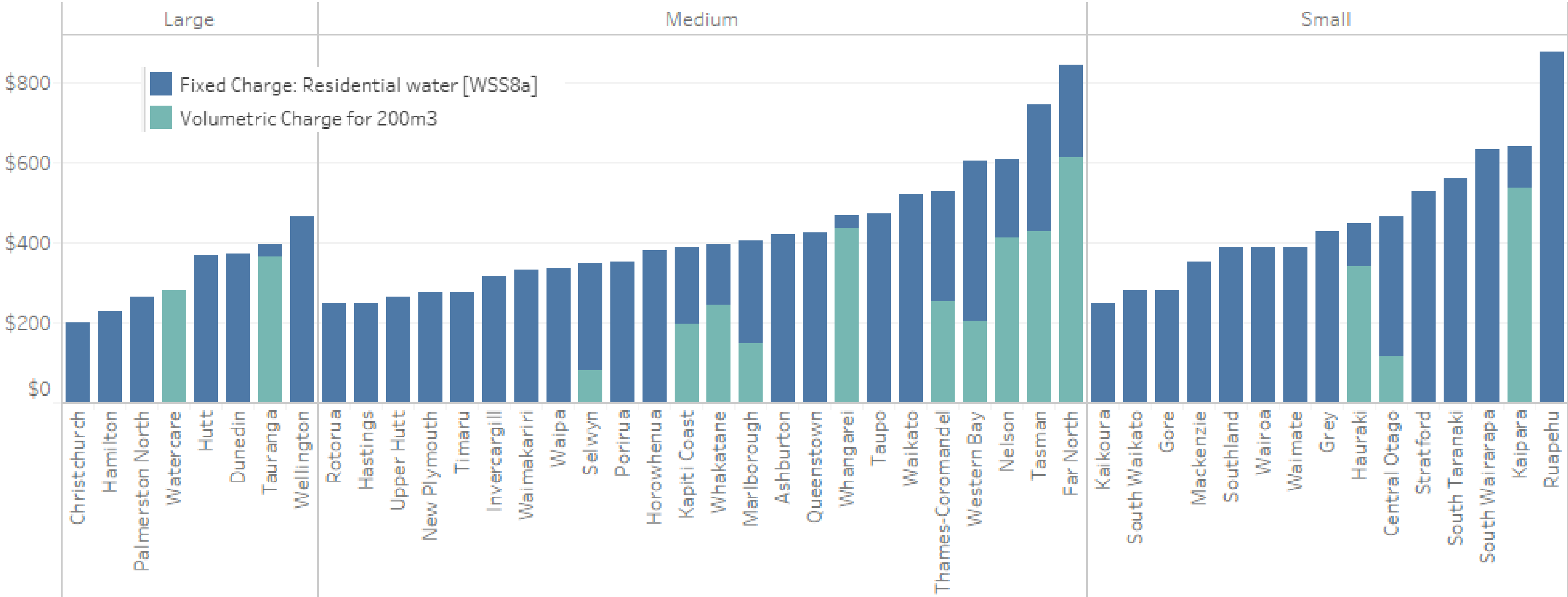


Table 3.3-1: Volumetric residential water charge approach

Council	Fixed annual charge (weighted average for multiple schemes)	Free water allowance	Usage charge 1st step	Usage charge 2nd step	Usage charge 3rd step	Usage charge ($/m³)	Notes
Ashburton	$421.85					$4.10	
Central Otago	$349.92					$0.58	
Dunedin	$482					$1.47	Volumetric charge for excessive usage
Far North	$233					$3.06	
Hauraki	$105.24					$0.62-$1.34	
Horowhenua	$381.17					?	
Kaikoura	$248.96					$1.00	
Kaipara	$104.30					$2.68	
Kapiti	$190					$0.99	
Mackenzie	$351.67					$0.75	
Marlborough	$254.00					$0.75	
Nelson	$198.86					$2.052	
Ruapehu	$876.30					$2.19	
Selwyn	$267					$0.40	
South Taranaki: metered	$260					$2.36	
Stratford	$527					$1.72	
Tasman	$314.87					$2.14	
Taupo	$470.43					?	The fixed charge is for Taupo only. Taupo has 16 schemes, with a price range of $254.80 – $802.80 Residential lifestyle blocks pay volumetric charges
Tauranga	$28.45					$1.83	
Thames-Coromandel: metered	$273.04					$0.87-$1.27	Not all of Thames-Coromandel district is metered
Waikato: metered	$200					$1.76	
Waimate	$387.46					$0.65	
Waipa: metered	$121.96					$0.98302-$1.462	Not all the Waipa network is currently metered
Wairoa	$386.45					?	Some residential properties with troughs and lifestyle sections are metered with charges
Watercare						$1.409	
Porirua	$352.21					$1.25	Allows users to elect for a meter and volumetric charge
Upper Hutt	$282.17					$1.90	Allows users to elect for a meter and volumetric charge
Western Bay of Plenty	$327.69-$563					$1.02-$1.12	Charges vary depending on supply zone

Watercare is the only participant that charges volumetrically for wastewater. The charge is applied at $2.394/m³ with volumes based on 78.5% of metered water use, except apartments which are based on 95%. Watercare's wastewater discharge volume benchmark shown in Figure 3.3-9 is based on residential use of 157m³/year (78.5% of 200m³).

Figure 3.3-9: Wastewater charges

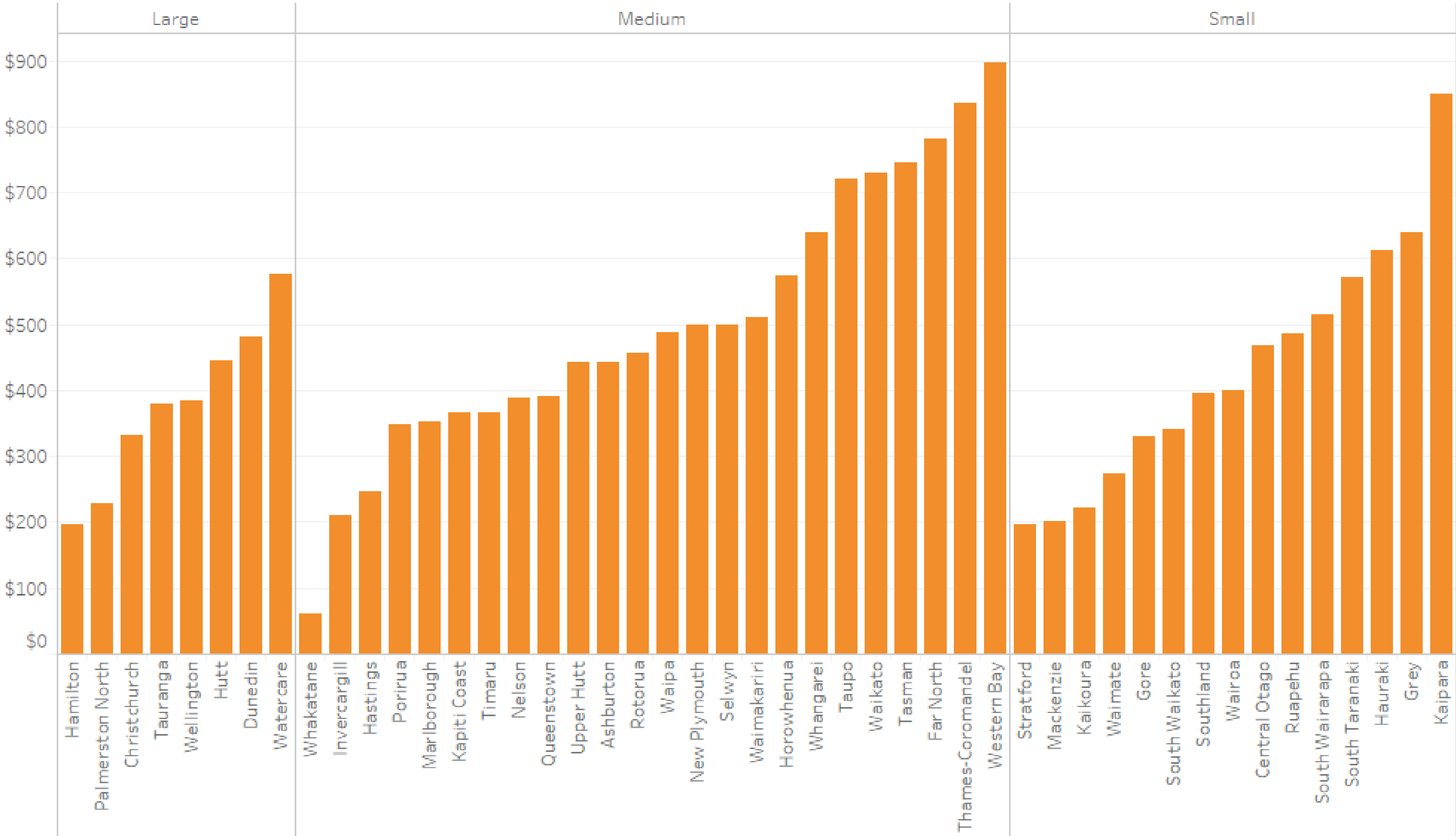
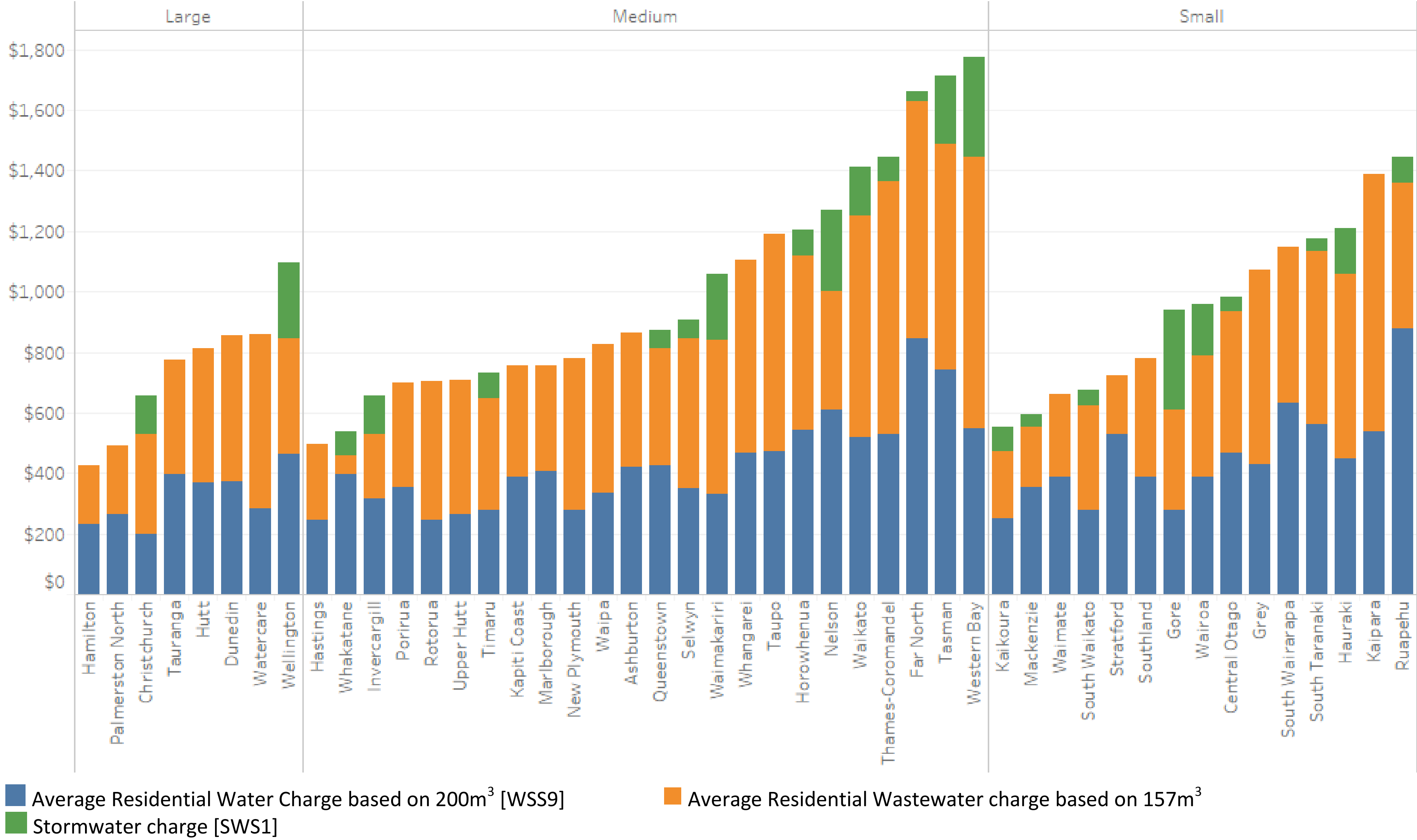


Figure 3.3-10: Annual 3 Waters residential services charges for properties using 200m³ a year



3.4 Affordability

The affordability of charges is based on participant-supplied data of 3 Waters charges and Statistics New Zealand 2013 census data of the median household income by Territorial Authority (Statistics New Zealand, 2013). Affordability has then been calculated using the formula below:

$$Affordability = \frac{\begin{matrix} Average\ Residential\ Water\ Charge\ Based\ on\ 200\frac{m3}{yr}\ [WSS9] + \\ Average\ Annual\ Residential\ Wastewater\ Charge\ Based\ on \frac{157m3}{year} + Stormwater\ charge\ [SWS1] \end{matrix}}{Median\ Household\ Income\ [CN7]}$$

Not all participants have supplied a separate stormwater charge as this is sometimes included in other rates, such as urban amenity rates. Participants included in Figure 3.3-3 have their stormwater charge included in the affordability metric.

Figure 3.4-20: Water, wastewater, and stormwater service charges as a proportion of household income

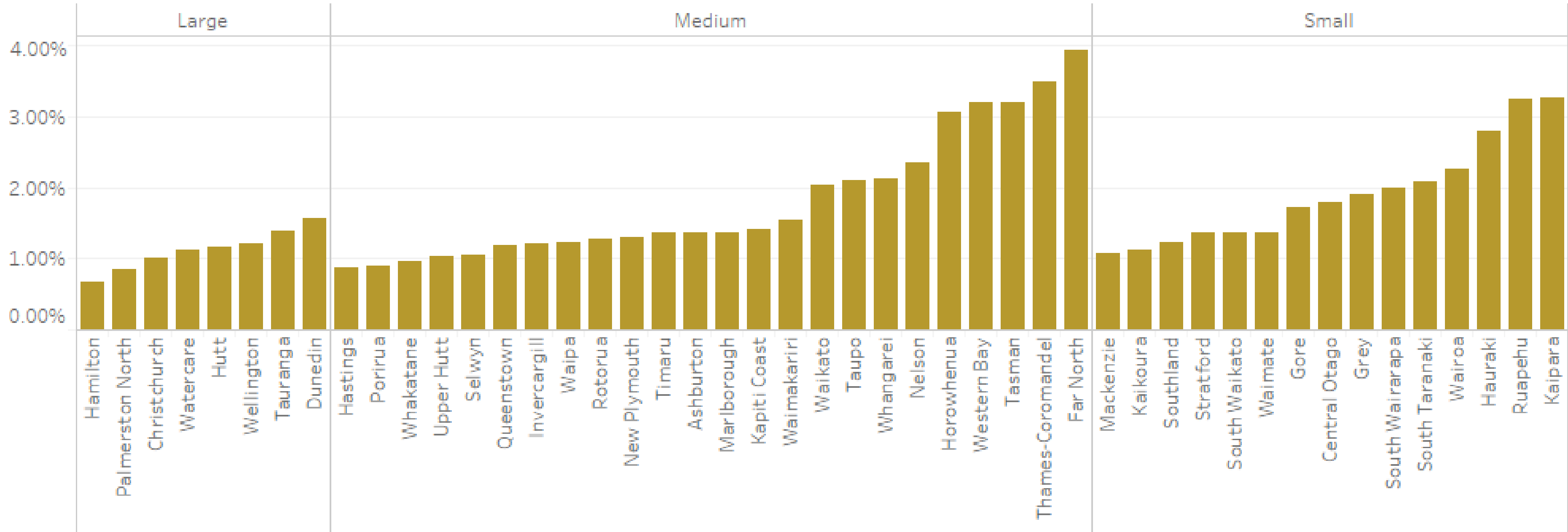
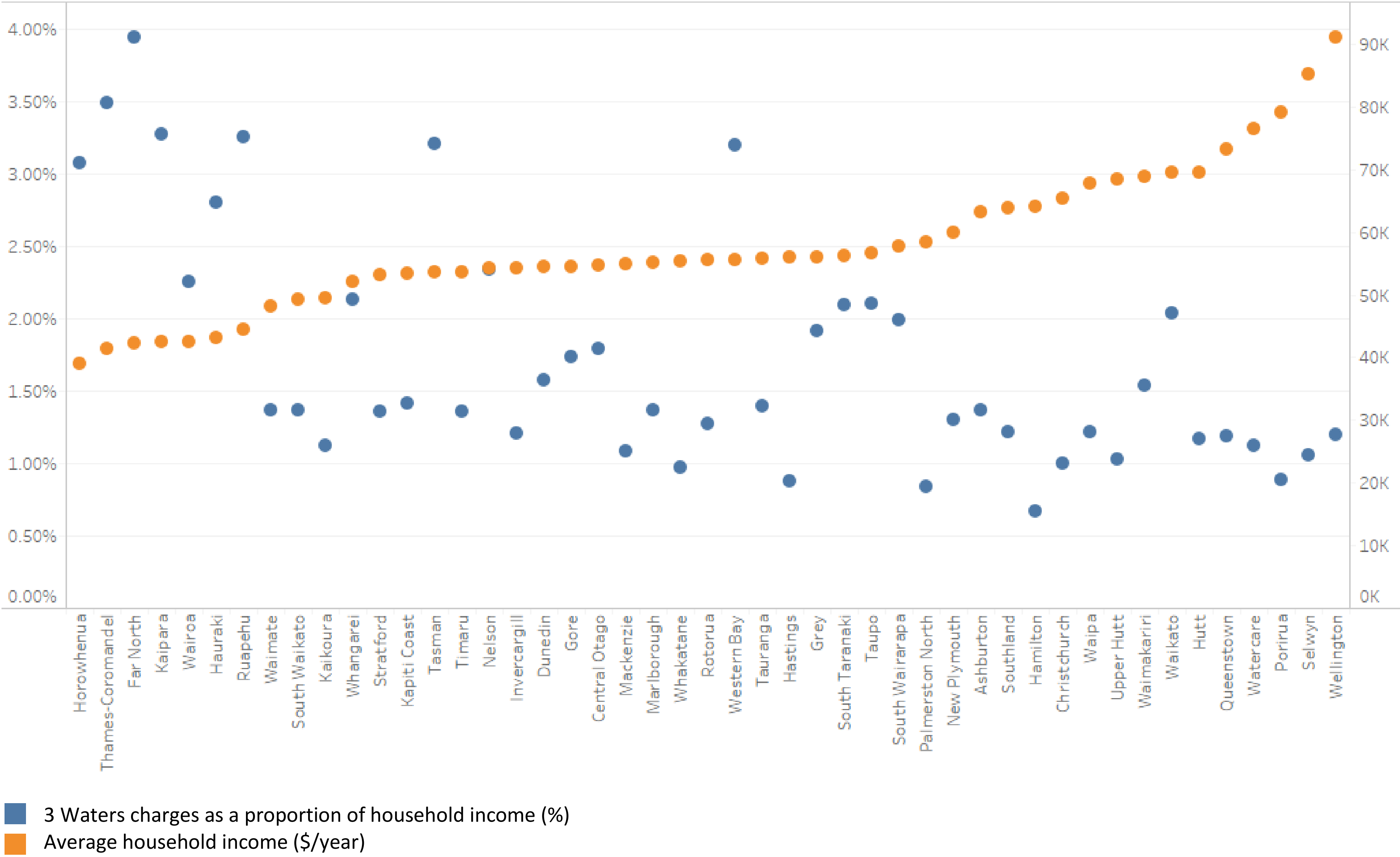


Figure 3.4-1: Affordability of 3 Waters services plotted against household income



4 ECONOMIC SUSTAINABILITY

CASE STUDY: KĀPITI COAST DISTRICT COUNCIL
An accounting system that supports engineers

On the Kāpiti Coast, a new realigned accounting system giving an instant snapshot of spending across the district's water asset has started to provide real benefits.

The new approach provides extra layers of categories that means budgets that were once spread across various schemes can be bundled by work and/or asset types. This allows for quick identification of expenditure against the budgets available districtwide, so that overall progress can be monitored and resources targeted when and where they are needed to deliver the annual works programme.

"Instead of having to go through five different pages of reports, I get an instant summary of what the overall spend against any one type of budget is," says Kāpiti's Water and Wastewater Asset Manager, Martyn Cole. "I can balance any overs and unders in individual budgets accurately across the district's expenditure and make sure the overall works programme and budget are on track".

In practice, it provides a comprehensive 'big picture' of the status of finances across all the different schemes in the district.

With the average capital expenditure of NPR being only 69% of that budgeted for, the ability to keep budgets on track is likely to be a priority for a number of NPR participants.

"In a nutshell, I now spend less time co-ordinating budgets and more time on delivering our programmes of work where it matters" Mr Cole says.

Key Observations

OPEX has been gradually increasing since reliable figures have been available in the National Performance Review

Since the 2011/12 reporting period, the operating expenditure per property has increased by 39% from $198.12 to $274.70 for water supply systems, 46% from $179.83 to $262.00 for wastewater systems, and 46% from $42.34 to $61.80 for stormwater networks.

Cash flow related to 3 Waters assets is concentrated in the Auckland region

Combined expenditure on stormwater services at Auckland Council, and water and wastewater services at Watercare, accounted for 45% of 3 Waters-related expenditure and 38% of revenue. This proportion was slightly higher than the proportion of the New Zealand population living in Auckland, which was 33% of the 2013 census night population count (Statistics New Zealand, 2013).

Total expenditure for water supply systems is double that of stormwater systems, and for wastewater systems over three times higher than stormwater systems

Collectively participants spent $690,000,000, $1,118,000,000 and $313,000,000 on drinking water, wastewater, and stormwater systems respectively.

Interest exceeds 10% of revenue for 19 water systems, 28 wastewater systems, and 17 stormwater systems

This may be attributable to the long life and high cost of water infrastructure assets which commonly lend themselves to debt funding, in line with principles of intergenerational equity. If not offset elsewhere in a council's balance sheet, this will adversely affect a participant's ability to meet the DIA Debt Servicing outlined in the *Local Government Financial Prudence Regulations* (New Zealand Government, 2014). A local authority meets the debt servicing benchmark for a year if its borrowing costs are less than 10% of its revenue for the year. However, a high-growth local authority meets the debt servicing benchmark for a year if its borrowing costs are less than 15% of its revenue.

Capital expenditure as a proportion of budget was a median of 69%

This continues a trend evident in previous years. The figure was 66% in 2014-15 NPR and 68% in the 2013-14 NPR.

All monetary figures provided in this section exclude GST.

4.1 Revenue

Participants collected $1.7 billion in revenue for operating 3 Waters networks. Not all participants identified a direct source of revenue for their stormwater system.

Figure 4.1-1: Total revenue by source

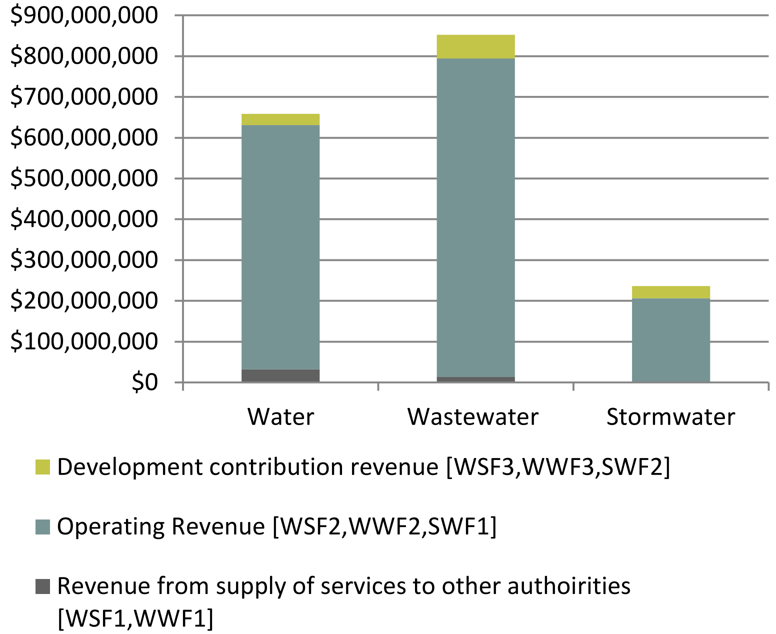
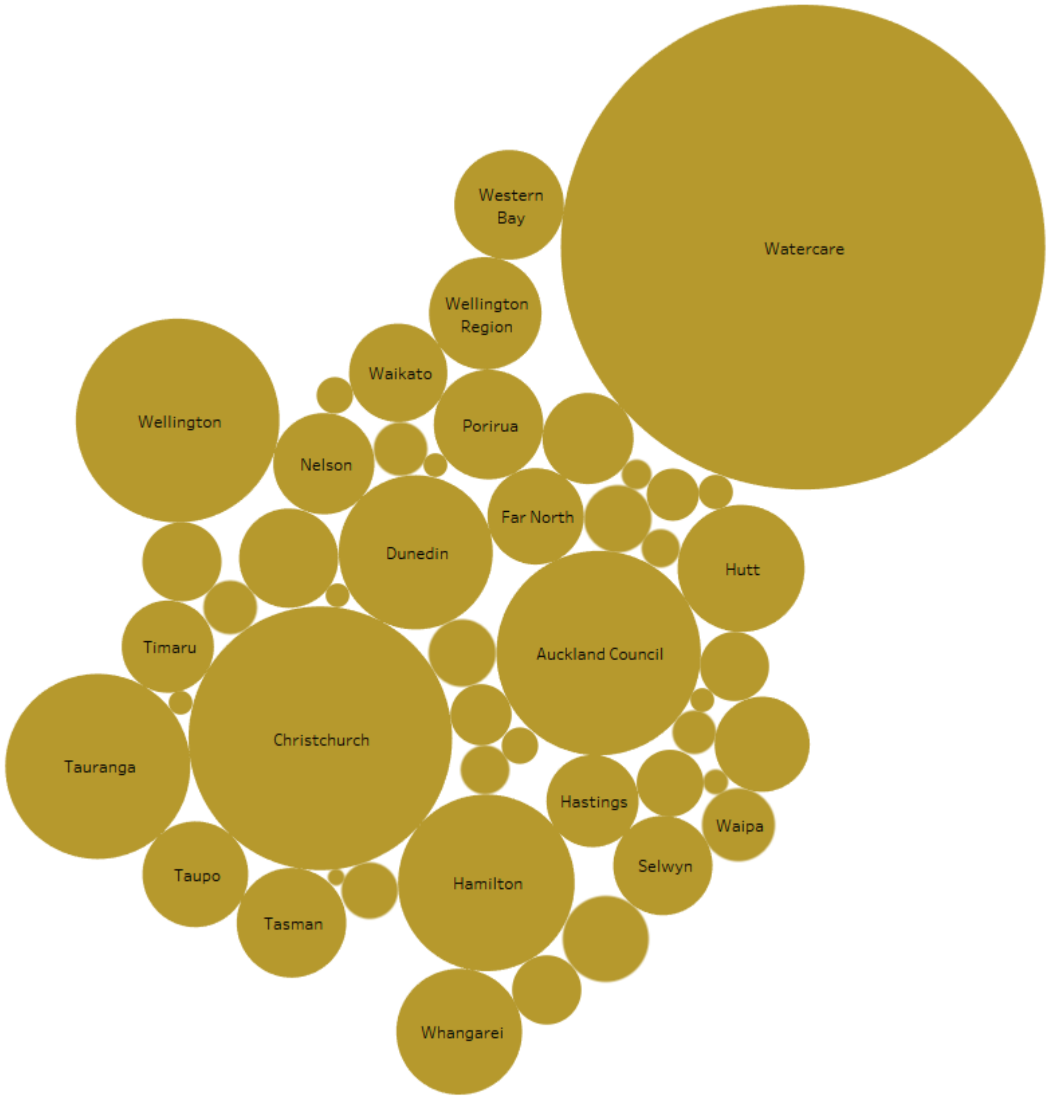


Figure 4.1-2: Total revenue for water, wastewater, and stormwater



4.1.1 Development contributions

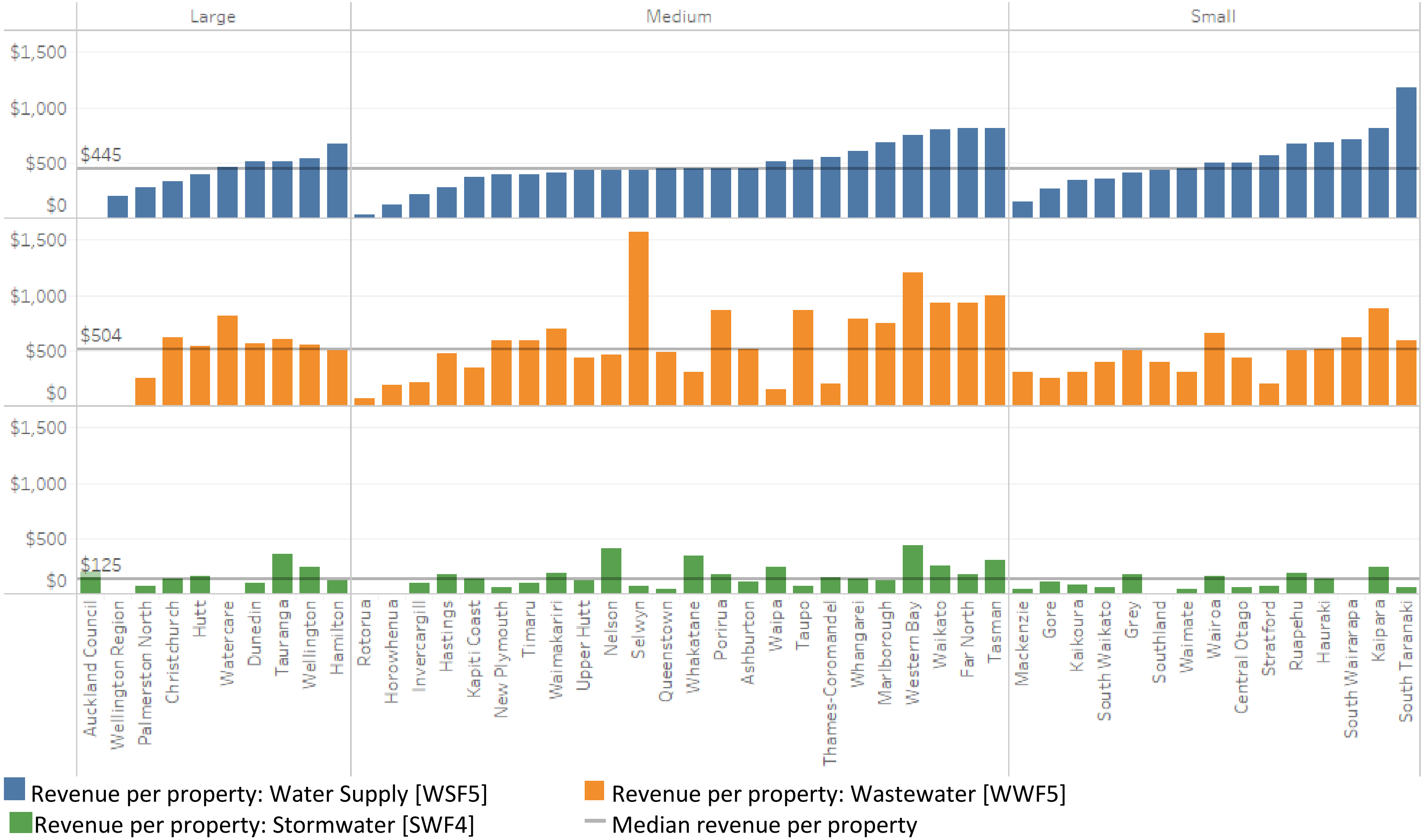
A total of $311 million was received from developer contributions in both cash and assets. Table 4.1-1 shows the split of assets and cash contributions.

Table 4.1-1: Total development contributions of assets and finance

TOTAL	Water	Wastewater	Stormwater
Cash contributions	$27,459,974	$57,553,687	$29,211,188
Asset contributions	$32,503,073	$55,963,841	$107,845,818

Revenue per property is shown in Figure 4.1-3[8]. Median revenue for each system is shown on the graph.

Figure 4.1-3: Revenue per property for water, wastewater, and stormwater



[8] South Taranaki noted that water supply revenue per connection in its district is skewed by the large proportion of farms and industry in the district. South Taranaki supplies 300,000 dairy cows with water that meets NZ drinking water standards. In addition, major industry (7 connections) contributes to 14% total consumption.

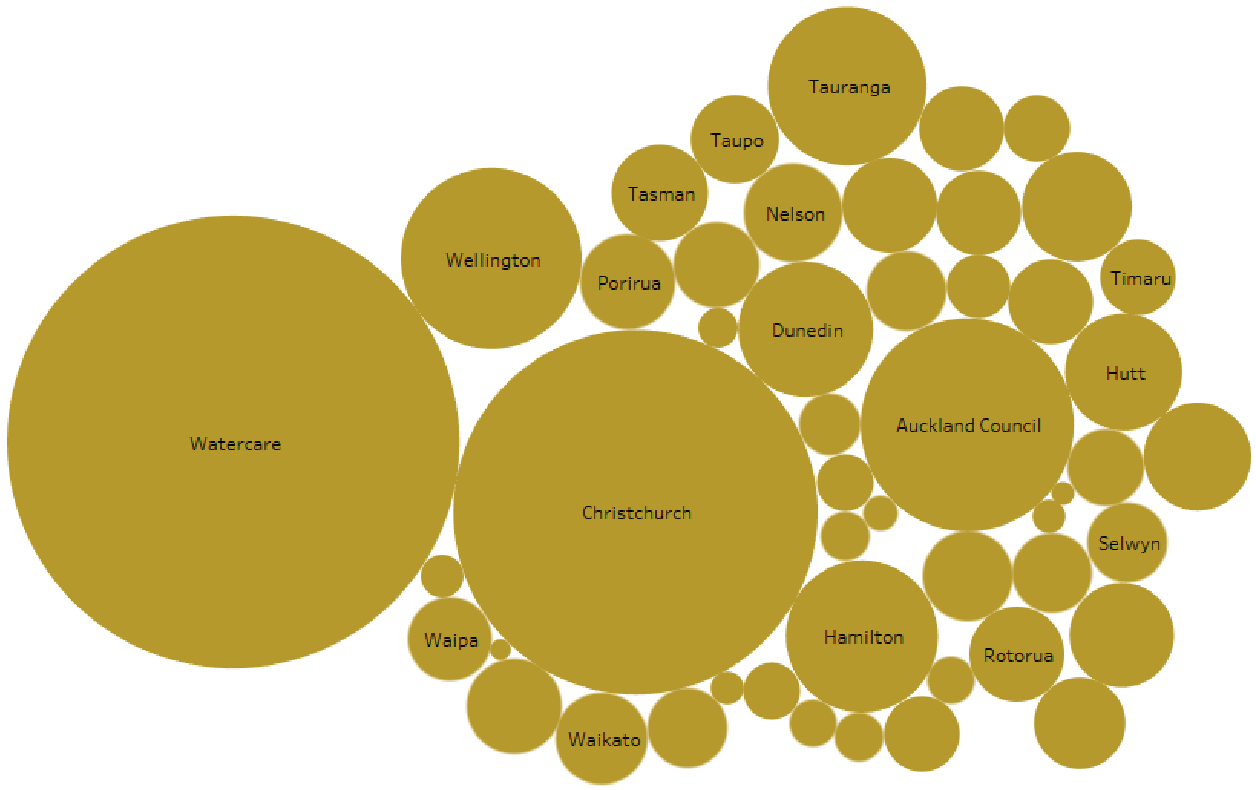
Watercare' s revenue is normalised based on the number of accounts (not properties) in its service district.

4.2 Expenditure

$2.1 billion dollars of expenditure on 3 Waters networks was reported in 2015/16. This figure shows only cash items and does not include depreciation.

Figure 4.2-2: Total expenditure by source

Figure 4.2-1: Total expenditure for water, wastewater, and stormwater



4.2.1 OPEX

$809 million of operational expenditure across participant networks was reported in 2015/16.

Figure 4.2-3: Total operational expenditure by source

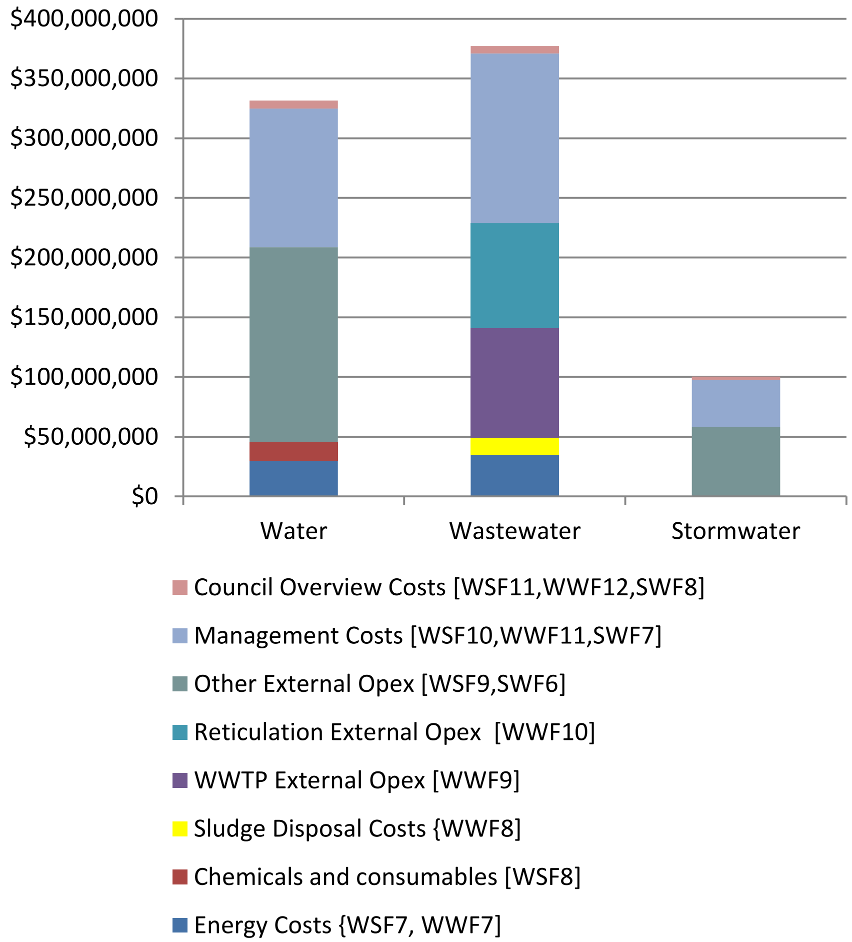


Figure 4.2-4: Change in median water, wastewater, and stormwater operational expenditure per property

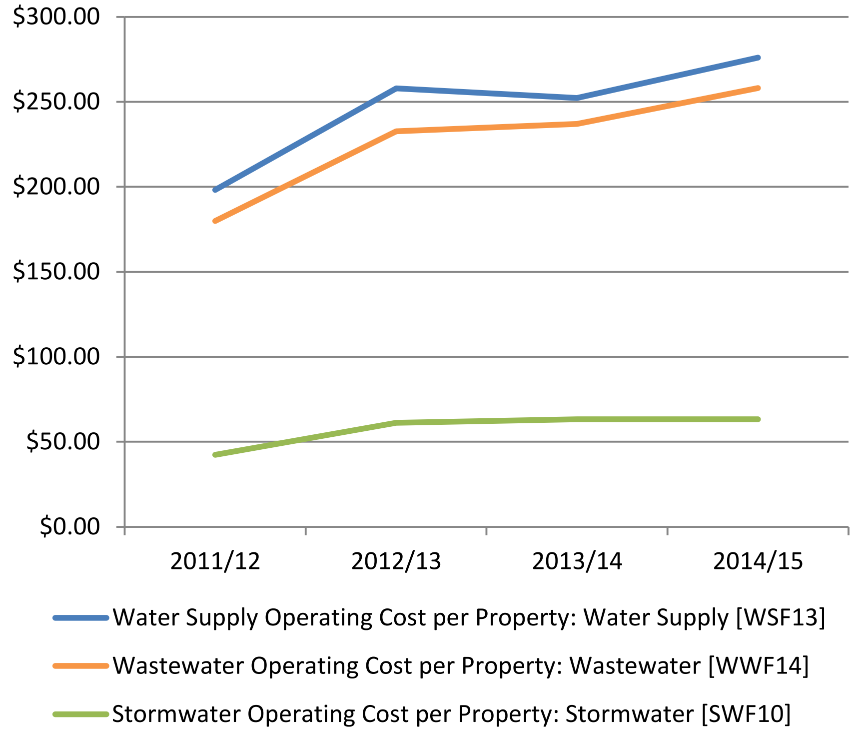
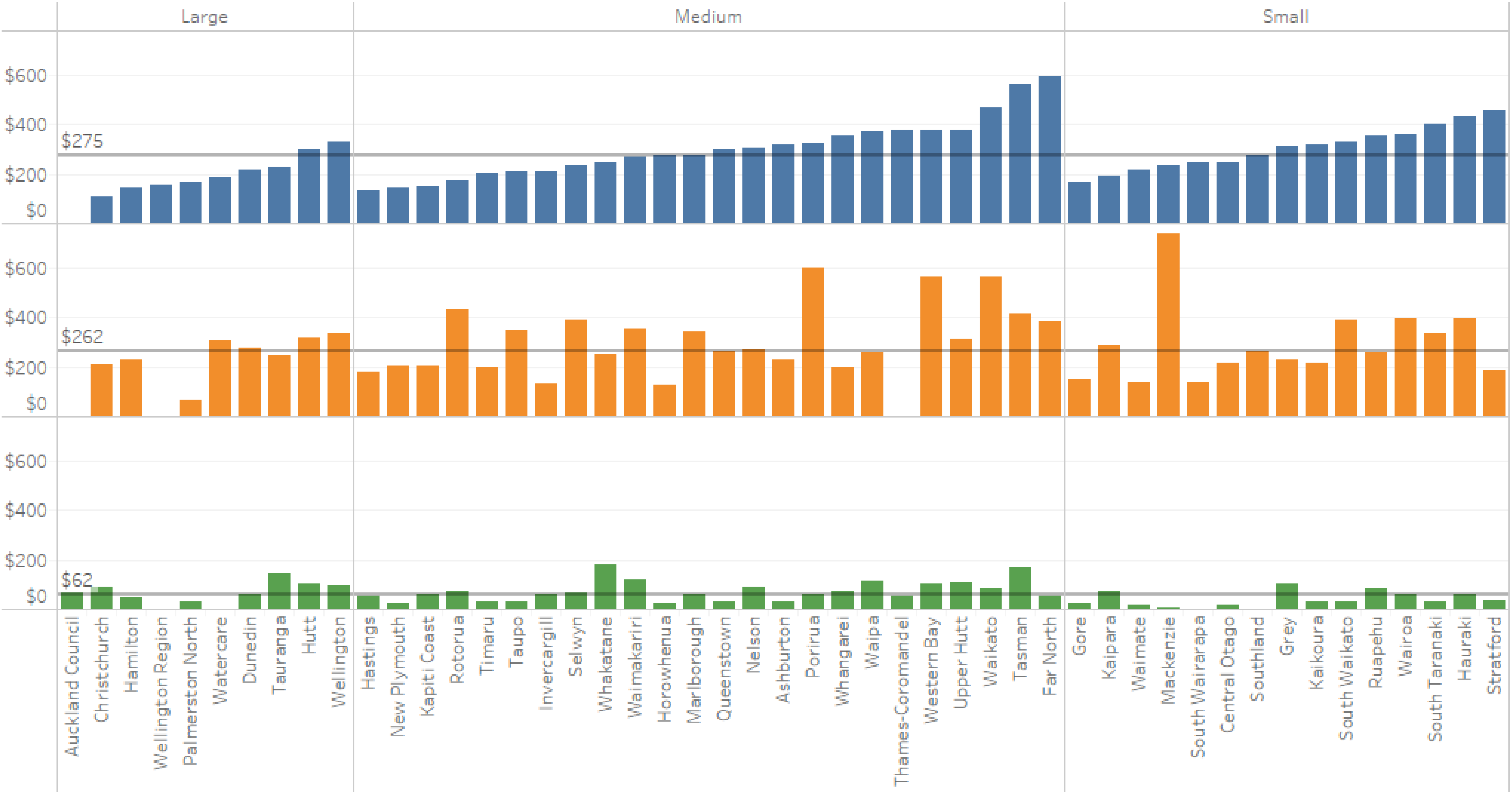


Figure 4.2-5: Operational expenditure per property for water, wastewater, and stormwater[9]



Operating cost per property: Water Supply [WSF13]
Operating cost per property: Wastewater [WWF14]
Operating cost per property: Stormwater [SWF10]
Median operating cost per property

[9] Watercare' s revenue is normalised based on the number of accounts (not properties) in its service district.

4.2.2 CAPEX

$1.1 billion of capital expenditure across participant networks was reported in 2015/16. Figure 4.2-6 and Figure 4.2-7 illustrate that the median CAPEX per property was higher for water supply, whereas total CAPEX was higher for wastewater, which was significantly skewed by Christchurch's wastewater spend of $286,406,000 where significant expenditure continues to replace assets damaged in the 2011 earthquakes.

Figure 4.2-6: Total capital expenditure by source

Figure 4.2-7: Change in median water, wastewater, and stormwater capital expenditure per property

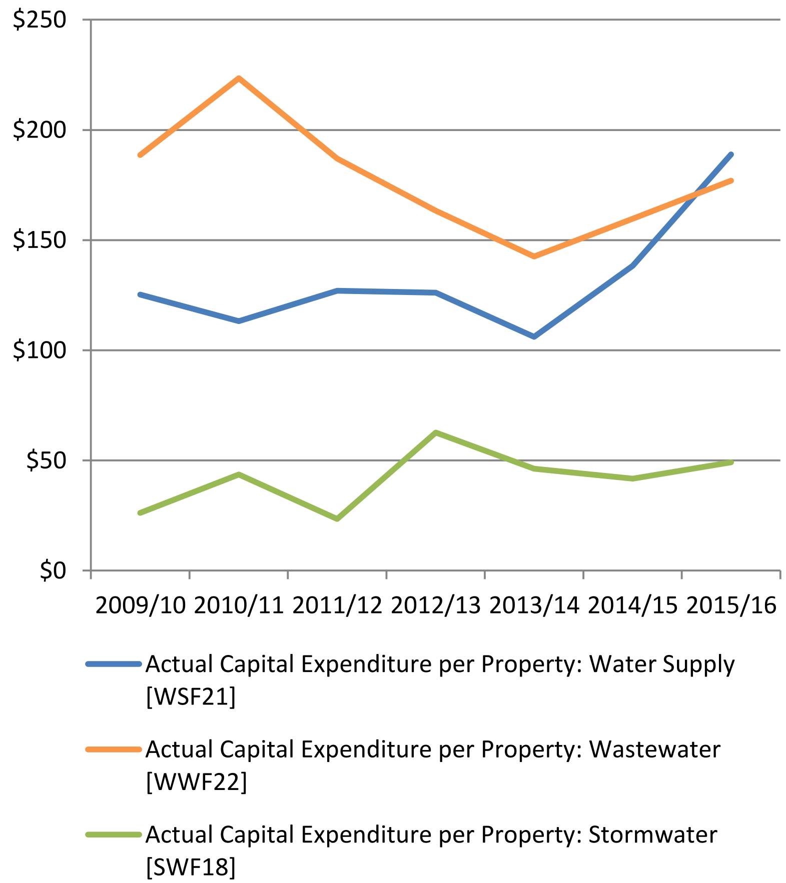
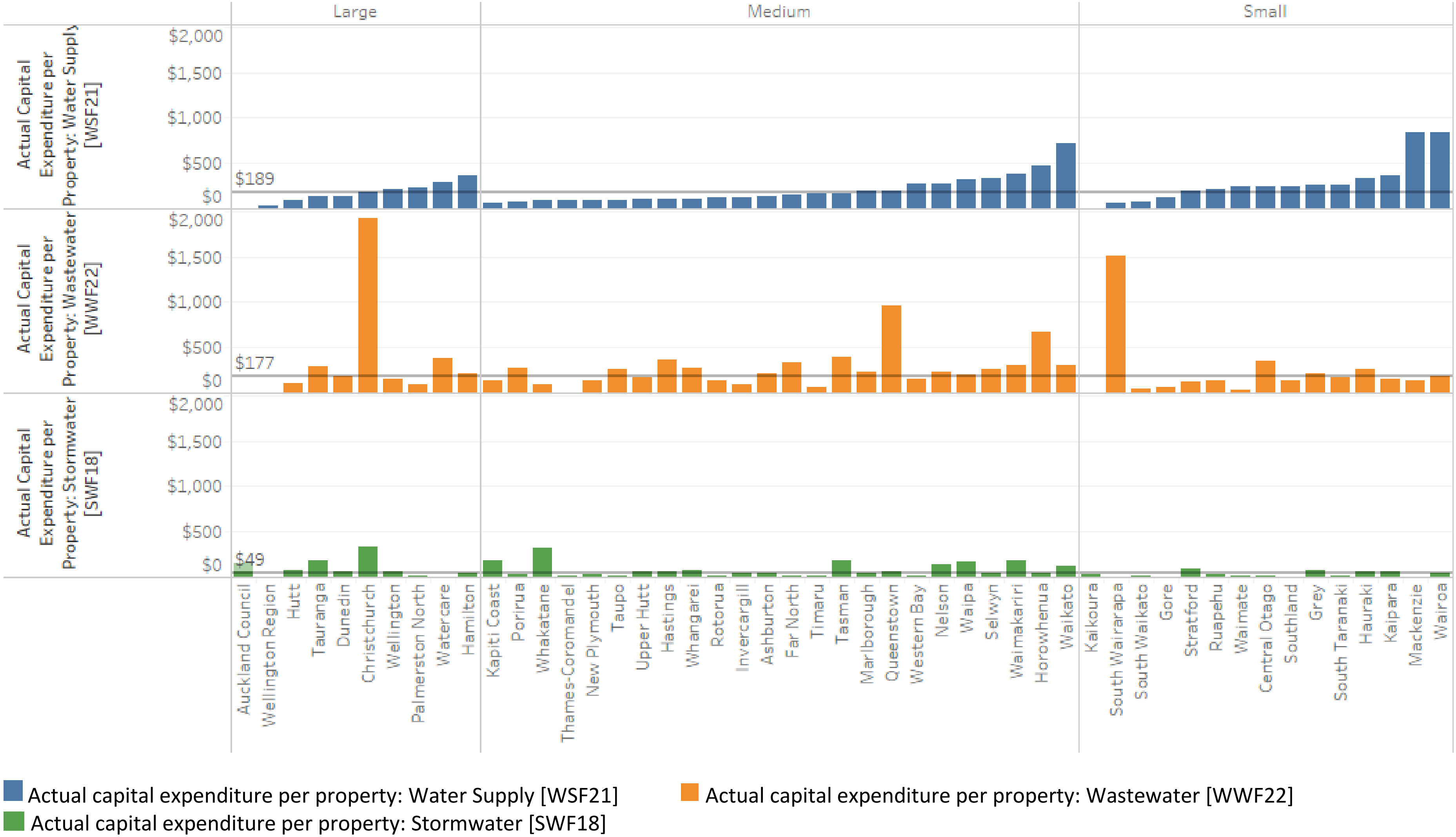


Figure 4.2-8: Capital expenditure per property for water, wastewater, and stormwater[10]



[10] Watercare’ s revenue is normalised based on the number of accounts (not properties) in its service district.
High capital expenditure at Wairoa was a result of the Tahawa Reservoir replacement project.

4.2.3 Depreciation

Annual depreciation recognises the decline in service potential of water, wastewater, and stormwater assets at rates that will write off the cost or valuation of the asset to its expected residual value over its expected useful economic life. The definition for depreciation reported in the National Performance Review is based on the latest replacement cost valuation. The annual depreciation applied across all participants' assets is shown in Table 4.2-1.

Table 4.2-1: Annual depreciation across all participant 3 Waters systems

	Annual Depreciation
Water Supply [WSF14]	$255,107,519
Wastewater [WWF15]	$312,400,750
Stormwater [SWF11]	$128,976,221
TOTAL	***$696,484,489***

4.2.4 Capital expenditure versus depreciation

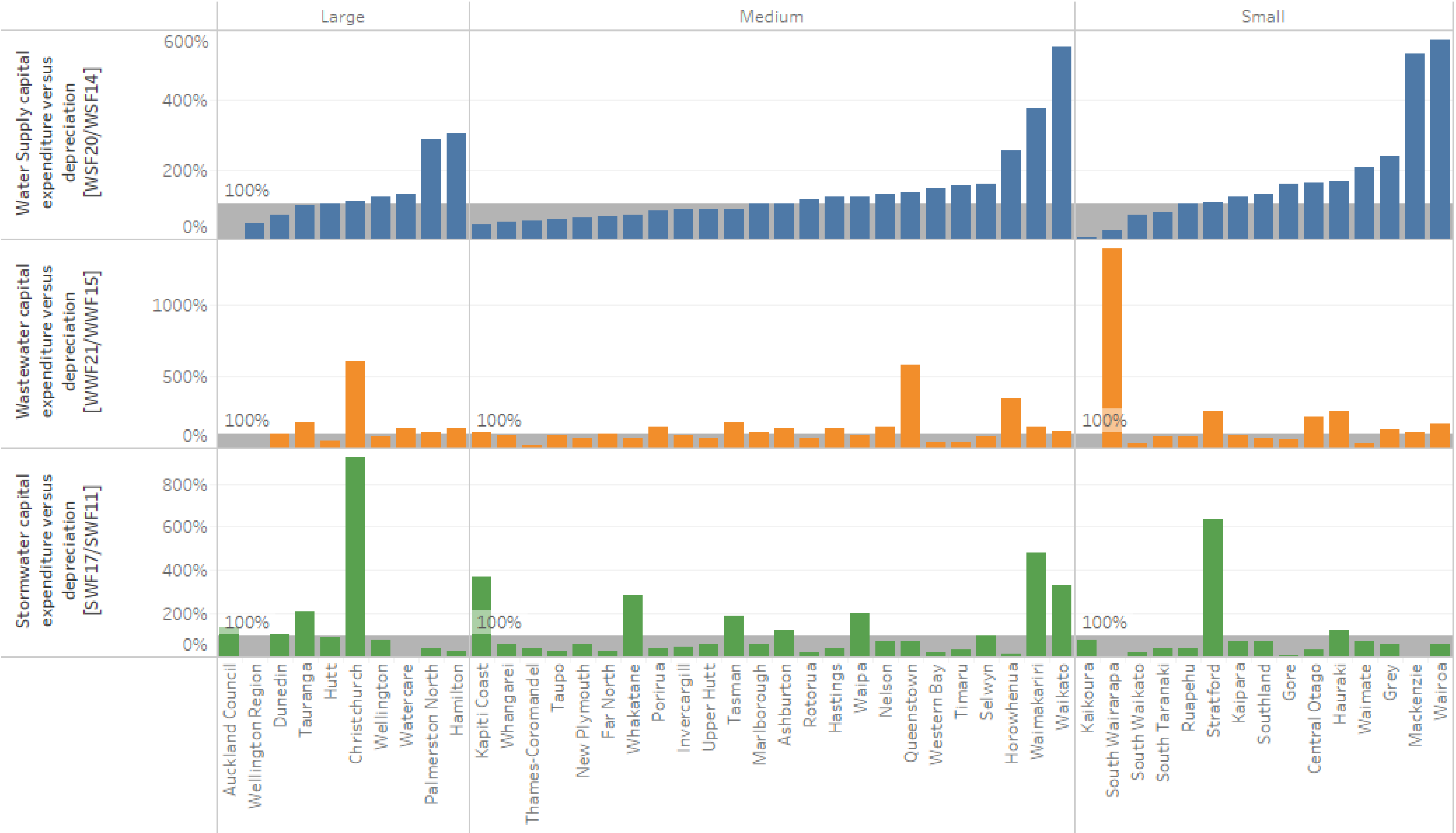
The measure aligns with the *Local Government (Financial Reporting and Prudence) Regulations 2014* (New Zealand Government, 2014) Essential Services Benchmark. A local authority meets the essential services benchmark if its capital expenditure on network services is greater than depreciation on network services (i.e. greater than 100%) for the year. Figure 4.2-9 illustrates actual capital expenditure as a proportion of depreciation.

$$Capital\ expenditure\ versus\ depreciation = \frac{Actual\ Capital\ Expenditure\ [WSF20, WWF21, SWF17c]}{Annual\ Depreciation\ [WSF14, WWF15, SWF11]}$$

The measure attempts to illustrate the extent to which service potential is being maintained in 3 Waters networks. This benchmark would provide a more accurate reflection of decline in service potential if data was averaged over time; however, integrity of the National Performance Review historic data set is currently not of a sufficient quality to achieve this.

The annual data shown in this measure is unlikely to provide an accurate snapshot of depreciation versus renewals spending where renewals peaks occur, or councils in high growth areas have relatively new assets.

Figure 4.2-9: Capital expenditure as a proportion of total depreciation for water, wastewater, and stormwater[11]



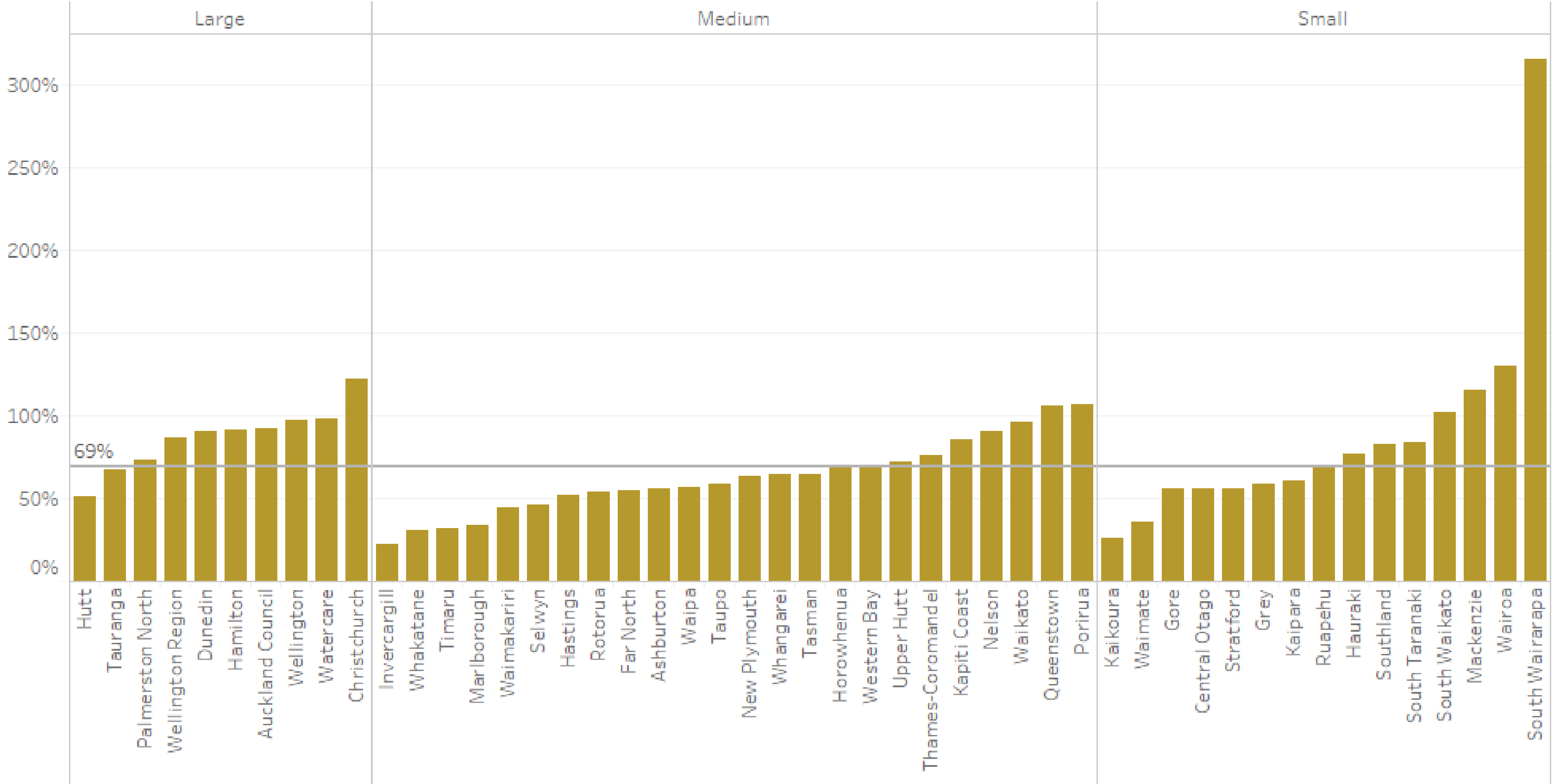
[11] The high ratio of capital expenditure to depreciation at Wairoa was due to the Tahawa Reservoir replacement project.

4.2.5 Budgeting

Figure 4.2-10 shows the proportion of budgeted capital expenditure (CAPEX) that was actually spent. The median CAPEX actually spent was only 69% of what was budgeted.

$$Actual\ vs\ Budgeted\ Capital\ Expenditure = \frac{Actual\ Capital\ Expenditure\ [WSF20 +\ WSF21 +\ SWF17]}{Budgeted\ Capital\ Expenditure\ [WSF19, +WWF20 +\ SWF16]}$$

Figure 4.2-10: Actual versus budgeted expenditure for 3 Waters assets



4.3 Debt servicing

This benchmark aligns with the debt servicing benchmark in the *Local Government (Financial Reporting and Prudence) Regulations 2014* (New Zealand Government, 2014). Figure 4.3-1 shows interest paid on 3 Water assets as a proportion of revenue.

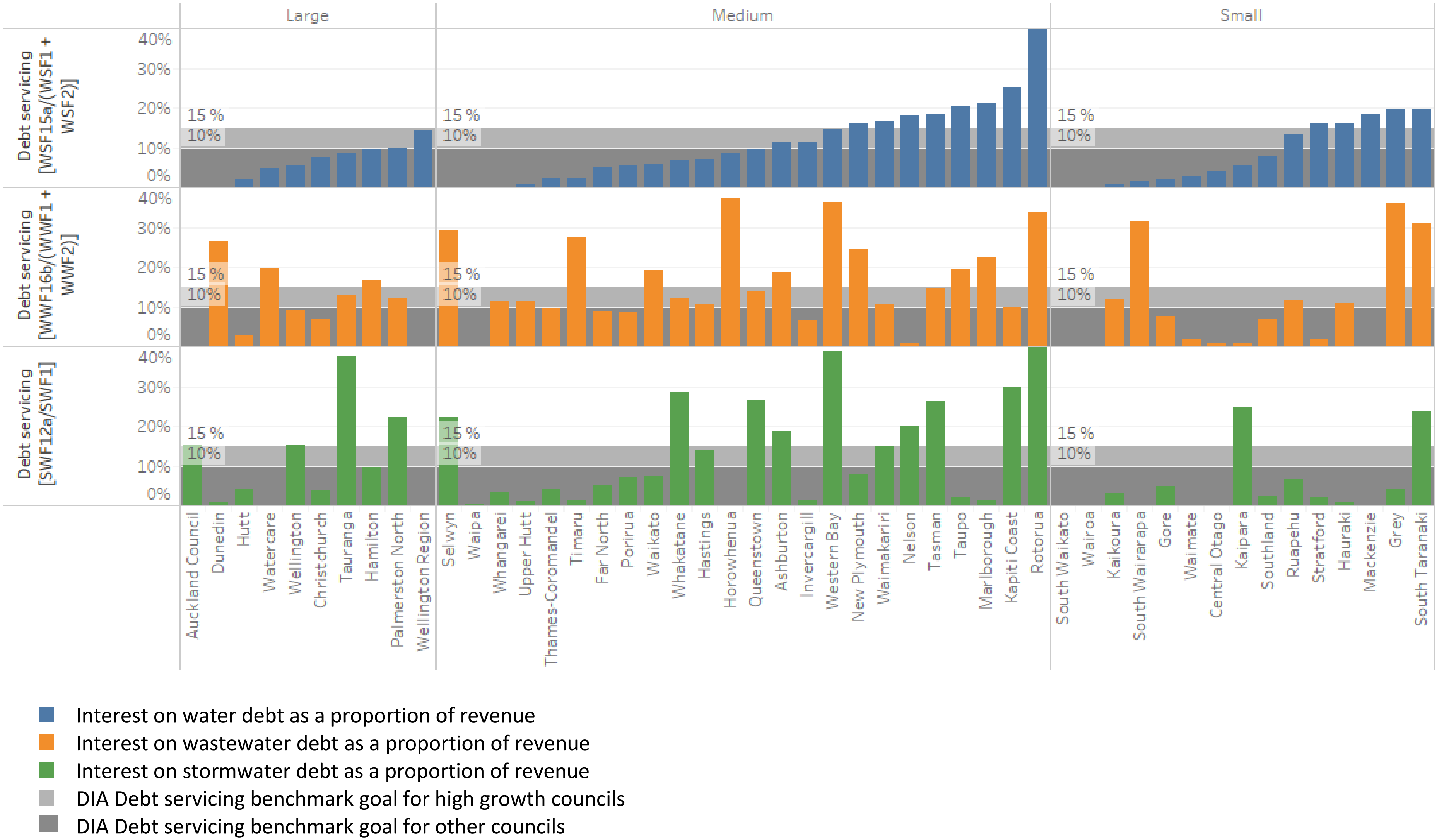
$$Debt\ servicing = \frac{Interest\ [WSF15a, WWF16b, SWF12a]}{Revenue}$$

$$Revenue = Revenue\ from\ supply\ of\ water/wastewater\ services\ to\ other\ authorities\ [WSF1, WSF2] + Operating\ Revenue\ [WSF2, WWF2, SWF1]$$

The Regulations state that a local authority meets the debt servicing benchmark for a year if its borrowing costs equal or are less than 10% of its revenue for the year, or 15% for a high growth council. Revenue excludes development contributions, financial contributions, vested assets, gains on derivative financial instruments, and revaluations of property, plant, or equipment. Note that the revenue calculation included in this figure is different from revenue automatically generated on participant data sheets which does include revenue from developer cash contributions.

The DIA benchmark applies to total Council operations, not each activity separately (water, wastewater, and stormwater). Disclosure by activity is for the purpose of this review only.

Figure 4.3-1: Interest as a proportion of total revenue [12]



12 Thames-Coromandel has been excluded from graph, as reported revenue figures where too low to be realistic.

4.4 Cost coverage

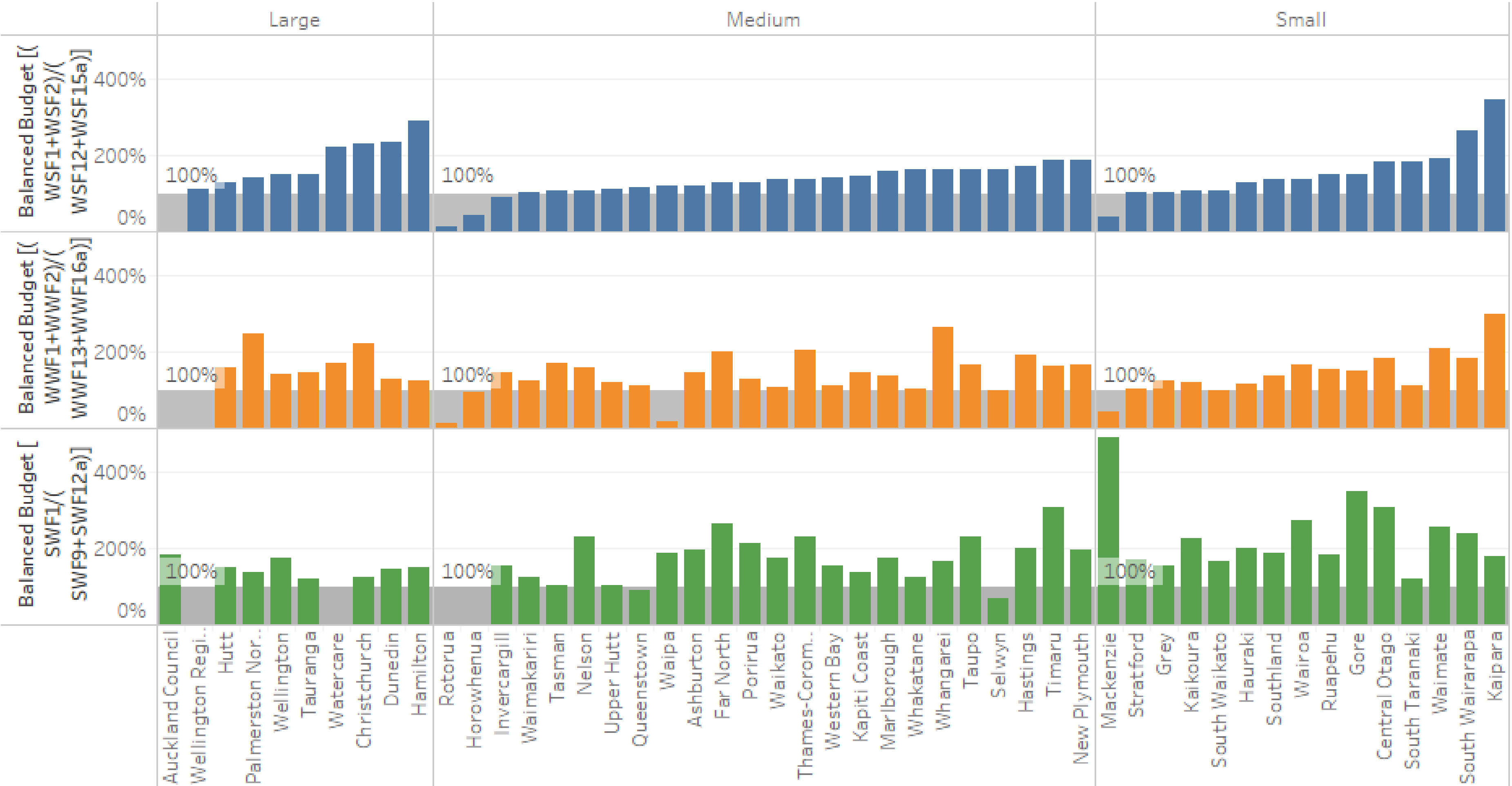
This benchmark aligns with the balanced budget benchmark in the *Local Government (Financial Reporting and Prudence) Regulations 2014* (New Zealand Government, 2014). Figure 4.1-1 shows operating costs and interest paid on 3 Waters assets as a proportion of revenue;

$$Balanced\ Budget = \frac{Revenue\ from\ supply\ of\ water/wastewater\ services\ to\ other\ authorities\ [WSF1, WWF1] + Operating\ Revenue\ [WSF2, WWF2, SWF1]}{Operating\ Costs\ [WSF12, WWF13, SWF9] + Interest\ [WSF15a, WWF16a, SWF12a]}$$

The regulations state that a local authority meets the balanced budget benchmark for a year if its revenue exceeds its operating expenses for the year.

The DIA benchmark applies to total Council operations, not each activity separately (water, wastewater, and stormwater). Disclosure by activity is for the purpose of this review only.

Figure 4.4-1: Ratio of revenue to operating costs for water, wastewater, and stormwater



- Water revenue over operating costs
- Wastewater revenue over operating costs
- Stormwater revenue over operating costs
- DIA Balanced budget benchmark

5 RELIABILITY

CASE STUDY: Fit-for-purpose inflow and infiltration assessment helps clarify wet weather overflow issues

Inflow and infiltration has been introduced as a new measure into the National Performance Review. It measures the amount of liquids other than wastewater (such as stormwater or groundwater) entering the system.

Inflow and infiltration can lead to or create additional pumping and treatment costs, has adverse impacts on the wastewater treatment process, and can cause or exacerbate wet weather wastewater overflows.

At the Far North District council, wet weather overflows in the district are of considerable concern, and have resulted in abatement notices from the Regional Council.

To quantify the contribution of inflow and infiltration to the network, and determine which of the Council's 14 wastewater schemes were the worst performers, an internal investigation of each catchment was conducted by Barry Somers, the Council's 3 Waters asset manager.

Barry has found the Rainfall Dependent Independent Inflow (RDII) benchmark both logical and useful. Prior to adopting RDII Barry's stakeholders focused on peaking factors that failed to take into account storm sizes. This caused incorrect assumptions around the amount of stormwater entering the schemes, resulting in knee jerk reactions to overflows.

The RDII benchmark is helping Barry make informed comparisons across the 14 schemes, and to prioritise the inflow and infiltration reduction works. The Council now has its efforts firmly focused on rectifying wet weather wastewater overflows in Kaitaia.

To assist councils establish cost effective inflow and infiltration programmes, Water New Zealand has commissioned a revision of the Inflow and Infiltration Control Manual (Carne & Le, 2015). With only 14 participants in the NPR providing data on their inflow and infiltration, it is likely there are a number of councils who could utilise the guide. The 2015 edition of the Manual is freely available online at: www.waternz.org.nz/library

Key Observations

Condition grading approaches are too variable to make national comparisons or assessments of pipeline condition

Five different guidance documents were referred to for conducting pipeline gradings. These consisted of guidance material produced by IPWEA, Water New Zealand, and NAMS. Water New Zealand is currently working with IPWEA and the University of Canterbury Quake Centre to improve asset condition guidance material used for pipelines.

Only 14 participants provided data on inflow and infiltration

Further definition guidance is required in the National Performance Review to provide comparative benchmarking figures for this metric. The Inflow and Infiltration Control Manual (Carne & Le, 2015) provides guidance for authorities wishing to undertake inflow and infiltration assessments, and is freely available on the Water New Zealand website.

5.1 Water Supply Interruptions

Buller, Kaipara, Nelson, Selwyn, and Waikato District Councils did not provide data on unplanned interruptions to their water supply system.

The different types of supply interruptions for those who did provide data is shown in Figure 5.1-1.

Figure 5.1-1: The total number of 2015-16 water supply interruptions by type

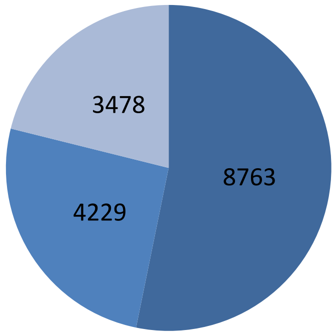
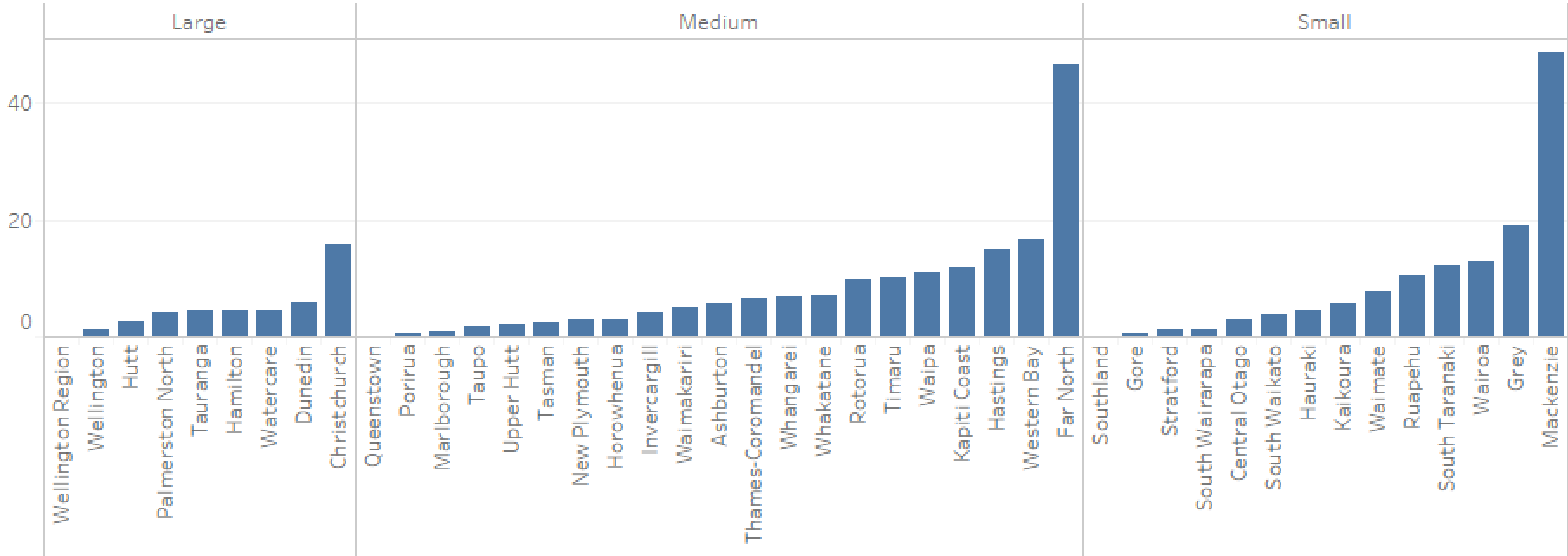


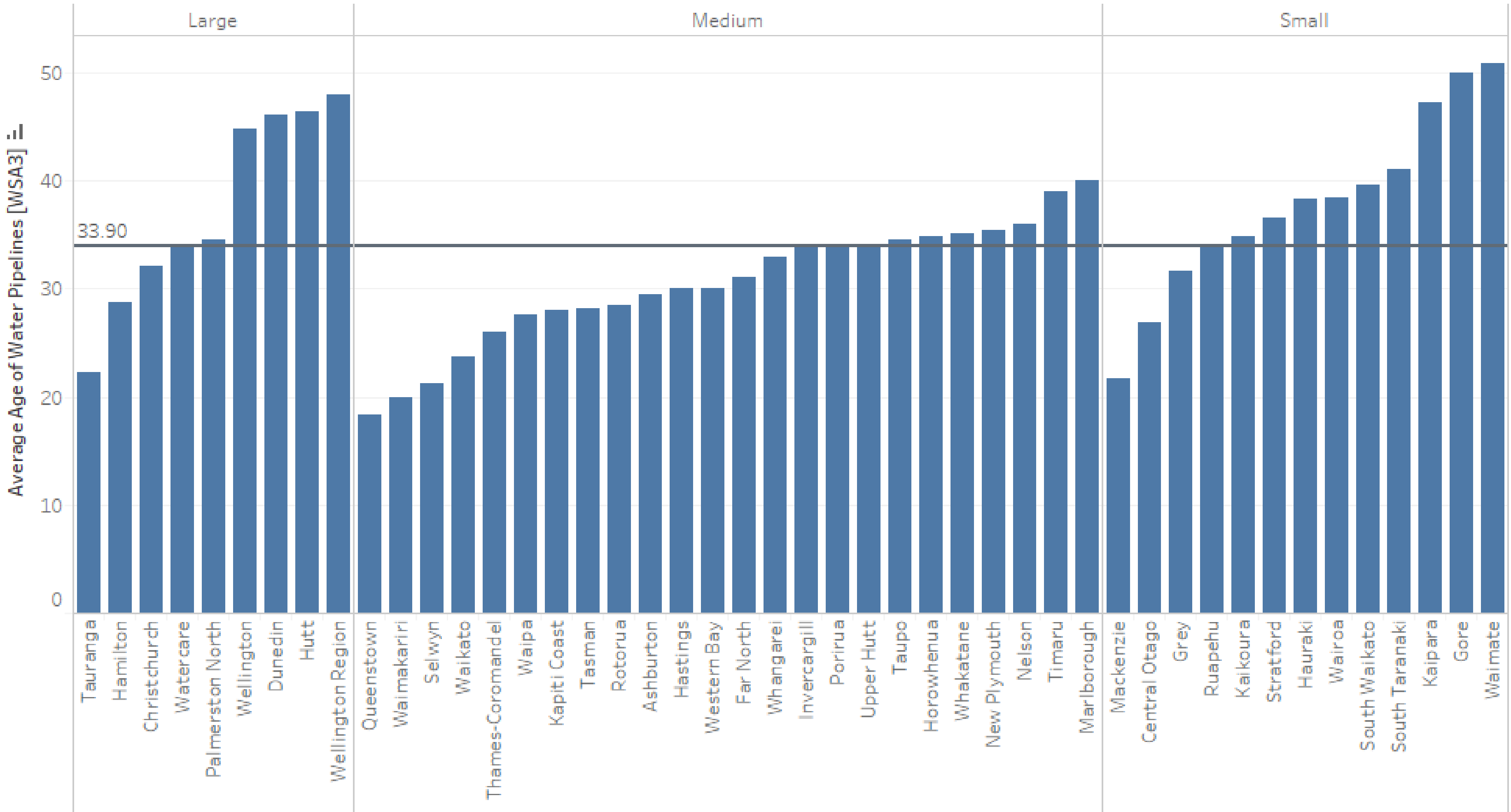
Figure 5.1-2: The number of unplanned interruptions to the water supply system per 1000 properties



5.2 Asset condition

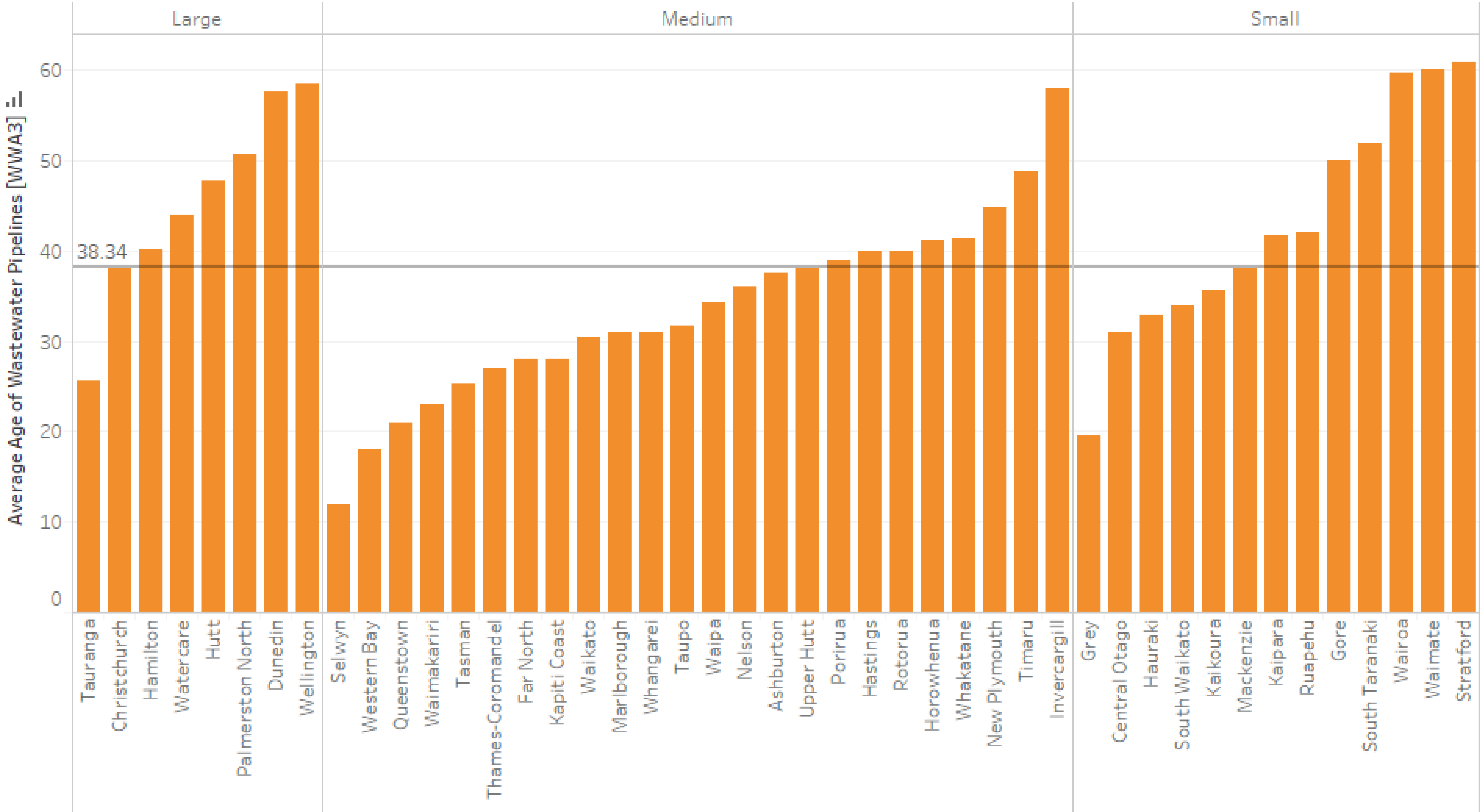
5.2.1 Asset age

Figure 5.2-1: Average age of water pipes in years[13]



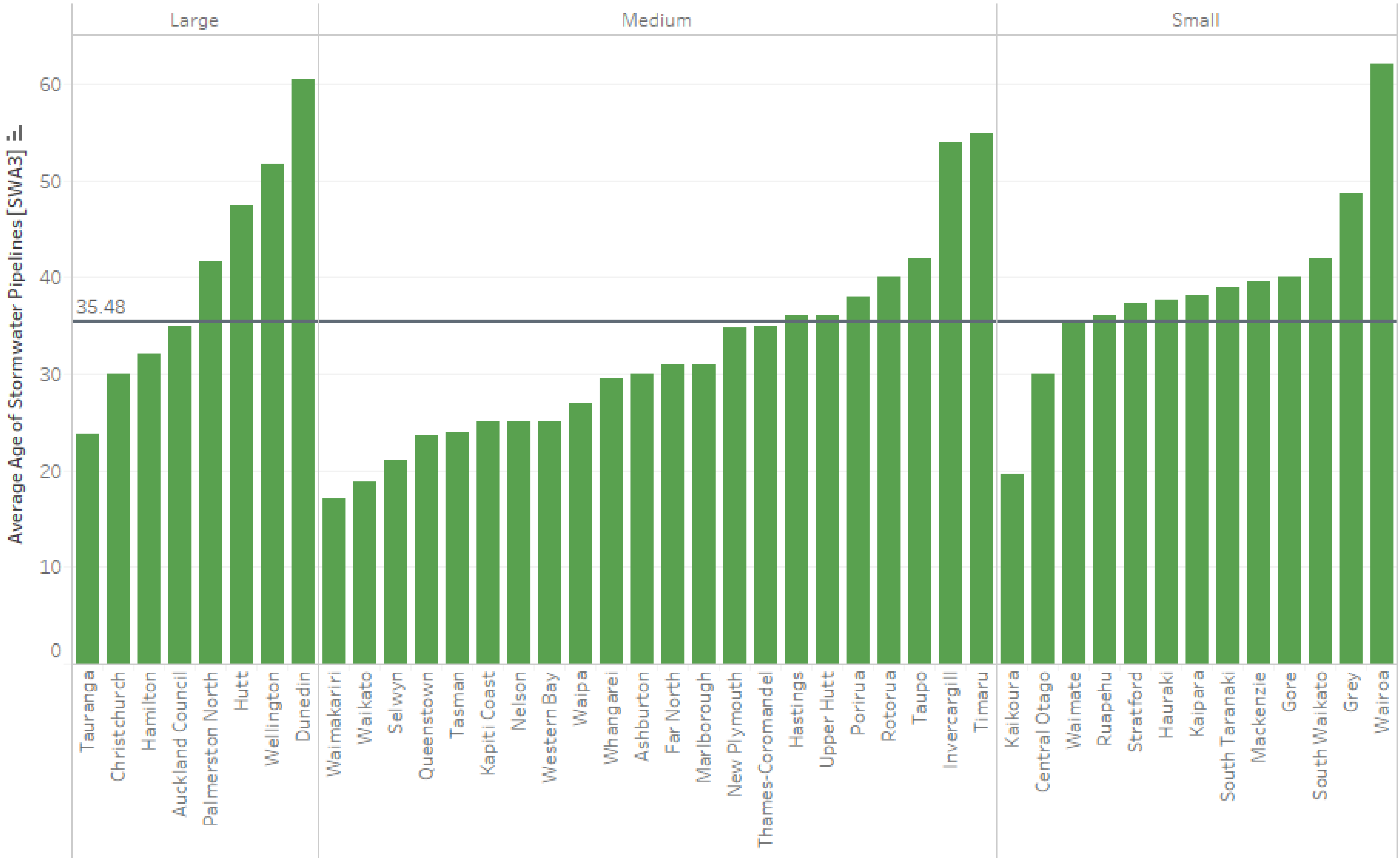
[13] Buller and Southland did not supply data on water pipeline age.

Figure 5.2-2: Average age of wastewater pipes in years[14]



[14] Buller and Southland did not supply data on wastewater pipeline age.

Figure 5.2-3: Average age of stormwater pipes in years [15]



[15] Buller and Southland did not supply data on stormwater pipeline age.

5.2.2 Pipeline condition

Figure 5.2-4 through Figure 5.2-8 show condition gradings assigned to participant pipelines. This data should be considered in the context of Figure 5.2-4 which shows that participants employ a variety of approaches for undertaking condition assessments. The complexity of these approaches varies from simple age-based extrapolations of conditions to visual and Closed Circuit Television (CCTV) inspections. The proportion of participants' pipelines assessed using CCTV is shown in Figure 5.2-9.

Figure 5.2-4: Condition assessment methodologies in use for water, wastewater, and stormwater pipelines

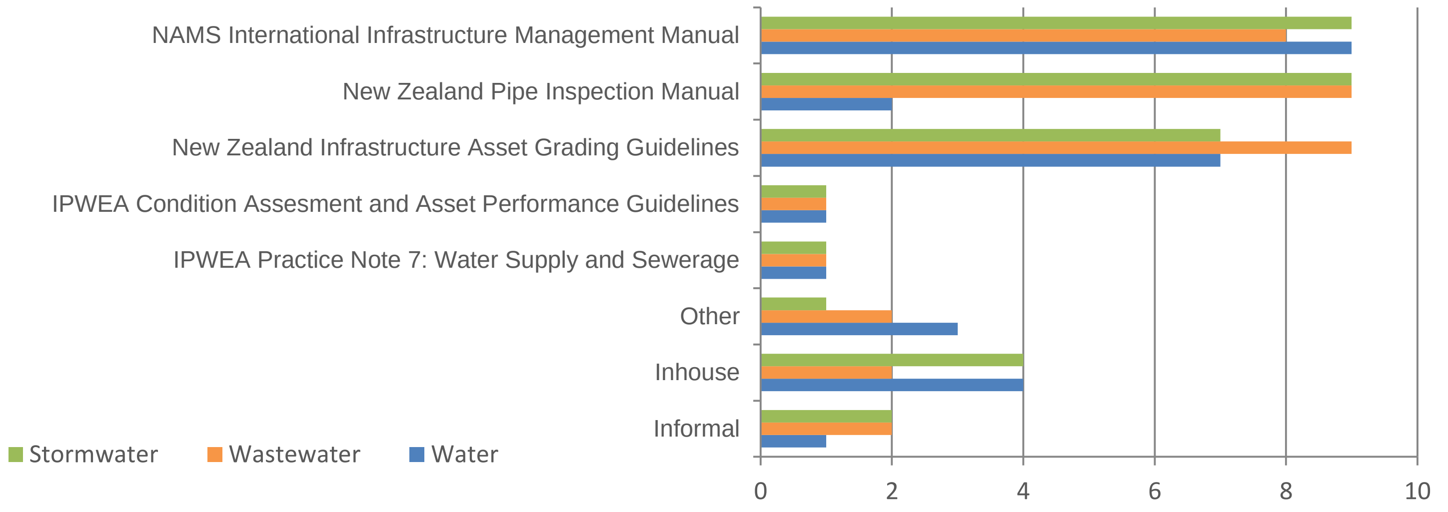


Figure 5.2-5: Percentage of pipelines that have yet to be assessed for a condition grading

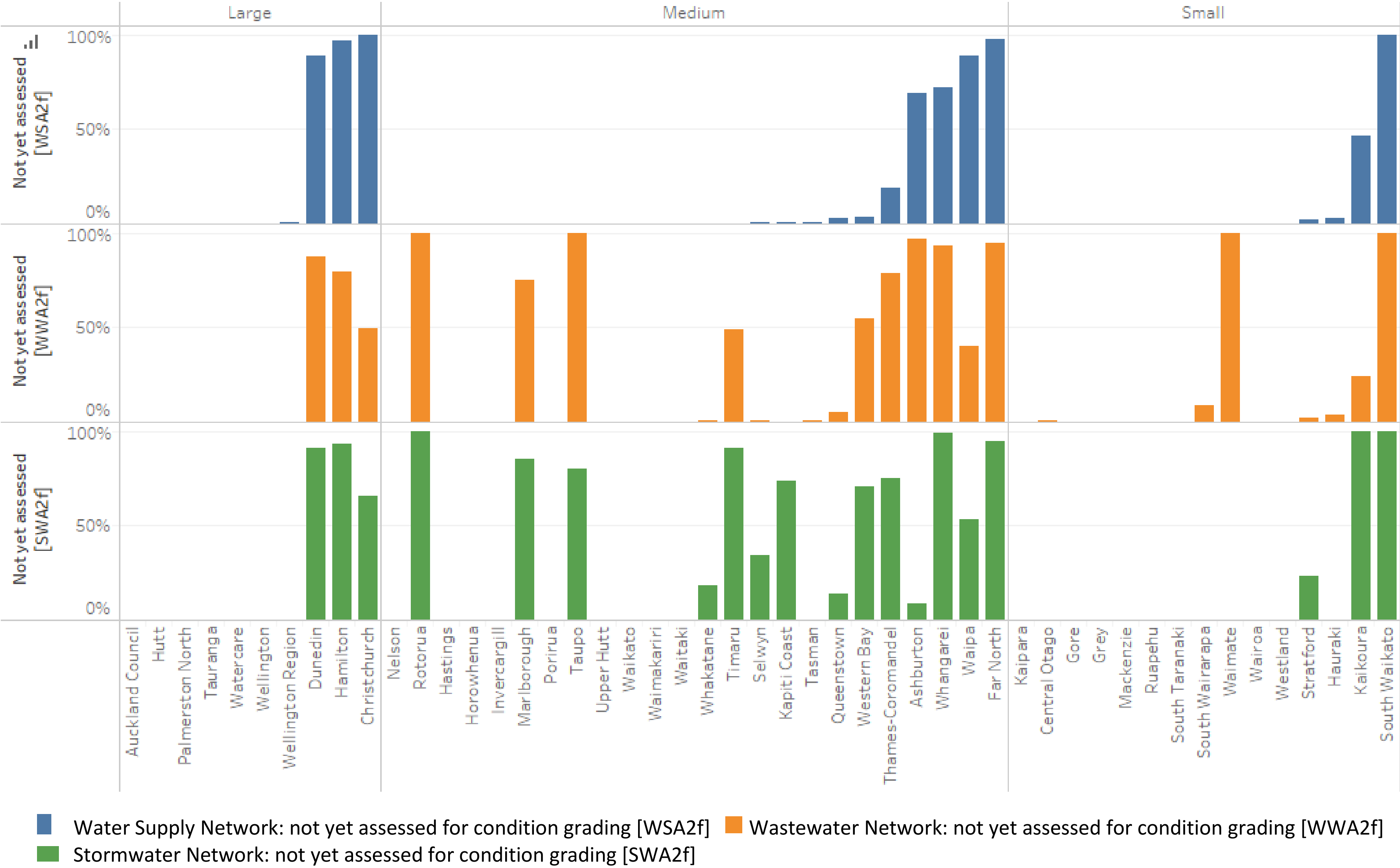


Figure 5.2-6: Percentage of water pipelines that have been assessed in poor or very poor condition

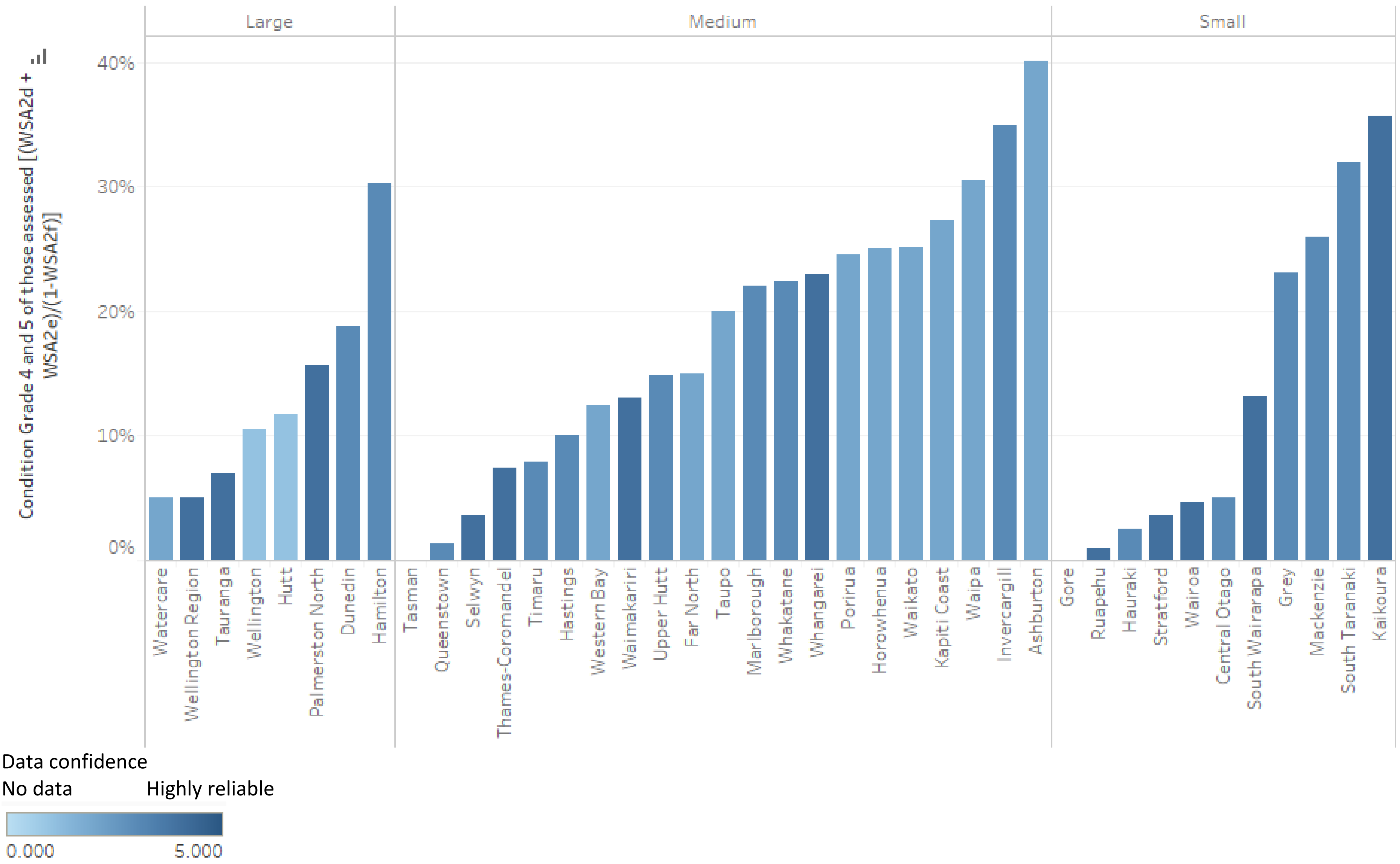


Figure 5.2-7: Percentage of wastewater pipelines that have been assessed in poor or very poor condition

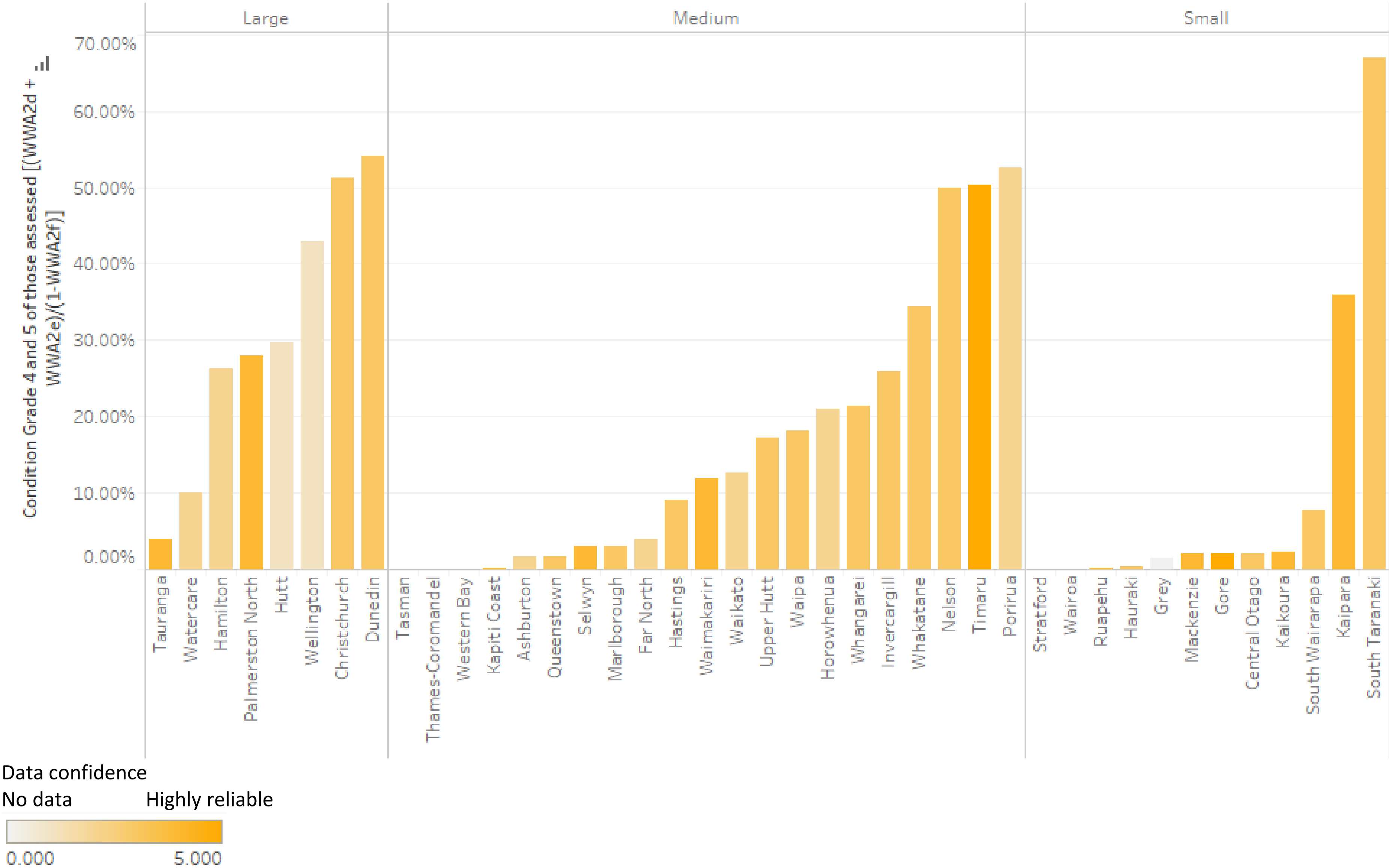
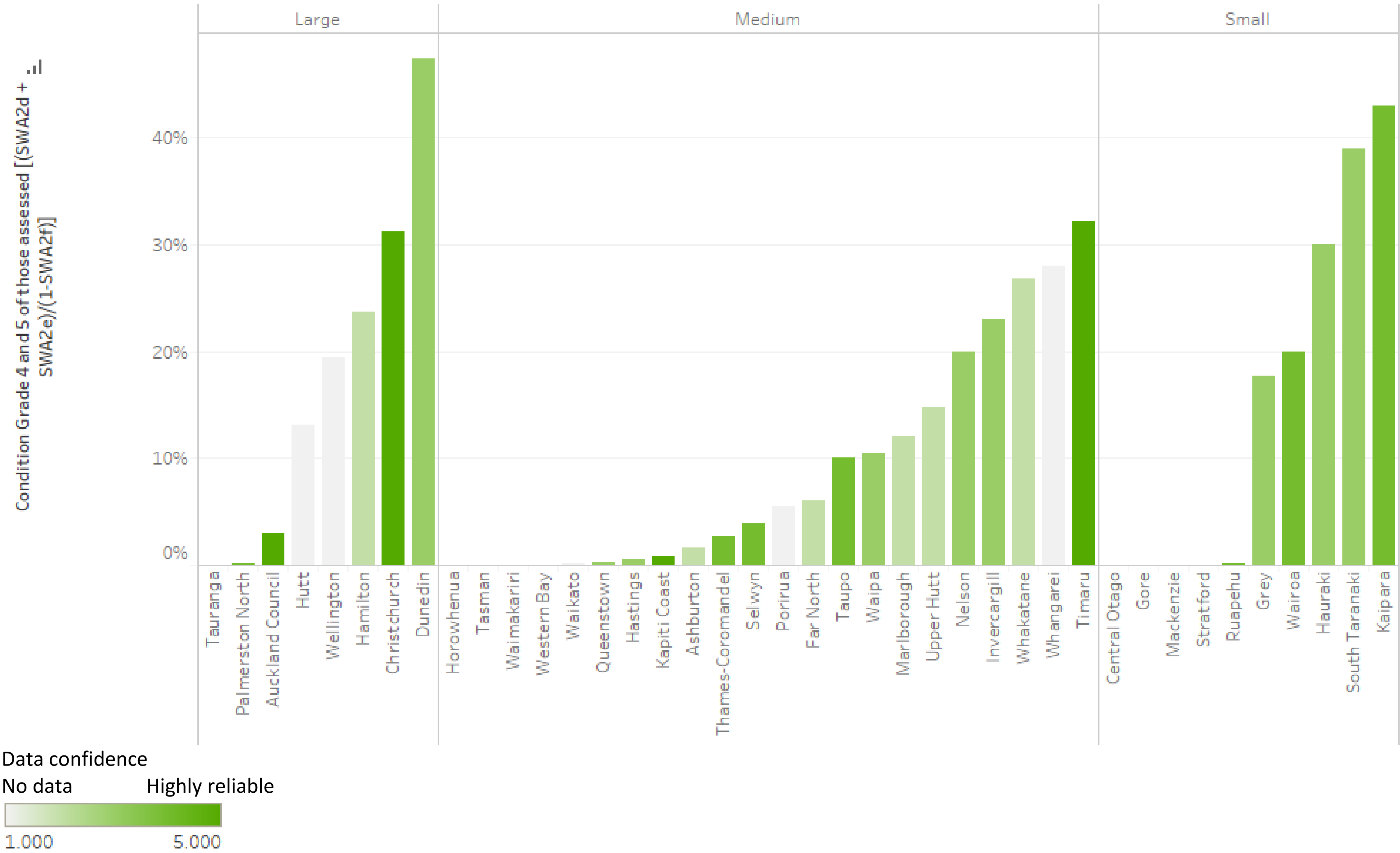
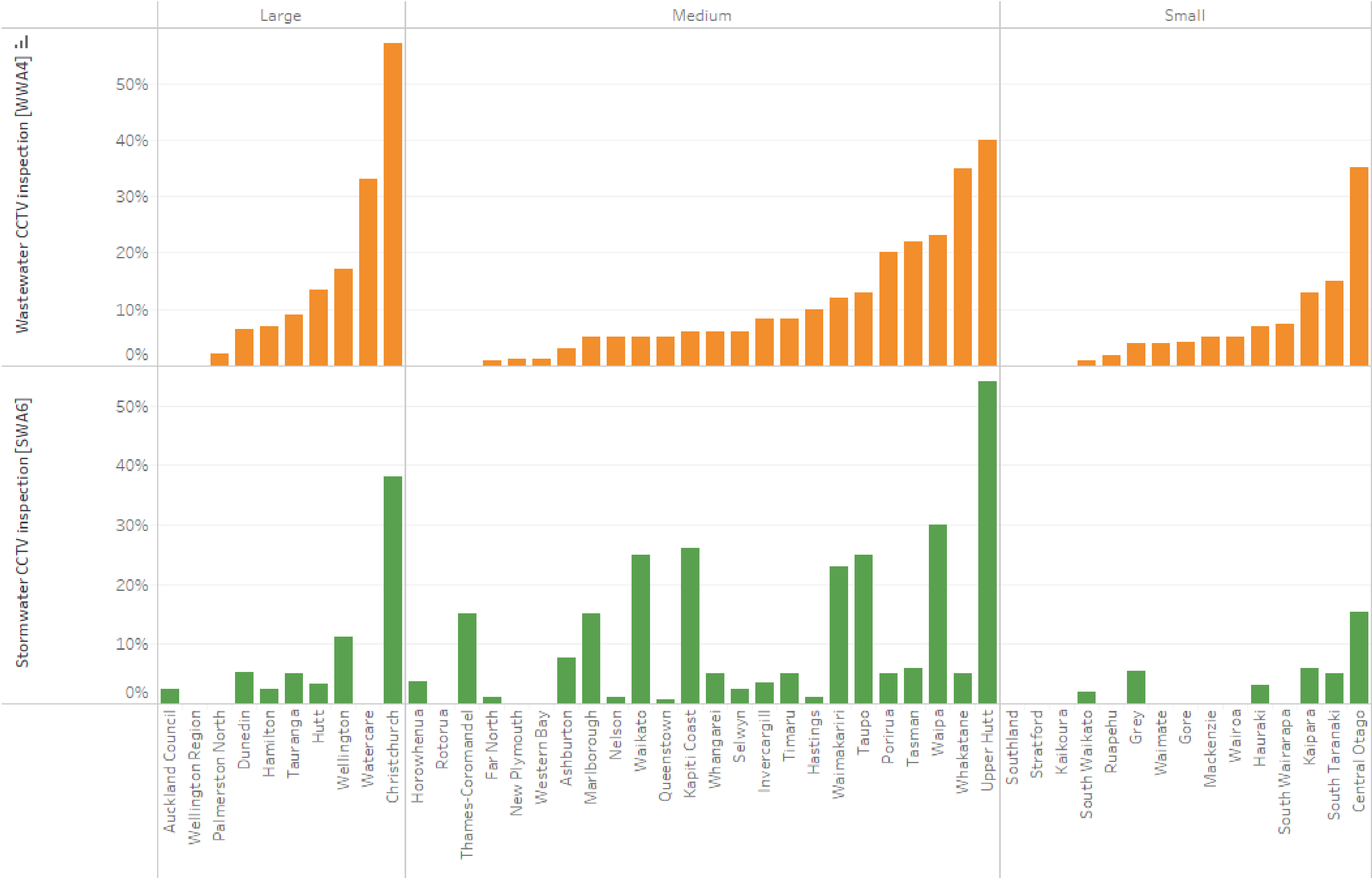


Figure 5.2-8: Percentage of stormwater pipelines that have been assessed in poor or very poor condition



5.2.3 CCTV use

Figure 5.2-9: Percentage of wastewater and stormwater network that has had CCTV completed in the last 5 years



5.2.4 Above-ground asset condition

Figure 5.2-10: Proportion of participants with formal condition assessments of above-ground assets

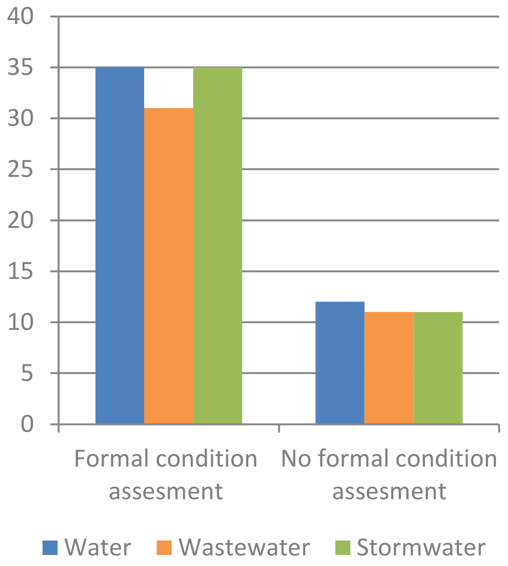


Figure 5.2-11: Condition assessment methodologies in use for above-ground water, wastewater, and stormwater assets

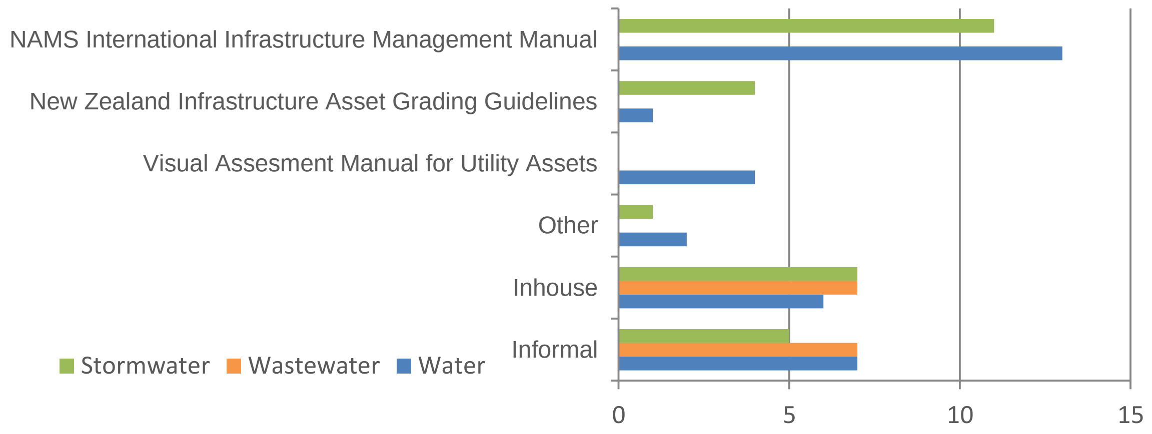
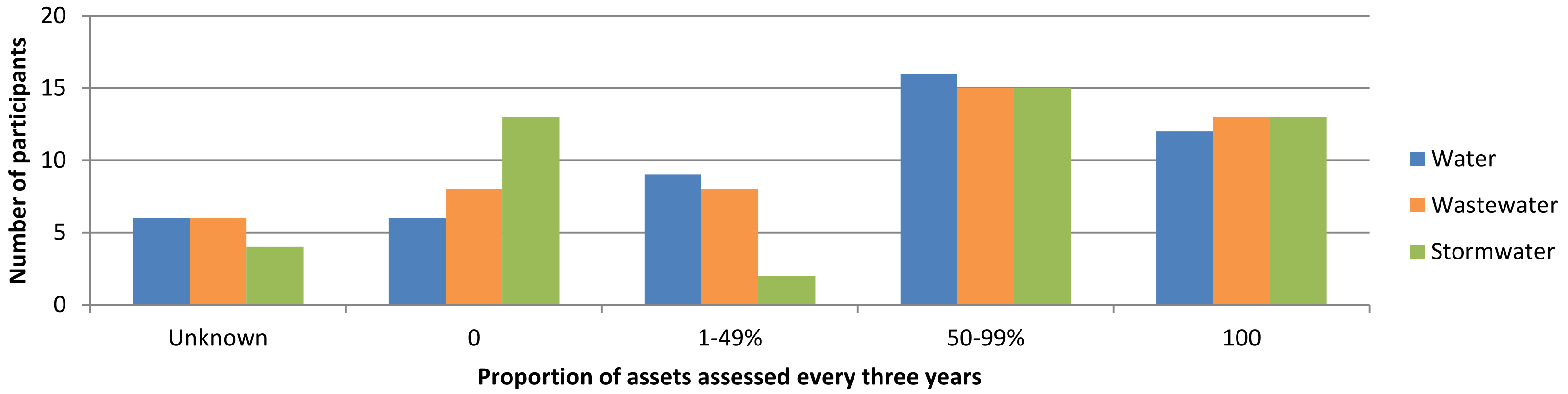


Figure 5.2-12: The frequency of above-ground water, wastewater, and stormwater assets on a 3-yearly cycle



5.3 Inflow and infiltration

Inflow and infiltration benchmarking was introduced into the NPR for the first time this year. Data was requested on participants' Rainfall Dependent Inflow and Infiltration (RDII), assessed using the approach outlined in the Infiltration and Inflow Control Manual (Steve Carne, 2015).

RDII is a percentage of total ingress parameter, which is the measure of the percentage of actual rainfall falling on a catchment that ends up in the wastewater system.

$$RDII = \frac{Recorded\ Wet\ Weather\ Volume - Average\ dry\ weather\ volume}{Measured\ Rainfall\ Depth\ \times Catchment\ area}$$

The definition guidelines failed to specify under what intensity a rainfall event data would be provided for. They also did not specify an averaging approach, meaning benchmarks are difficult to compare directly. Data provided by those who reported benchmarks are listed below.

A number of authorities reported that inflow and infiltration investigations are currently underway. Waimakariri had undertaken inflow and infiltration studies, but not in the Rainfall Dependent Inflow and Infiltration format outlined in the Infiltration Manual. Watercare commented it was not meaningful to report Auckland data in a single measure, as some catchments have combined wastewater and stormwater networks. Marlborough had also undertaken catchment scale inflow and infiltration assessments, but was not able to aggregate this into a single measure.

Table 5.3-1: Rainfall-dependent inflow and infiltration

Participant	Inflow and infiltration values
Christchurch	Estimate 15% average, varies from 5% to 20%
Far North	Average across all scheme 1.6% varies from 0.2% to 7.0%
Hamilton	0-22% - range across 27 catchments
Hastings	10%
Hauraki	11%
Invercargill	18%
New Plymouth	7.9% Calculated for week commencing 17/3/16. Largest rain event in the year. ARI5.9years for 12hour duration
Palmerston North	3%
Queenstown	14%
South Taranaki	18.4% Combine across catchments – range from 10.2% - 21.5%
South Wairarapa	Estimated at 9L/s Featherston, 3L/s in Greytown, and 2L/s in Martinborough
Stratford	10.4%
Tauranga	1.21% total city for one year event
Wairoa	14.58%

6 RESOURCE EFFICIENCY

CASE STUDY: Biosolids converted to profitable fertiliser product

Nearly two decades ago, New Plymouth was struggling to find suitable disposal sites for the sludge from its Waste Water Treatment Plant, but thanks to a decision by the New Plymouth City Council to invest in a thermal drier, the sludge has been converted to a highly successful fertiliser product.

The conversion of biosolids into a successful and sustainable business solution began in early 2000, after it became clear that dumping 8000 tonnes a year of wastewater sludge on productive land was unsustainable. In the long term, more and more land area would be required. Spreading sludge over farmland means no production from that site for at least 18 months, not to mention the cost of transportation for such huge volumes of material.

The Council purchased a new thermal drier that removes around 90 percent of the water from the sludge and converts it to a biosolid, effectively reducing 10,000 tonnes of sludge to around 1500 tonnes of quality fertiliser in the form of small pellets. To reuse pellets, the Council entered into a business arrangement with a local entrepreneur, passionate about the prospects of its ability to be successfully marketed as a highly effective fertilising solution. Hence, the brand Bioboost was launched.

Bioboost is made from the micro-organisms used in the aeration basins at the treatment plant that eat the waste in the wastewater. The excess water is squeezed out of them and then they are dried, sterilised, and pelletised in the rotary drier. The end product achieves an ‘A’ grade for pathogens under the Guidelines for the Safe Application of Biosolids to Land in New Zealand (NZWWA 2003), and is able to be used on an unrestricted basis. Zinc and copper levels mean it has achieved a ‘B’ grade in the guidelines for those metals. Water New Zealand is currently consulting on the content of new guidelines, which aim to facilitate the safe, beneficial re-use of bio-solids.

After fifteen years, Bioboost is now a valuable organic fertiliser which is used on golf courses, in horticulture and agriculture, and on private lawns and gardens. It’s a fertiliser of choice at New Plymouth’s renowned rhododendron gardens at Pukeiti where its promotion of root growth and healthy thickening of the sward helps with recovery of grass pathways. Ironically, in New Plymouth, it’s not used by the council on its own parks. It’s so effective that it makes the grass grow too fast for council mowers to keep on top of!

While the cost of producing BioBoost is currently at equivalent levels to alternative sludge management methods such as landfilling, because of increased energy costs in recent years, a major upgrade to the wastewater treatment plant is expected to result in increased energy efficiency. In the long run, solar drying may further reduce energy costs and maintenance.

With the National Performance Review showing 67,353 tonnes of dry solids ending up in landfill, there is clearly an opportunity for other councils to replicate New Plymouth’s experiences turning a costly waste product into a sustainable business.

Key Observations

Sixteen authorities listed wastewater sludge production as 0

It is likely that these are lagoon-based systems which haven't been desludged. Water New Zealand has commissioned the development of oxidation pond guidelines that will provide guidance for the management of lagoons, including recommended desludging frequencies.

Six participants did not have sufficient data from regional councils to determine whether their drinking water takes were over-allocated

Water demand management is an issue in a number of districts

Fifty-three water takes were over-allocated. Forty-seven participants had in place water restrictions.

Fifteen out of 47 metered the majority of their residential water customers

Full residential water metering correlates with lower water use

For participants with 100% metering coverage, none used greater than 300L/person/day. There were 16 participants who had water use in excess of this.

There is room to improve water loss management

All participants reported the annual percentage of water lost from their networks, however due to fluctuating water supply volumes this metric does not enable water loss comparisons across time or systems. Current annual real losses and the Infrastructure leakage index are measures of water loss efficiency that can be used to enable comparisons across time and systems respectively. Ten participants did not supply data on water loss efficiency. Of the 26 authorities that supplied infrastructure leakage data, 6 had high or very high leakage rates.

6.1 Water abstractions

6.1.1 Changes in water abstractions

Figure 6.1-1: Changes in volume of water supplied to small participant systems (m^3/year)

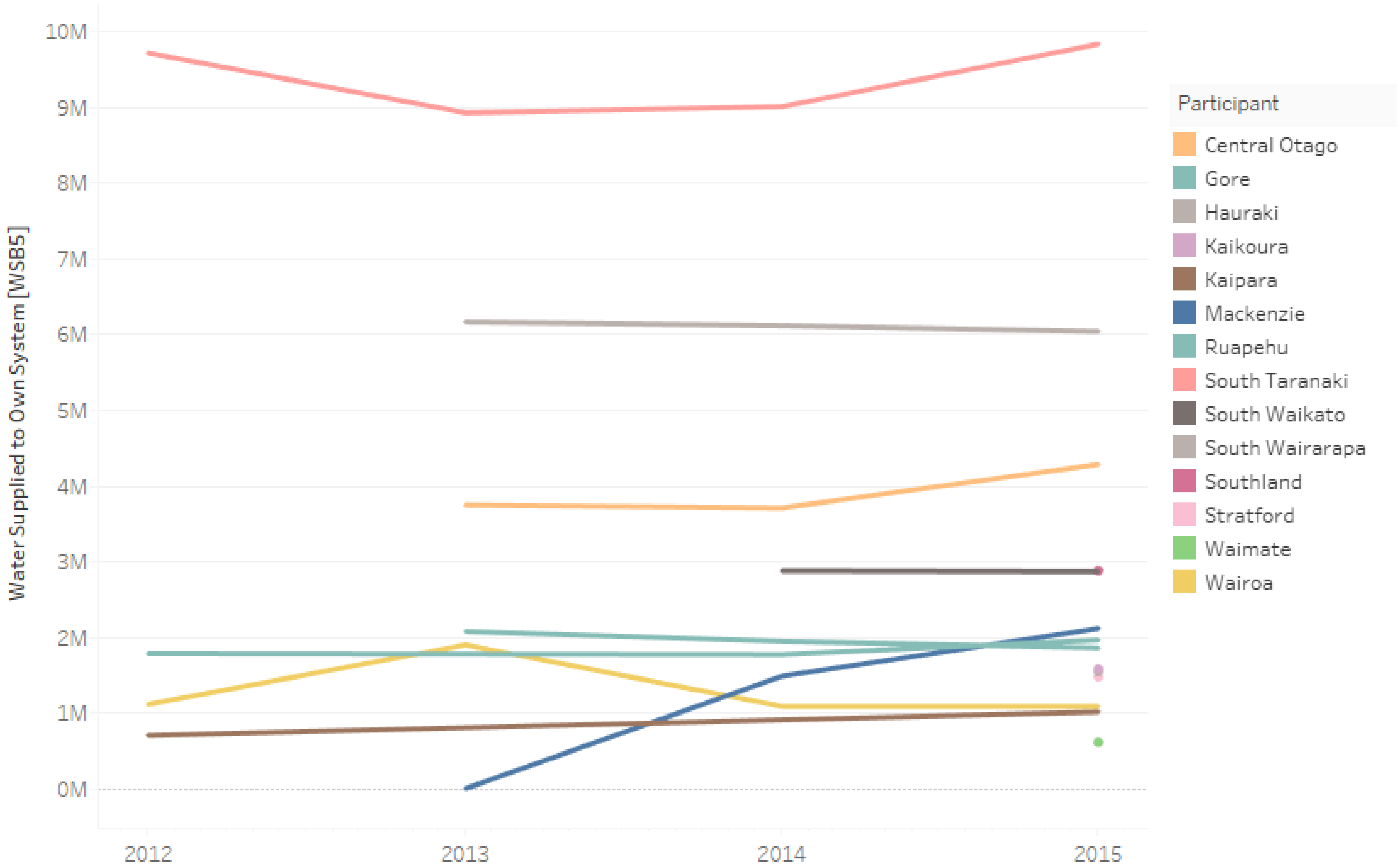


Figure 6.1-2: Changes in volume of water supplied to medium participant systems in the north island (m^3/year)

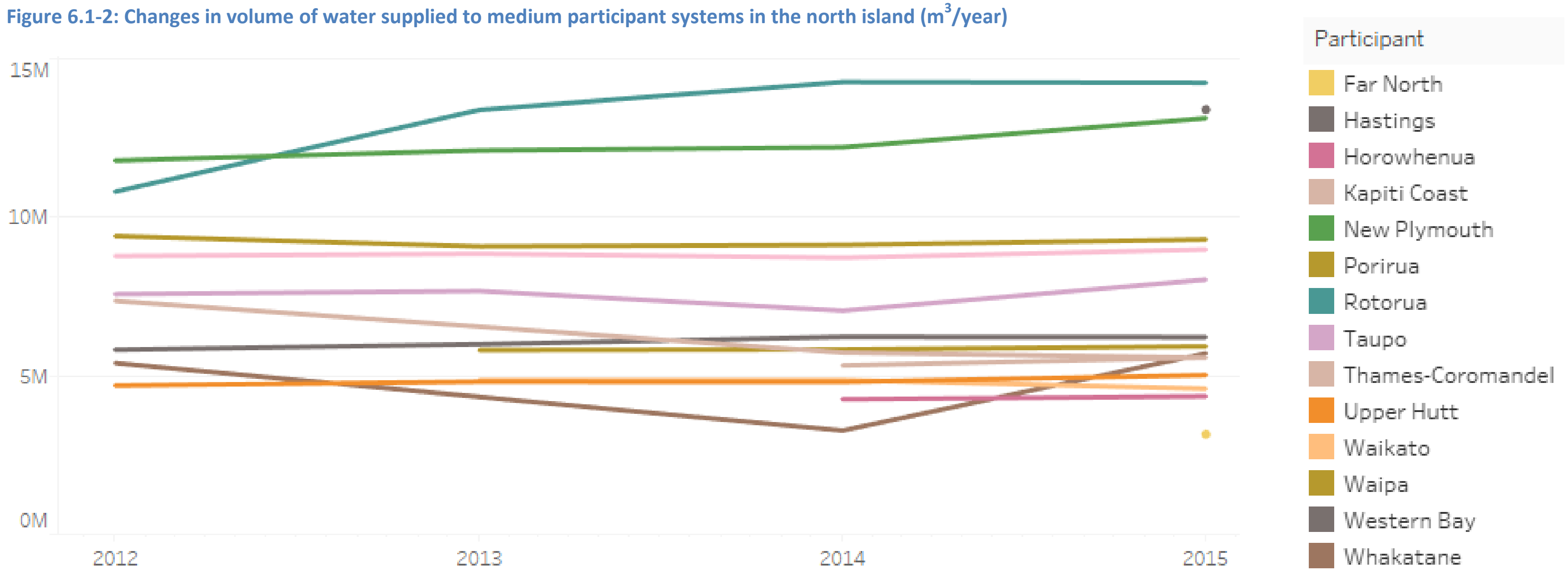


Figure 6.1-3: Changes in volume of water supplied to medium participant systems in the south island (m^3/year)

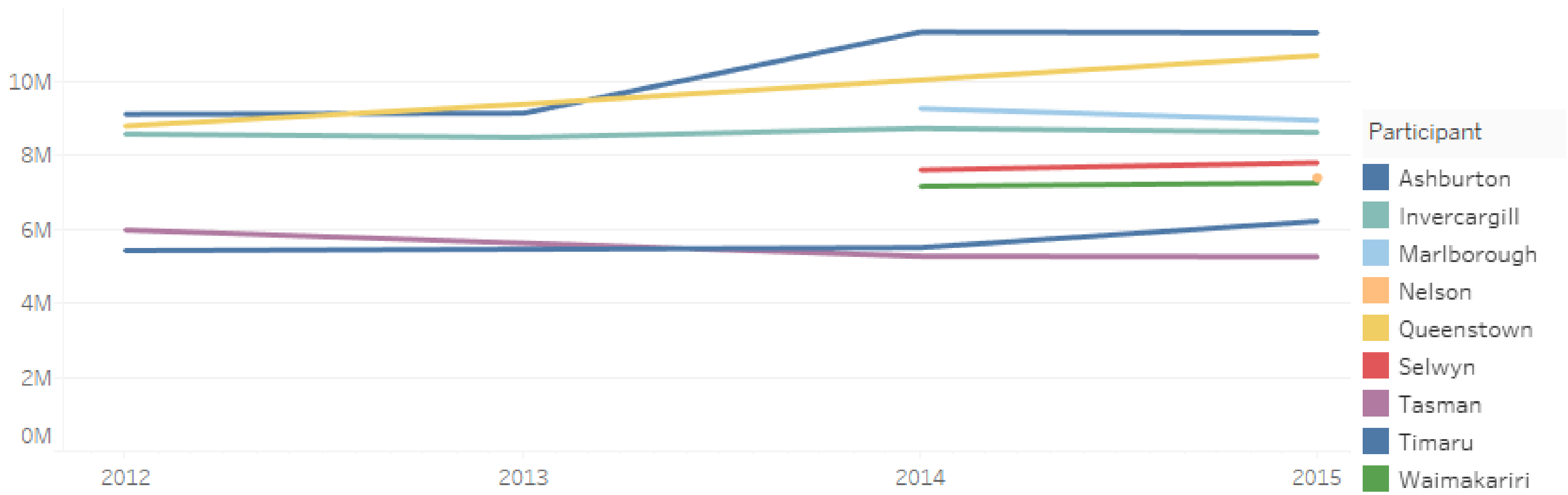
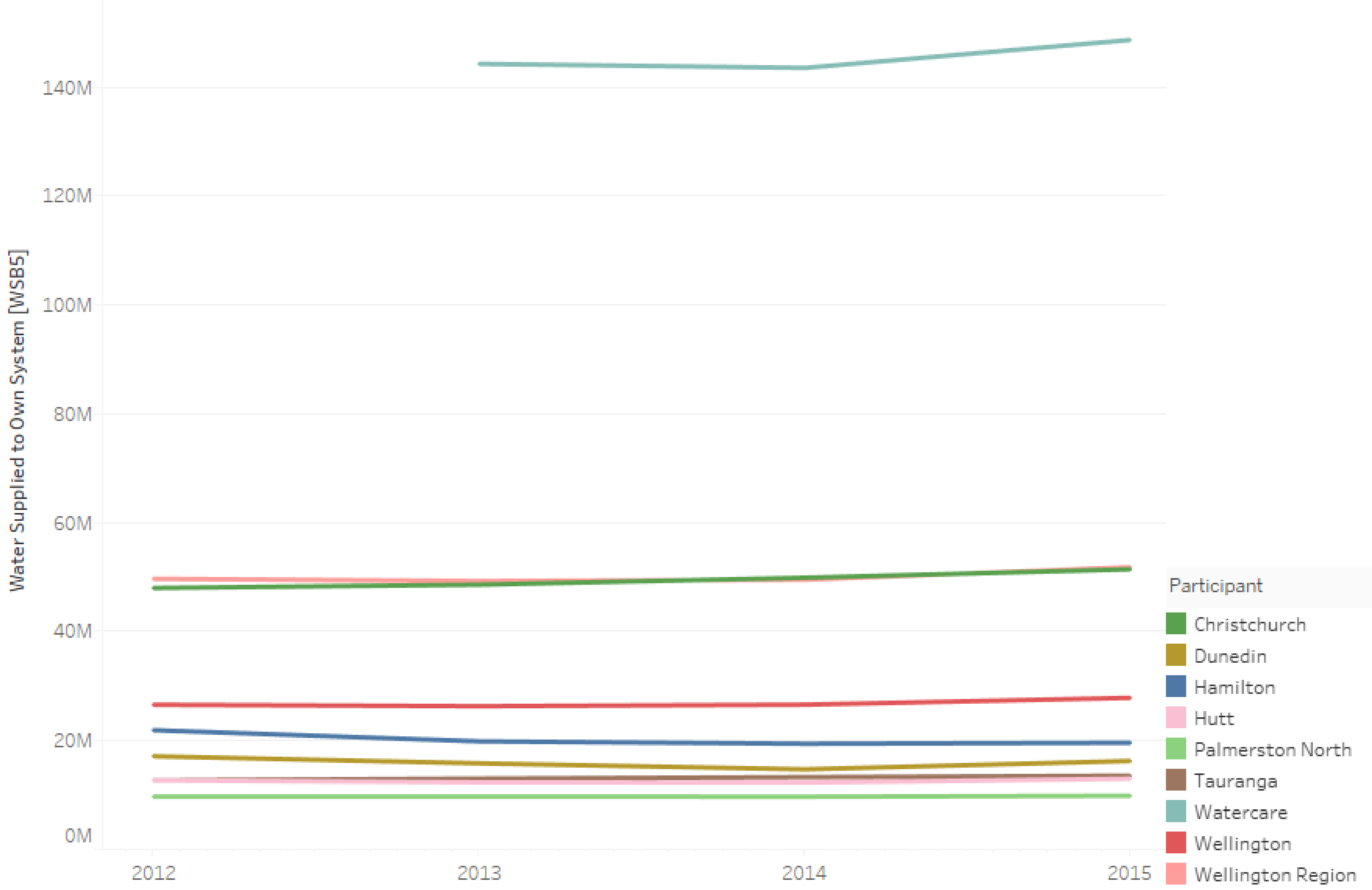
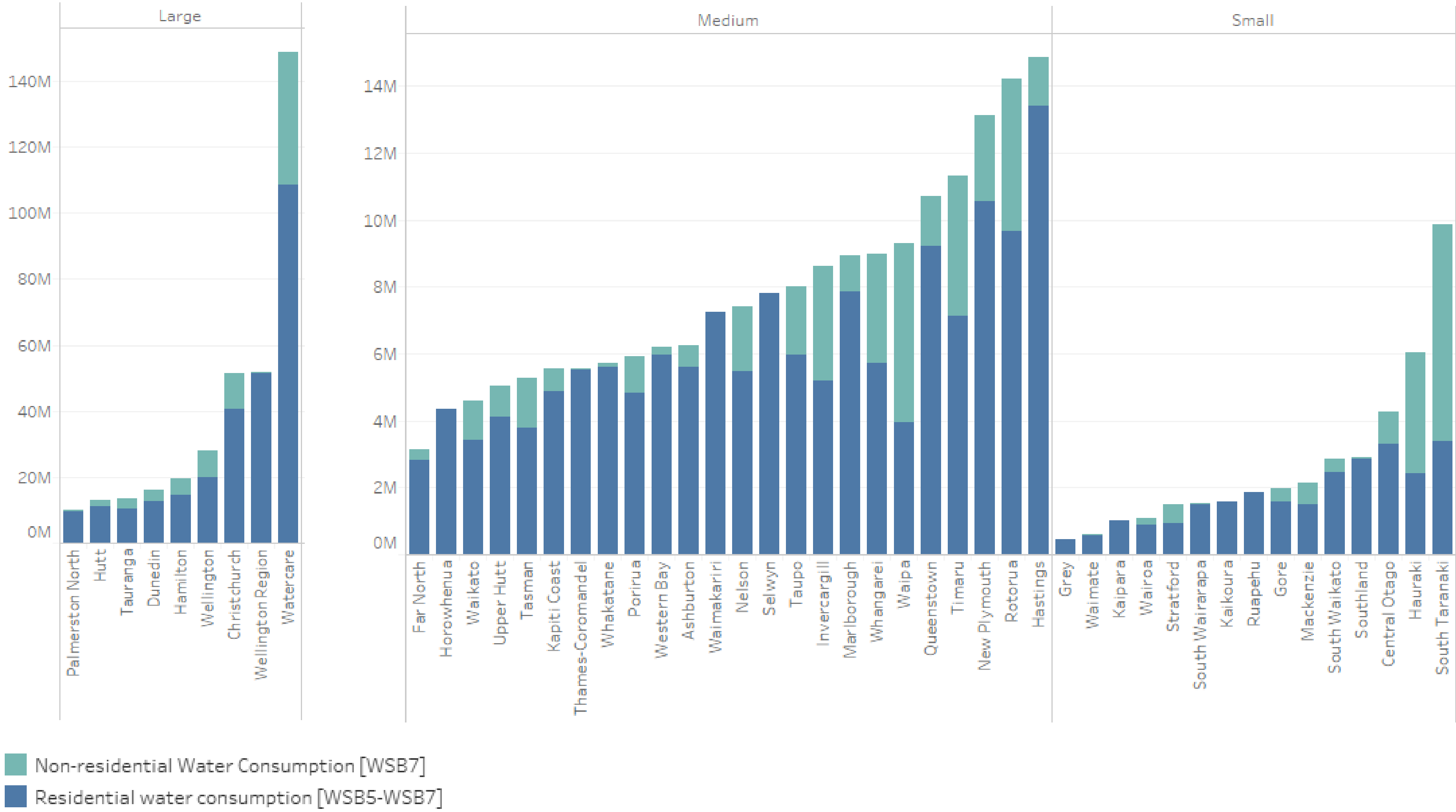


Figure 6.1-4: Changes in volume of water supplied to large participant systems (m^3/year)



6.1.2 Commercial vs residential volumes

Figure 6.1-5: Proportion of water used for residential vs commercial use



6.2 Sludge

6.2.1 Water sludge

Sixteen authorities provided data on water sludge disposal. Collated results are shown in Table 6.2-1.

Table 6.2-1: Water treatment sludge production by disposal route

Disposal route	Sludge volume (tDS/year)
Landfill	20,769
Sewer	4,562
Other	423
Total sludge volume	25,755

6.2.2 Wastewater sludge

Thirty-one authorities provided data on the volume of wastewater sludge disposed of. Sixteen listed their 2015/16 sludge disposal volumes at 0 (most likely attributable to lagoon-based systems which did not receive desludging), and a further two authorities did not have data on sludge volumes. Collated results of the data provided are shown in Table 6.2-2.

Participant responses listed in the "Other" category were:

- **Watercare**: Returned to other treatment facilities
- **Invercargill**: Land application
- **Dunedin**: Incineration
- **Ashburton**: Applied to pasture that is not harvested for reuse
- **Tauranga**: Placed in lagoon for drying prior to landfill
- **Horowhenua**: Returned to oxidation pond

Table 6.2-2: Total wastewater sludge volumes by disposal route

Disposal route	Sludge volume (tDS/year)
Onsite stockpile	25774
Landfill	50228
Composting and reuse	26982
Other disposal route	11747
Unknown	2464

6.3 Water availability stress

6.3.1 Security of water resources

Twenty-three participants indicated they did not have any over-allocated takes. Six participants did not have data for this metric. For those who did indicate catchments were over-allocated, reported values are shown in Table 6.3-1. The following supporting commentary was provided alongside water allocation data:

- **South Taranaki**: has two schemes (Waimate West with 3 takes and Inaha with 2 takes) that reach the consent limit during summer months. Water demand is managed instead of over-allocating.
- **Ruapehu**: Raetihi – Taumarunui, Owhango, National Park, and Ohakune schemes are marginally over-allocated. The Ohura scheme has insufficient hydrology data to assess allocation status.
- **Queenstown:** wasn't aware of allocation issues however noted the Arrowtown scheme demand exceeds consented capacity.
- **Nelson:** was unable to supply data as assessment of catchments allocation is currently underway.
- **Marlborough**: two consents have limits on chloride related to salt water intrusion of the supply aquifer.
- **Kaikoura**: did not register over-allocated takes, but noted the Kaikoura Plains is a red zone for surface water.
- **Hamilton**: water take is not currently over-allocated, however noted once the current backlog of applications are processed it is likely that over allocation will be reached.
- **Dunedin**: Otago Regional Council feedback on allocation limits was that flow data was insufficient to respond, however an educated guess on groundwater and surface water takes suggested of 29 consents to take water, 17 are in catchments likely to be over-allocated.
- **Whakatane**: Was unable to supply data as the regional council was currently undertaking an assessment.
- **Watercare**: Both Helensville takes are over-allocated according to the Auckland Unitary Plan's method for setting surface water allocation, however abstraction remains within consented limits.
- **Timaru**: Has a source in a river which is over-allocated, however the flow allocation plan confirms drinking water as a priority take. The water is safeguarded for the future, although within the entire catchment there is a target to reduce the allocation over time.
- **South Wairarapa** Resource consent takes are close to their limit, however the allowed take in comparison to actual for drinking water is about 60% of that allowable.

Table 6.3-1: Number of consented water takes drawing from an over-allocated supply

Participant	Total Water Takes [WSE5]: Total number of participants' consented water takes used to supply drinking water.	Security of Water Resources [WSE6]: Total number of participants' consented water takes used to supply drinking water that are over-allocated.
Ashburton	15	13
Dunedin	29	17
Far North	16	3
Marlborough	9	2
Ruapehu	6	4
Stratford	4	3
Tauranga	2	2
Waikato	6	3
Waimakariri	24	1
Watercare	18	2
Wellington Region	3	3
Western Bay	18	1

6.3.2 Restrictions

Figure 6.3-1: Proportion of participants with water restrictions

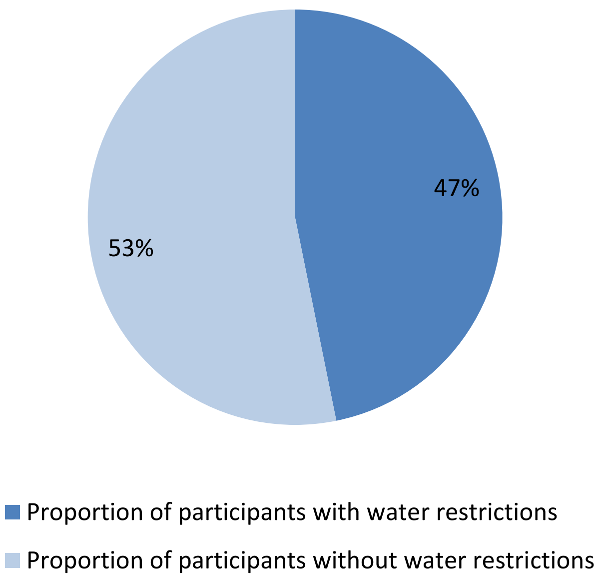


Figure 6.3-2: Number of days a year water restrictions are applied

Participant	Water restriction days [WSS11]
Thames-Coromandel	20
Stratford	37
Palmerston North	38
Tasman	42
New Plymouth	64
Hastings	68
Timaru	77
Queenstown	90
Far North	91
Horowhenua	92
South Wairarapa	98
Hamilton	120
Waipa	121
Waikato	123
Ashburton	133
Gore	133
Ruapehu	146
Wellington	180
Hutt	180
Porirua	180
Mackenzie	193
Upper Hutt	365

6.4 Water metering

Figure 6.4-1: Residential water metering coverage (%)

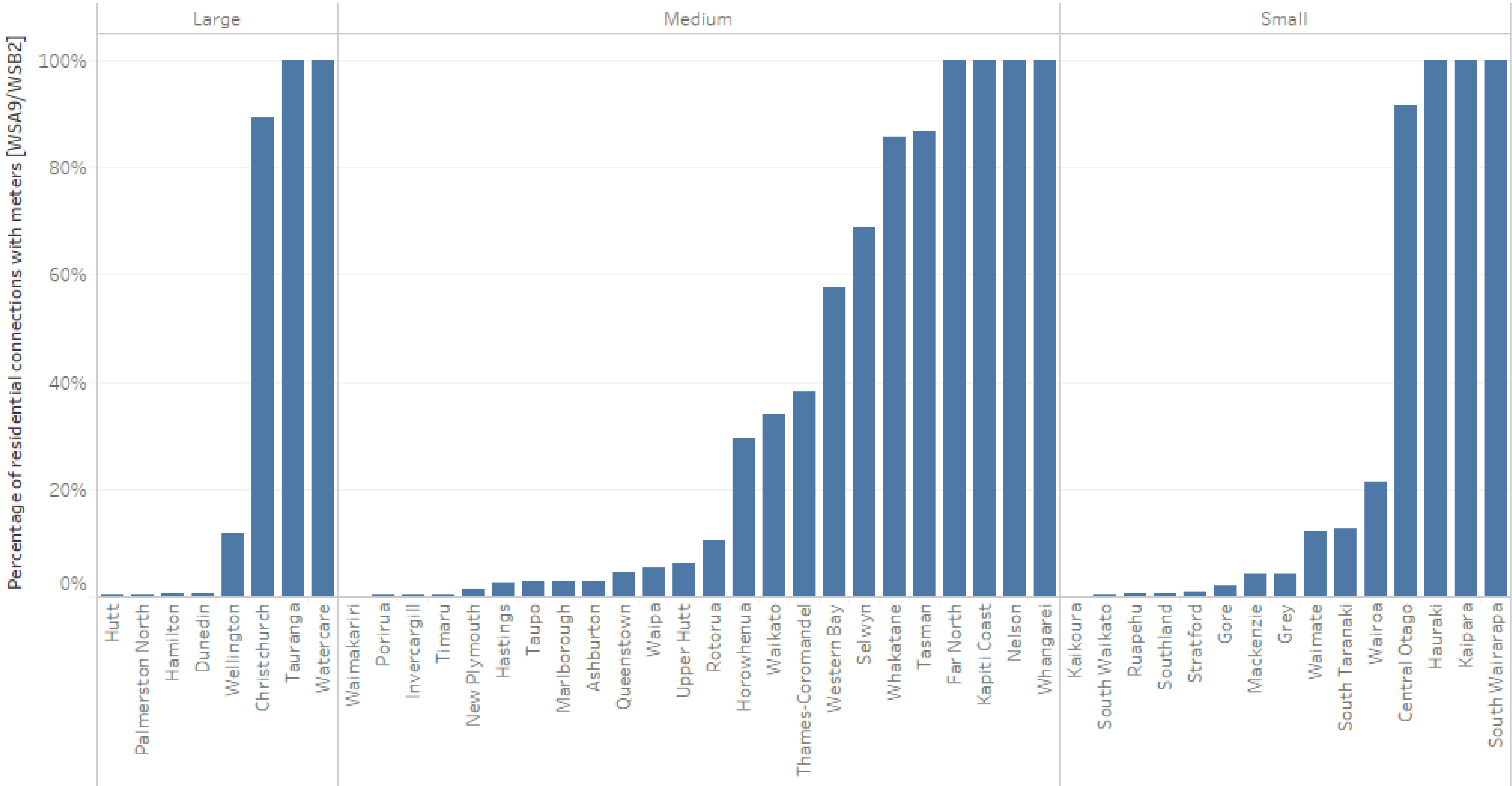
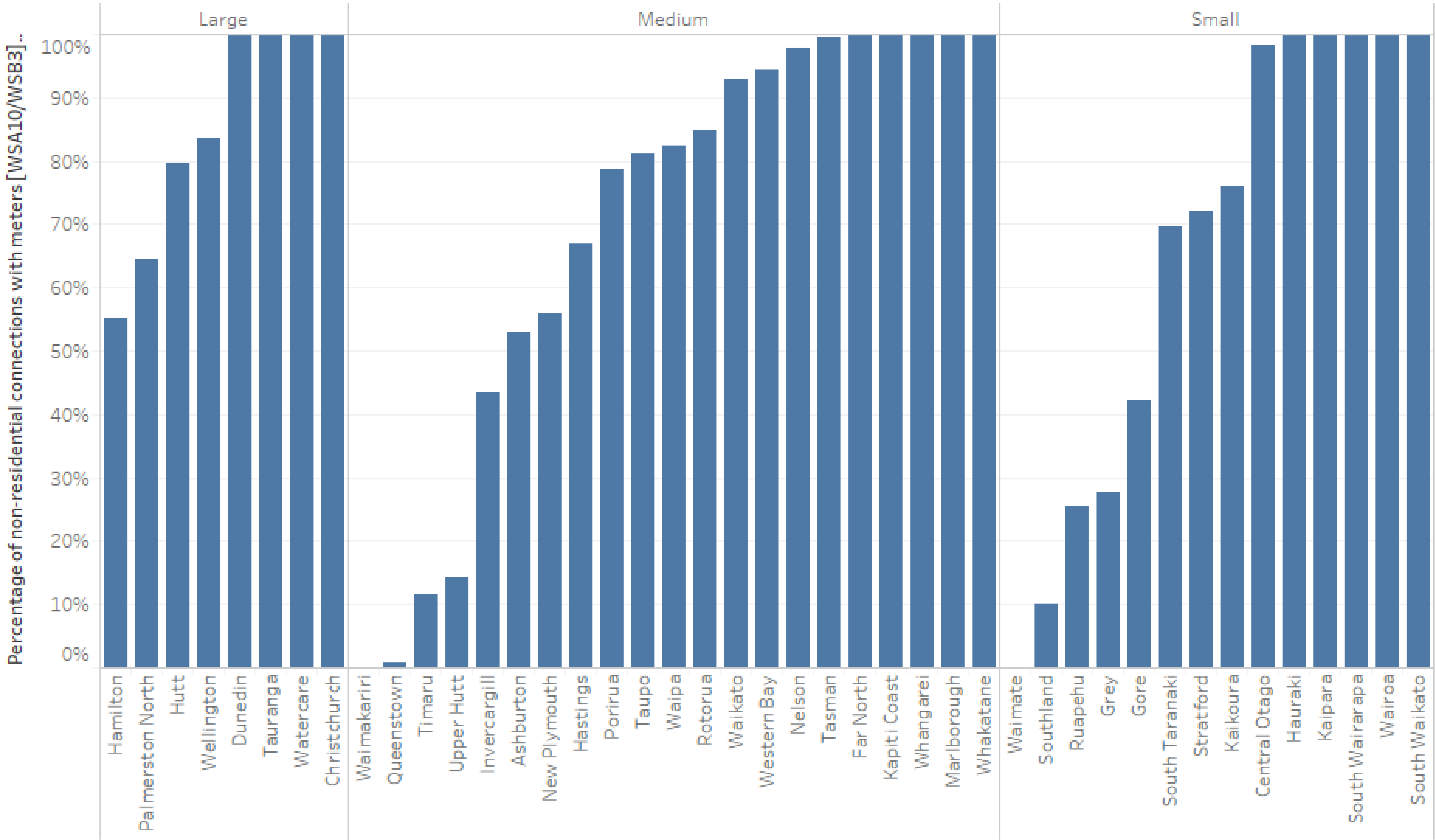


Figure 6.4-2: Non-residential water metering coverage (%) [16]



[16] In Christchurch, there are 13,803 meters recorded as being commercial/high consumer, on 9,849 properties (land parcels). A large number of properties have multiple meters. Marlborough and South Waikato also have more non-residential water meters than non-residential properties.

6.5 Residential water efficiency

Residential water use is calculated as:

$$Average\ Daily\ Residential\ Water\ Consumption\ [WSB8] = \frac{\begin{array}{c}Water\ Supplied\ to\ Own\ System\ [WSB5] - Total\ non-residential\ Water\ Consumption\ [WSB7]\\ - Estimated\ total\ network\ water\ loss\ [WSE1]\end{array}}{365 \times Total\ water\ serviced\ population\ [WSB1]} \times 1000$$

Kaikoura's residential water use appears high, as non-residential and residential water use is not currently recorded separately.

Figure 6.5-1: Residential water consumption (L/person/day)

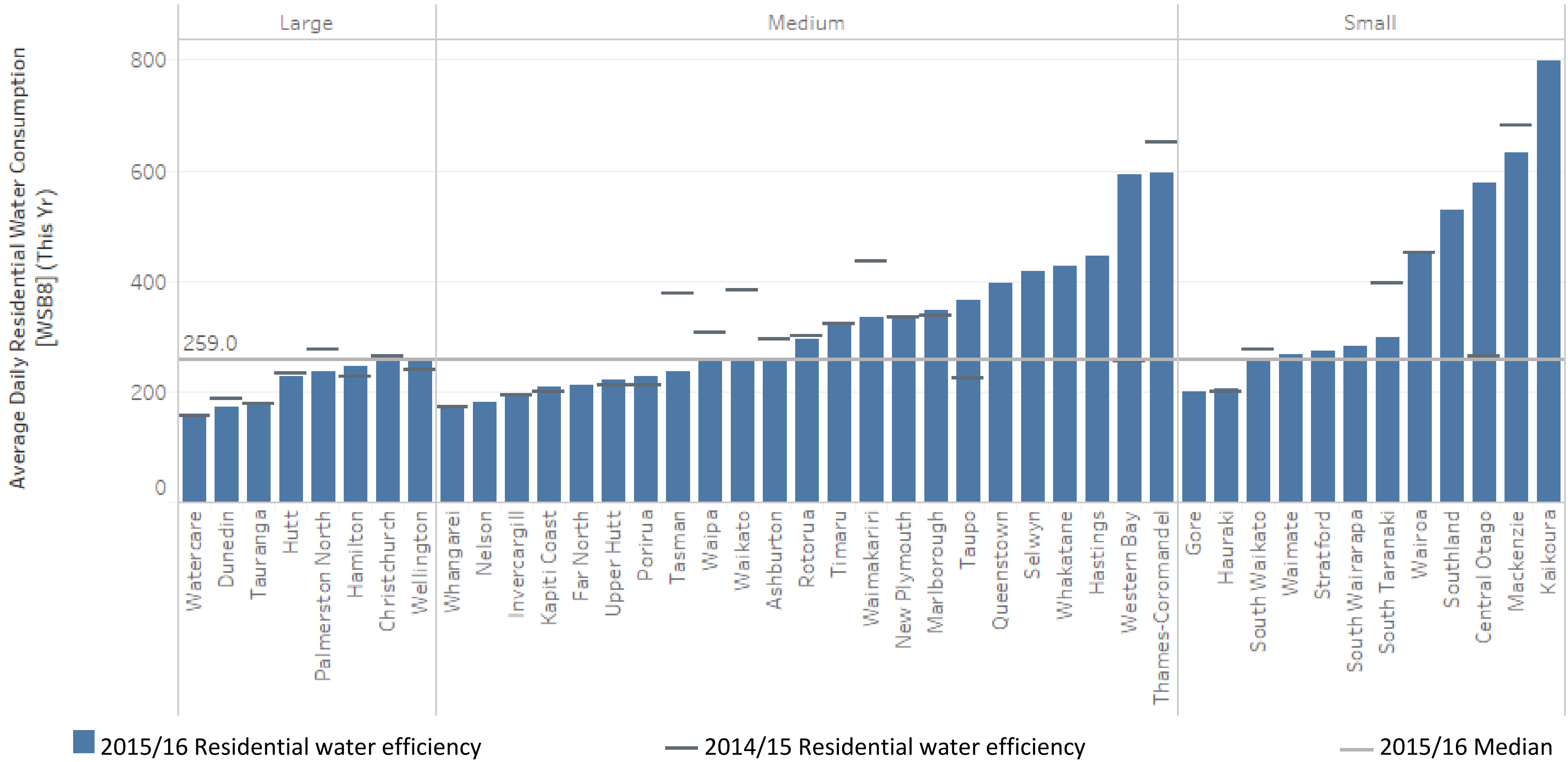
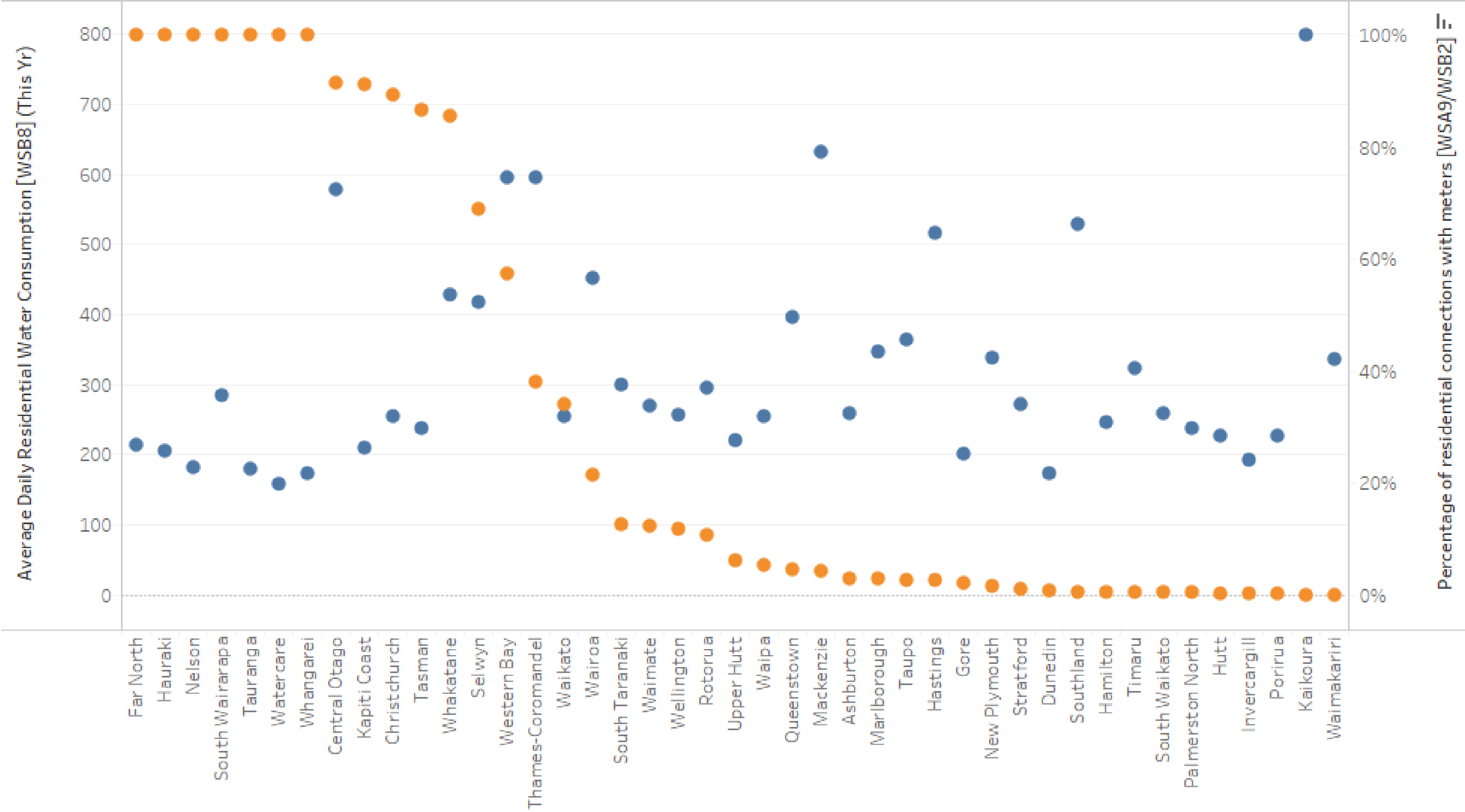


Figure 6.5-2 Residential metering coverage (%) and residential water efficiency (L/person/day)



Average daily residential water consumption (L/person/day)
Percentage of residential properties with meters (%)

6.6 Water loss

A total of 101,818,350m^3 of water losses was reported across all participant networks in 2015/16.

The Infrastructure Leakage Index (ILI) is a water loss performance indicator for inter-utility water loss comparisons recommended by leading international best practice (European Benchmarking Commission, 2015) and New Zealand water loss guidance material (Dr Ronnie McKenzie, 2008). The European Benchmarking Commission (European Benchmarking Commission, 2015) uses the ILI to classify water loss as "very high", "high", "moderate" or "low" and outlines suggested actions for each of these categories.

ILI is determined using the following equation:

$$ILI = \frac{Current\ annual\ real\ losses}{Unavoidable\ annual\ real\ losses}$$

ILI allows for current system pressure in the UARL formula. However, pressure is a strong determinant of leak flow rates and burst frequency. The current system pressure is not necessarily optimal, and excess operating pressure and pressure transients are not beneficial; they should be reduced wherever feasible, without breaching minimum standards of service for pressure. Hence, Figure 6.6-1 includes system operating pressure in the figure.

Figure 6.6-1: Infrastructure leakage index and average system pressure (m)

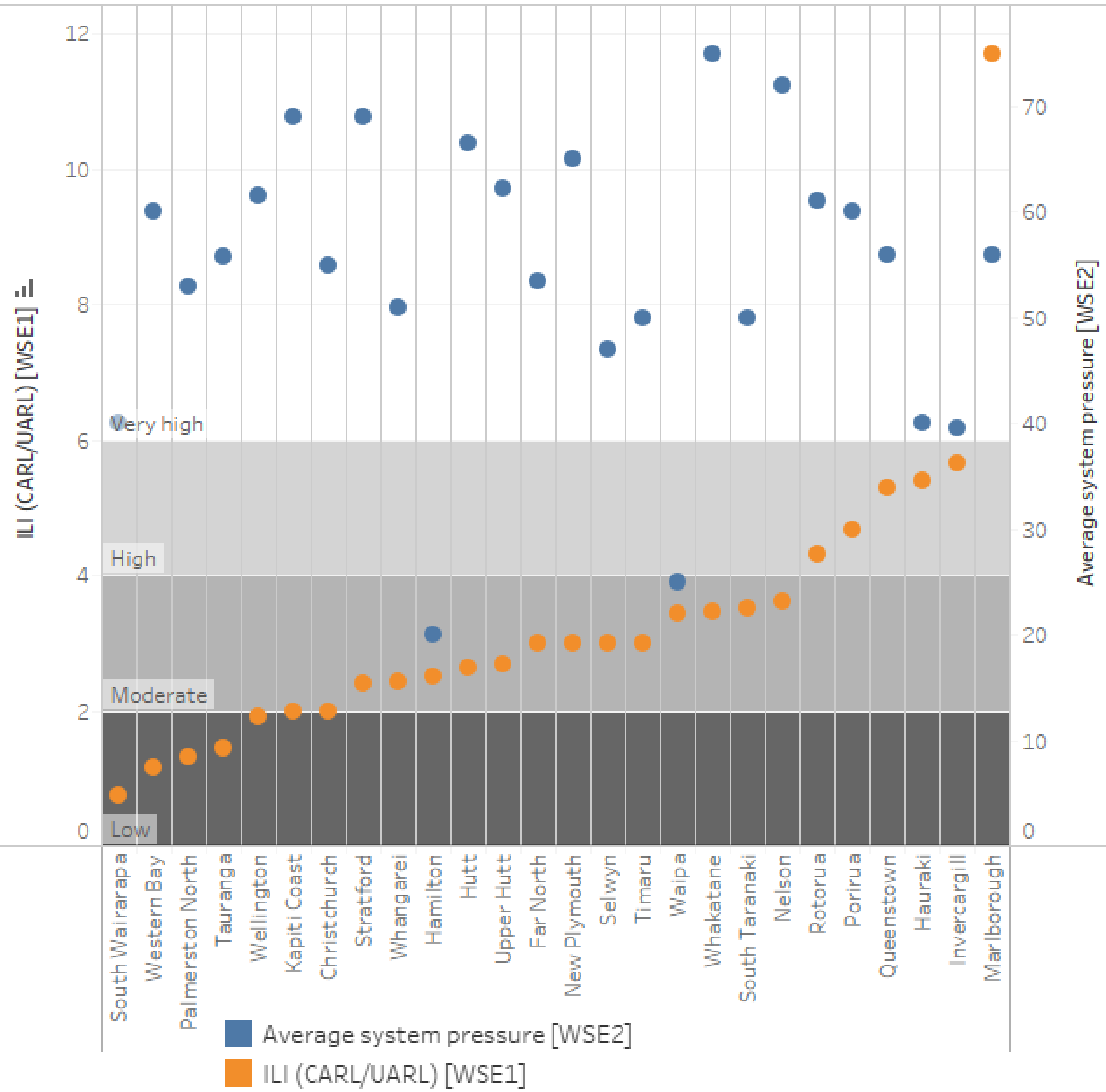


Figure 6.6-2: Changes in average current annual real losses over time for large participants (L/service connection/day)

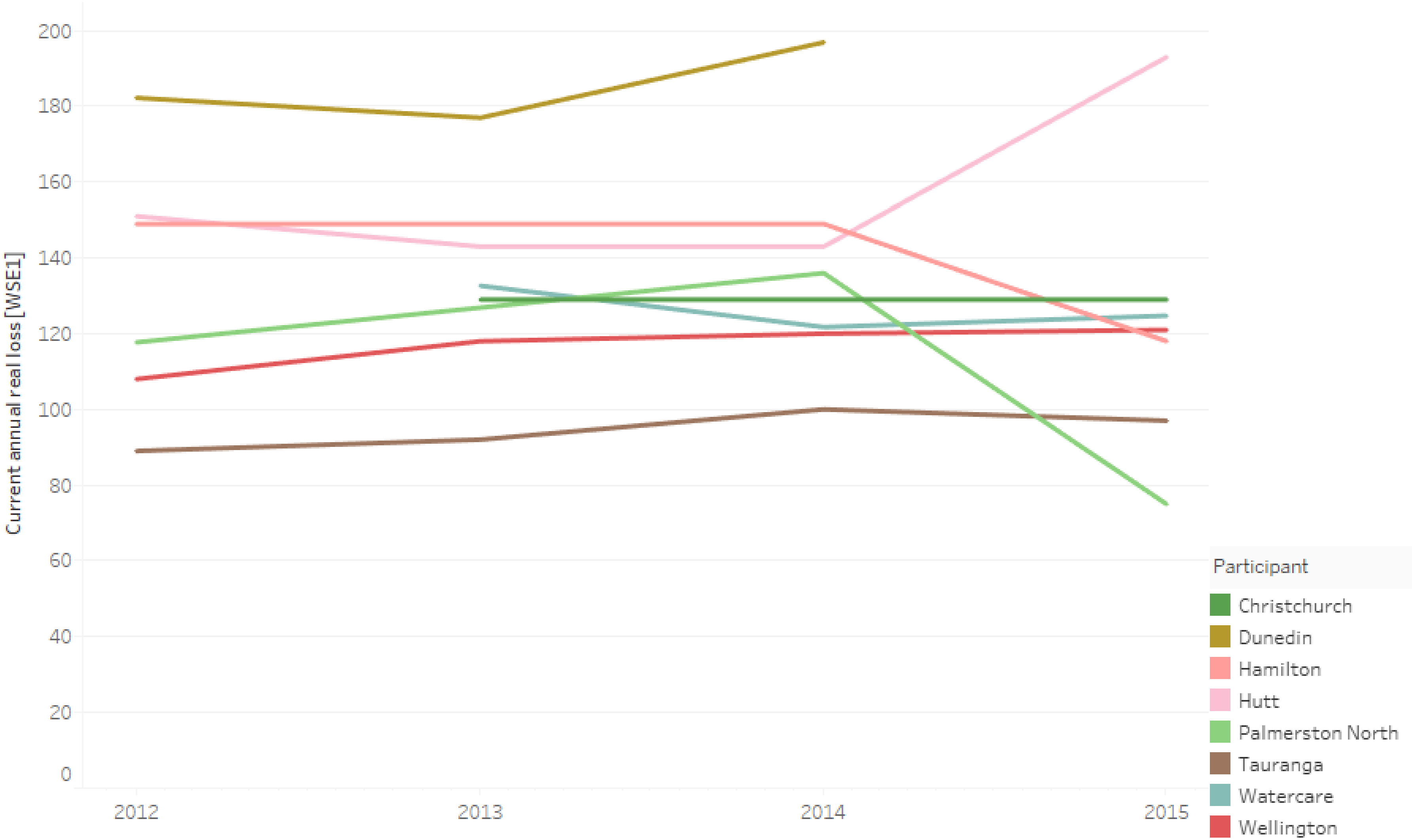


Figure 6.6-3: Changes in average current annual real losses over time for medium participants in the north island (L/service connection/day)

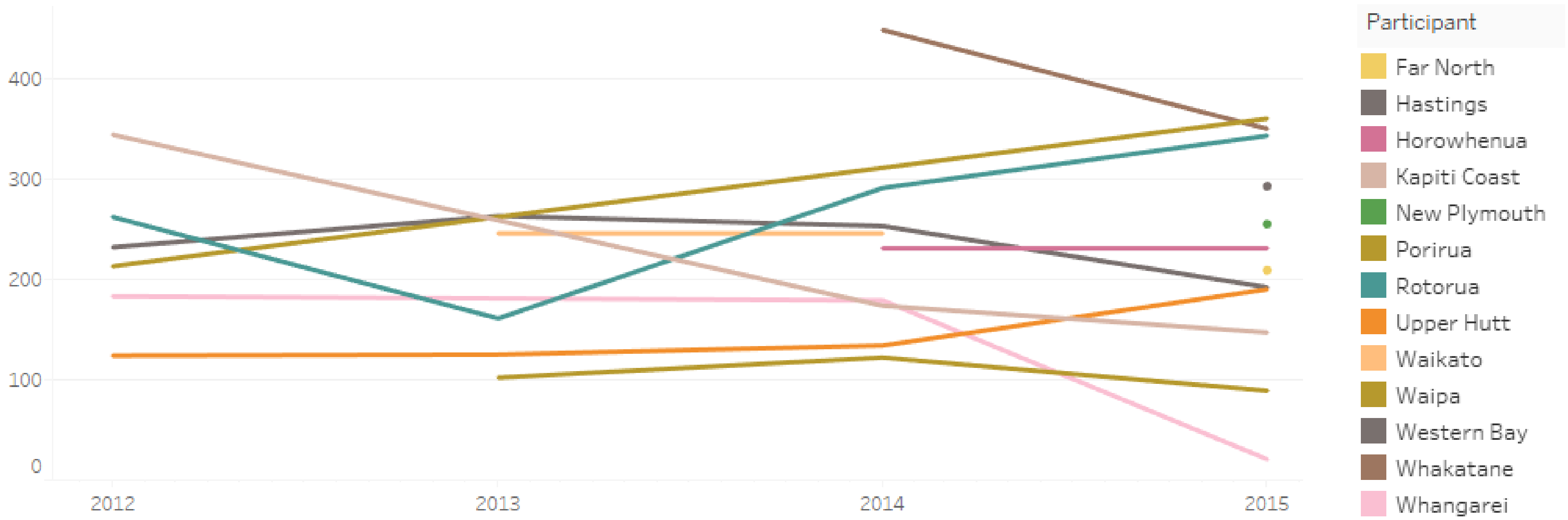


Figure 6.6-4: Changes in average current annual real losses over time for medium participants in the south island (L/service connection/day)

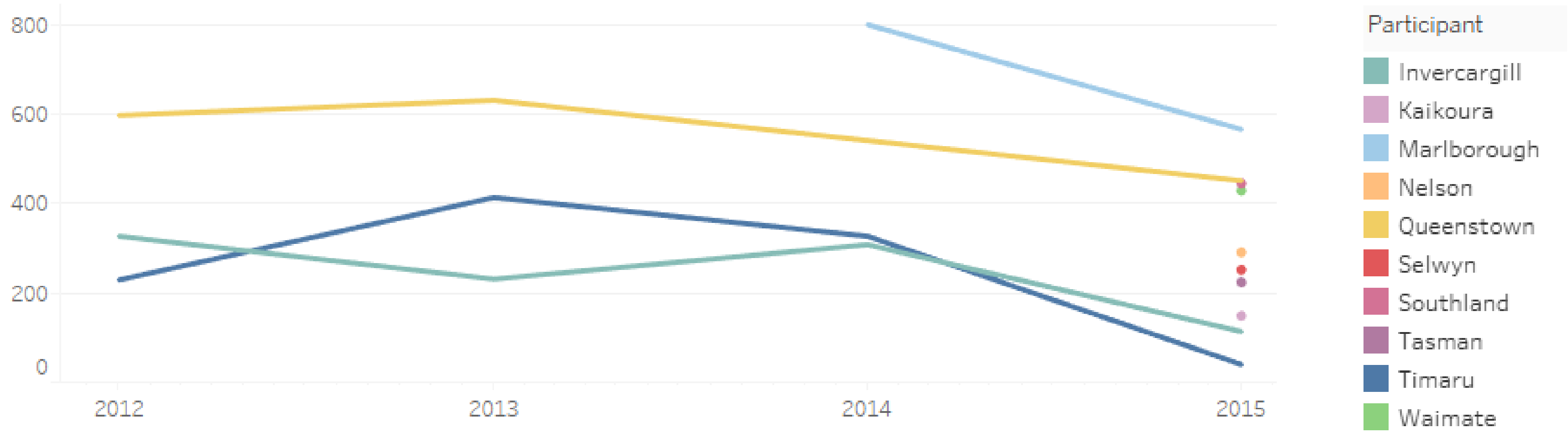
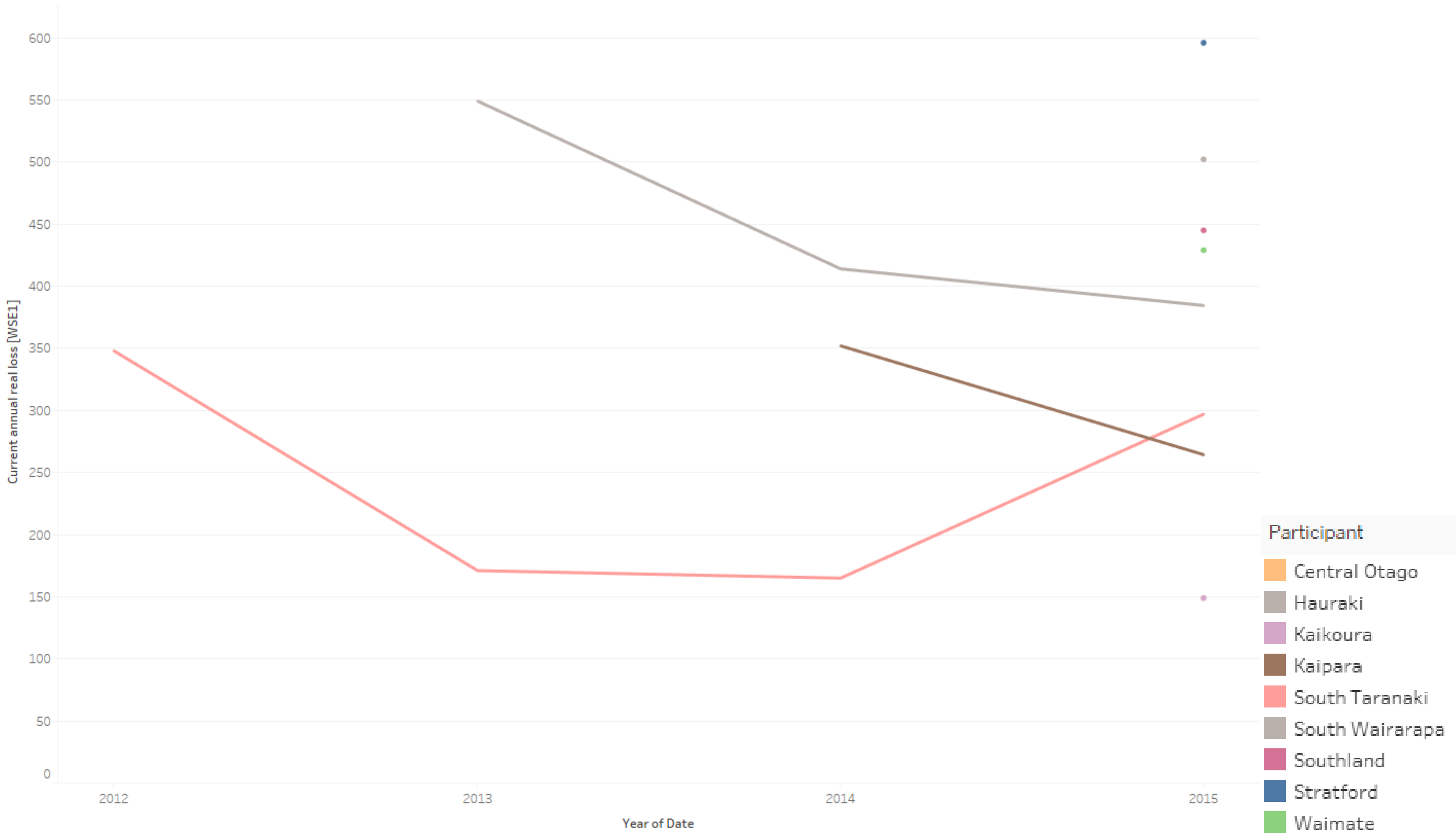


Figure 6.6-5: Changes in average current annual real losses over time for small participants (L/service connection/day)

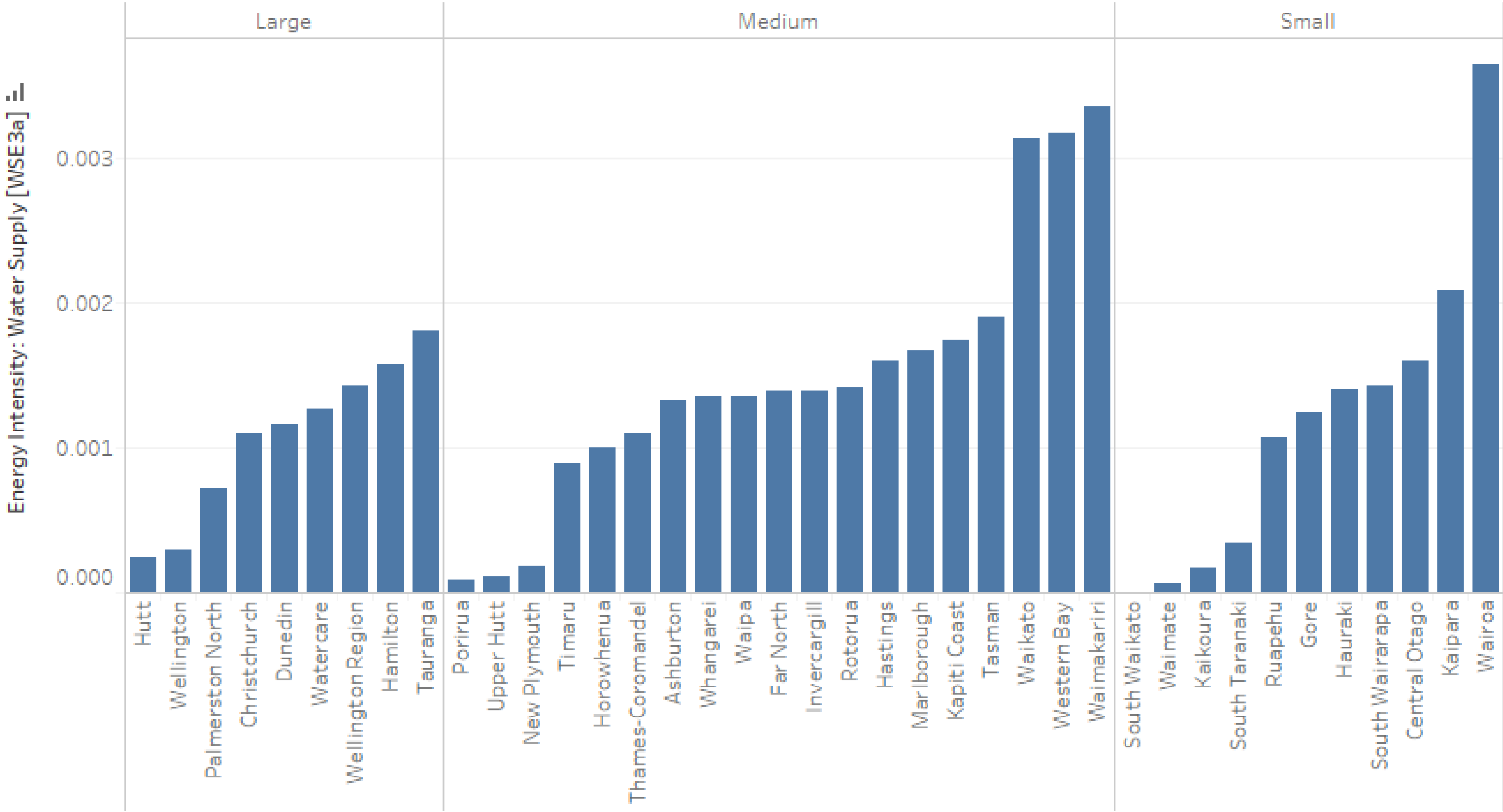


6.7 Energy use

Table 6.7-1: Total energy use

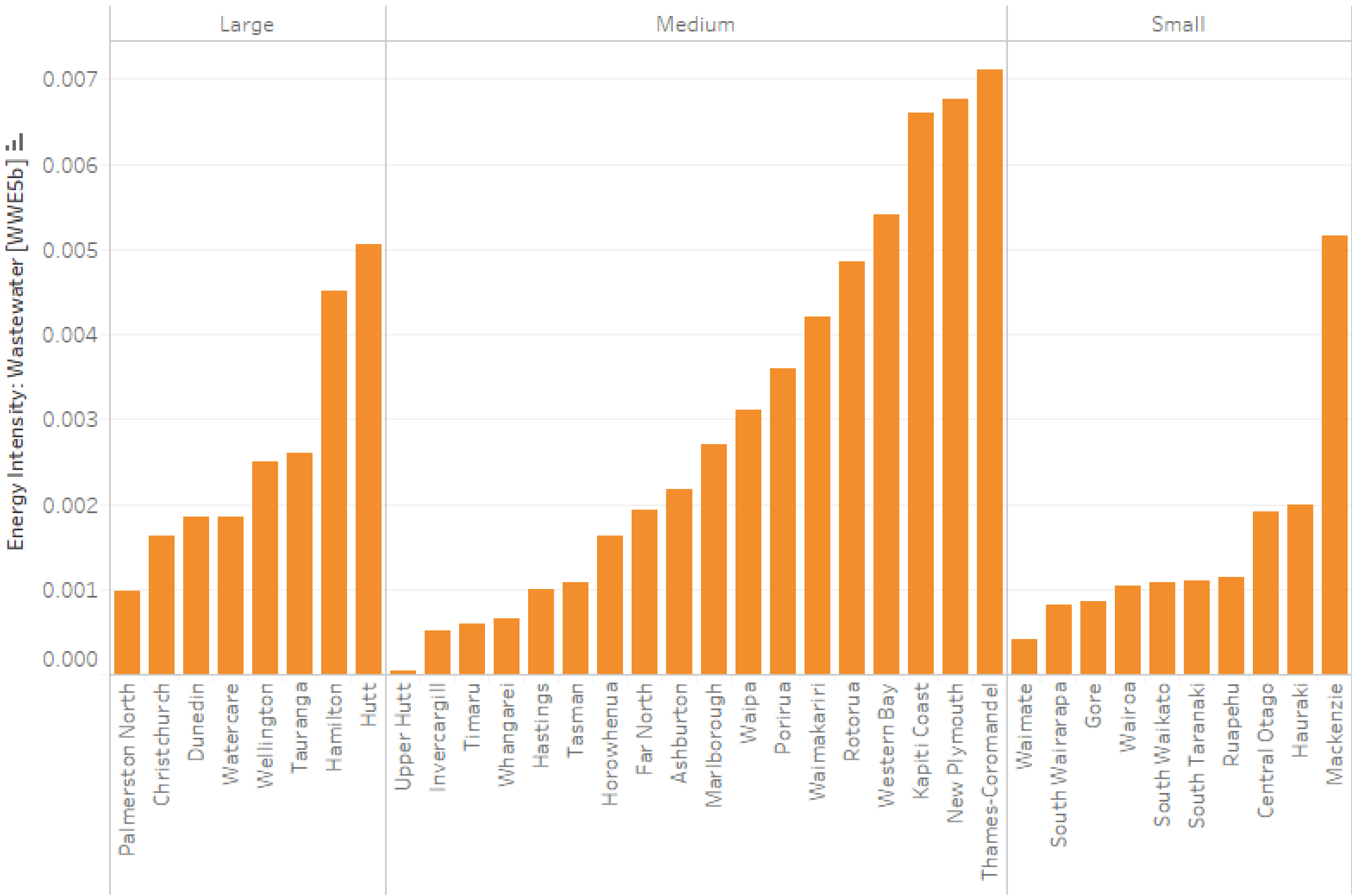
Participant water supply systems consumed a total of 2,350,135 GJ of energy. Wastewater systems consumed 2,347,760 GJ.

Figure 6.7-1: Energy used (GJ) per m^3 of water supplied[17]



[17] Greater Wellington water treatment plants and mains consume much of the energy used to treat and distribute to Wellington City, Upper Hutt, and Porirua City Councils. Mackenzie and Stratford have been excluded from these figures as they were both significant outliers. The data provided for their systems was 0.2004 and 0.2456 respectively.
High energy density use at Wairoa is attributed to supply of water to Affco. While it is not possible to disaggregate energy use data, water supplied to Affco has been excluded from Wairoa's water usage figures.

Figure 6.7-2: Energy used (GJ) per m3 of wastewater collected[18]



[18] Stratford was an outlier in the graph, and so has not been included. Data provided for its wastewater energy use was 0.06 GJ/m^3 of wastewater treated.

7 RESILIENCE

CASE STUDY: Planning for climate change in Dunedin

Understanding the implications of climate change, how they will affect the 3 Waters assets, and what to do about them, has been the focus of a recent study by the Dunedin City Council.

"There is a lot of literature documenting the physical changes of climate change such as increased temperatures, changing rainfall patterns, and accelerated sea level rise. But we set out to find out what specific actions are likely to be needed, and when, so they can be included in long term asset plans and budget forecasts," says Dunedin City Council Water and Waste Services Asset Planner, Sarah Stewart.

The Climate Change Asset Vulnerability Assessments were developed by the Council for areas with 3 Waters infrastructure particularly vulnerable to climate changes effects, such as coastal wastewater treatment plants. The assessments identified issues unique to the area, such as coastal inundation, storm surges, mean temperature rise, flooding, and so on. This highlighted which risks need to be managed passively, and which need to be actively managed, and provided a range of options to do so. Two climate change scenarios –2040 and 2090 – were looked at in order to identify the impact and the risk, and enable the development of mitigation and adaptation strategies in both the shorter and longer term.

She says the study gives greater certainty that Council's decisions today about asset renewal and new capital expenditure will not be undermined by changes to the climate over the practical lifespan of those assets.

The National Performance Review's varied number of approaches to climate change reports suggests there is lots of room for other councils to learn from adaptation trail blazers like Dunedin.

Key Observations

A number of participants are running water treatment plants without back-up generation

In these instances storage buffers will be used to supply water for the duration of a power outage.

Habitable floors provide a conservative indicator of flooding events

Across all participants only 87 habitable floors were listed as impacted by flooding in the 2015/16 period. This was despite a number of severe rain events occurring during the same period: in January Auckland flooding occurred in the wake of cyclone Victor, in March flooding affecting the upper and west coast of the South Island saw hundreds evacuated, in April heavy rainfall caused flooding and landslides in the Coromandel.

Designed flooding standards are generally consistent across all participants

Eighteen of the 36 respondents who provided data on stormwater systems design secondary networks to have an annual exceedance probability of 1%. A further 13 design for an exceedance probability of 2%. For primary networks, 19 of the 36 who responded designed for exceedance probabilities of 10% and 13 for 20%. However, there is currently no consistent approach to determining rainfall and runoff volumes. This could lead to large differences in the interpretation of these design guidelines. Water New Zealand is advocating for the development of a consistent set of rainfall and runoff guidelines to address this gap.

Climate change is generally given consideration in the management of 3 Water assets, however approaches vary significantly

Thirty-six of the 50 respondents provided some account of how climate change considerations had been factored into 3 Waters management. The approaches and reported changes accounted for were different for each participant. The only standardised guidance referred to was the "Climate Change Effects & Impacts in New Zealand – A Guidance Manual for Local Government in NZ" (May 2004).

Not all authorities have full insurance for 3 Waters assets

Twenty-seven percent of participants who responded did not have full insurance for water networks, 27% for wastewater networks and 20% for stormwater networks.

7.1 Back up generation

The average number of days storage available in buffers is shown in Figure 7.2-1.

Figure 7.1-1: Number of water treatment plants with and without backup generators

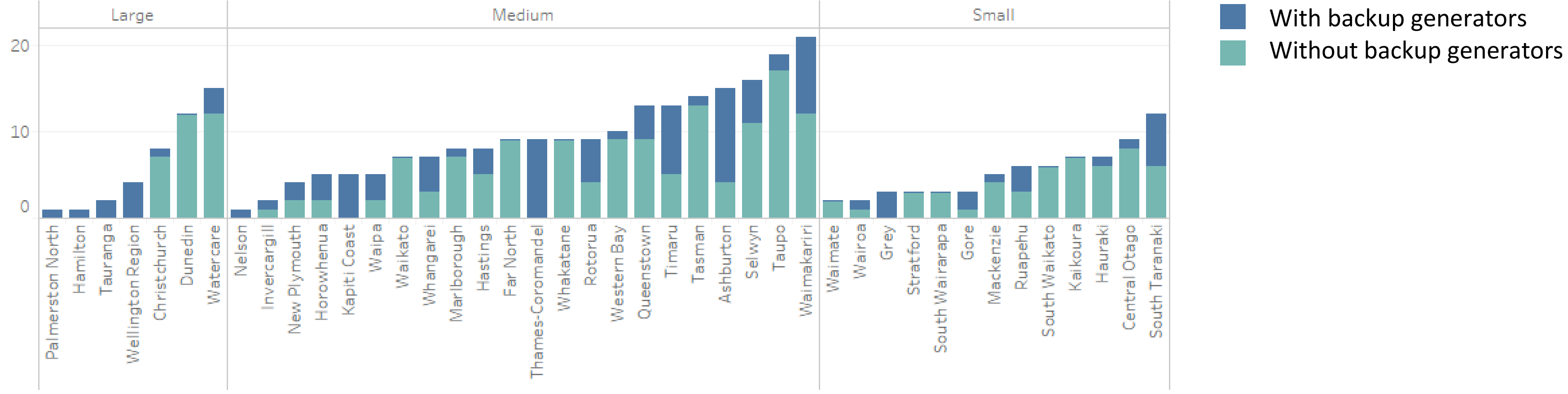


Figure 7.1-2: Number of water pump stations with and without backup generators

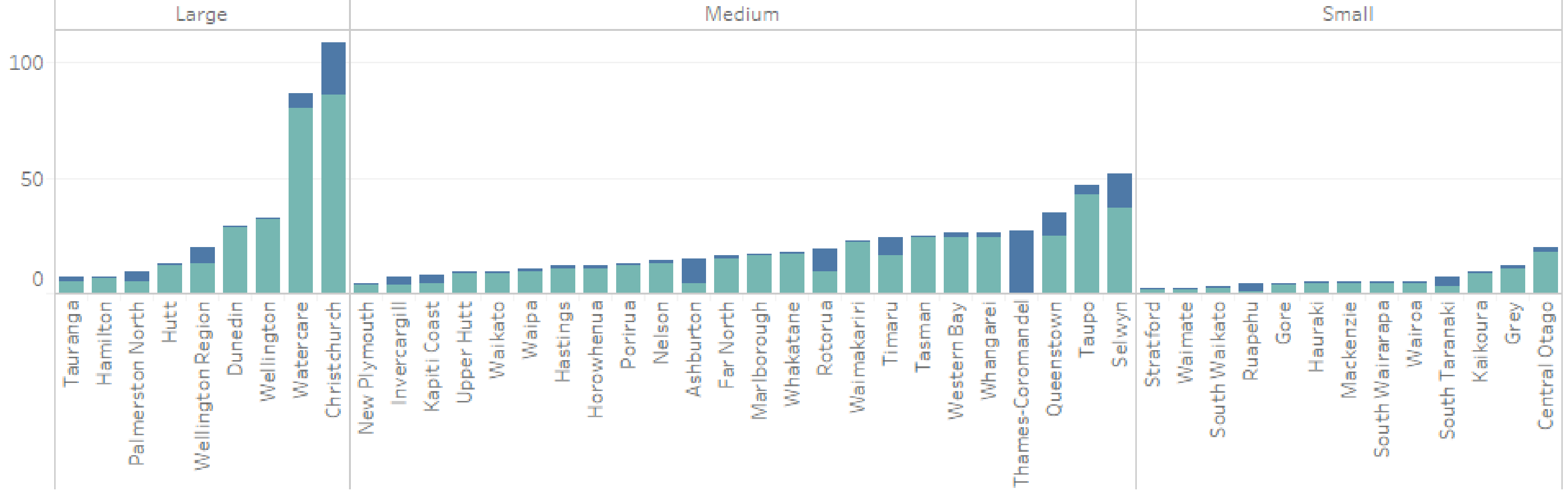


Figure 7.1-3: Number of wastewater pump stations with and without backup generators

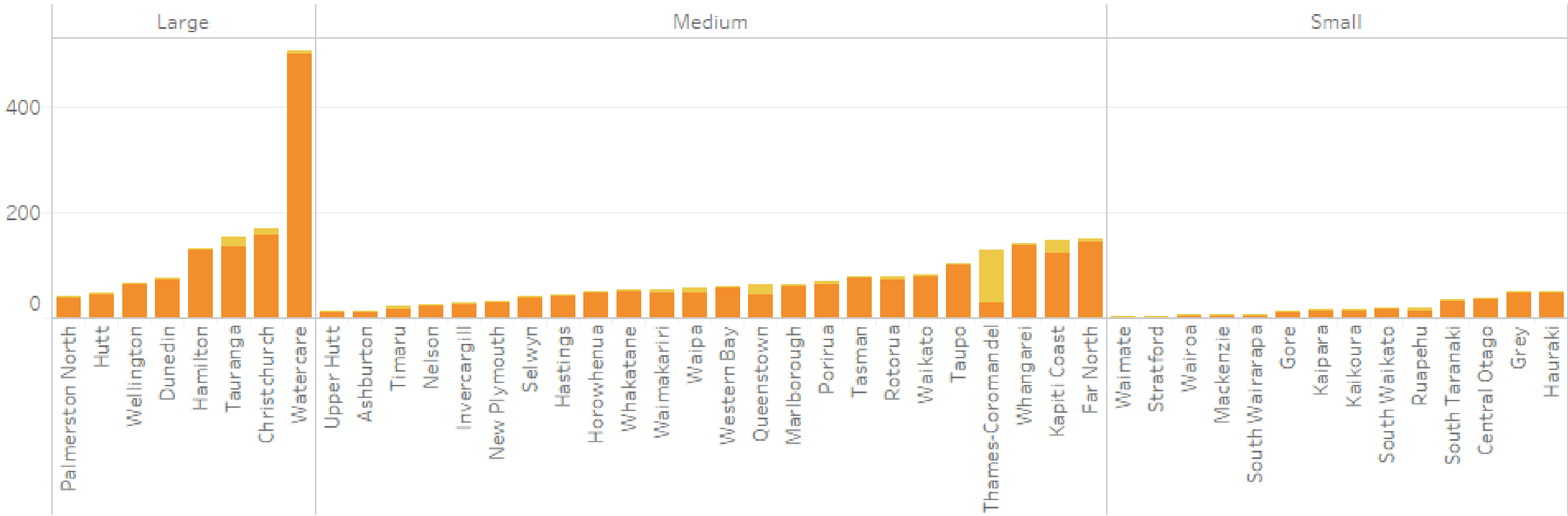
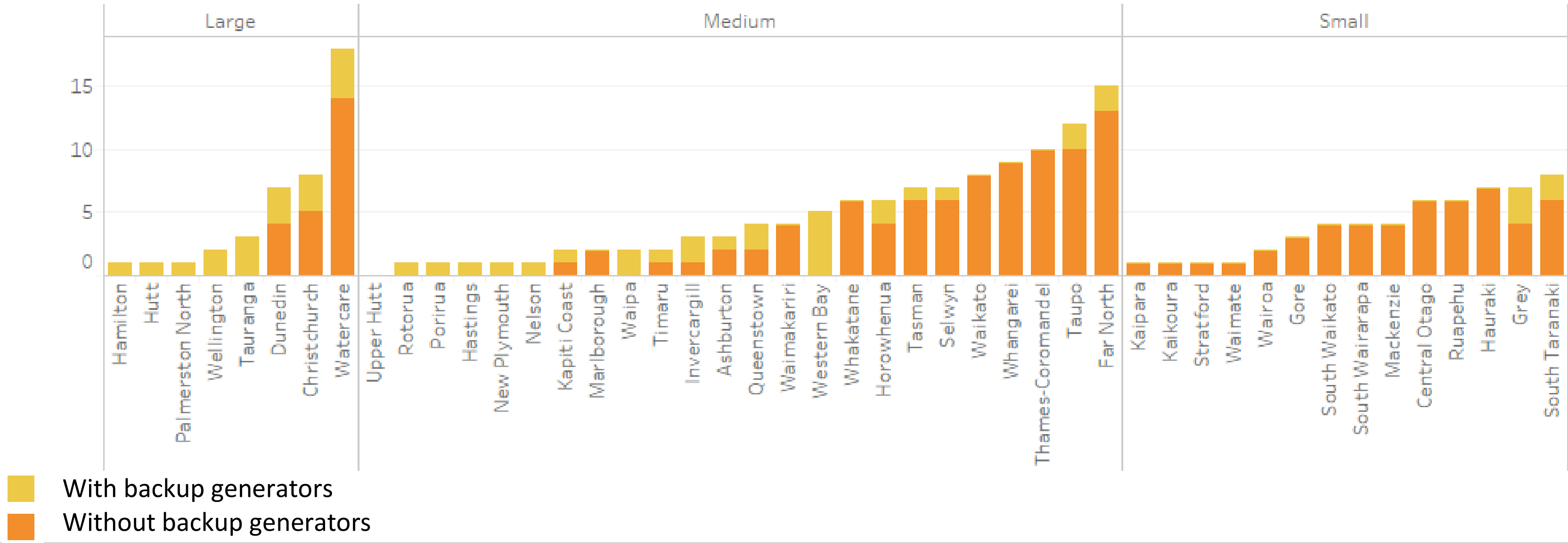


Figure 7.1-4: Number of wastewater treatment plants with and without backup generators



7.2 Reservoir storage buffers

Figure 7.2-1: Days of treated water stored in reservoirs on average

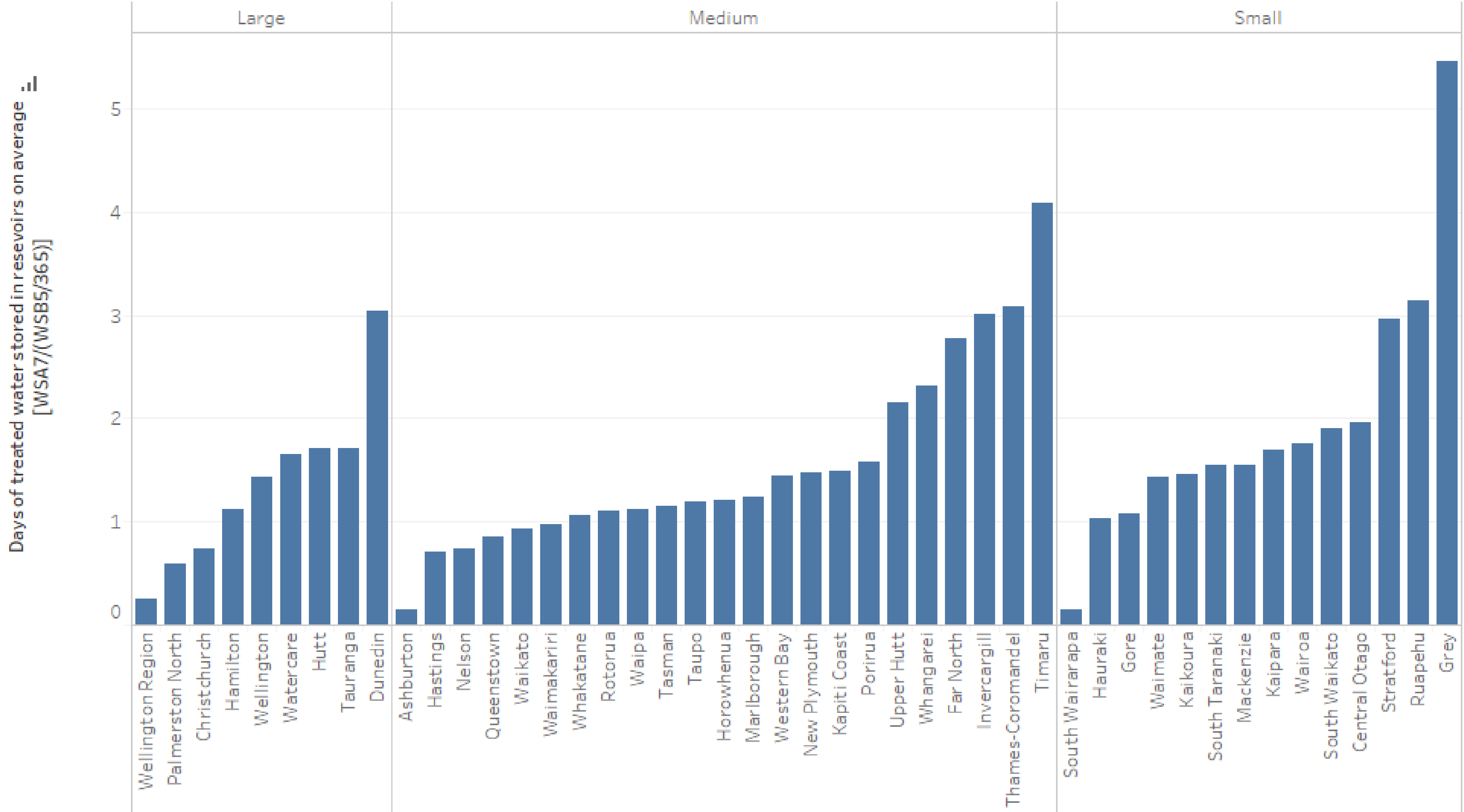
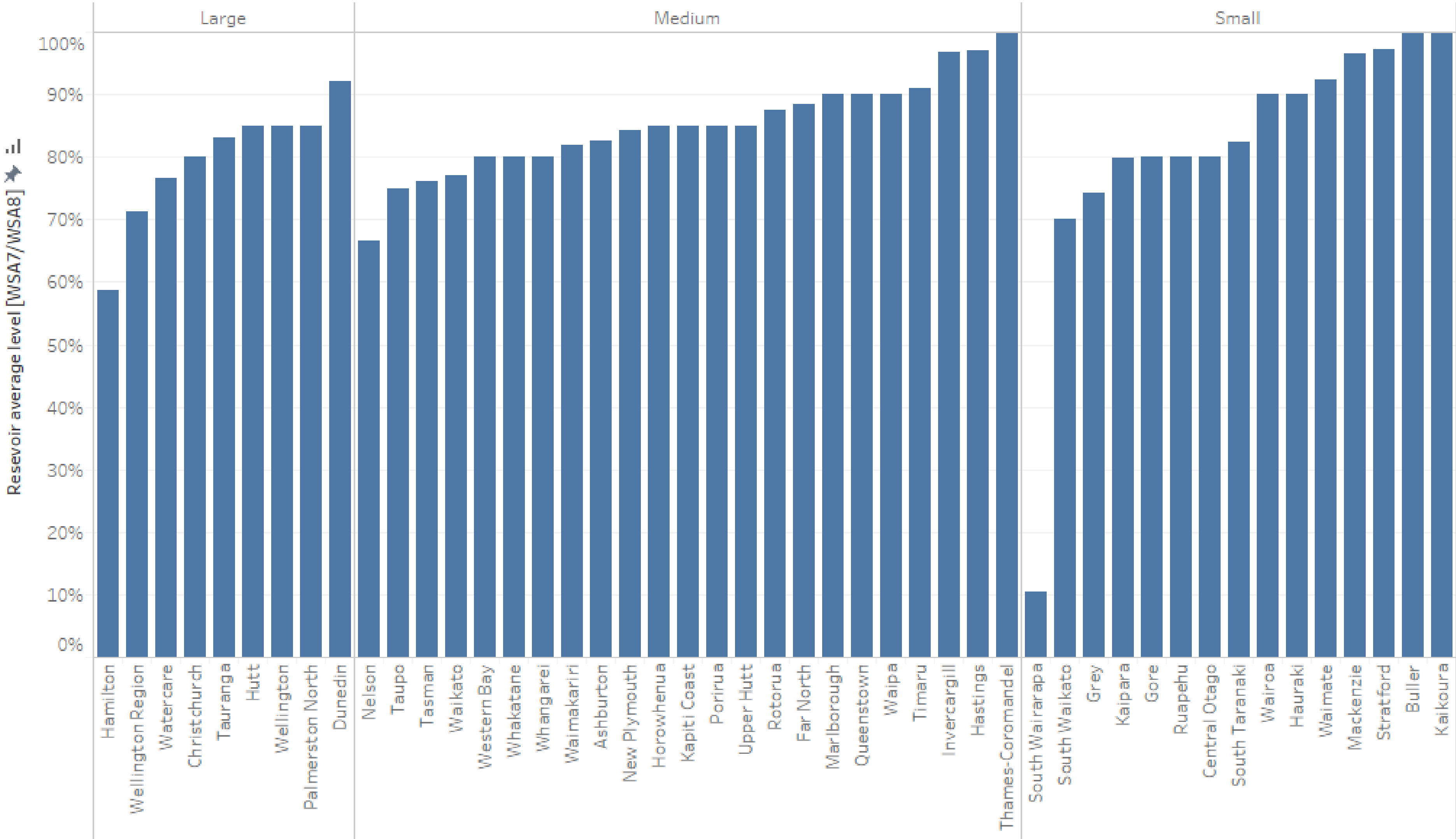


Figure 7.2-2: Treated water reservoir level on average



7.3 Flooding

Habitable floors continue to be reported in line with DIA Non-Financial Performance Measure Rules. Feedback from participants indicates that habitable floor flooding does not provide a good reflection of local authorities' stormwater infrastructure:

a) Not all flooding events impact habitable floors
b) Rain events have a larger impact on habitable floor flooding than infrastructure capacity

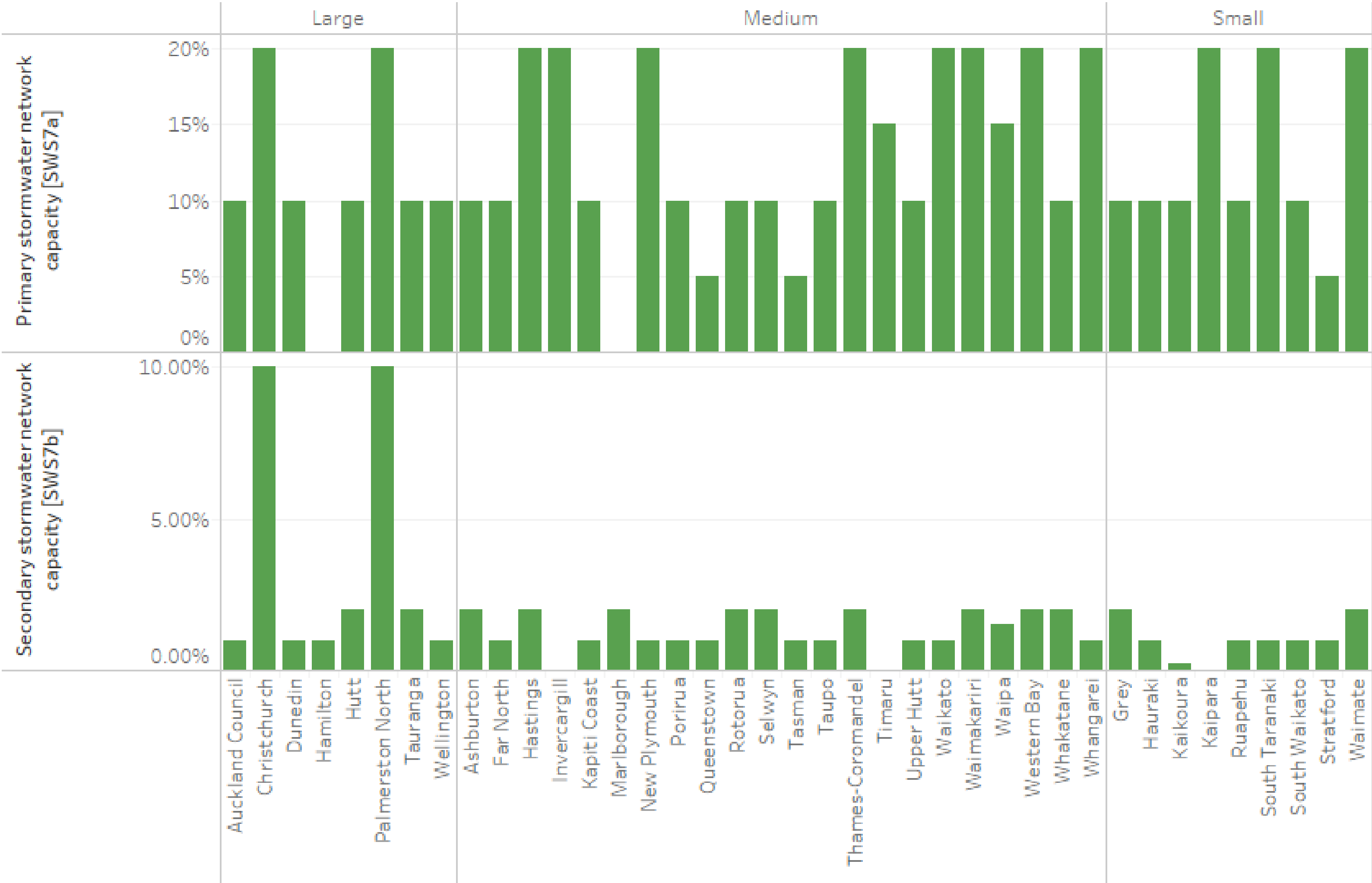
The definition provided for a flooding event follows that outlined in the DIA non-financial performance measure rules. It measures responses to situations where water from a stormwater system gets into buildings and affects habitable floors. One participant noted they had experienced many instances of flooding to transport corridors and public spaces that had not impacted on buildings. This is likely the case for a number of other councils who recorded 0 or null data values against this performance measure. Only councils who indicated they had flooding events are shown in Table 7.3-1.

An additional measure has been introduced to indicate the design capacity of stormwater infrastructure to cope with flooding events. This is shown in Figure 7.3-1.

Table 7.3-1: Habitable floor flooding events

	Flooding Events [SWS5]	Number of habitable floors affected [SWS5a]
Auckland Council	21	35
Christchurch	1	1
Dunedin	4	0
Grey	3	0
Hastings	22	0
Hauraki	1	1
Invercargill	16	0
Kaikoura	2	0
Kapiti	4	0
Marlborough	1	1
Nelson	1	0
New Plymouth	1	2
Palmerston North	1	4
South Taranaki	1	17
South Waikato	1	0
Tasman	2	6
Taupo	3	0
Tauranga	2	0
Thames - Coromandel	1	1
Timaru	1	1
Wellington	1	1
Porirua	1	17

Figure 7.3-1: The annual exceedance probability (AEP) design standard for primary and secondary stormwater networks[19]



[19] Hamilton employed various AEP's for the primary stormwater network: 50% for Residential, 20% for Industrial, 10% for Commercial

7.4 Climate change preparedness

Table 7.4-1: Climate change risk assessments conducted for water, wastewater, and stormwater systems

Participant	Water	Wastewater	Stormwater
Ashburton	Climate change impacts considered as part of Asset Management Process.		Modelling performed for forward infrastructure planning and stormwater management plan development included estimates of climate change impacts.
Auckland			All hydraulic models after 2011 incorporate climate change scenario.
Christchurch	Climate change impacts have been taken into account in future demand forecasts.		Allowance for 16% higher intensity rainfall and a 1m rise in sea level over 100 years.
Dunedin	3 Waters Strategy and Security of Supply strategy report include climate change planning scenarios and recommended options. Risk assessment tables for climate change impacts on the water supply are included in the WWS AMP risk registers. The metro Dunedin City Water Supply Safety Plan (WSP) contains supply-specific risk assessments and mitigation measures. WSP's for other supplies will be updated to include detailed supply-specific risk assessments as they are reviewed.	3 Waters Strategy reports include climate change planning scenarios and recommended options. Risk assessment tables for climate change impacts on the broader wastewater network are included in the WWS AMP risk registers. Climate Change Asset Vulnerability Assessments are in place for key asset systems identified as being 'at risk'.	Climate change considerations have been incorporated into all 10 ICMP hydraulic models.
Far North	Has sourced data to prepare an inventory of infrastructure at risk in 2016/17.		Modelling for catchment management plans included a climate change component, conducted circa 2010 with data current at the time.
Gore	Asset management plan mentions a process for incorporating climate change in future design.		
Grey	Investigation has been completed around extended dry weather periods.		Allowances within stormwater design for climate change.
Hamilton	Water model includes climate change.	Wastewater hydraulic model incorporates climate change.	Flood hazards' modelling incorporates climate change.
Hauraki	Considered at strategic planning level. Only one asset has been identified to be at minor risk of salt intrusion due to sea level rise within the next 50 years. This will easily be mitigated when renewing infrastructure at end of life.	Very high level strategic plan done.	Yes. All new Stormwater infrastructure (last 10 years) has been sized to accommodate increased flows expected from short duration high intensity events.
Hastings	Code of Practice factors in climate change.	Code of Practice factors in climate change. WWTP designed to 35yr growth horizon.	Code of Practice factors in climate change.
Invercargill	Interpretation from NZ Climate Change Office "Climate Change Effects & Impacts in New Zealand – A Guidance Manual for Local Government in NZ" (May 2004).		

Kapiti	Reliable yield calculations for Waikanae river and Bore field. Key mitigations and adaption issues in water asset management plan.	Key mitigations and adaption issues in water asset management plan.	Incorporated in design.
Marlborough	Climate change is incorporated into hydraulic modelling and subsequent design works.		
Nelson	Underway.	Ongoing. Treatment plant, rising mains, plus two pump stations reviewed.	Started. Flood Models of streams and rivers first to include climate change.
New Plymouth	Water masterplan has looked at historical trends of river flow and considered whether this is reducing.		Climate change accommodated in rainfall depth duration tables used in stormwater catchment management plans.
Palmerston North	Climate Change impact allowed in 2014 Water Supply Development Plan: Water Demand projection, drought & dam yield evaluation.		SMART 2D modelling.
Queenstown	Within 30 year infrastructure strategy.		Based on MfE 'Climate Change Effects and Impacts Assessment; A Guidance Manual for Local Government In New Zealand', 2008.
Ruapehu	Asset Management Plan has section on changes in weather patterns which identifies impact of climate change on water supply.		
Selwyn	A report: "Impact of Climate Cycles and Trends on Selwyn District Water Assets" was undertaken by Aqualinc and Selwyn District Council in 2015/16. The assessment looks out 32 years to 2048 to align with their 2018 to 2038 Infrastructure Strategy. The report considers projected changes in climate in light of historically observed climate cycles and trends to assess what the impact of changes could be on Council's water assets.		
South Taranaki	Long Term Plan addresses climate change in new physical works and renewals design, e.g. moving location of upgraded Kapuni WTP away from river for flood/lahar protection.	Long Term Plan addresses climate change, e.g. Inflow and Infiltration reduction program to account for increased rainfall.	Long Term Plan addresses climate change, e.g. upgrading Opunake stormwater system for higher flood levels.
South Wairarapa	Water conservation measures as required by consent and water conservation plan. Also considered in effect on flood levels and potential of flooding for the water treatment plants or bore fields.	Considered in terms of effect on flood levels and potential of flooding of wastewater treatment plant ponds.	
Taupo			Climate change included in Code of Practice and overland flow path modelling undertaken.
Tasman		Considered on a project by project basis, e.g. Mouteka WWTP upgrade, Kaiteriteri pipeline replacement. Also part of Lifelines.	Has included assessments in some modelling and upgrade works, but no specific risk assessments for the coastal areas of the stormwater catchments. Awaiting Government direction on updated provisions required for Climate Change.
Tauranga	Asset Management Plan and other risk assessments done. Flood modelling for 100 and 50 yr development scenarios. 10 yr Average Recurrence Interval (ARI) and 0.3m sea level rise included. Drought Management Plan in place.	Flood modelling for 100 and 50 yr development scenarios. 10 yr ARI and 0.3m sea level rise included.	Undertaken flood modelling for all urban catchments, and some rural catchments. 100 & 50 yr development scenarios. 10 yr ARI component and 0.3m sea level rise included.
Timaru	Assessed as a risk in 30-year Infrastructure Strategy, the Water Activity Management Plan, and the 3 Waters Risk Management Plan developed in 2012.		

Hutt City	Likely climate change effects are integrated into the water supply strategic planning tool (Sustainable Yield Model (SYM)). Previous assessments included the effect of climate change on the capacity and timing of future source upgrades, and expected impacts of sea level rise on abstraction from the Waiwhetu aquifer (included in the Asset Management Plan). The SYM has recently been updated by NIWA consistent with the outcomes of the latest IPCC fifth assessment.	Climate change is considered through design and modelling processes. No formal assessment is undertaken.	
Wellington City			
Porirua		Climate change factors are included in modelling scenarios and resulting master plan documents.	
Upper Hutt			
Wellington Region			
Waipa	Included in Asset Management Plan (2015), and also revised in preparation for the Asset Management Plan (2018) review.		Risk Management is covered in the Storm Water Drainage Activity Management Plan 2015-2025.
Waimakariri	Considered as part of the risk assessment in the Asset Management Plan.	Climate change is considered as part of the risk assessment in the Asset Management Plan, system assessments and the design of new infrastructure.	
Watercare	Considering scope for an assessment.		
Western Bay of Plenty			Allowed for in hydraulic modelling, pipe design and assessment for future upgrades.
Whangarei	A preliminary assessment of sea level rise implications undertaken using maps produced by the Regional Council. Other implications will be included in new Asset Management Plans.	Taken into consideration in wastewater modelling.	Environmental Engineering Standards.

7.5 Insurance

The proportion of participants who had full insurance is illustrated in the "Yes" field.

It may be that others who responded that they did not have full insurance have excluded coverage for underground infrastructure damage caused by a natural disaster under a 60/40 co-funding arrangement that exists between the crown and local councils. For those who indicated they had only partial insurance, assets covered were:

- Above-ground assets only
- Above-ground assets and underground pump stations
- Headworks, treatment plants, and pump stations only
- Fixed assets only
- 40% of asset value or a $125 million maximum across 3 Waters
- 100% for facilities and 40% for reticulation
- 31% of underground assets
- 60% and material damage
- 83% of assets

Figure 7.5-1: Insurance value assessment methods

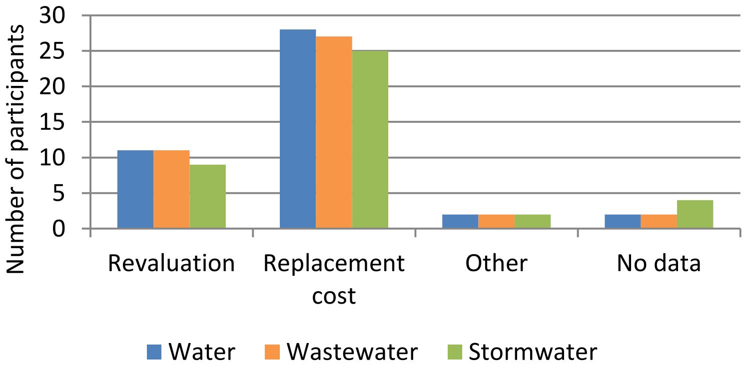


Figure 7.5-2: Proportion of authorities with insurance for water networks

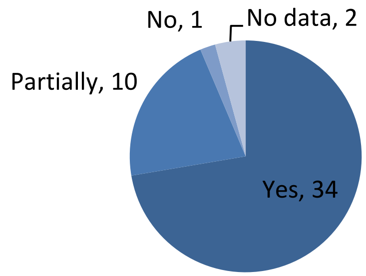


Figure 7.5-3: Proportion of authorities with insurance for wastewater networks

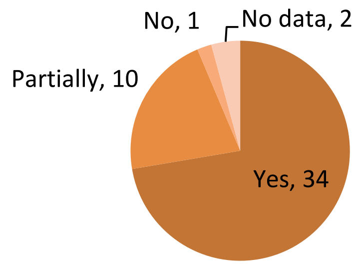
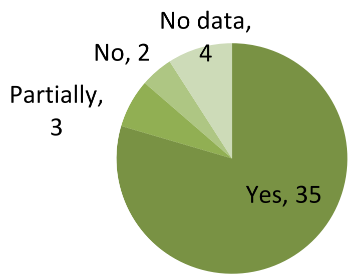


Figure 7.5-4: Proportion of authorities with insurance for stormwater networks



Appendix I: Data confidence descriptors

DATA CONFIDENCE			
RATING	**DESCRIPTION**	**PROCESSES**	**ASSET DATA**
5	Highly reliable/ Audited	Strictly formal process for collecting and analysing data. Process is documented and always followed by all staff. Process is recognised by industry as best method of assessment.	Very high level of data confidence. Data is believed to be 95-100% complete and ±5% accurate. Regular data audits verify high level of accuracy in data received.
4	Reliable/Verified	Strong process to collect data. May not be fully documented, but usually undertaken by most staff.	Good level of data confidence. Data is believed to be 80-95% complete and ±10-15% accurate. Some minor data extrapolation or assumptions have been applied. Occasional data audits verify reasonable level of confidence.
3	Less Reliable	Process to collect data established. May not be fully documented, but usually undertaken by most staff.	Average level of data confidence. Data is believed to be 50-80% complete and ±15-20% accurate. Some data extrapolation has been applied based on supported assumptions. Occasional data audits verify reasonable level of confidence.
2	Uncertain	Semi-formal process usually followed. Poor documentation. Process to collect data followed about half the time.	Not sure of data confidence, or data confidence is good for some data, but most of dataset is based on extrapolation of incomplete data set with unsupported assumptions.
1	Very uncertain	Ad hoc procedures to collect data. Minimal or no process documentation. Process followed occasionally.	Very low data confidence. Data based on very large unsupported assumptions, cursory inspection and analysis. Data may have been developed by extrapolation from small, unverified data sets.
0	No data	No process exists to collect data.	No data available. *Please note* that 'no data available' is different from collecting a legitimate data value of zero (0), where the data confidence could potentially be very high.

Appendix II: Audit questions

MEASURE	DESKTOP AUDIT	ONSITE AUDIT
WSS5: Water quality complaints **WWS4: Wastewater complaints** **SWS3: Stormwater complaints**		Are complaints being recorded in line with the definition? Do councils have processes for managing complaints that allow them to capture this data? In particular, are they separately recording complaints and service requests?
CB12: Near miss reports **CB13: Lost time injuries**		Are systems adequate to capture this information?
WSF6, WWF6, SWF5: Debt funding	Does this measure appear to be populated correctly (i.e. if there is a shortfall between revenue and expenditure, is this matched by an increase in debt funding – if not, why not)?	
WSS7a: Fixed charge non-residential water **WSS7c: Volumetric charge non-residential water** **WSS8a: Fixed charge residential water** **WSS8c: Volumetric charge residential water** **WWS1a: Fixed charge non-residential wastewater** **WWS1c: Volumetric charge non-residential wastewater** **WWS2a: Fixed charge residential wastewater**	Does it appear that these measures are being populated in accordance with guidelines? Are comments sufficient to understand the region's charging regime?	
WWS1c: Volumetric charge: non-residential wastewater	Is only the volumetric charge all that has been included (not contaminant based charges also)?	
SWF1: Operating revenue	Ensure that stormwater revenue is captured.	
SWS2: Stormwater charge type	Ensure it is clear how revenue for stormwater charges is collected.	
CB10: Internal staff **CB11: Contracted staff**		Have support staff (e.g. admin, finance, etc.) been included in the measure?
CB10a: Internal staff positions	Does the number provided suggest that participants are understanding the measure (i.e. is it greater than or equal to CB10)?	

WSA7: Water stored in reservoirs		Is average being consistently determined?
WSA6: Water supply reservoirs		Check break pressure tanks are not being included.
SWA1: Length of public stormwater networks		Check that unlined stormwater channels are being captured in accordance with guidelines.
WSF2: Operating Revenue: Water Supply **WWF2: Operating Revenue: Wastewater** **SWF1: Operating Revenue: Stormwater**		Is there any confusion about what should be considered revenue?
WSA5: Water pump stations		Are bores and water takes included in the figure?
SWB2: Stormwater Serviced Properties – Residential **SWB3: Stormwater Serviced Properties – Non-residential**		Are the numbers of properties being listed in accordance with the guideline definitions?
WWA7c: Wastewater treatment plant level of treatment		Is the level of treatment at the plant aligned with the definition provided in the guidelines?
WSF14: Annual depreciation: Water Supply **WWF15: Annual depreciation: Wastewater** **SWF11: Annual depreciation: Stormwater**		Is the depreciation provided using data sources specified in the guidelines?
WWE7: Inflow and infiltration		Are there other measures of inflow and infiltration that should be allowed for?
WSF23a: Water treatment facility value at end of reporting year **WSF23b: Other water supply asset value** **WWF24a: Wastewater facility value at end of reporting year** **WWF24b: Other wastewater asset value**	Are all assets being included (specifically, do the assets split across these classes equate to the same amount as last year's value)?	
WWE1: Dry weather overflows **WWE2: Wet weather overflows**		How are councils distinguishing between wet and dry weather overflows in practice?
SWE2: Climate change: Stormwater **WWE8: Climate change: Wastewater** **WSE4: Climate change: Water supply**	Is it clear from comments how this question is being interpreted?	

WSE5: Total water takes **WSE6: Security of water resources**		Is the question understood and consistently interpreted?
WSF27, WWF28, SWF24: Insurance Calculation methods		Are participants clear about what is being asked?
SWS7a: Primary stormwater network capacity **SWS7b: Secondary stormwater network capacity**	Are AEP values being provided? If not, is there an explanation or alternative measure provided in the comments box?	
WSB2: Water-Serviced Properties: Residential **WWB2: Wastewater-Serviced Properties: Residential**		Are apartments, retirement homes, etc. are being captured in accordance with the guidelines?
WSF16: Operational Cost Coverage: Water Supply **WWF17: Operational Cost Coverage: Wastewater** **SWF13: Operational Cost Coverage: Stormwater**	If this is not close to 1, what are the reasons for the discrepancy?	
WSE3: Energy consumption: Water Supply **WSE3a: Energy intensity: Water Supply**	Is the energy intensity within a feasible range?	
WWE5a: Energy consumption: Wastewater **WWE5b: Energy intensity: Wastewater**	Is the energy intensity within a feasible range?	
WWE6: Trade waste management	Has the question been populated with an appropriate response?	

Appendix III: Software packages in use for 3 Waters management

	Customer & Community Engagement	Development & Regulatory Services	Asset Management	Works Management	HR Management include H&S	Corporate Services – Finance, Rates etc.	Strategic Planning	SCADA	Telemetry	Hydrological Modelling	GIS
OZONE	X	X				X					
Authority	X		X			X					
MIGIQ Software (NCS & Chameleon)					X	X	X				
Technology One	X	X	X	X	X	X					
Vault					X						
People Soft					X						
QPulse					X						
ABBEY Systems Aspec SCADA HMI								X	X		
ArchestrA SCADA								X	X		
Asset Finda			X								
Infor EMA (Hansen8)			X			X					
Water Outlook								X			
HydroTel									X		
Accela		X	X			X					
InfoWorks CS										X	
SAP	X	X	X	X	X	X	X				
Maximo			X	X							
ESRI											X
MAPInfo											X
ArcGIS											X
Retic Manager			X								
Confirm			X								
IntraMaps											X
WorkSmart	X										

Appendix IV: Non-residential water and wastewater charging mechanisms

Fifty-three percent (25 of 47) of participants who supplied data on water charges used the same charging mechanism for both non-residential water and residential water. These included: Ashburton, Central Otago, Far North, Hauraki, Horowhenua, Kaipara, Kapiti, Mackenzie, Marlborough, Nelson, Ruapehu, Selwyn, South Waikato, Stratford, Tasman, Thames-Corromandel, Waimakariri, Waimate, Waipa, Wairoa, Watercare, Upper Hutt, Western Bay, Whakatane, and Whangarei. Participants who used the same charges for residential and non-residential wastewater where Central Otago, Gore, Kaipara, Mackenzie, Queenstown, Ruapehu, South Taranaki, South Waikato, Southland, Taupo, Waimakariri, Waimate, Wairoa, and Porirua. Where the non-residential charging approach differs from the residential charging approach, non-residential charges are shown in the tables below.

Participants' non-residential water charging mechanisms where they differ from residential charges

Participant	Non-residential water charging mechanism	
	Fixed	*Volumetric*
Christchurch		$0.73/m^3, for any volume used beyond a free allowance set up to the volume of capital value multiplied by the targeted rate.
Dunedin	None apply	$1.47/m^3
Gore		$0.7/m^3
Grey		$1.29/m^3 charged to non-residential consumers where annual consumption >300m^3
Hamilton	$430, based on a six-monthly minimum charge of $215 based on consumption of 120m^3	$1.79/m^3
Hastings	$312 (average)	
Invercargill		$0.92/m^3
Kaikoura	None apply	$1/m^3
New Plymouth	$145.52	$1.24/m^3 (increases for volumes in excess of 50,000m^3)
Palmerston North	$40.25-$865.95 depending on size	$0.86/m^3
Queenstown	$717	
Rotorua	None apply	$1.096/m^3, with a minimum charge of $61.74 per quarter for 56m^3 or less.
South Taranaki	Varies based on pipe size and location ($260 for town water supply, <32mm)	$1.70/m^3 (median value, varies based on location)
Southland	$170	$1.07/m^3
Taupo		$2.47/m^3 for water in excess of allocated allowance
Tauranga	Based on meter size, $28.45-$1,117	$1.83/m^3
Timaru		$0.60/m^3 for water in excess of allocated allowance (for urban customers; rural customers may not exceed allocation)
Waikato	$200	$1.70/m^3
Wellington City	$128.69	$2.24/m^3

Hutt		\$1.88/m^3 for <100,000m^3, \$1.34/m^3 for charges in excess of this
Porirua	None apply	\$1.25/m^3
Upper Hutt	\$368	\$1.90/m^3

Participants' non-residential wastewater charging mechanisms where they differ from residential charges

Participant	Non-residential wastewater charging mechanism		
	Fixed	*Volumetric*	*Contaminant-based charging*
Ashburton	\$159.30	Excess volume of \$0.50/m^3	Biological Oxygen Demand \$1.90/m^3
Christchurch		Peak (\$0.76/m^3) and off peak (\$0.38/m^3) volumetric charges	Suspended Solids \$0.36/m^3 Biological Oxygen Demand \$0.50/m^3 Metals (Cadmium, chromium, copper, zinc, mercury)
Dunedin			Applies (charge unknown)
Grey		\$0.64/m^3	
Hamilton	\$430	\$1.18/m^3	Suspended Solids \$0.69/m^3 Biological Oxygen Demand, \$1.06/m^3 Total Kjeldahl nitrogen \$1.65/m^3 Total phosphorous \$4.64/m^3 Arsenic \$212/m^3
Hastings	\$601 (average)	\$2,499 per l/s of average peak flow	
Hauraki			
Horowhenua		Yes (unknown)	Applies charges for Suspended Solids Biological Oxygen Demand (charge unknown)
Invercargill		\$0.386/m^3	Applies (charge unknown)
Kaikoura	\$180 for each additional water unit and closet		
Kapiti	\$366.00 for one toilet or \$183.00 <u>per toilet pan/urinal</u> for commercial buildings.		Applies (charge unknown)
Marlborough		Charged at a litres/minute rate (charge unknown)	Applies charges for Suspended Solids Biological Oxygen Demand (charge unknown)
Nelson	\$97.39	\$1.67/m^3	Applies (charge unknown)
New Plymouth	\$1,000 (varies based on number of toilet pans)	\$1.23/m^3 (TW only)	Applies (charge unknown)
Palmerston North	\$176		Applies (charge unknown)
Rotorua		\$1.66/m^3	Biological Oxygen Demand \$5.93/m^3
Selwyn	Equivalent number of wastewater connections multiplied by \$500		Applies (charge unknown)

South Wairarapa	Charge based per pan if greater than two pans (charge unknown)	$0.56/m^3$	Biological Oxygen Demand ($0.59) Suspended Solids ($0.61)
Stratford	Charge based per toilet (charge unknown)		
Tasman	$745.11 for the first pan, $558.83 for 2-10 pans, $372.55 for all pans greater than 10.	$0.42/m^3$	
Tauranga	$342.35/pan. $171.17 for additional pans	$1.36/m^3$	Suspended Solids Biological Oxygen Demand (charge unknown)
Thames-Corromandel	$835.80 for one pan or $417.90 per pan for 2 pans and over		
Timaru	$367 per pan	$0.77/m^3$ for trade waste customers	
Waikato		$0.88/m^3$	
Waipa	Additional charges for pans in excess of 3 (charge unknown)	$1.00/m^3$	Applies (charge unknown)
Watercare	Customer selects one of four plans per meter, ranging from $200 fixed charge and $4.485/m^3$ discharge volume, to $75,854 fixed charge and $2.829/m^3$ discharge volume.		
Wellington City	$970.39 (average based on capital value)		Applies (charge unknown)
Hutt	$444 for fist pan, $222 for subsequent pans		Applies (charge unknown)
Upper Hutt	$1,330		Applies (charge unknown)
Western Bay	An additional pan-based charge applies (charge unknown)		
Whakatane		Applies to trade waste customers (charge unknown)	
Whangarei			Applies to Chemical Oxygen Demand, total Kjeldahl nitrogen, and suspended solids (charge unknown)

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