2018-2028 WATER SUPPLY ASSET MANAGEMENT PLAN

He Rautaki Whakahaere Rawa mō Te Wai Whakarato

WATER TREATMENT PLANTS

NGĀ TAUPUNI WHAKATIKA

VOLUME TWO | PUKAPUKA TUARUA

Mountain to Sea

Te Kaunihera-ā-Rohe o Ngāmotu

NEW PLYMOUTH DISTRICT COUNCIL

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DOCUMENT CONTROL

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1. INTRODUCTION

This volume provides details of the asset lifecycle management for the **Treatment Plant** asset category of the Water Supply AMP. The framework and key elements of the overall asset management plan are outlined in Table 1.

Table 1 Asset management document summary

No.	Document Name	Key Document Contents
1	Long Term Plan (LTP)	Infrastructure Strategy • Strategic Framework • Guiding Themes • High Level Information for Each Asset Class Council Services • High Level Information • Levels of Service • Financial Plan
2	Asset Management Strategy	General Asset Management Principles and Overview
3	Asset Class General Volumes	General Information and Glossary about each asset class • Executive Summary • Introduction • Levels of Service • Future Demand • Risk Management Plan • Financial Summary • Plan Improvement and Monitoring
4	Asset Category Lifecycle Management Volumes	Asset Life Cycle Management for each asset category within each asset class • Description • Condition • Remaining Lives • Valuation • Operations & Maintenance • Renewals • Acquisition and Augmentation • Disposals • Annual Work Plan • Risk Management • Financial Summary • Improvement Plan

1. INTRODUCTION

Purpose and key issues

The purpose of water treatment plants is to treat the raw water received from headworks and intakes to meet drinking water and other standards, prior to supplying it to the reticulation network.

Key issues in relation to water treatment plants are:

- Ensuring operational compliance with the New Zealand Drinking Water Standards (NZDWS 2005 (2008 revision).
- Ensuring compliance with RMA consents, NES regulations, and Regional Water Plans.
- Increasing operational costs due to higher chemicals and energy costs.
- Providing sufficient redundancy for emergencies within treatment plants.
- Addressing NPWTP treated water conveyance restrictions to the plant reservoirs.
- Seeking to replace or augment existing raw water sources and the necessary treatment changes that may result.
- Process sludge management and disposal.
- Managing and removing built up lime solids from plant clear wells and reservoirs.
- Controlling equipment damage and stainless steel pipe work corrosion in high chlorine atmospheres.
- Removing manganese in treated water to levels that are operationally manageable in the reticulation system in Inglewood.
- Potential changes to the NZDWS.
- Potential changes to the Regional Fresh Water Plan.
- Obsolescence of plant and equipment.
- Upgrades required at Oakura WTP to comply with possible changes to the NZDWS which may include removal of the existing "secure bore" status.

Levels of Service

Water treatment plant assets support the community level of service expectations of a reliable water supply that is safe to drink.

Our in-house operations team ensures compliance with Drinking-water Standards for New Zealand (DWSNZ) 2005 for protozoa, bacterial and organic and chemical contaminants. Daily water samples are analysed either at site or by an accredited external laboratory. Our in-house NPWWTP laboratory is MoH registered for some tests and also provides some analysis. We enter data into the MoH's Drinking Water Online central data base, which calculates and reports on compliance. Plant staff use Excel to generate the sampling schedules.

Historically, we used the Management Information System (MIS) software that was developed in-house to take data from the SCADA system and produce standard reports on drinking water compliance and other specific information requirements. Key reports, the protozoa, chlorination and plant flow reports, enabled these parameters to be assessed against DWSNZ requirements. Users of the MIS could also create and customise their own reports.

As of 1 July 2011, we replaced MIS with Water Outlook. In the new system, data is hosted by a third party (Water Outlook). Data ownership remains with NPDC and the data cannot be extracted, shared or used by any third party unless we authorise it. The database is fully accessible and internal staff can customise reports. Water Outlook also enables synchronisation with tablets, allowing water technicians to capture operational data in the field.

Future Demand

Future forecasts have identified the need to increase plant capacities to meet increased demand. As outlined in the Section 4 of the Water Supply General AMP, the Water Master Plan addresses the options to cater for increased future demand on the water supply system. Any items from the Water Master Plan involving augmentation of water treatment plants are included in Section 2 of this volume.

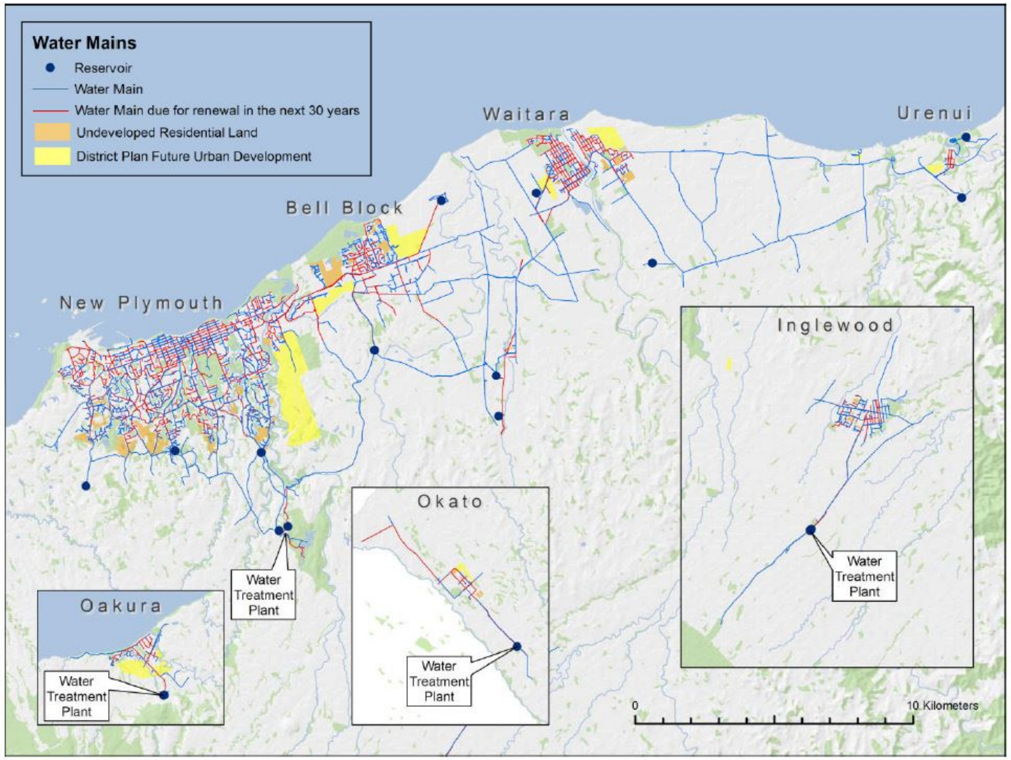
Note: All financial forecasts are shown in inflation adjusted dollar values.

2.1 Asset Description

2.1.1 General

We have four Water Treatment Plants in the New Plymouth District. These are located at New Plymouth (serving New Plymouth City, Bell Block, Waitara and Urenui), Inglewood, Oakura and Okato, as sown in Figure 1.

Figure 1 Location of water treatment plants



The facilities and processes of each plant are specifically designed to cater for the characteristics of the plant's raw water supply and the population it serves. The components of the treatment process included at each treatment plant is summarised in the Table 2.

Table 2 Treatment process component summary

Water Treatment Plant Facilities and Process				
	NP	INGL	OKATO	OAKURA
Administration	Y	Y		
Chemical Dosing	Y	Y	Y	
Chemical Preparation	Y			
Floculation - Poly-Mix	Y			
Clarification	Y	Y		
Filtration	Y	Y	Y	
Gallery Intake		Y	Y	
Contengency Intake	Y	Y		
Intake				Y
Raw Water Preparation	Y			
Reservoir	Y	Y	Y	Y
Services & Utilities	Y	Y		
Sewage Pumping	Y			
Sludge Handling	Y	Y		
Telemetry	Y	Y	Y	Y

The accuracy of data presented in this AMP has been assessed and graded in accordance with Section 5 of the Asset Management Strategy.

2.1.2 New Plymouth Water Treatment Plant

Source of water

Lake Mangamahoe / Waiwhakaiho River.

Present capacity

70,000,000 L/day (2,917,000 L/hour)

Treatment

- Screening at inlet (stepper screens).
- Taste and odour removal (powdered activated carbon).
- Raw water conditioning (lime and/or CO2 addition).
- Mixing (mechanical and static mixers).
- Coagulation (polyaluminium chloride).
- Floculation (polyelectrolyte).
- Clarification (hopper bottom clarifiers fitted with plate seperators).
- Filtration (rapid gravity filters).
- Manganese removal ("green sand" filter media).
- Sterilisation (chlorine gas).
- pH correction and corrosivity contral (CO2 and lime).

Clarifiers

Sixteen Portals – hopper bottom clarifiers fitted with plate settling tubes and gravelectric cones.

Filters

Eight rapid gravity sand filters filled with 600mm of anthracite coal over 400mm silicon sand media. A wedge wire collection and backwash system is bolted to the floor of the filters. Each filter is fitted with launders to aid filter cleaning at the time of back washes, and has filter to waste capacity.

Operation

The water for the New Plymouth Water Treatment Plant is diverted from the Waiwhakaiho River via a tunnel that leads to Lake Mangamahoe. During the summer, water is normally drawn from an intake (called the river intake) near the tunnel outlet. The water passes through the pipe which runs under the lake to a stepper screen chamber and then to the treatment plant.

When the river intake is not in use, water is drawn from one or other of the lake intakes on the north-western side of Lake Mangamahoe. This water is also piped to the stepper screening chamber and then on to the treatment plant. The stepper screens trap large debris such as twigs and other organic matter, and stop them from flowing into the plant. They also prevent wild life such as ducks and eels from inadvertently entering the water supply pipes.

The stepper screens are checked regularly to prevent blockages and to help maintain good, even flow. Plant operators use automated valves to control which intake is used.

The raw water is piped to the plant where depending on raw water conditions, it may be dosed with carbon dioxide or lime to control the pH to 6.7 followed poly aluminium chloride (PACL) addition. This ensures the pH is optimal for coagulation.

Powdered activated carbon (PAC) is also added to remove organic taste and odour causing compounds. A mixing tank ensures enough reaction for lime and PAC.

Following the carbon dioxide and/or lime addition a small amount of a chemical called polyaluminium chloride (PALC) is added. This enables the tiny particles in the water which cause colouration, and other suspended particles, to clump together. This process, called coagulation, makes particles easier to remove. Adding lime also ensure sufficient alkalinity is available if the natural water contains an insufficient level for the coagulation process to work well.

Polyelectrolyte is then added to bind together the clumps of particles resulting from the coagulation process. This binding of coagulated particles into larger particles is called flocculation.

2. LIFECYCLE MANAGEMENT PLAN

The water is fed into the bottom of the settling tanks and rises slowly, allowing the heavier particle clumps to settle out into a sludge (floc) blanket. The floc blanket binds micro-organisms such as giardia and other protozoa for removal with the sludge, or into filterable floc particles. Plate settling tubes greatly increase the capacity of the clarifiers.

The clear water flows out the top of the tanks via the decant troughs, while the sludge is drained off to the sludge lagoons in front of the plant.

On average it takes the water 4.5 hours to pass through the settling tanks. As the water leaves the tanks, hydrated lime (calcium hydroxide) is added to raise the pH of the water to 7.7 and chlorine is added in order to create the right conditions in the filters for manganese removal.

From the settling tanks, the water travels in channels to the rapid sand filters where it passes downwards through layers of anthracite coal and sand which remove any remaining particles. This process usually takes about 35 minutes. The filters are taken out of service for back washing, either on a scheduled timetable or when conditions such as head loss or turbidity mean the filters require it. Backwashing the filter removes the particles trapped in the coal and sand layers. The resulting dirty water is drained to the sludge lagoons, where the particulates settle out.

From the filter outlets, the treated water goes into a large “clear water” tank directly beneath the plant. As a final disinfection process to ensure there are no remaining micro-organisms present in the water, chlorine gas is added to the water before it enters the “clear water” tank. This also provides a residual disinfetant which safeguards against accidental contamination in the reticulation system. CO2 and lime are added to give a final pH level of 7.8 to 8.0 and to condition the water and minimise its corrosivity. The NZDWS requires 30 minutes contact time for chlorine disinfection. The “clear water” tank and reservoirs are required to achieve this time.

Water quality is monitored constantly throughout the various stages of the treatment process to ensure that it meets strict standards for public health.

Critical online monitoring equipment includes:

- pH meters.
- Turbidity meters.
- Chlorine monitors.
- Streaming current monitors.
- S:CAN multifrequency UV spectral analyser

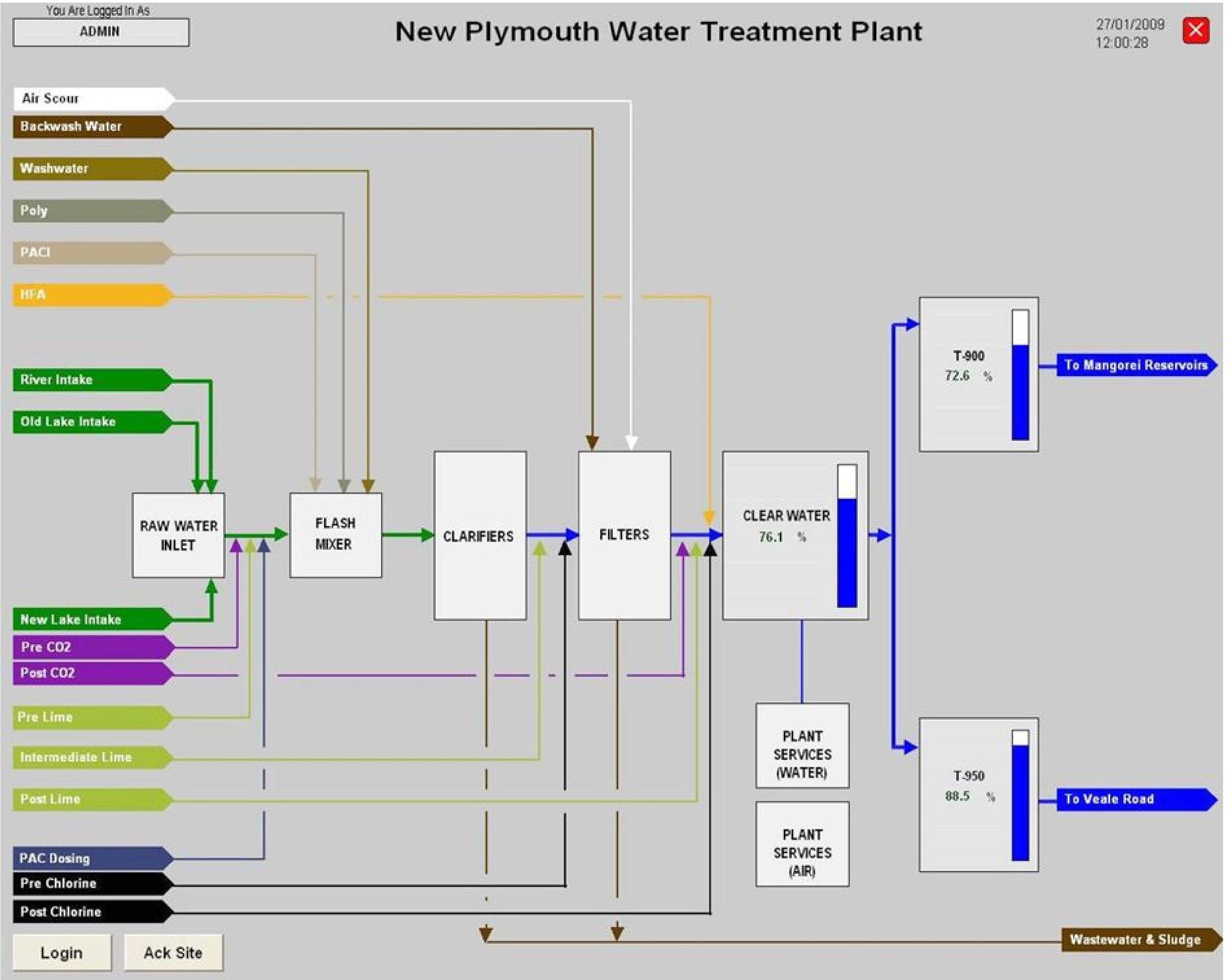
Supplementing our online monitoring is regular water testing by the water treatment technicians and contract laboratories that are IANZ accredited and recognised by Ministry of Health (MOH).

Our IANZ accredited laboratory operates under strict requirements to maintain process and quality management systems. Our water treatment technicians receive specialist training to gain NZQA Drinking Water Diploma/Certificate qualifications from external authorities. We implement ongoing training to ensure staff are operating the plant in line with best practices based on national and international standards and guidelines.

The treatement process is shown in Figure 2 and the plant capacity in Table 3.

Asset Capacity /Performance

Figure 2 NPWTP process diagram



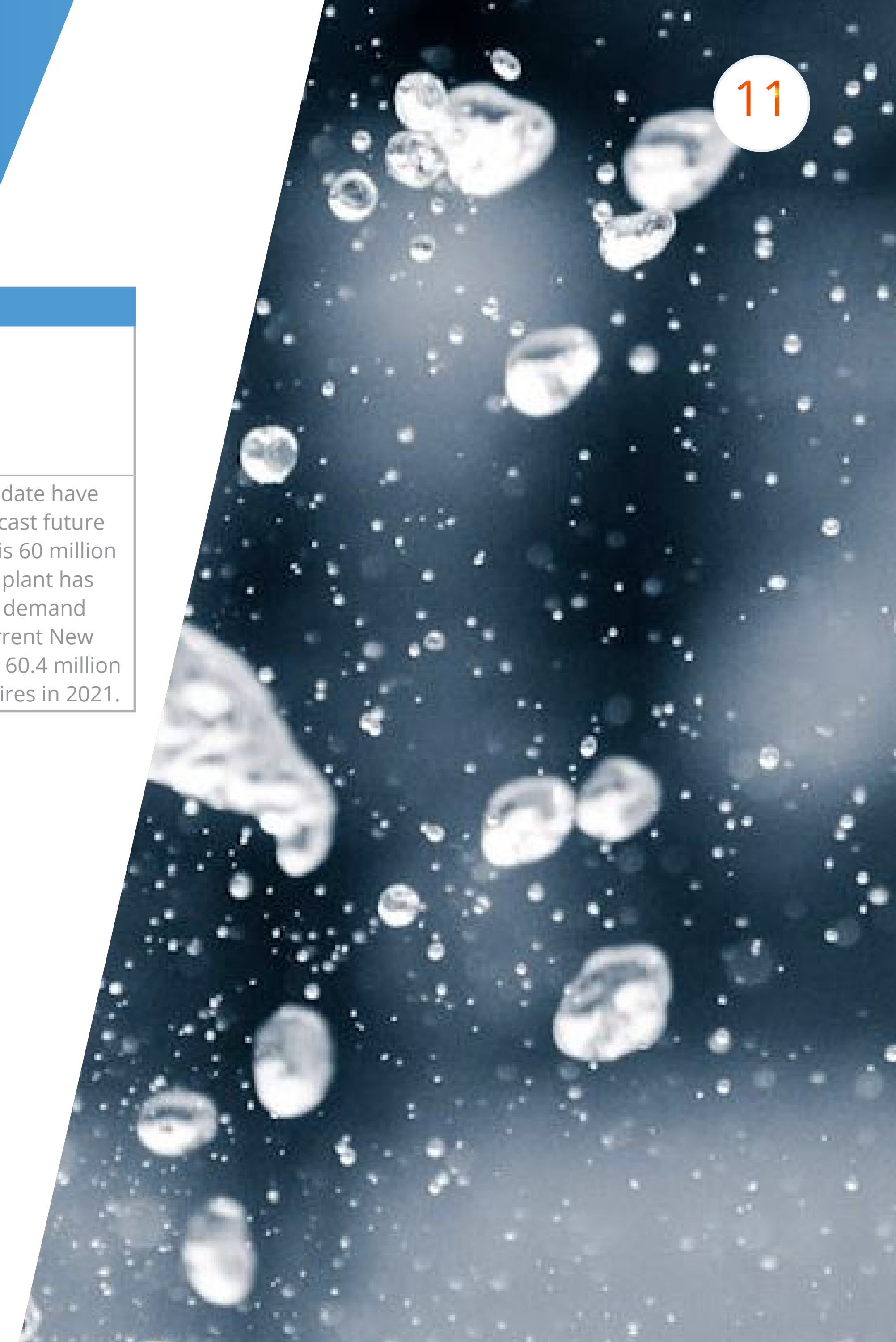


Table 3 NPWTP capacity

Water Treatment Plant Capacity				
Water Treatment Plant	Design Peak Capacity (million litres/day)	Average Daily Winter Consumption (million litres/ day)	Average Daily Summer Consumption (million litres/ day)	Commentary
New Plymouth	70	30	40	Peak recorded flows in summer to date have been 47 million litres per day. Forecast future peak demand for the next ten years is 60 million litres per day. This means that the plant has adequate capacity to meet future demand beyond the next 10 years. The current New Plymouth consent abstraction limit is 60.4 million litres per day, for which the term expires in 2021.

Forecast future peak demand for the next ten years is 60 million litres per day. This means that the plant has adequate capacity to meet future demand beyond the next 10 years. The current New Plymouth consent abstraction limit is 60.4 million litres per day. However, this consent expires in 2021 and a revised water extract limit may be imposed when it is renewed.

2.1.3 Inglewood Water Treatment Plant

Source of water
Ngatoro Stream.

Present capacity
200,000 L/hr (normal current flow 100,000 L/hr).

Treatment
- Filtration at inlet (infiltration gallery) – currently does not meet Bank Filtration requirement of the NZDWS.
- Coagulation (poly aluminium chloride).
- Mixing (static mixers).
- Flocculation (polyelectrolyte).
- Contact flocculation (pressure adsorption clarifiers).
- Filtration (pressure filters).
- Sterilisation (chlorine).
- pH correction (lime).

Clarifiers
Two pressure adsorption clarifiers, media – granular MDPE (Medium Density Polyethylene), rise rate at 100,000L/hr.

Filters
Two pressure filters, media – dual media (silicon sponge and sand), filter rate at 100,000L/hr is 10.7m/hour.

Operation
The water for the Inglewood Water Treatment Plant is extracted from the Ngatoro Stream via an infiltration gallery. The infiltration gallery consists of two slotted pipes buried under the stream bed. The stream bed and filter material placed on top of the pipes act to filter gross solids from the raw water before it enters the plant. The two gallery pipe legs feed a pipeline that supplies the treatment plant.

At the entrance of the plant a small amount of a chemical called poly aluminium chloride is added. This enables the tiny particles in the water to clump together in a process called coagulation, which makes them easier to remove. A static mixer and large diameter detention pipe allow turbulence and time for this reaction to take place. Polyelectrolyte is also added to bind the clumps of particles.

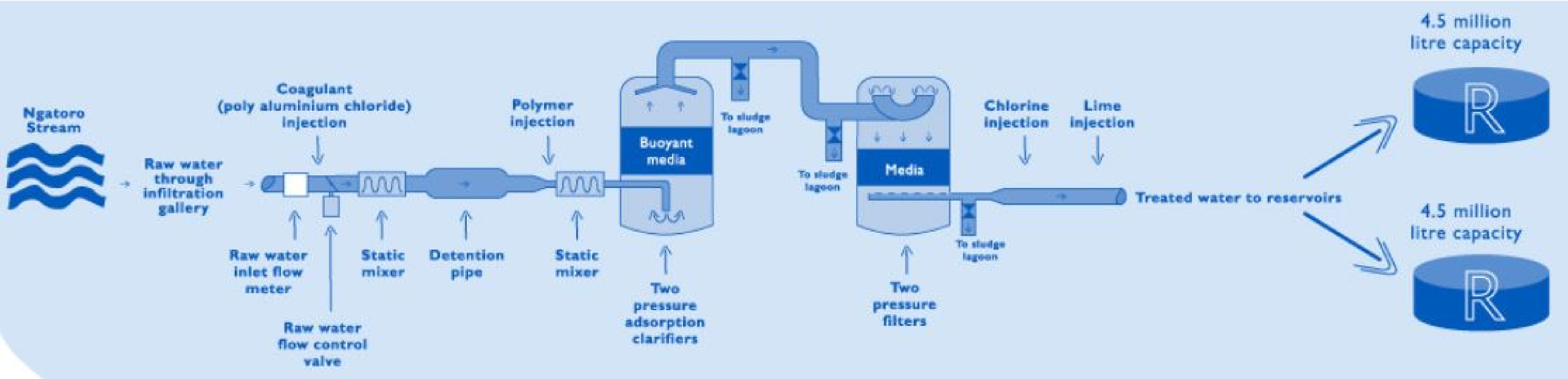
The water flows upwards through two pressure adsorption clarifiers. Buoyant granular media in the clarifier further helps the clumping of solids in a process called contact flocculation, and traps the majority of these solids on the surface of the media. A regular wash sequence flushes the trapped solids from the media to waste.

The clean water flows out of the top of the clarifiers into two pressure filters and passes down through silica sponge and sand filtration media where any remaining particles are removed. The filters are also backwashed regularly to remove particles trapped in the media.

From the filter outlets, the treated water flows to the reservoirs. On the way, chlorine gas and hydrated lime (calcium hydroxide) are injected. Chlorine is added as a disinfectant to ensure there are no micro-organisms present in the water. This also provides a residual disinfection safeguard against accidental contamination in the reticulation system. Lime is added to raise the pH of the water to 7.8 - 8.0, making the acidity/alkalinity level healthy for consumers and non-corrosive to household plumbing. The NZDWS requires 30 minutes contact time for chlorine disinfection. The reservoirs are required to achieve this time.

The treatement process is shown in Figure 3 and the plant capacity in Table 4.

Figure 3 Inglewood WTP process diagram



Asset Capacity /Performance

The water infrastructure at the Inglewood water treatment plant supply area is sufficient to meet current and future demands. Egmont Village currently does not have a reticulated water supply. One option would be to consider supplying Egmont Village from the Inglewood WPT and network but the capacity at the plant may need to be increased to achieve this and cater for predicted growth. Submissions have been made in each annual plan to extend the water reticulation to Egmont Village. Due to cost, lack of any known negative health impacts and lack of unanimous agreement this has not been approved by the Council.

Table 4 Inglewood WTP capacity

Water Treatment Plant Capacity				
Water Treatment Plant	Design Peak Capacity (million litres/day)	Average Daily Winter Consumption (million litres/day)	Average Daily Summer Consumption (million litres/day)	Commentary
Inglewood	4.8	1.8	2.5	There is adequate plant and reservoir capacity for at least another 10 years.

2.1.4 Oakura Water Treatment Plant

Source of water
Groundwater: Aquifer (via two bores granted secure bore status).
Surface water: Wairau Stream.

Present capacity
2,800,000 L/day (normal use 720,000 L/day)

Treatment
- Secure bores.
- Chlorination to provide residual disinfection in reticulation system.
- pH control and corrosion minimisation (lime).

Operation
The groundwater is pumped from a deep volcanic avalanche flow strata originating from the Pouakai Range. It is then piped to the water treatment plant where sodium hypochlorite disinfectant and lime slurry for pH correction and corrosion minimisation are added before it is sent to reservoirs for storage. The age of the groundwater has changed over recent years from >300 years in 2005, 75 years in 2011 and 175 years in 2017.

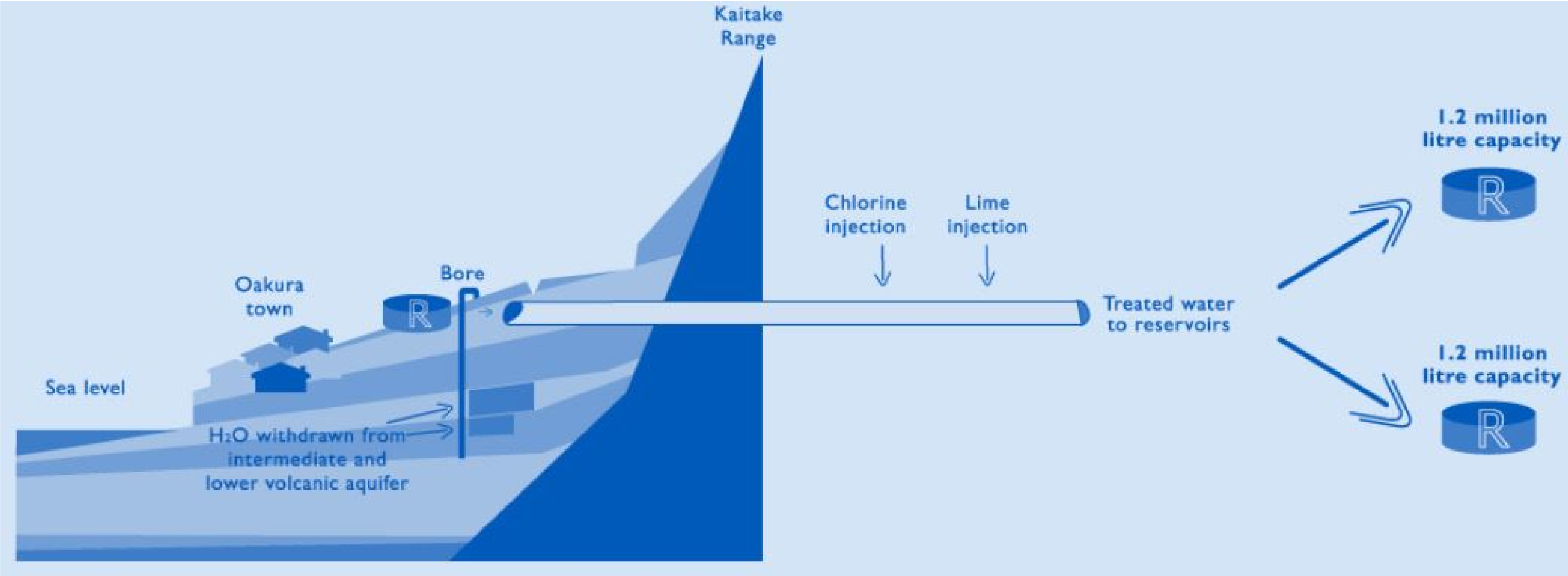
Disinfection is necessary to protect against contamination occurring in the reticulation, e.g. in the case of back flow. Production from the bores and dose rates are set automatically to maintain quality standards. The water is pumped to two 1.2 million litre capacity reservoirs.

To ensure security of supply, a second bore has been commissioned. Having two bores provides backup to cover maintenance or pump failure, and can double the production when run in ‘dual mode’. Each bore alone can supply the average daily demand. However, it is preferable that each bore takes an equal proportion of the demand to minimise any possible adverse effects on the aquifers. Any over-pumping could permanently damage the aquifers and the equipment. We operate one bore in preference and have found that each bore influences the other but we haven’t yet been able to prove that both bores are supplied from the same aquifer.

An existing surface water source is maintained as a contingency in case both bores are unavailable. The surface water treated system is via an ‘automatic valve-less gravity’ sand filtration and gas chlorination. This system is still connected but no maintenance has been conducted since 2002 and would now require upgrade work if was required for use in the future.

The treatement process is shown in Figure 4 and the plant capacity in Table 5 .

Figure 4 Oakura WTP process diagram



Asset Capacity /Performance

Table 5 Oakura WTP capacity

Water Treatment Plant Capacity				
Water Treatment Plant	Design Peak Capacity (million litres/day)	Average Daily Winter Consumption (million litres/day)	Average Daily Summer Consumption (million litres/day)	Commentary
Oakura	3.7	0.53	0.85	There is currently adequate capacity in Oakura but the development of the proposed large sub-division will require a capacity review.

2.1.5 Okato Water Treatment Plant

Source of water

Mangatete Stream

Present capacity

50,000L/hr.

Treatment

- Filtration at inlet (in bank infiltration gallery) – currently does not meet Bank Filtration requirement of the NZDWS.
- Cartridge filtration (1 micron nominal pre and 1 micron absolute post).
- Ultraviolet disinfection.
- Sterilisation (chlorination).
- pH correction (lime).

Operation

Water from the Mangatete Stream is drawn through an infiltration gallery under the riverbank and flows by gravity to the treatment plant where the following multi-barrier process occurs:

- Two-stage microfiltration – two banks of cartridge filters operate in parallel to remove fine particles and protozoa (e.g. giardia). Each bank has two different filter sizes. The first filter at 1 micron nominal acts to protect the second at 1 micron absolute from blocking too quickly.
- Ultra-violet sterilisation unit – acts as an additional barrier against protozoa contamination.
- Lime addition for pH adjustment – to reduce the corrosive potential of the water to plumbing.
- Chlorine addition for disinfection – to ensure there are no microorganisms present in the water distributed to the reservoir.

The water is then transferred to the 1.2 million litre capacity reservoir.

Asset Capacity /Performance

The Okato water treatment plant has a design capacity of 1.0 million litres per day. Average daily consumption demands for water in the Okato water supply area are approximately 0.8 million litres per day in winter and 0.5 million litres per day in summer. There have been a number of incidences where water conservation measures have been imposed in this area, due to low water levels in the Mangetete Stream.

The issues associated with the water source limitations at Okato are described in Volume 1 – Headworks and Intakes.

The treatement process is shown in Figure 5 and the plant capacity in Table 6.

Figure 5 Okato WTP process diagram

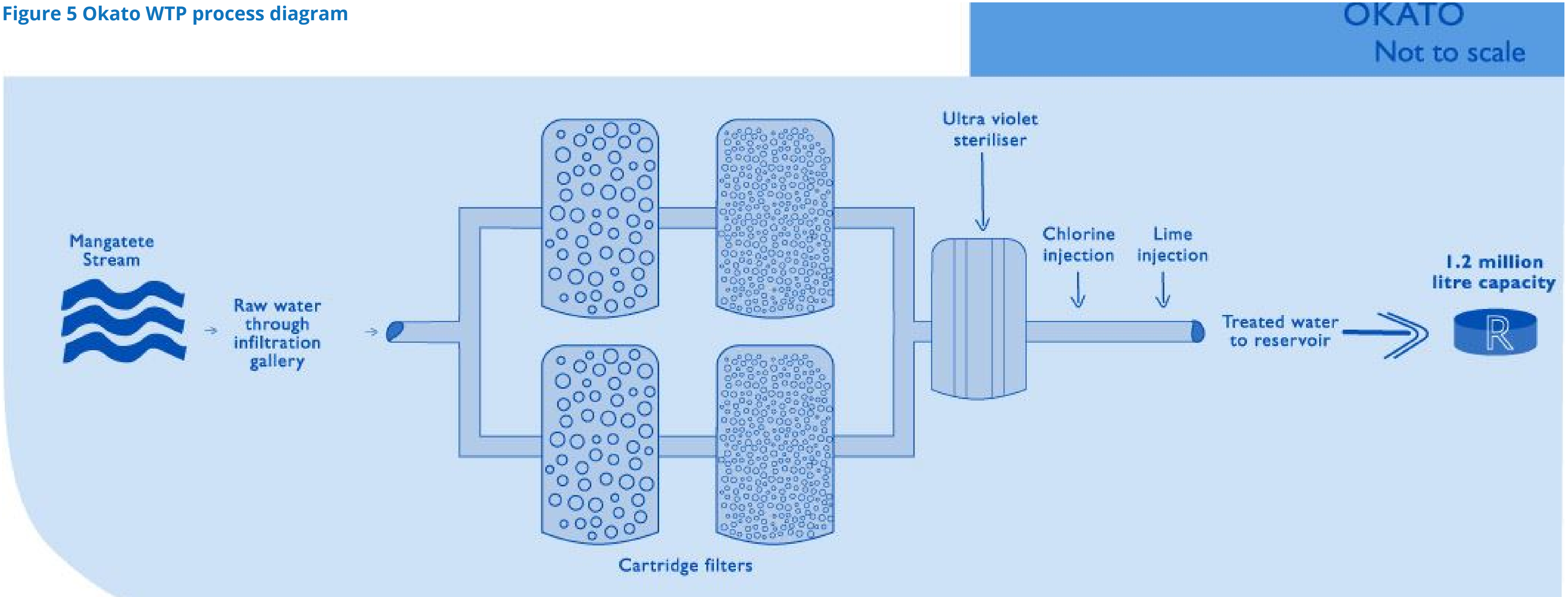


Table 6 Okato WTP capacity

Water Treatment Plant Capacity				
Water Treatment Plant	Design Peak Capacity (million litres/day)	Average Daily Winter Consumption (million litres/day)	Average Daily Summer Consumption (million litres/day)	Commentary
Okato	1.2	0.4	0.5	There have been a number of incidences where water conservation measures have been imposed in this area due to low water levels in the Mangetete Stream. The issues associated with the water source limitations at Okato are described in Volume 1 – Headworks and Intakes.

A well maintained and updated asset inventory means the data presented in this AMP on the quantity and age of the assets at the water treatment plants is classed as grade **B – Reliable**.

2.2 Asset Condition

Asset condition grades are given in accordance with Section 5 of the Asset Management Strategy.

No formal asset conditions for treatment plants have been recorded and all asset conditions are recorded in the inventory as 6 - Unknown. Therefore, the data accuracy for asset condition is classed as grade E – Unknown. **This is a data integrity issue and is recorded as an action in Section 5 – Improvement and Monitoring Plan.**

Despite this, the water treatment assets are generally considered to be in good condition with a few known exceptions that have already been addressed or will be addressed in either renewals plans or reactive maintenance.

2.3 Asset Remaining Lives

The life expectancy data for treatment plant assets has been recorded in EAM. This data was provided by Beca as part of the plant and equipment valuation and is therefore classed as grade **B – Reliable**.

The life expectancy of water treatment plant assets is variable as it based on construction materials and usage. Concrete structures have a life expectancy of 100 years; valves and other miscellaneous assets have a life expectancy similar to those described in Volume 4 of this AMP.

2.4 Asset Valuation

As at is 30 June 2016, the value of all water treatment plant assets is shown in Table 7.

Table 7 Asset valuation

Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
32,654,966	803,524	16,776,900

Beca provided a detailed valuation of each asset component as part of the general plant and equipment valuation during the 2016 statutory valuation. Therefore, in conjunction with a well maintained and updated asset inventory, the data is classed as B – Reliable.

2.5 Operations and Maintenance Plan

2.5.1 Operations

Operational expenditure is the greatest component of water treatment costs, incorporating all energy, chemical and staff costs. All costs per plant are separately budgeted and accounted for to enable cross-supply comparison and external benchmarking against comparable supplies. As the largest plant and supply area, the New Plymouth plant has a greater economy of scale than the other treatment plants. Its water production costs are half those of the smallest plant at Okato.

Routine operational activities at treatment plants includes the following:

- Operational control and monitoring of reservoir water levels, flows in trunk mains and pump station operation within the distribution network.
- Checking the treatment chemical inventory, flow and dose rates at the WTP.
- Daily flushing and operation of valves, pumps, and dose lines and validating and maintaining the analyser.
- Sampling and laboratory analysis of water quality for process optimisation and compliance.
- Monitoring plant processes and logging recorded results.
- Mixing of chemical solutions for dosing (e.g. coagulant, lime, polyelectrolytes).
- Equipment maintenance and maintenance checks.
- Cleaning of facilities.

Additional duties include:

- Undertaking and co-ordinating reactive and planned maintenance.
- Checking (including cleaning) of intake structures (typically daily or on receipt of heavy rainfall warning).
- Issuing and administrating permits to work (required for works on all operational sites).
- Calibrating & troubleshooting of analysers (weekly).
- Answering customer enquiries and hosting interest visits (e.g. schools, technical groups).

Outside of manned hours, the duty operator is able to monitor and control the plants via a laptop with remote access to the SCADA system.

In addition to the above, every two years the NPWTP lagoon needs to have sludge removed, at an estimated cost of $250k-$350k.

2.5.2 Maintenance

Our general approach to asset maintenance is outlined in our Asset Management Strategy.

Instrumentation and Electrical (I&E) Maintenance

Planned and reactive maintenance for electrical equipment and instrumentation at the water treatment plants is managed by the Water Treatments Plant Coordinator who is supported in-house by water treatment operators and the NPDC Electrical & Systems team. In the case of a fault, the duty operator will contact our electrical contractor directly and if necessary escalate the fault it to our Electrical & Systems team. This team maintains an inventory of all required instrumentation and the preventative and predictive electrical maintenance required at the water treatment plants.

Mechanical Maintenance

Planned and reactive mechanical maintenance at all WTPs and facilities is managed by the Water Treatment Plant Coordinator supported by the Mechanical Maintenance Coordinator and in‑house by the water treatment technicians. Our mechanical maintenance contractor and various specialist suppliers/providers provide external support. Plant technicians undertake front line reactive maintenance and some smaller planned works. Typically, the duty technician will contact the mechanical contractor as a first responder. They may call upon the projects team and other specialist service providers to facilitate works beyond reactive maintenance e.g., major repairs, upgrades and major works in general. All preventative and predictive mechanical maintenance activities are recorded and managed in EAM.

Building and Grounds Maintenance

Building facilities and ground maintenance work is managed by our Property team. We also contract approved suppliers to provide building maintenance services. This includes 10-yearly painting of buildings. Most grounds keeping is done by our Parks teams or by approved contractors in line with a grounds keeping agreement. Any grounds work outside of the agreement is undertaken by approved contractors as required.

Major Maintenance

Major repairs are undertaken on a case by case basis – subject to prior approval and within approved budgets. Major maintenance items required include:

- NPWTP polyaluminum chloride (PACl) storage tanks 1 & 2 need internal fiberglass relining to remain serviceable.
- NPWTP cleaning clarifiers: lamella plates (settling tubes). There are eight of these plates with a life expectancy of 10 years. Starting in 2018, we plan to replace one per year.
- NPWTP sludge lagoon requires regular emptying. Investigation needed for long term solution to sludge disposal (investigation could include other WTPs).
- NPWTP clarifiers require annual camera inspection.
- NPWTP clear water tank requires annual cleaning.
- All WTPs filters median needs inspection / replacement.
- Inglewood WTP requires inspection/ replacement of clarifiers and filters.
- Inglewood WTP sludge tank requires regular emptying and has very poor access arrangements.

2.5.3 Critical Spares

We have not yet conducted assessment of the critical spares required for the water treatment plants. **This is an asset data integrity issue and is recorded as an action in Section 5 – Improvement and Monitoring Plan.**

2.5.4 Opex Forecast

The general 10-year Opex forecast for water supply assets is included in the General Water Supply General Volume. It includes the Opex forecast for the maintenance and operation of water treatment plant assets.

2.6 Renewals Plan

Our general approach to asset renewal is included in the Asset Management Strategy. As the water treatment plant assets continue to age, we will require investment in renewals to maintain current levels of reliability. We have planned for general and emergency renewals of plant and equipment and general building components, based on historical performance. These values are approximate to the currently recorded accounting expiries in EAM. Prior to confirming expenditure on renewal projects, we will undertake condition and criticality assessments and review the remaining life of the assets to ensure we achieve optimum value from the assets. Specific renewals projects include:

- WTP Sludge Disposal at $378k in 2018/19 – This project is driven by consent condition requirements to empty the sludge lagoon and dispose of the sludge. Sludge disposal methods will be reviewed in the future. One option is to use a screw press to increase the dry solid content.

- Critical Spares at $53k in 2020/21 – This project is based on the planned review of critical spares referred to in the Improvement Plan in Section 5. It will mainly focus on plant and equipment spares for treatment plants, but may also include reticulation and pump station spares.

The 10 year expenditure forecast for renewals is shown in Table 8.

Table 8 Renewal expenditure forecast

Water Treatment Plants Renewal Expenditure Forecast ($000)											
Activity	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	LTP Total
WA1042 - WTP sludge disposal	378	-	-	-	-	-	-	-	-	-	378
WA1085 - Water General P&E and I&E Renewals	252	515	841	1,182	1,208	1,236	1,266	1,296	1,329	1,363	10,488
WA2002 - Emergency Water P&E Renewals	70	21	126	129	132	135	138	141	145	149	1,186
WA2013 - Water Critical Spares	-	-	53	-	-	-	-	-	-	-	53
WA2025 - Water Building Renewals	5	5	5	5	5	6	6	6	6	6	55
Total	705	541	1,025	1,316	1,345	1,377	1,410	1,443	1,480	1,518	12,160

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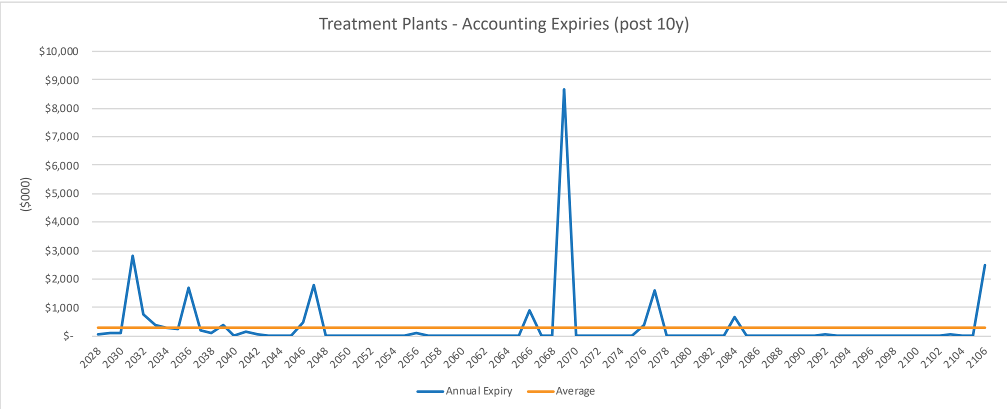
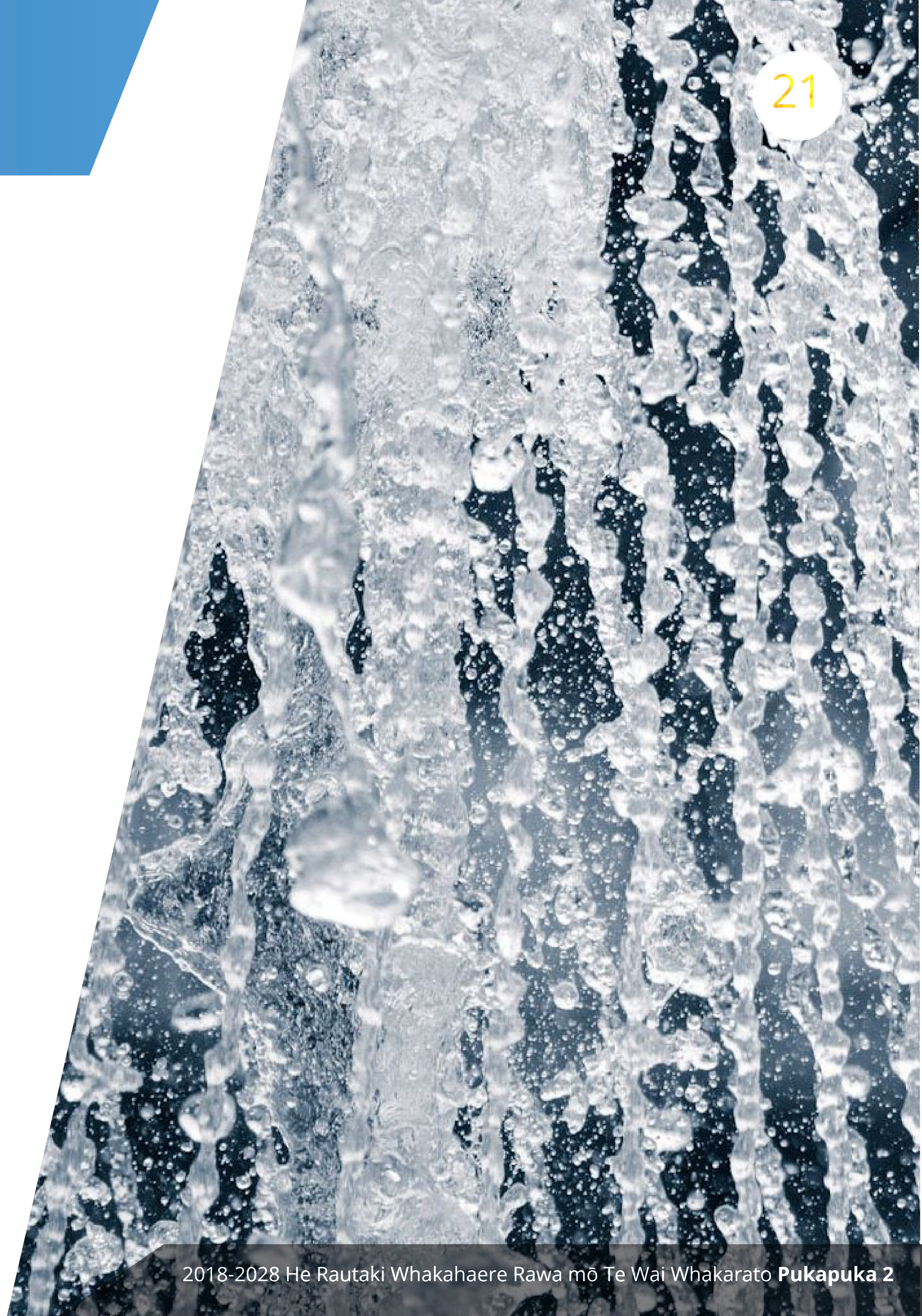
2. LIFECYCLE MANAGEMENT PLAN

The accounting expiries for the years beyond 27/18 are shown in Figure 6. There are two major items:

- renewal of the NPWTP clarifier tube settlers at approximately $2.0m in 2031. These are already showing signs of failure and may require renewal as part of the inspection and repair of the sludge cones. This will be assessed and included in the next LTP if required , and
- renewal of the NPWTP clarifiers and filtration shells at approximately $9.0m in 2070.

Figure 6 Accounting expiries post 10y





2.7 Acquisition and Augmentation Plan

Acquisition

There are no acquisitions of treatment plants planned over the next 10 years.

Growth

The Water Master Plan identifies the new water supply assets that will be required to meet future predicted demand. The assets required are summarised in section 4 of the Water Supply General AMP.

There are no growth projects for treatments plants planned during the period of the AMP.

Levels of Service

The Water Master Plan includes a total provision of $30.1m over the period of the plan to establish a new water source and water treatment plant. Even with successful demand management to reduce water usage as the population grows, the district's total water demand will continue to grow. At some point demand on the current water source will exceed supply capabilities and we will require a new water source to maintain levels of service. Further investigation to identify a suitable water source is required – possible solutions include new bore holes or another river supply together with new treatment plant facilities. The expenditure forecast for this project includes provision for any associated headworks and intakes.

Other specific level of service projects include:

- Junction Road Residences and Crematorium Water Supply at $210k in 2020/21 – the existing water supply to these premises does not have the correct chlorine contact time to meet drinking water regulations. This project is designed to correct this issue.

- Oakura WTP Upgrade at $1,544k in 2019/20 – following on from the findings of the Havelock North Water Contamination Inquiry it is expected that the NZDWS will remove the secure bore status at this site. This means that we will need to provide a protozoa treatment at the plant. This may include installation of UV treatment to supplement the existing chlorine and lime treatment.

- NPWTP Site Security at $53k in 2020/21 – this project is to update systems to ensure adequate security is in place including keys, alarms and monitoring. It will also ensure risk to the public is reduced.

- NPWTP Welfare Modifications at $210k in 2020/21 – the office interior, lab and control room need reconfiguring and renovation to meet health and safety requirements. This is partly because of incremental growth having an impact on effective working space. The benefits of this project include providing a work space that meets industry standards, providing sufficient space for existing staff and ensuring quality assurance for drinking water.

The Capex forecast for level of service projects is summarised in the Table 9.

Table 9 Level of service expenditure forecast

Water Treatment Plants Level of Service Expenditure Forecast ($000)											
Activity	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	LTP Total
WA2008 - NP WTP & Junction Rd Residence & Crematorium	-	-	210	-	-	-	-	-	-	-	210
WA2028 - Oakura WTP Upgrade	-	1,544	-	-	-	-	-	-	-	-	1,544
WA2026 - New Water Source	-	-	-	3,225	-	-	-	-	13,287	13,632	30,144
WA2011 - NP WTP and NP WWTP Site Security	-	-	53	-	-	-	-	-	-	-	53
WA2009 - NP WTP Welfare Modifications	-	-	210	-	-	-	-	-	-	-	210
Total	-	1,544	473	3,225	-	-	-	-	13,287	13,632	32,161

2.8 Disposal Plan

Disposal is the retirement or sale of assets when they become surplus or superseded by new or improved systems. Assets may become surplus to requirements for any of the following reasons:

- Under-utilisation
- Obsolescence
- Provision exceeds required level of service
- Replacement before end of predicted economic life
- Uneconomic to upgrade or operate
- Policy changes
- Service provided by other means (e.g. private sector involvement)
- Potential risk of ownership (financial, environmental, legal, social)

A number of existing land assets associated with former water treatment plant assets have no further anticipated use and are now intended for disposal. This includes the following:

- Former Motunui WTP adjacent to Methanex Motunui petrochemical site.
- Minor land holdings associated with the Waitara Raw Water Industrial Supply, contingent on a presumption of divestment of this scheme.

2.9 Annual Work Plan

Detailed work plans included in Annual Plans will be based on the asset renewal forecasts included in section 2.6 and the augmentation projects identified in section 2.7.

3. RISK MANAGEMENT PLAN

3.1 Critical Assets

We have not yet conducted criticality ratings for treatment plant assets; therefore, there is currently no data recorded in EAM. **This is an asset data integrity issue and is recorded as an action in Section 5 – Improvement and Monitoring Plan.**

Certain treatment plant assets are recognised as critical for monitoring and controlling water quality. These are:

- pH meters
- Turbidity meters
- Chlorine monitors
- Streaming current monitors

Following asset criticality assessments, we will develop a focused management plan to ensure the integrity and resilience of critical assets.**This is recorded as an action in Section 5 – Improvement and Monitoring Plan.**

3.2 Risk Assessment

Details of our Risk Management Framework are included in section 6.2 of the Water Supply General AMP volume and section 7 of the Asset Management Strategy.

3.3 Infrastructure Resilience Approach

The Water Master Plan considers opportunities to improve asset resilience when planning for the construction of new assets to meet growth projections and maintain levels of service. Once we have completed asset condition and criticality assessments, we will undertake further resilience planning to identify any potential improvements.

Following on from ex-cyclone Gita which damaged one of our trunk mains crossing a pipe-bridge in February 2018 and the Havelock North Water Inquiry; the importance of our water network has been highlighted. This has caused us to consider the resilience of our water assets based on cost versus risk assessments. Section 6.3 of the General Water Supply volume gives details the items selected for investment in improving asset resilience.

4. FINANCIAL SUMMARY

The Capex forecast for water treatment plants is shown in the Table 10.

Table 10 Capex forecast summary

Treatment Plant Capex Forecast ($000)											
Activity	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	LTP Total
Renewals	705	541	1,025	1,316	1,345	1,377	1,410	1,443	1,480	1,518	12,160
Service Level	-	1,544	473	3,225	-	-	-	-	13,287	13,632	32,161
Growth	-	-	-	-	-	-	-	-	-	-	-
Total	705	2,085	1,498	4,541	1,345	1,377	1,410	1,443	14,767	15,150	44,321

The Opex forecast for operations and maintenance is included in the overall Opex forecast for Water Supply detailed in the LTP. It is also included in the General Water Supply Volume.

5. IMPROVEMENT AND MONITORING PLAN

Our general Asset Management Maturity Improvement Plan is included in the Asset Management Strategy.

General improvements to Water Supply assets are included in the Water Supply General Volume.

The specific areas of improvement identified for water treatment assets are listed in Table 11.

Table 11 Improvements summary

No	Improvement Area	Owner	Start Date	End Date
1	Assess asset condition and record results in EAM	Asset Operations Planning Lead	Jul 2018	Jun 2020
2	Assess critical spares and procure any required components	Manager Three Waters	Jul 2018	Jun 2020
3	Assess criticality of assets and record results in EAM	Asset Operations Planning Lead	Jul 2018	Jun 2020
4	Produce focused management plan for those assets identified as critical	Manager Three Waters	Jul 2018	Jun 2020

2018-2028 WATER SUPPLY ASSET MANAGEMENT PLAN

He Rautaki Whakahaere Rawa mō Te Wai Whakarato

WATER TREATMENT PLANTS
NGĀ TAUPUNI WHAKATIKA

VOLUME TWO | PUKAPUKA TUARUA

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