Ohura Water Loss Analysis

Prepared for RDC
Prepared by Veolia

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1. Introduction

The Ohura Village's water usage is considered high for the population served. When the average abstraction volume is taken into account, this issue becomes evident. Water is abstracted from the Mangaparare Stream at an adjustable rate of between 10 and 14m^3/hr by the raw water suction pump. A raw water turbidity sample is pumped from the intake via a separate transfer "aquajet" pump, which provides a constant sample of raw water to online instrumentation and fed to the plant PLC. The abstracted flow is measured by the raw water flow meter prior to being dosed with polyelectrolyte at the static mixer. The resource consent for abstraction of raw water from the stream is due for renewal and motivated a thorough investigation which involved planned water supply shutdowns during the night.

By separating the Ohura water network into three different zones during the night, Veolia was able to target specific areas and understand where high consumption occurs (possibly leakage). Each zone was isolated from the rest of the water network by closing pre-determined valves. The goal was to identify the zones where the reservoir outflow decreased. For this exercise, a temporary flow meter rig was put in place due to the lack of reservoir outflow metering.

The information obtained from the night-time shutdowns will allow Veolia to carry out the second stage of the investigation works which will focus on the areas where the reservoir outflow decreased the most while isolated. Network leak detection campaigns followed by private property meter installation are amongst the considered subsequent actions.

2. Water Conservation - Management Actions

The management of water abstraction is a resource consent requirement and RDC is expected to diligently manage water loss in the reticulation.

Table 1 Actions

		Target Date	**Action Status**
Water Measurement	Installation of meters in specific areas	Ongoing	Network bulk metering Specific properties meter installations (swimming pool)
	Audit/replace faulty meters	Ongoing	Replacement of faulty water meters as needed
	Undertake meter readings	Ongoing	Water meters are read as required
Network Investigations	Leak Detection and Minimisation Plan	2021	A leak detection campaign for the Ohura water supply is part of a strategy to minimise the demand on the Mangaparare Stream.
Replacements of water mains	Renewals program, AMP	Ongoing	Replacement of water mains and upgrades as per capital works schedule.

3. Methodology and Strategies

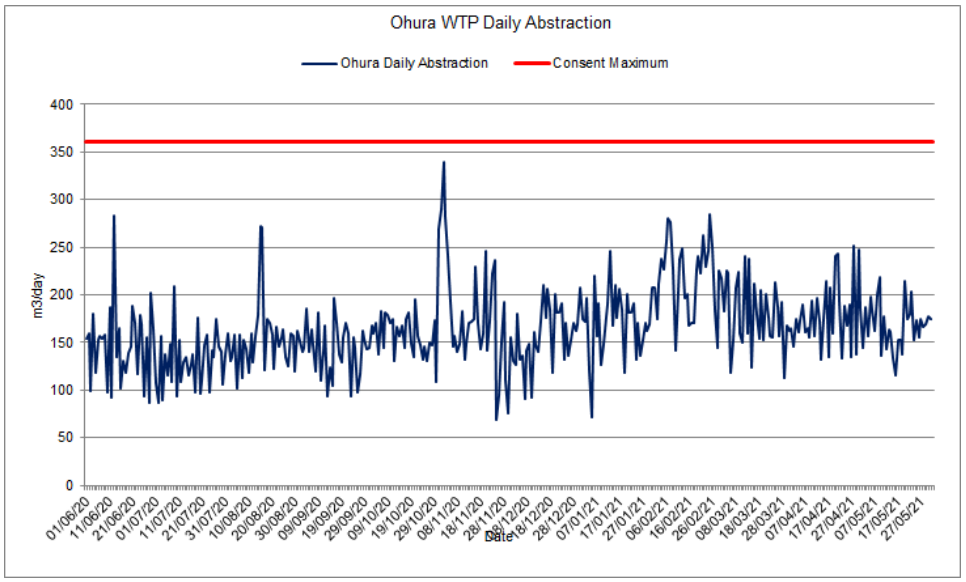
Due to the lack of reservoir outflow metering, Veolia organised Alf Downs to provide a temporary flow rig which was connected to the water network over 5 nights. The temporary installation plugs the rig into the network by a bypass line and two valves. The flow meter was installed in the main gravity pipeline feeding the Ohura customers from the treated water reservoir. For the purpose of this assessment, the WTP was kept offline, ensuring the only feed into the network was from the reservoir.

Flow through the meter was recorded. A flow rate baseline was established during the night of 07/07/2021. The average flow rate was $5m^3$/hr.

Ohura water network

On 08/07/2021 water shut downs were scheduled from 00:30am to 05:30 am. Over one night, three zones were isolated independently so the flow rate through the temporary meter could be recorded. Night time is when reservoir outflow is at its lowest and generally very consistent. Approximately $5m^3$/hr (this rate has been increasing over the last few months) has been recorded as the average night time demand.

The graph below shows the daily abstraction volumes compared to the daily total volume as per resource consent. It is clear that the total abstracted volumes per day sits below the



The northern part of the network was isolated first. This zone is located at the northern part of the water network. One network isolation valve was operated to interrupt the flow from the reservoir into this part of the network which included Williams Ave and Matai Street. The flow through the meter was recorded once the flow rate was stable. During the time this area of the water network remained isolated, no significant changes were recorded to the reservoir outflow. An average flow rate of 4.6m3/hr was recorded.

The second zone was identified as the more central area in the network. Here is where the water demand significantly dropped while this zone was isolated from the supply. Four network valves were used to fully isolate zone 2. During the interval of time when zone 2 was offline, the flow through the meter dropped to approximately 1m3/hr. This area includes Ngarimu Road, Huia, Kakapo and Hihi Streets.

Finally, a third zone was assessed. This zone covered the largest covered area but with smaller diameter main pipes and fewer connections. This zone included the outskirts of the network, where there is a possibility of unknown connections possibly feeding farms and lifestyle properties. An average flow of 4.8m3/hr was detected through the meter. No significant drop was detected in flow rates while this zone was isolated.

By continually monitoring the flow meter values before any zones were isolated, we established a base (average) outflow rate for the night. When a particular zone was isolated, it was quickly evident if it was contributing to the night loss.

When restoring the service, the selected valves were opened in the opposite order. Once sufficient data was acquired, the team was ready to move onto the next zone. With up to three fire hydrants open at a time, the air in the network was released appropriately. (All valves were recorded as they were turned off and checked off when turned back on).

The team doing the work had a systematic approach which ensured everything went exactly to plan, no times were breached and no known breaks or leakages resulted from the exercise. No leaking valves or fire hydrants have been recorded, which had been anticipated as a possible consequence from the shutdowns.

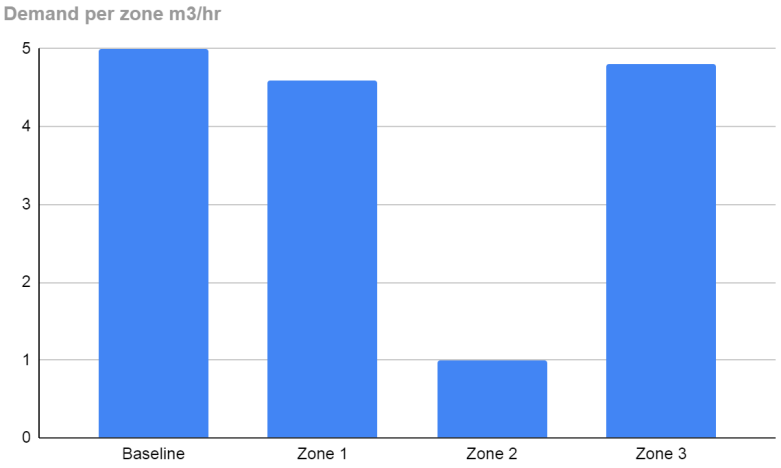
This approach minimises the chance for mistakes to happen due to the wrong valves being manipulated which would nullify the exercise. In some cases, the team double checked flow to be sure of surrounding zones when outflow dropped to low levels.

4. Results

· Zone 1 (Ohura Road) has no significant night time consumption/loss.

· Zone 2 (Ngarimu Road and adjacent streets) had the largest drop in flowrate through the meter. Further investigation is required in this part of the network. Approximately 3-4m3/hr is estimated to be lost in this part of the water system.

· Zone 3 (Tongaporutu Road, Hihi Street, Waitaanga Road) showed small losses, nothing to note.



Graph showing the bottom-line daily usage per zone. Values are based on the savings made by isolating each area at night when the demand is at minimum levels.

5. Recommendations of works

It is highly recommended that a leak detection program gets established for the assessment of water loss in the Ohura network. More specifically, it is recommended that zone 2 gets assessed for water loss. As the night-time shutdowns have highlighted, if a targeted leak detection campaign can be implemented, there is a high probability of a reduction in water demand. This will reduce the waste and maximise the use of resources.

A leak detection study would identify water loss in the network and provide the opportunity for the leak to be repaired. However, there is a possibility of a large water leak existing within a private property and that the leak detection campaign would not be able to identify it as this situation would be outside the scope of the campaign.

To reinforce the proactive approach recommended in this report, it is recommended the installation of water meters. Bulk meters can be an important resource for monitoring water usage within different zones in the network. By reading the meters, data can be analysed and actions implemented. When it comes to narrowing down to the individual properties, connection meters can be installed and regularly checked for any excessive peaks.