Wellington Water
Our water, our future.

Wellington Water Committee Meeting

Meeting: 25 November 2020

Our water supply system

Purpose

1. To outline the current state of our water supply system, from catchment to tap, and the actions we are taking to ensure our customers always have enough water, and that we supply and use it as efficiently as possible, all while respecting the water and the environment.

Summary

2. Providing a sufficient quantity of safe and healthy water to customers while managing the environmental impact is a fundamental requirement for any water supply entity, but our ability to achieve this for the Wellington metropolitan region is becoming increasingly challenging.

3. When considering this issue it is important to take a complete system view, including both supply and demand and looking from water sources to the customer.

4. This paper describes the current state of this system, and the actions underway to ensure we meet our customers' expectations.

Recommendation

5. It is recommended that the Water Committee:

   a) **notes** Wellington Water has evaluated the water supply system from source to customer and laid out the challenges the metropolitan councils of Wellington face;

   b) **notes** Wellington Water has yet to carry out a similar exercise for the South Wairarapa District Council;

c) **notes** the previous decision of the Wellington Water Committee to conserve water first and then to look to build more storage second;

d) **notes** one of the tools which could be used to conserve water could be residential meters and that an economic case investigating the merits of residential meters has been completed;

e) **notes** the Economic Case for Providing Residential Water Consumption Information prepared for Wellington Water by Ernst Young (EY) concludes there is a case for residential meters due to a reduction in leaks and the influencing of customers use of water with timely information;

f) **agrees** Wellington Water should now commission a detailed business case on behalf of its shareholder councils to further refine the case for residential meters;

g) **notes** Wellington Water has advised its shareholder councils to place the cost of residential meters in year five of their long term plans (LTPs) as part of the region's approach to the conservation of water; and

h) **requests** all members of the Wellington Water Committee to refer Wellington Water Limited's Water Supply System report and the Economic Case for Providing Residential Water Consumption Information to their individual councils.

Attachments

6. There is one attachment:

a) Attachment A: Economic Case for Providing Residential Water Consumption Information, October 2020.

A system-wide view is required

7. Being able to supply enough water is a fundamental requirement for a water business. What is a water utility without water? In recent years we have seen that our water supply system is under increasing pressure, with growth and relatively high demand pushing us towards the limits of our current system.

8. The increasingly urgent need to respond to this pressure is reflected in our Statement of Intent (SOI), where 'reducing water consumption' is one of our strategic priorities. This focus on reducing consumption reflects the preference expressed by our owners to favour conserving water over constructing new sources and infrastructure.

9. Reducing demand is where we see the greatest opportunity, but our existing sources of supply are under pressure too. We must take a system view to ensure we meet customer demand in a world of growth, climate change, and an increasing focus on the health of our environment. Do we have access to enough, suitable water? And are we managing and using it efficiently?

10. Looked at the complete system for the Wellington metropolitan region from end-to-end, from catchment-to-tap, our water system is complex and extensive. Every component of it is critical to the supply of sufficient safe and healthy water in its own way.

Number of water takes:	3 – Te Awa Kairangi/Hutt River; Wainuiomata & Orongorongo Rivers; and Waiwhetu aquifer
Number of treatment plants:	4
Water treated and supplied	~160 million litres per day on average ~200 million litres per day at peak ~58,000 million litres per year

Length of pipes	2,378 km
Number of reservoirs	180
Number of pump stations	89
Number of customers served	Around 147,000 connections, serving around 425,000 people Around 8,000 commercial customers

11. Our strategy needs to consider this entire system, and ensure it is in balance from both a supply-and-demand and environmental sustainability perspective. Water supply is an inter-generational concern – we need to ensure future generations enjoy the same access to safe and healthy water that we enjoy today.

12. In this paper we will take a step-by-step look at the current state of the system and the actions we are taking to improve it. Early next year we will present a follow-up paper setting out our strategy and identifying the steps we propose taking over time to ensure we have sufficient water for everyone, including our rivers themselves, now and into the future.

Access to water – sources and allocations

13. The first step in our process is to have access to sufficient water of a suitable quality. Our water currently comes from two key sources, Te Awa Kairangi - the Hutt River - and the combined flows of the Wainuiomata and Orongorongo Rivers. Te Awa Kairangi is the most significant of these, providing water via an offtake at Kaitoke and the aquifer at Waterloo.

Te Awa Kairangi at Kaitoke		Supplies 43% of the annual total
Waiwhetu aquifer at Waterloo		45% of annual total Typically increases to around 70% over summer
Wainuiomata and Orongorongo Rivers		12% of annual total Typically declines to 0% over summer

14. We are very lucky in having the headwaters for these sources within protected catchment areas where the nature of permissible activities is relatively limited. This enables the catchments to act as the first barrier in our multiple-barrier approach to providing safe drinking water.

15. The risks to water safety increase as the water approaches the cities, and activities undertaken above the aquifer must be managed appropriately to reduce the risk of contamination.

16. It has also become clear that the total amount of water being taken from Te Awa Kairangi is affecting the health of the river and its ecosystems. Our access to water is governed by resource consents that are due for renewal from 2031. At that time, the amount of water potentially available to us will be dictated by the relevant provisions of Greater Wellington Regional

Council's (GWRC) proposed Natural Resources Plan (pNRP). That plan[1] reflects the understanding that water takes from the river have been over-allocated and need to be reduced if the river is to be restored to good health.

17. Our expectation is that the pNRP will significantly change the way in which we are able to take water, moving away from 'take it when you need it' to 'only take it when it is plentiful'. This move to a "harvesting" approach changes to the nature of the infrastructure required, including an increase in the volume we need to store together with other collection and treatment process changes.

18. The current status of this step in our process, and the actions we are taking are set out in the table below:

Process step	Status		Actions underway
Water sources		Our catchments are healthy and well-managed	We are working with GWRC and Hutt City to ensure the aquifer is adequately protected from development activities
Available volumes		Te Awa Kairangi is over-allocated and we'll be more restricted in how we take water in the future	We are engaged in appeals related to the decisions on the pNRP and are supporting GWRC's Whaitua process as it considers what future limits will be recommended We will commence a review of our water supply strategy in 2021/22

19. Our objectives for this part of the system are that:

[1] GWRC released the decisions on the plan in mid-2019. It is now operative, but subject to a number of Environment Court appeals.

- we have healthy catchments that are free of contamination that could create risks to public health; and
- we have a range of sources available to us that can be enabled as required to meet demand growth and as costs and technology changes over time (for example, modular desalination units are expected to become increasingly cost effective).

Bulk water – storage, treatment and transport

20. The daily and seasonal changes in both water demand and water supply means that is currently not possible to supply water on an 'as needed' basis. Flows in the river are rainfall dependent, and so are highly variable – with this variability expected to increase through the impact of climate change. This means that we need to store water in the lakes at Te Marua for use in the summer when the river flows are at their lowest. Our target level of service is to ensure that there is sufficient water available to meet normal demand in a 1-in-50-year drought event.
21. While the catchments are in excellent health, the river still carries sediment and there is a residual risk of contamination so our water treatment plants clean the water and ensure that any contaminants are removed. The treatment plants need to have sufficient capacity to be able to meet our peak daily demand, with some spare capacity to allow for plant outages, as the reservoirs in the network only hold sufficient water for 1-2 days of operation.
22. Our three water sources are all located in the Hutt Valley, so the water has to be transported to the cities across the metropolitan region through a network of pipelines and pumping stations. That network crosses the region's fault lines in a number of locations, increasing the risks to supply.
23. Reservoirs at key locations around the network store treated water close to our customers so that we are able to meet peak demand and to provide operational and seismic resilience.

24. The current status of this step in our process, and the actions we are taking are set out in the table below:

Process step	Status		Actions underway
Bulk storage		High growth and per capita demand means that demand could exceed supply within 5-6 years	We will commence a review of our water supply strategy in 2021/22, including re-visiting the conceptual design for an additional water storage lank
Water treatment		We are unable to meet the 1-in-50-year drought resilience standard and high levels of demand are putting pressure on our ability to meet peak daily demand	We are completing the concept design for an upgrade of the Te Marua Water Treatment Plant and are proposing that GWRC fund the necessary investment in years 1-2 of their 2021/31 LTP.
Bulk transport		We have sufficient capacity to meet current demand	We are undertaking targeted projects to increase seismic resilience, such as the replacement of the Silverstream pipe bridge
Network storage		The amount of storage is under pressure in growth areas	The new Omaroro reservoir is under construction in Wellington city, and other reservoir investments have been proposed for 2021/31 LTPs.

25. Our objectives for this part of the system are that:

- we are able to meet both the 1-in-50-year drought resilience standard and peak daily demand;
- we have a range of sources available to us that can be enabled as required to meet demand growth and as costs and technology changes over time; and
- network storage meets our design standards for daily demand

and operational and seismic resilience.

Distribution and use

26. Having gotten the water to the cities, it needs to be distributed to each individual customer. We do this through a network that typically runs under the cities' streets and footpaths with tee-connections to each property and premise. The network typically operates under gravity, with the water flowing down from the reservoirs located at the tops of hills and ridgelines.

27. The use of a gravity-based distribution system means that the houses located at the bottom of the hills experience a greater water pressure than those closer to the top. We apply a range of pressure reducing approaches to mitigate the impacts for customers and the network, but higher operating pressures typically increase the rate of pipe wear and the likelihood of pipe bursts.

28. Much of this network is past or approaching the end of its nominal lifetime, with more than 50% expected to require replacement within the next 30 years. In many cases the pipelines will require replacement ahead of that nominal end-of-life due to the impacts of factors such as operating pressure (as discussed above) and ground movement (including from seismic activity). These factors are considered to be a particular issue for the asbestos-cement pipes that make up much of the existing water distribution network.

29. As the pipelines age they become more susceptible to bursts and leakage, increasing the amount of water lost in the network. If water loss and leakage is not actively managed it gets progressively worse over time as the number and size of the leaks increases. Delays in identifying, locating and repairing leaks also increase the amount of water lost.

30. Evidence is now clearly showing that the ageing network is causing an increasing water loss issue. The number of reported leaks has increased significantly in recent years but are expected to represent only part of the problem, with the majority of leaks not visible at the surface. We have also seen a significant increase in night time flows. These flows can be attributed mainly to leaks as there is typically very limited customer consumption over these periods.

31. Data for the 2019/20 year suggests water losses across the metropolitan region of between 6% and 31%, with an average of 19%. This means that potentially close to

one third of the water that we collect, treat and supply is lost before it reaches the customer.

32. At each connection to the public network each property has its own pipes carrying the water to its various end uses. These 'private networks' are also ageing and susceptible to leaks, with very limited ability to detect them and to require customers to make the necessary repairs. Leaks and losses in the customers' pipes could potentially be significant – the identification and repair of leaks on just a few hundred properties in Kapiti made a significant contribution to a 25% reduction in total water demand. The nature and age of properties in the Wellington metropolitan region is likely to mean that this issue is even more significant than it was in Kapiti.

33. At the end of the process is end-use by our customers. This is likely to vary significantly from house-to-house depending on factors such as family size and whether or not they have a garden. Water use in a house is typically includes toilets, showers and baths, washing machines, dishwashers, taps, and outdoor uses.

34. The average household water use in the Wellington metropolitan region is more than 200 litres per person per day. This is significantly higher than the other major cities in New Zealand (for example, Auckland's is around 160 l/p/d) and comparable cities overseas (e.g. Melbourne's is just over 150 l/p/d). There is nothing to suggest that there is something particular about our region that requires us to use more.

35. This household demand is around 60% of the total, with the remaining 20% used by commercial customers. A relatively small number of these commercial customers are responsible for much of this use, with many only using water for 'domestic' purposes (i.e. drinking water, toilets, etc.)

36. The region's relatively high level of water leakage and per capita residential demand has prompted us to undertake an economic evaluation of different options for providing residential customers (and Wellington Water) with water consumption information. A report into that evaluation is provided as Attachment A.

37. The evaluation shows the universal adoption of advanced meter infrastructure (AMI, or "smart" meters) with automated reporting as being likely to deliver net benefits, including reducing water demand, supporting customer engagement, reducing environmental impacts, and improving network management. We are now proposing to develop this option further, with a view to the investment being undertaken over years 5-8 of the 2021/31 LTPs.

38. Our residential customers have indicated to us in our customer surveys that they have a strong interest in conserving water. At the moment there is little information available to them to help them to understand how their use compares to relevant benchmarks, or to see whether and how changes in behaviour are impacting on their water consumption. Providing customers with their usage information, together with targeted education material will help take action to water use.

39. The majority of commercial customers (and certainly all of the largest ones) are metered and charged on a volumetric basis, which creates an incentive for water-efficient behaviour. It is unlikely that water charges will be a significant component of total operating costs for many of these businesses, so there is likely to be some potential for further efficiency gains.

40. The current status of this step in our process, and the actions we are taking are set out in the table below:

Process step	**Status**		**Actions underway**
Distribution		Leaks on the network are increasing as it ages and the pipes deteriorate	We have increased our leak detection and repair activities using funding from the water reform Delivery Plan. We are using network meter data to improve our leak detection process. Our renewals programme will replace pipes with a high susceptibility to leaks.
Private		Private-side leaks	See AMI meters, below.

network		could represent 20% of total demand, but we have no ability to detect them	
Customer use		The region's per capita water use is high by national and global standards	An economic case has identified that there is expected to be net benefits from installing Advanced Metering Infrastructure (AMI, or 'smart meters' with remote communications capability) on each property. Investment in these meters is proposed for years 5-8 of the 2021/31 LTPs. A 'proof-of-concept' is being undertaken in South Wairarapa using funds from the Delivery Plan.

41. Our objectives for this part of the system are that:

- we reduce the amount of leaks and water loss in the network, as measured by recognised metrics including night flows, the infrastructure leakage index (ILI) and volume lost per kilometre (and/or connection) per day; and
- gross (i.e. leakage, household and commercial) and household per capita demand are reduced in line with relevant benchmarks.