3WATERS DELIVERY ON THE CHATHAM ISLANDS – MAXIMISING OPPORTUNITIES

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ABSTRACT

The Chatham Islands are located 800 km east of mainland New Zealand, with approximately 660 people residing on Chatham and Pitt Islands. Chatham Island Council (CIC) provides 130 residents in Waitangi with both reticulated water and wastewater services, and 60 residents in Kaingaroa with reticulated water. The remaining residents rely on rainwater collection or private bores for water, and on-site wastewater systems.

Property owners pay targeted rates for three waters services based on their connection. But given the small rating base, CIC primarily relies on an annual Crown allocation to fund its services. The annual allocation is sufficient for day-to-day operations and minor urgent repairs, but not enough to complete preventative maintenance, renewals, or upgrades. As a result, urgent capital works are regularly deferred until external funding is secured.

In late 2020 CIC secured Ministry of Health and Three Waters Stimulus funding for critical water and wastewater capital works, totaling $1M. To maximise this funding opportunity, an integrated programme of works was developed to substantially improve public health and water resilience outcomes for residents. The programme of works was completed by the 30 June 2022 funding deadline.

This paper discusses the delivery of the funded works and associated challenges for small, remote schemes.

KEYWORDS

Water Reforms, Procurement, Service Delivery, Compliance

PRESENTER PROFILE

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Kirsten Norquay is a principal process engineer who specialises in water and wastewater management. She has worked on various projects, from strategic planning and feasibility to design, operation and compliance. Many have been to address more stringent regulatory requirements. Kirsten is a founding member of Stantec's Water Safety Group.

1 INTRODUCTION

The Chatham Islands are located 800 km east of mainland New Zealand, with approximately 660 people residing on Chatham and Pitt Islands. Chatham Island Council (CIC) provides 130 residents in Waitangi with both reticulated water and wastewater services, and 60 residents in Kaingaroa with reticulated water. The remaining residents rely on rainwater collection or private bores for water, and on-site wastewater systems.

All goods, such as food and fuel (including for power generation) or spare parts and materials for three waters infrastructure, must be transported to the Chatham Islands by ship (>2 days direct) or plane (~2 hours) from mainland New Zealand. This results in relatively high capital and operating costs. The logistics of a remote location poses challenges to the design, construction, and operation of three waters infrastructure, including compliance.

Property owners pay targeted rates for three waters services based on their connection. But given the small rating base, CIC primarily relies on an annual Crown allocation to fund its services. The annual allocation is sufficient for day-to-day operations and minor urgent repairs, but not enough to complete preventative maintenance, renewals, or upgrades. Deprecation is also not funded by the annual allocation. As a result, urgent capital works are regularly deferred until external funding is secured.

In 2018, CIC identified significant capital upgrades that were required to address substantial limitations with the existing water and wastewater schemes in its Combined Financial and Infrastructure Strategy (Strategy). Limitations were due to the poor condition of several critical assets, as well as inability of the current systems to address key matters raised by the Government Inquiry into Havelock North Drinking Water, and comply with the revised Drinking Water Standards for New Zealand (DWSNZ). CIC subsequently made numerous applications for full or partial external funding for the necessary upgrades, without success until late 2020.

In 2020, two external funding source opportunities became available to CIC to use for critical water and wastewater capital works. CIC's Ministry of Health (MoH) application to fund the most urgent water and wastewater work from the Strategy was successful. At the same time, the Three Waters Stimulus (3Ws) funding became available, with the funding amount totaling $1M. Both funding allocations were required to be spent within the same timeframes.

To maximise this one-off funding opportunity for CIC, an integrated programme of works was developed to substantially improve public health and water resilience outcomes for residents. MoH and 3Ws funded projects were selected on the basis of providing the greatest improvement for a given spend, as well as the ability to be delivered within the required timeframes. Projects were selected from the remaining list of projects in the Strategy as well as urgent projects that had been identified by CIC, Stantec, and Fulton Hogan since the Strategy was developed. Whilst individual projects were either a MoH or 3W project from a funding perspective, they were delivered as a single programme of works from a construction perspective.

This paper discusses the delivery of the funded works and associated challenges for small, remote schemes. The programme of works was completed by 30 June 2022. Notable projects include:

- Wastewater treatment plant renewals, including balance tank replacement
- Water supply improvements, including new intake, treatment units and instrumentation
- Telemetry systems for online flow and water quality monitoring and reporting
- Community rainwater collection scheme for non-potable use.

Providing sustainable and affordable solutions that can be readily constructed, operated, and maintained under the unique conditions of the Chatham Islands requires close collaboration with Council, the Operation and Maintenance (O&M) Contractor, their subcontractors, and the local community.

Increasing compliance requirements is particularly challenging for small, remote communities. All laboratory samples are required to be flown to the mainland for analysis, and so transport logistics alone are a challenge. The two serviced communities are at least 30 minutes by car on either side of the airport. The 2-3 hour flight leaves Chatham Island only once a day and flies to only one location (either Christchurch, Wellington or Auckland) 6 days a week. If weather is favorable and the plane can land on the mainland, samples are physically collected from the airport and taken to the laboratory. If weather is not favorable, the airport is closed and samples are retaken the following week for reliable sample transfer from the mainland airport and meet the sample hold time requirements of the lab.

CIC has tackled the challenge of compliance sampling by moving towards online monitoring in parallel with laboratory sampling, leveraging the opportunity of the Islands' new cellular network by installing a cloud-based system which provides a low-cost solution. This is seen as an interim step prior to CIC's 3Ws services being delivered by a new, larger water entity from mainland New Zealand. It is anticipated that CIC's online monitoring data will be integrated into the new entity's preferred, remote monitoring system.

Given the tight timeframes to utilise the funding, a fast-tracked procurement process was needed. High-level concept designs were developed with the O&M Contractor to maximise local knowledge, and then refined with potential suppliers to identify a fit-for-purpose solution that met community needs, whilst achieving the technical objectives and timeframes. Works were procured through the existing O&M Contract, and where appropriate, nominated suppliers.

Overall, the CIC experience has shown that collaboration and thinking "outside the box" to maximise local opportunities can deliver substantial improvements in public health and system resilience for small, remote communities.

1.1 WAITANGI WASTEWATER SYSTEM

Raw wastewater is collected from the Waitangi Township's reticulated sewer network and pumped from the Inlet Pump Station to the Waitangi Wastewater

Treatment Plant (WWTP). At the WWTP, the wastewater passes through a mechanical inlet screen into one of the two flow balancing tanks, prior to being pumped to the Rotating Biological Contactor (RBC) units for biological treatment and a lamella plate settler for clarification. The clarified wastewater is collected in the Final Holding Tank. The settled particles from the clarifier are pumped to a waste sludge tank, with the supernatant returned to the inlet and settled sludge periodically removed and disposed off-site. From the Final Holding Tank, the wastewater is pumped through disc filters before entering the UV unit for disinfection. The treated wastewater is irrigated to land at the WWTP site.

Figure 1: Waitangi WWTP

The WWTP was constructed in 2005. This project included modifications to the Township's Septic Tank to create the Inlet Pump Station and the construction of the rising main to the WWTP. The wastewater reticulation network was constructed in 1978-1980 and was not renewed as part of the 2005 project. As-built details of the wastewater system constructed prior to 2005 are non-existent.

Except for the two Balance Tanks and two RBCs, the design of the WWTP is based on a duty-only philosophy. This was to provide an affordable solution that was simple to operate and maintain. Since 2005, Waitangi's wastewater system has been left unchanged, except for minor repairs and replacements (i.e., pump refurbishments, UV lamps, UV ballast). Significant repairs to the system were identified in CIC's Strategy.

By the 2020-2021 financial year, Waitangi's wastewater system was due for several critical repairs. The pump and check valves at the Inlet Pump Station required replacement, while the shafts and bearings of the RBCs required urgent attention. Both Balance Tanks at the WWTP had significant signs of corrosion. The interior liner of both tanks remained watertight, but several of the support panels had developed holes. Several support members at the top of both tanks had to be removed due to corrosion, and concern that they may fall into tank and damage the liner. With the removal of these supports, the structural integrity of the tanks was of concern.

Overdue maintenance on the irrigation areas was carried out in 2018-2020, including replacing broken pipework and fittings, clearing vegetation and replacing broken boundary stock fencing. However, localised ponding still occurred at low points on-site, particularly during prolonged wet periods. CIC had received complaints of runoff from a neighbouring property owner.

1.2 WAITANGI WATER SUPPLY SYSTEM

The raw water is pumped from the Tikitiki bore to the Waitangi Water Treatment Plant (WTP), where it passes through a multimedia filter and softener. Disinfection is provided by two parallel UV reactors, as well as secondary disinfection using sodium hypochlorite for chlorination. The treated water flows into the Tikitiki Reservoir adjacent to the WTP, then pumped into the distribution network. The Met Station Reservoirs consists of four treated water tanks that are connected to one end of the network and located at the southwestern edge of the Township.

Figure 2: Waitangi WTP

The bulk of Waitangi's water reticulation network was constructed at the time the WTP was constructed in 2005. Since 2005, Waitangi's WTP has been left unchanged, except for minor repairs and replacements (i.e., pump refurbishments, UV lamps). Due to budget constraints at the time of the 2005 upgrade, second-hand UV disinfection units from two different suppliers were installed. The ability of the units to inactivate protozoa is known – the units are not validated and do not have a UV dose sensor or inbuilt alarms. The units were also becoming increasingly difficult to service – one was taken out-of-service when replacement parts were no longer available and the other was due for replacement.

The WTP does not have online water quality monitoring equipment. The plant is operated using handheld FAC/pH instruments, as well as monthly turbidity and microbiological sampling.

The condition of the WTP building was poor. While the plywood siding was in reasonable condition for its age, several of the pipe penetrations through the walls were not sealed properly, allowing the ingress of water.

By the 2020-2021 financial year, the Waitangi WTP was due for equipment replacements and upgrades due to its age, as well as increased monitoring requirements to enable drinking water compliance.

1.3 KAINGAROA WATER SUPPLY SYSTEM

The Kaingaroa water supply was originally owned and operated by Moana Pacific Fisheries Ltd. The company and its predecessors built and operated the water supply system which served both the community and fish processing factory. When their operations ended, all of Moana Pacific's assets were transferred to the Hokotehi Moriori Trust, which requested that CIC manage the supply for the good of the community.

In 2009, CIC took over the ownership and management of the Kaingaroa Water Supply System. The supply was upgraded in 2014 to comply with the DWSNZ "as far as practicable". The upgrade was fully funded by the MoH, with the "best practicable" upgrade comprising a new WTP (filtration, macrolite, softening, UV disinfection), raw and treated water storage, and a new raw water intake pump. Due to high organics in the lake water, the installed UV disinfection system did not meet its validated operating conditions and chlorination was not included (discussed further later). Despite this, the upgrade resulted in a material improvement in public health for the residents of Kaingaroa. The old WTPs at the site and fish processing factory were decommissioned. Funding was not available to renew the reticulation system.

The raw water is pumped approximately 8 km from Lake Rangitai to the raw water reservoir at the Kaingaroa WTP. The water is then pumped through a multimedia filter for particulate removal and macrolite filter for pathogen reduction (albeit not recognized as a protozoal barrier under the DWSNZ). The water is softened to remove hardness and then undergoes UV disinfection before entering the treated water reservoirs and then into the reticulation network.

Figure 3: Kaingaroa WTP

Lake Rangitai has had historically high levels of organics (DOC > 10 mg/L), and presents two challenges to disinfection: 1) low UV transmittance (UVT) impacting protozoa inactivation, and 2) risk of forming chlorinated disinfection by-products (DBP). To demonstrate bacterial compliance of the drinking water supply, monthly E.coli and total coliforms monitoring is undertaken for the raw, treated, and delivered water since the 2014 upgrade.

Since 2017, there has been a steady decline in rainfall at Kaingaroa and has resulted in low water levels at Lake Rangitai, which has tested the resilience of the water supply system. Anecdotally, recent lake levels are the lowest, and have occurred for the longest period, that have been seen on the island. To enable a continued raw water supply to Kaingaroa during these periods, the operator excavates a channel in the sand to maintain the flow of raw lake water to the raw water intake structure (see photo). The channel periodically needs to be reinstated (e.g., when wind and wave action causes the channel to be infilled with sand).

Figure 4: Lake Rangitai at low water level

Figure 5: Lake Rangitai at high water level

The WTP is equipped with both raw and treated water turbidimeters, but there is no telemetry system. Turbidity data is manually recorded by operators from the turbidimeters when they complete their site visits (i.e., essentially a grab sample). Theoretically, data can be downloaded from the instruments using a removable SD card or USB memory stick, but this has not been successful for various reasons. In addition to the challenges of maintaining a specialized telemetry or control system on the Chatham Islands (i.e., trained personnel, spare parts), the internet

connection was unreliable and there was no cellular service prior to November 2021.

2 FROM CHALLENGES TO OPPORTUNITES

2.1 PROCUREMENT

The MoH and 3Ws funding was made available at the start of Quarter 2 of the 2020-2021 financial year, and the integrated programme of works began. The rationale behind why individual projects were included in the programme of works is provided in Section 1.

CIC has two existing contracts to deliver Three Waters services to the residents of the Chatham Islands: 1) Three Waters engineering services are provided by Stantec; and 2) operation and maintenance of Three Waters Infrastructure is provided by Fulton Hogan (FH). These existing contracts were leveraged to their fullest extent to deliver the programme of works within the budget and time constraints.

The design work was led by Stantec, but in collaboration with FH to leverage local knowledge and resources, as well as verify that the designs were constructable and could be readily maintained, as far as possible using on-island labour and plant. CIC's CEO, Operations Manager and elected Council members were engaged regularly to ensure that the programme of works achieved their objectives for the residents of the Chatham Islands. Stantec developed concept designs for initial discussion and then provided concise project specifications, equipment lists, construction drawings, and contract deliverable lists to FH.

Physical works were procured through CIC's existing O&M Contract with FH as much as possible, including the existing nominated subcontractors (e.g., Filtec) to that Contract. FH procured materials and provided the labour to complete works that were within their professional capabilities. Specialist equipment and service providers were engaged as subcontractors under the O&M Contract when required. All equipment and service providers were required to agree to FH's standard terms and conditions as well as their insurance requirements.

For larger equipment supply, an informal Request for Quotation process was undertaken by Stantec to obtain pricing, track record information, lead time, and resource availability to complete the work within the time constraints. Preference was given to the supply of equipment similar to that currently used successfully on-island. Following this process, Stantec requested FH engage the preferred parties as a nominated subcontractor under the existing O&M Contract.

A direct supply contract between CIC and the Balance Tank supplier, Reliant Solutions, was required. This was due to the long delivery lead time for the tank and challenges with obtaining agreement to standard contract terms. CIC entered into a supply and installation contract with Reliant based on their standard terms and conditions. This helped accelerate the schedule and allowed the tank to be delivered and installed before the expiry date of the funding grant.

Procurement of materials for all projects were fraught with shipping delays, and it was the greatest risk to the programme schedule. The global pandemic

significantly impacted the supply chain of materials to mainland New Zealand. In the interest of time and availability, substitution of products was required. In addition, the shipping schedule to the Chatham Islands shipping schedule from mainland New Zealand changed regularly due to weather or the ship being out of service for maintenance. To mitigate these shipping delays, material orders were placed as early as possible and delivered to the mainland port that was scheduled for the next sailing (i.e., Napier or Timaru).

These combined strategies provided CIC with a streamlined procurement process, reducing demand on Council Staff to administer several Contracts at once. The bulk of the contract administration duties and verification that the works were completed to the correct standard was completed by FH. Through regular communication and collaboration, the following works were completed successfully.

Whilst mainland New Zealand had its first Covid case in February 2020, Chatham Islands remained Covid-free until March 2022. This is fortunate as on-island medical facilities are limited. Whilst travel was permitted to the island from mid-late 2020, the programme delivery team opted for a precautionary approach to limit possible exposure, particularly to vulnerable members of the on-island operations team. Travel is planned for late 2022, after the local body elections and after the new Council has been sworn in.

2.2 WASTEWATER SYSTEM IMPROVEMENTS

CIC's overall objectives for the wastewater system improvements was to mitigate potential adverse public health and environmental impacts, address consent non-compliance, and improve resilience.

With the grant funding that became available by the start of Quarter 2 of the 2020-2021 financial year, the critical repairs to the Inlet Pump Station and the RBCs were completed quickly. A detailed programme of wastewater improvement works was developed to achieve CIC's objectives and included: Balance Tank replacement, land irrigation system upgrades, discharge consent variation, WWTP preliminary design for future upgrades, and wastewater network CCTV inspection to inform future renewals.

As the programme of works was progressed, concept and preliminary designs were developed and cost estimates were obtained, it became apparent that the full programme of works could be not completed within the available budget and grant expiry deadlines. Many of these programme challenges stemmed from the global COVID-19 pandemic such as unanticipated cost escalation and limited market resources (e.g., material/parts availability, shipping disruptions, lockdowns). Prioritisation of the works and modification of scope was necessary to make improvements to the wastewater system and maximise benefit for the community.

The CCTV inspection of the wastewater network was abandoned entirely. The scope of the land irrigation system was reduced to adding native plantings to the irrigation area to help mitigate the localised ponding issues. We worked collaboratively with the local nursery to develop a detailed planting plan based on currently available plants and natives that could be propagated and planted before

the expiry of the funding grants. All the plants that were selected are locally propagated, native to Chatham Island (which has a unique ecosystem) and maximise both water and nutrient update with minimal maintenance.

The O&M Contractor presented an opportunity to complete a drone based aerial survey. The surveying team was visiting the Chatham Islands to complete roading works. Cost sharing terms were agreed, a technical specification was developed quickly, and permissions were obtained from neighbouring property owners to survey the WWTP site. The survey data has been instrumental for the design of the Balance Tank, remotely developing the construction methodology with the O&M Contractor, and the discharge consent variation.

Figure 6: Waitangi WWTP site drone survey

A single glass-fused bolted steel tank, with the same combined operating volume, was selected to replace the two existing Balance Tanks due to its durability and ease of construction on-site. A standard tank design was selected to minimise both design inputs and delivery times. Open channels of communication were quickly formed between the Engineer, Supplier, and O&M Contractor. When site specific piping conflicts were discovered while the tank was being fabricated, the Team was able to work quickly and collaboratively to agree on solutions that could be implemented on-site. The Team held several meetings to confirm a construction schedule, roles and responsibilities, and ensure that all the necessary resources were available in Waitangi for the construction of the tank.

The site-specific investigations, design, and enabling works necessary to accommodate the new tank was completed in parallel with the tank manufacturing and shipping stages. This was done to fast track the schedule as much as possible and to mitigate shipping delays. Several works including the geotechnical investigations, design of the ground improvement works, relocation of the site boundary fence, demolition of the existing tank, and enabling works were scheduled and completed in advance of the delivery of the tank. All necessary materials (e.g., concrete mix, granular fill) was coordinated to be available on the Chatham Islands prior to tank construction. Design work was necessary relocate the existing screen to accommodate the new hydraulic grade line, and the Team took the opportunity to improve the Balance Tank pump arrangement and removal system.

Figure 7: Newly constructed Balance Tank

The RBC-based plant is nearing the end of its life, and its replacement was identified as being required in the current LTP, albeit as currently unfunded. At the start of the programme of works, it was indicated that further funding may be available as part of the 3Ws reform package. To inform this process (or a separate funding application), some of the 3Ws funds were used to carry out an assessment of WWTP replacement options. Concept designs were then developed for the three short-listed options – a trickling filter, textile media filter and a moving bed biofilm reactor – with cost estimates. The layout developed for the WWTP concept design was used to inform siting of the new balance tank.

2.3 WATER SAFETY IMPROVEMENTS

CIC's overall objectives for the water system improvements was to materially improve public health and move towards DWSNZ compliance.

A detailed programme of water safety improvement works was developed to achieve CIC's objectives and included: a new WTP intake (Kaingaroa), WTP upgrades (UV and building repairs at Waitangi, GAC and chlorine at Kaingaroa), and online instruments and cloud-based monitoring (Waitangi and Kaingaroa).

Critical upgrades to both the Waitangi and Kaingaroa WTPs were top priority.

At the Waitangi WTP, new electronic flowmeters, raw and treated water online turbidimeters, and an online FAC/pH analyser were added to monitor the performance of the WTP. The two existing UV disinfection units were replaced with a new UV reactor; it is the same as the one at the Kaingaroa WTP. Commonality between the plants improves their serviceability by visiting contractors and minimises the number of different spare parts (i.e., lamps, sleeves, ballast) that need to be stored on the island.

Replacing the roof and siding of the WTP was necessary to ensure that all the equipment was adequately protected from both the elements and possible vermin, as well as minimise the risk of contaminating the water supply. The local builder to was engaged to complete the work with excellent results.

Figure 8: Waitangi WTP following upgrade

A new Kaingaroa raw water intake, pipeline and pump was designed to extend it into deeper water at Lake Rangitai, well beyond the island that is in the background of both Figures 4 and 5. The pipe materials and fittings have been purchased and are on-island; however, the lake level rose before the pipeline could be installed. The on-shore works (i.e., pump and fittings) have been completed and the pipeline will be installed when the lake level recedes, and anticipated to be this summer (2022/23).

At the Kaingaroa WTP, new flowmeters and an online FAC/pH meter were added to monitor the performance of the plant. Two parallel GAC filters were also installed to remove DOC, increase the UVT, and reduce the chlorinated DBP formation potential of the treated water. Bench-scale trials were completed to demonstrate proof of concept of DOC removal and UVT improvement, as well as confirm GAC filter sizing. This allowed the installation of a chlorine dosing system to provide a residual disinfectant in the network.

The extent of data collection at both WTPs were limited to the monthly grab samples collected for compliance and manual data logs that were completed when visited by an operator. Given the lack of resources and local expertise as well as reliable internet connectivity, maintaining a data historian or telemetry system at the WTPs was not technically feasible. However, following the commissioning of the new cellular network on the Chatham Islands in November 2021, as part of the Rural Connectivity Project, the operation and maintenance of a telemetry system was now feasible.

All online monitoring instrument data (i.e., flow and water quality) is sent to a remote telemetry unit (RTU) where it is stored and equipped with a battery backup. The stored data is sent to a cloud-based portal, hosted and maintained by a third-party, at regular time intervals where it can be viewed and analysed. The portal has the ability to issue alarms and notify an operator by text message. This is planned to be set-up following Stantec's on-island visit and face-to-face discussion with plant operators.

This online monitoring with RTU and cloud-based portal offered a low-cost and easy to maintain solution, while still achieving the water safety objectives. The cloud-based portal is seen as an interim step prior to CIC's 3Ws services being delivered by a new, larger water entity from mainland New Zealand. It is

anticipated that CIC online monitoring will then be integrated into the new entity's preferred, remote monitoring system.

The addition of a programmable logic controller (PLC) was considered at the options stage but disregarded in favour of the selected option for several reasons including cost, lack of on-island expertise, and funding available to implement additional WTP automation at this stage.

2.4 WATER RESILIENCE

CIC's overall objectives for the water resilience projects were to improve the availability of water supply for communities, particularly during peak summer periods.

Three key projects were carried out to improve future water resilience: Waitangi toby valve replacements, Waitangi MPA bore investigations, and the Kaingaroa rainwater scheme for non-potable use.

The toby valves in Waitangi were installed at property connections in 2005 and are at the end of their serviceable life. Several are leaking and some can no longer be closed. New toby valves for all houses in Waitangi were purchased, with approximately 15 installed as part of this funding, with the balance due to be installed as part of the day-to-day O&M contract funding.

The current water demand in Waitangi exceeds the sustainable yield for the existing Tikitiki bore during peak summer months, especially when visitor numbers are high. CIC and Stantec developed a preliminary design to use an existing, unused bore (MPA bore) as the new water supply, a new WTP, new treated water reservoir and extension of the gravity reticulation to Te One (currently unreticulated). Aquifer testing was done to understand the sustainable yield of the MPA bore as part of a proof of concept of the preliminary design. The yield is sufficient for current flows for Waitangi and Te One, or sufficient for future flows for Waitangi only. There is ongoing water level monitoring of the MPA bore to assess the seasonal effects on the MPA bore's sustainable yield.

The water levels in Lake Rangitai have been consistently low during the warmer months for several years. When the community is advised to conserve water, or the on-site tanks run low, some residents collect raw water directly from the lake, particularly for stock water. A community rainwater harvesting scheme has been installed in Kaingaroa for residents and the wider area for non-potable use (e.g., crayfish pot washdown, stock water), particularly during the drier summer months. The site was selected as a commercial operator has just replaced its roof and spouting, it has a suitable level area to site the tanks, it is on the main road near the edge of town, and has good vehicle access for the water filling point. In addition to providing non-potable water, it is hoped it will help to educate the community about the need to conserve the Island's limited freshwater resources and to use potable water for potable uses.

3 CONCLUSIONS

Key lessons from the Chatham Islands 3Ws projects for other councils, particularly those that deliver 3Ws services to small, remote communities are:

- Leverage local projects to maximise 3Ws opportunities.
    - Rural connectivity project used to progress affordable, real-time monitoring to substantially reduce public health risk.
    - Wharf upgrade used to gain a new raw water source for community supply (MPA bore).
    - Local commercial upgrade used to gain a new non-potable community water source.
- Set clear objectives for the programme of works. Plan well to deliver projects. However, a flexible and adaptable programme was needed to ensure overall objectives are still achieved, even if a delivered project departs from the original plan.
- Group similar projects into an integrated programme of works, and use a common procurement method to deliver them. Procuring the majority of works under the existing O&M contract reduced programme timeframes, had cost savings, and enabled the contractor to move between projects if one was delayed.
- Adopt alternative procurement methods when appropriate to accelerate programme schedule.
- Assemble a collaborative project team with open and honest channels of communication. This was critical to fast-tracking the programme of works to its successful completion. This allowed issues to be both raised and resolved quickly.

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