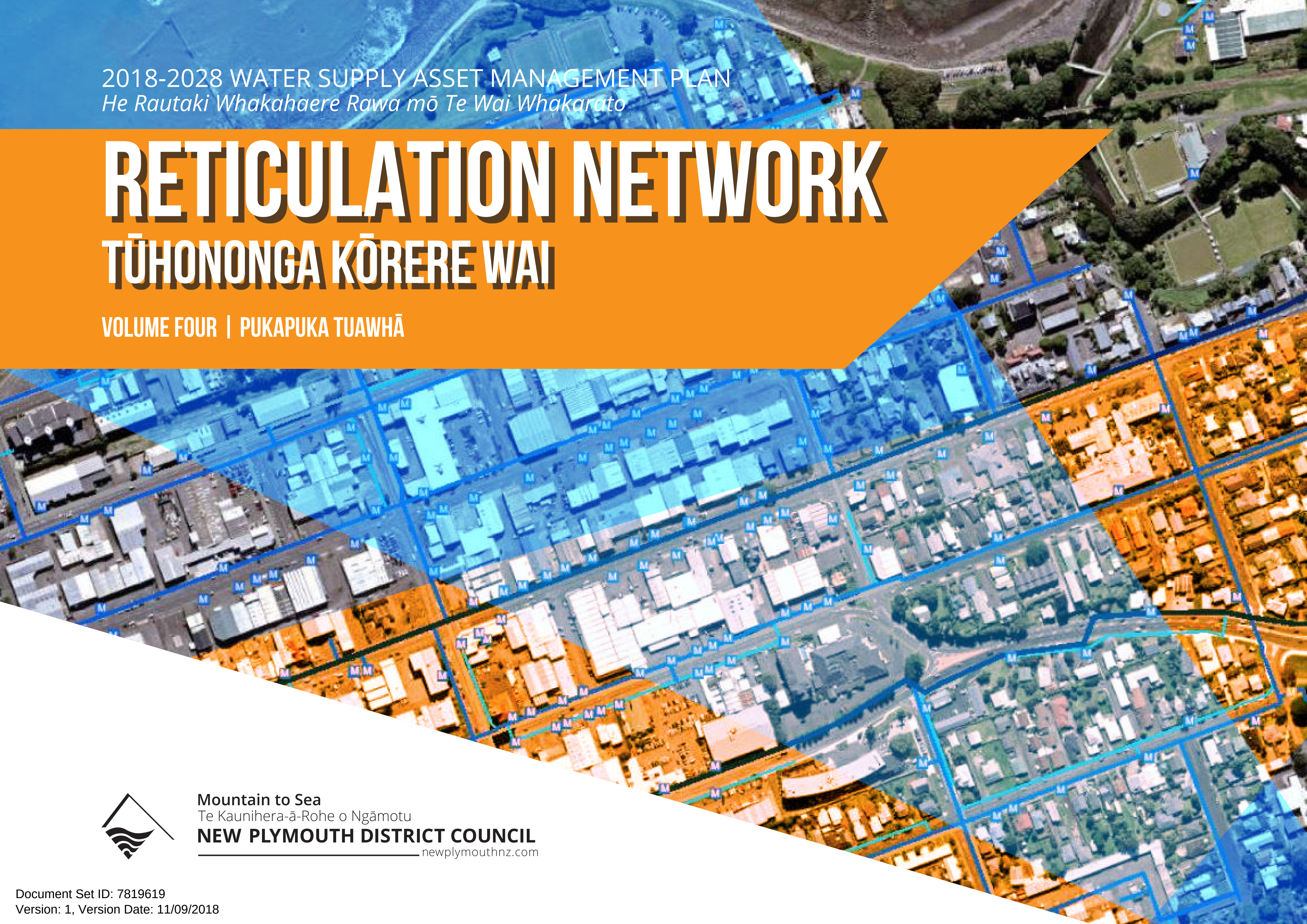

2018-2028 WATER SUPPLY ASSET MANAGEMENT PLAN

He Rautaki Whakahaere Rawa mō Te Wai Whakarato

RETICULATION NETWORK

TŪHONONGA KŌRERE WAI

VOLUME FOUR | PUKAPUKA TUAWHĀ

Mountain to Sea
Te Kaunihera-ā-Rohe o Ngāmotu
NEW PLYMOUTH DISTRICT COUNCIL
newplymouthnz.com

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DOCUMENT CONTROL

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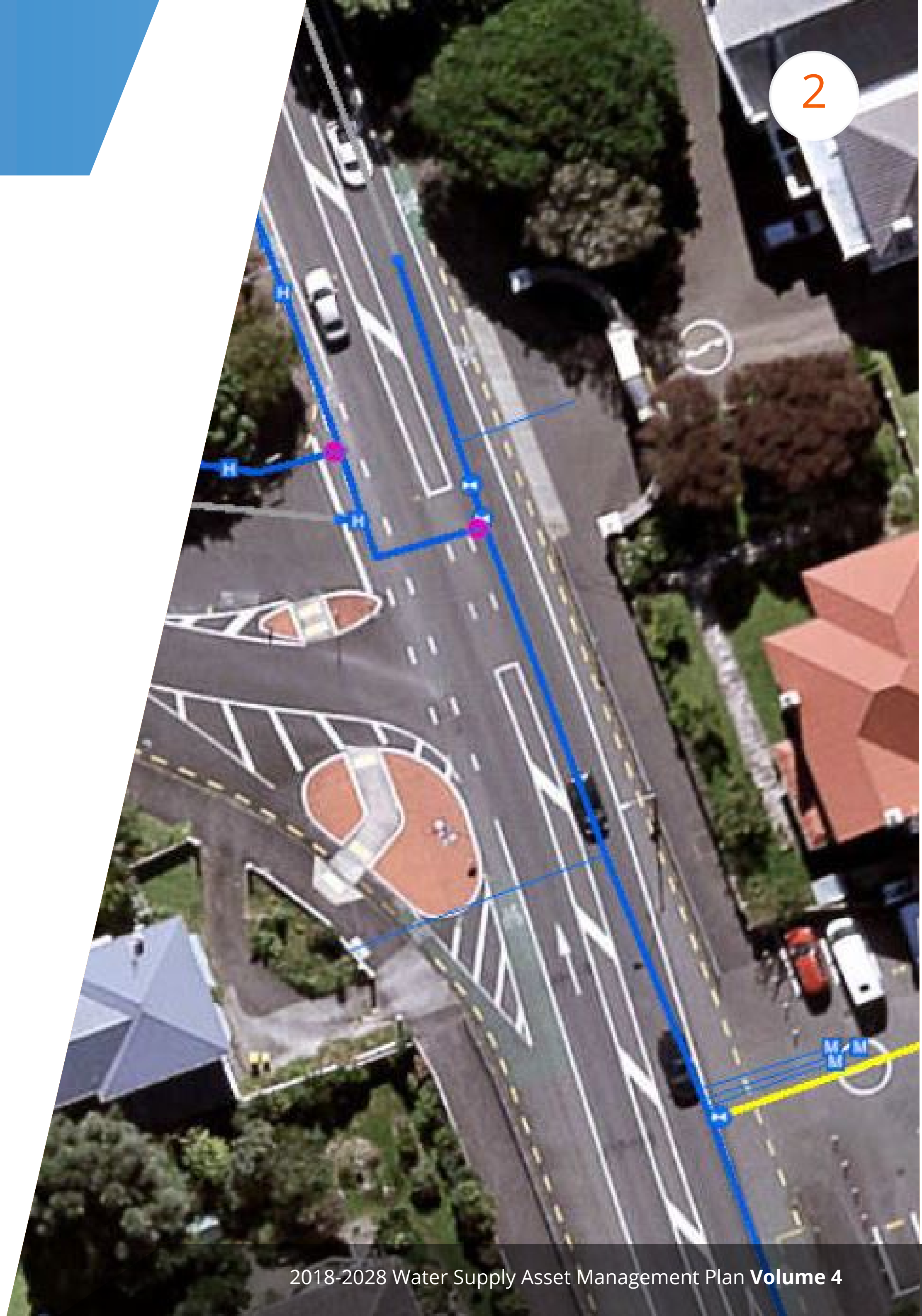

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1. INTRODUCTION

This volume provides details of the asset lifecycle management for the Reticulation Network 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 structure

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

Purpose

The purpose of the reticulation network is to supply water to the community. The network carries water from water treatment plants to reservoirs, between distribution zones via trunk mains, and finally through distribution and rider mains, services and water meters to the supply point. The network also includes valves, fittings, and hydrants and the associated civil structures.

Levels of Service

The reticulation network assets and our operation, maintenance, renewal and augmentation of these assets support meeting all the customer and technical levels of service defined in Section 3 of the Water Supply General Volume.

Future Demand

Future demand forecasts have identified significant impacts on the reticulation system, mainly related to firefighting capacity, population growth and demand management. As outlined in the Section 4 of the Water Supply General AMP, the Water Master Plan addresses the options to cater for increased demand on the water supply system. Any items from the Water Master Plan involving augmentation of reticulation network assets are included in Section 2.5 of this volume.

2.1 General

2.1.1 Asset Data

Our water supply network has of 805 km of reticulation and trunk mains made up of a variety of materials depending on when the system was constructed. From the early 1900's cast iron pipes were used but large shipping costs meant this material eventually became less favourable. During the 1960-70s, mostly asbestos cement pipes were installed but as polyethylene and PVC pipes became cheaper and stronger these were used more widely. In some instances steel pipes were used. The reticulation and trunk main system also includes pipe bridges, isolation valves, air valves, scour valves, pressure reducing valves, manholes, fire hydrants, services connections, backflow preventers, and meters. The 30 June 2016 valuation data for each component in the reticulation network is summarised Tables 2 and 3.

Note: the number of service connections, backflow preventers and meters shown in table 2 includes those that are connected direct to trunk mains. The location of the reticulation schemes is shown in Figure 1 and the layout of the trunk mains is shown in Figure 2.

Table 2 Reticulation mains asset summary

Reticulation Mains (Distribution and Rider Mains)					
Description	Quantity	Expected Life (years)	GCRC ($)	Annual Depreciation ($)	ODRC ($)
Asbestos cement pipes	164 km (25%)	50	29,029,519	580,590	4,936,399
Cast iron pipes	65 km (10%)	110	13,520,182	146,228	3,416,929
Steel pipes	66 km (10%)	80	10,408,664	126,431	3,798,319
Flexible pipes	355 km (55%)	100	39,321,156	393,212	31,738,549
Pipe bridges	14 No	Tbc	Tbc	Tbc	Tbc
Valves	5,782 No	80	7,443,083	95,195	4,369,648
Manholes	23 No	100	96,975	970	84,177
Fire hydrants	3,613 No	90	7,599,900	84,443	4,095,714
Service connections	28,037 No	95	20,914,362	236,052	12,541,534
Backflow preventers	459 No	50	591,676	11,834	482,387
Meters	3,252 No	20	1,915,800	95,790	948,382
			130,841,318	1,770,745	66,412,038

Table 3 Trunk mains asset summary

Trunk Mains					
Description	Quantity	Expected Life (years)	GCRC ($)	Annual Depreciation ($)	ODRC ($)
Asbestos cement pipes	45 km (29%)	50	19,926,480	388,837	4,952,261
Cast iron pipes	7 km (5%)	110	2,286,736	23,330	455,898
Steel pipes	63 km (41%)	80	15,791,909	157,919	13,893,746
Flexible pipes	40 km (25%)	100	46,027,961	551,422	22,898,922
	155 km		84,033,086	1,121,508	42,200,827

Figure 1 Map of reticulation schemes location

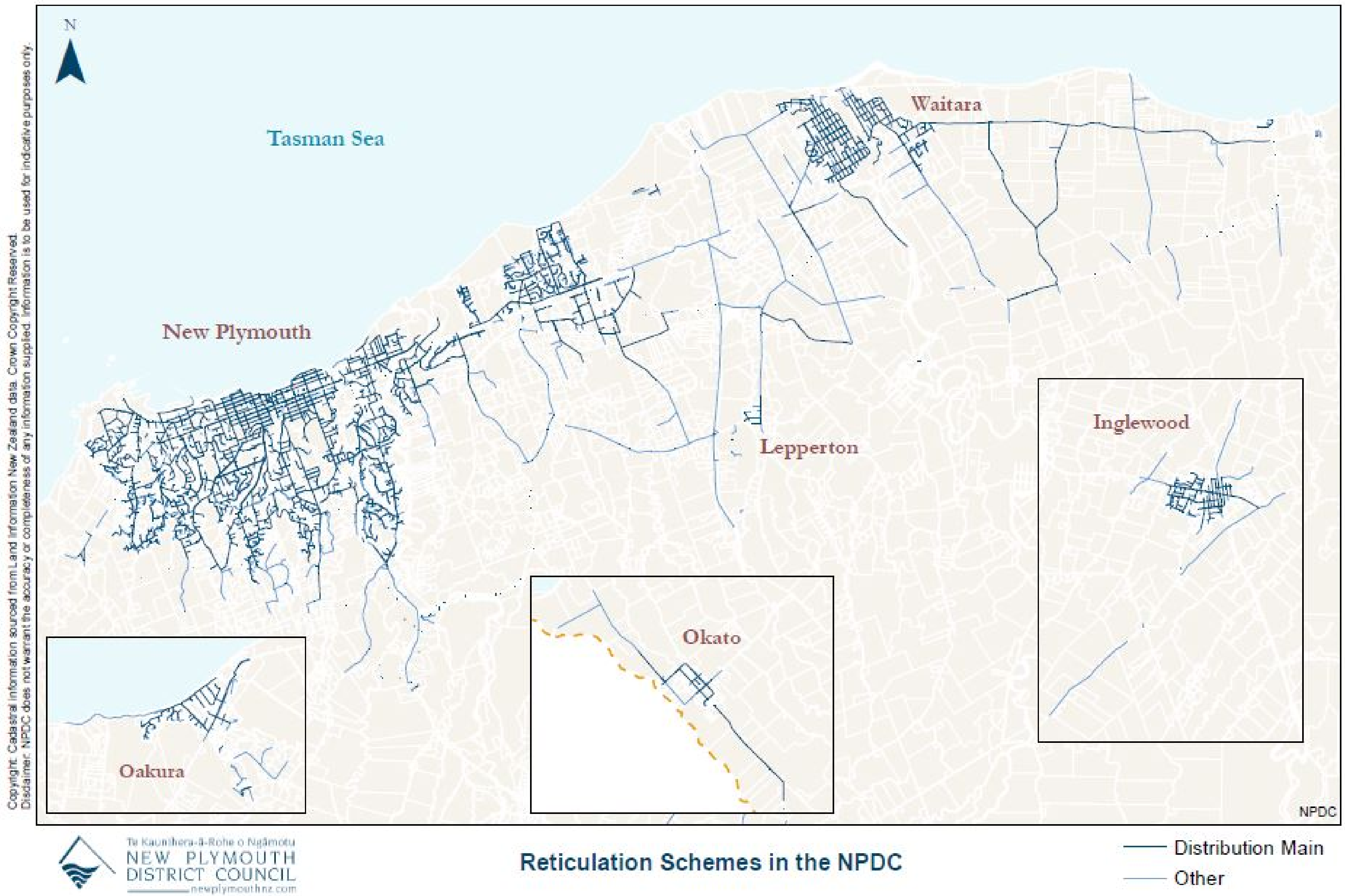
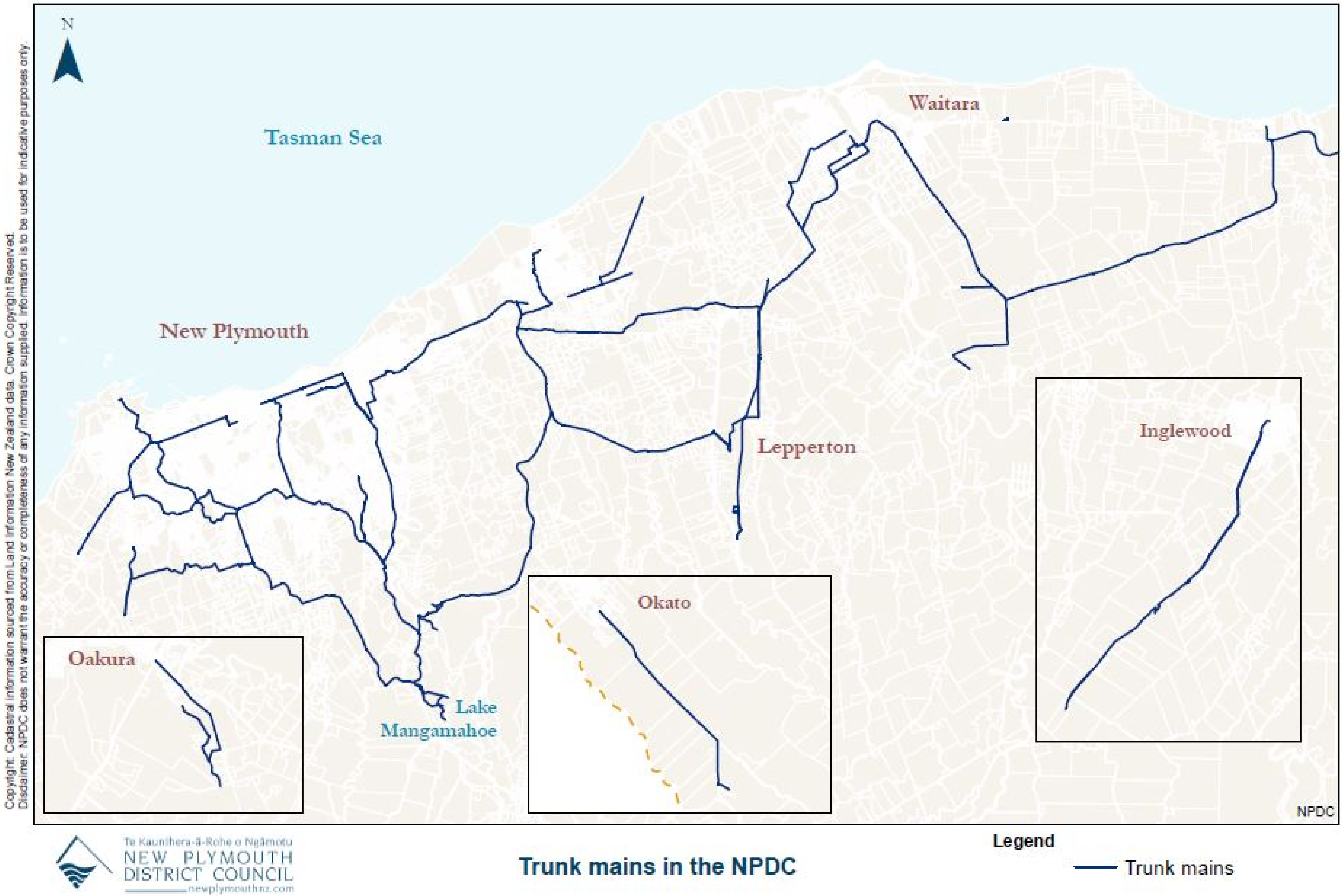


Figure 2 Trunk mains layout



2. LIFECYCLE MANAGEMENT PLAN

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

The data presented in this AMP on the length, diameter, quantity and age of the assets is classed as grade **B – Reliable** due to databases and GIS systems being well maintained and updated.

2.1.2 Asset Capacity/Performance

As outlined in Section 4 of the Water Supply General AMP, the Water Master Plan addresses the future capacity requirements for water supply in relation to growth predictions. Items identified in the Water Master Plan are included in the corresponding AMP volumes, as expenditure forecasts for the years 2018/19 to 2027/28 and as commentary for the years beyond 2027/28.

We have made a nominal provision to improve the levels of service associated with firefighting capacity and maintaining satisfactory water pressure. Details are included in section 2.4 of this volume.

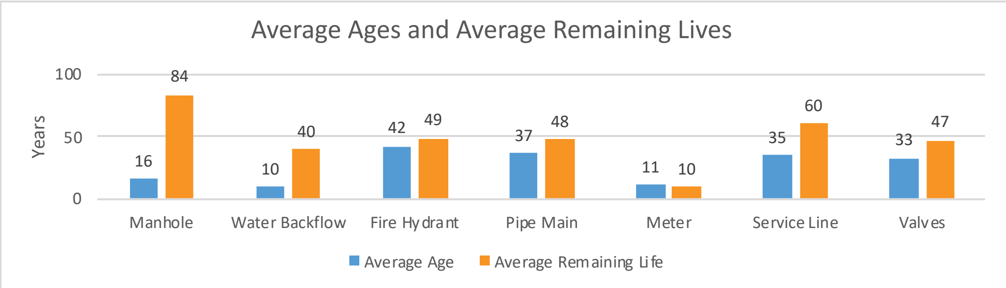
2.1.3 Asset Condition

The condition of our water main assets has been assessed by desk-top modelling using available historical data, knowledge and experience. Condition grades have been assessed using information on material performance, asset age, failure rates/modes, ground conditions and typical deterioration curves. Asset grades have been recorded in the EAM asset inventory and have need used to advise renewal plans. 73% of our water main assets are rated moderate or better condition. Therefore, the data accuracy for the condition grades of our water mains is classes as B – Reliable. No formal asset condition grades for the other reticulation network assets have been assessed or recorded and all asset conditions are recorded in the asset inventory as 6 - Unknown. Therefore, the data accuracy for asset condition of these assets 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.**

2.1.4 Asset Remaining Lives

Based on the recorded installation dates and expected lives of assets, as at 30 June 2016 the water reticulation and trunk mains are 49% through their aggregated expected life. At the previous valuation dated 30 June 2013, the aggregate asset life was 46%, indicating that the rate of asset depreciation is higher than the rate of renewal. The average age of the assets and their average remaining lives are shown in Figure 3.

Figure 3 Asset average age and remaining life



2.1.5 Asset Valuation

The most recent valuation was the 2016 statutory valuation dated 30 June 2016. Because we have well maintained and updated databases and GIS systems, updated unit rates, and good knowledge and understanding of estimated remaining asset lives, the accuracy of the valuation data is classed as B – Reliable. The valuation was independently peer reviewed by Beca and audited externally. Tables of summary values and individual asset category values can be found above in 2.1.1 Asset Data.

2.1.6 Asset Renewal Plans

Our renewal strategy for each asset category is described in Section 2.2 – Asset categories. In summary, renewal plans are based on the following principles:

1. Assessing the number of assets that have either reached or will reach their expected life over the next ten years.

2. Estimating the expenditure forecasts for renewal of these assets over the next ten years (based on 2016 valuation unit rates) then allocating the total forecast expenditure evenly across each year.

3. Selecting individual components of assets for renewal based on priorities including:

   a. Criticality
   b. Leakage and maintenance history
   c. Age
   d. Remaining life
   e. Condition (using sampling analysis results where known)
   f. Condition prediction
   g. Geographical grouping
   h. Timing in relation to other asset renewal plans e.g. in conjunction with footpath resealing to optimise costs

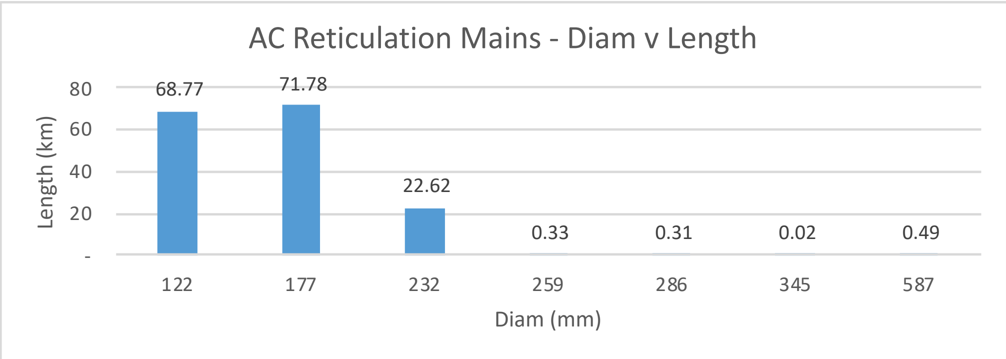
These principles allow us to produce a realistic renewal programme that recognises asset life may be lower than originally anticipated, but guards against the unnecessary and premature replacement of assets.

2.2 Asset Categories

2.2.1 Asbestos Cement (AC) Pipes
Asset Data

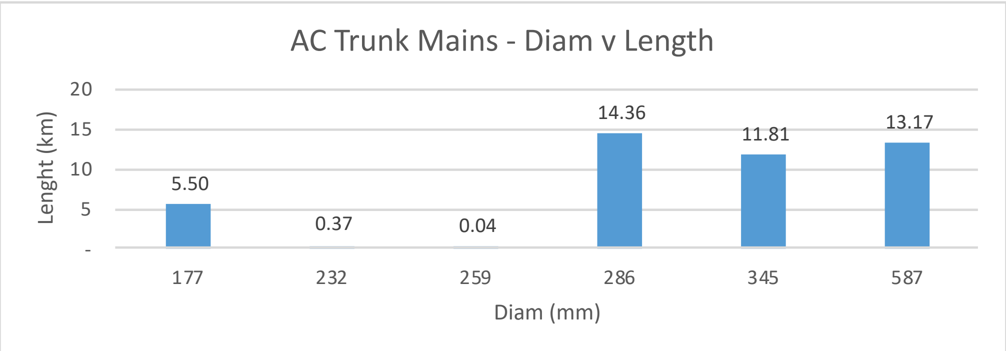
There are 164 km of AC reticulation mains in the water supply network – approximately 25% of the total length. Figure 4 shows the lengths of pipe by diameter.

Figure 4 AC reticulation mains diameter v length



There are 45 km of AC trunk mains or approximately 29% of the total length. Figure 5 shows the lengths of pipe by diameter.

Figure 5 AC trunk mains diameter v length



Asset Condition and Remaining Lives

AC pipes deteriorate both internally and externally as the pipe material slowly dissolves and erodes. The rate of internal deterioration is related to the characteristics of the water, with soft water more aggressive than hard water. The external surface of the pipe is affected by the composition of the surrounding soil, with silt material more acidic than stony, sandy material. This is an important factor in predicting the relative priorities of the renewal works programme.

In 2001, Opus Consultants produced the Lifetime Prediction Model for AC pipes. This model determines two methods for assessing the condition of AC pipes based on pipe sample analysis. They are the Predicted Remaining Life Method and the Remaining Wall Thickness Method. Both of these methods use the results of pipe sample testing and analysis over time to determinate pipe condition grades and to predict when they will fail. Pipes of smaller diameter tend to deteriorate faster because they have thinner pipe walls. The Opus assessments of expected remaining life are thought to be conservative for a number of reasons. Samples in the Opus database have sometimes been taken from failed pipes, which are likely to produce worst case results. Also, the deterioration rate of a pipe is based on an average of the whole database, which may not be typical of our pipes. The Opus database assumes a surge pressure factor of 1.5 times above the operating pressure. This may be high for some of our water supplies, which have quite stable operating pressures.

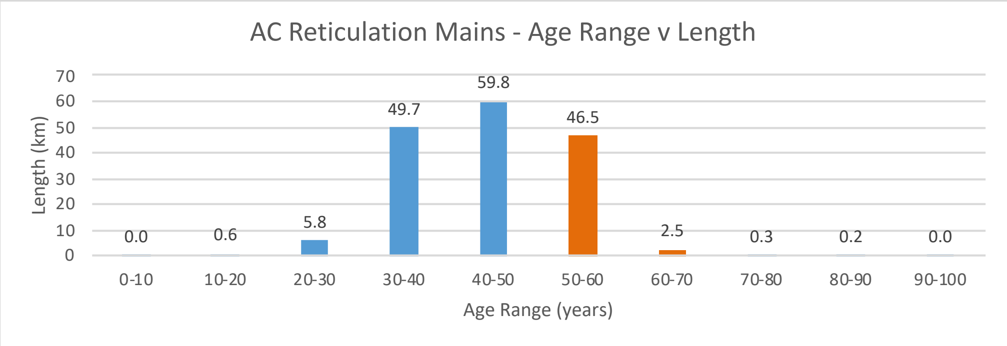
Therefore, our model is based on pipe age, actual pressure regimes, criticality (the effect on the level of service from pipe failure) and soil type (where known). Our AC pipe sampling programme has started and we will use the results to determine the actual and predicted condition of our AC pipe assets.

Another indication of pipe condition is the rate of required repairs and the causes of failure. When conducting repairs, our contractors record the mode of failure and record it in our asset management systems for analysis. We also gather data about the overall condition of the pipe during reactive maintenance, recording observations made in general visual inspections. This identifies coating failures, corrosion, pipe wall anomalies and other features.

According to various reports and studies, the performance of AC pipes has been poorer than expected in New Zealand. In general, these pipes will reach the end of their useful life when their expected asset life has been reached.

The life expectancy of AC pipes is 50 years. Almost all AC pipes were installed in the 1950s to the 1970s. As at 30 June 2016, 29% (48.3km) of AC distribution and rider mains were 50 or more years old. Over the next ten years, a further 31% (50.8km) will exceed an age of 50 years as shown in Figure 6.

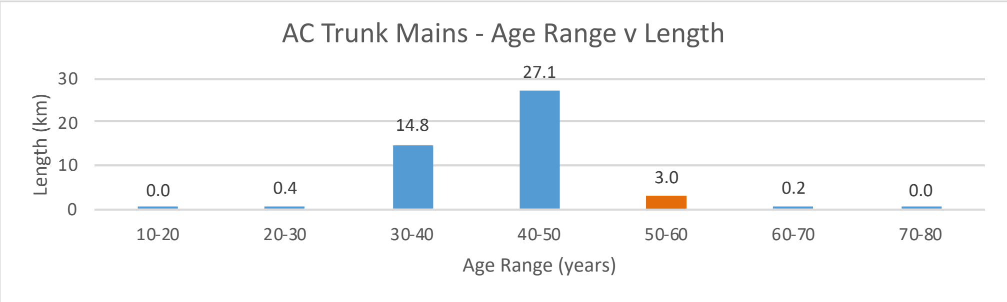
Figure 6 AC reticulation mains age range v length



The aggregate average age of the AC reticulation mains was 43 years at 30 June 2016. The aggregate average age of AC reticulation mains at 30 June 2013 was 40 years.

At 30 June 2016, 8% (3.8 km) of AC trunk mains reached an age of 50 years or greater. Over the next ten years a further 60% (27.0 km) of AC trunk mains will exceed an age of 50 years as shown in Figure 7.

Figure 7 AC trunk mains age range v length



The aggregate average age of the AC trunk mains on 30 June 2016 was 42.8 years. On 30 June 2013 the aggregate average age was 39.8 years.

Asset Valuation

As at 30 June 2016, the value of AC reticulation and trunk mains is shown in Tables 4 and 5.

Table 4 AC reticulation mains asset valuation

AC Reticulation Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
29,029,519	580,590	4,936,399

Table 5 AC trunk mains asset valuation

AC Trunk Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
19,926,480	388,837	4,952,261

Asset Renewal Profiles

The expenditure profiles based on renewing the assets when they reach the end of their expected life is shown in Figures 8 and 9. These renewals would require a total expenditure of approximately $31.0m over the next ten years, at an average of $3.1m/year.

Figure 8 AC reticulation mains accounting expiries 10Y

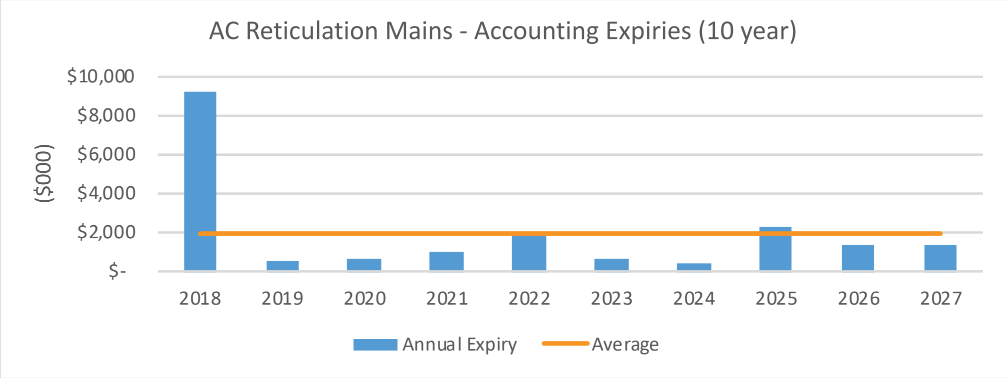
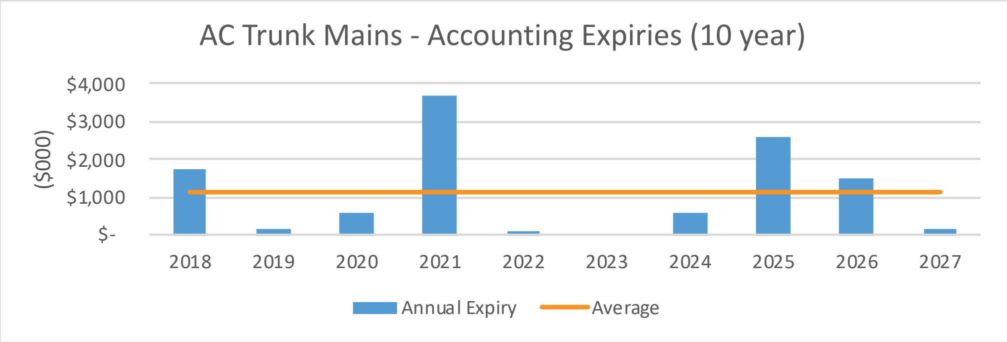


Figure 9 AC trunk mains accounting expiries 10Y



To complete the full renewal of the AC pipe stock, a further $17.0m of expenditure is forecast beyond 2027/28 through to 2047, at an average of $1.7k per year. This is shown in Figures 10 and 11. Depending on the actual rate of renewal in the years prior to 2028/29, this may need to be reviewed and modified accordingly.

Figure 10 AC reticulation mains accounting expiries post 10Y

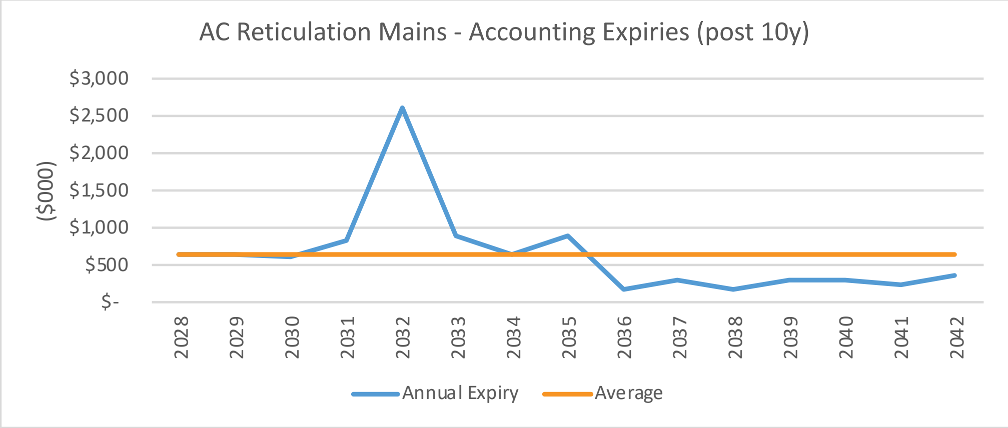
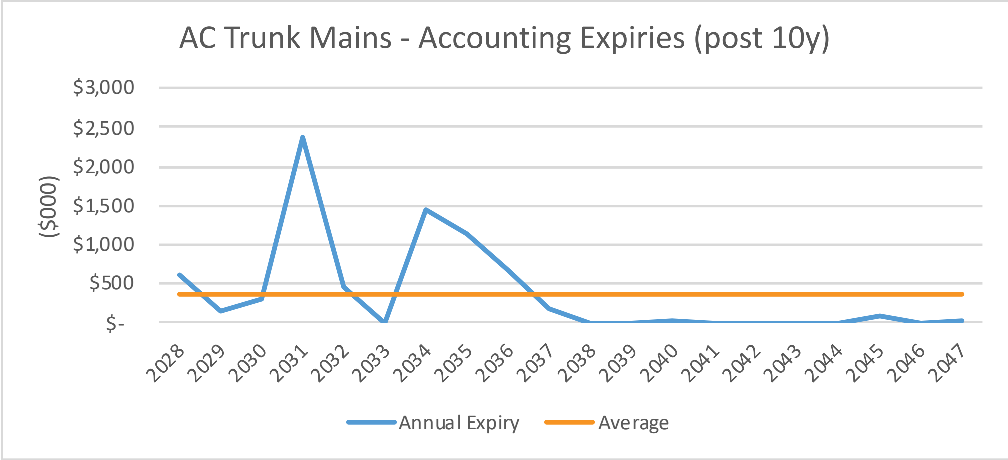


Figure 11 AC trunk main accounting expiries post 10Y



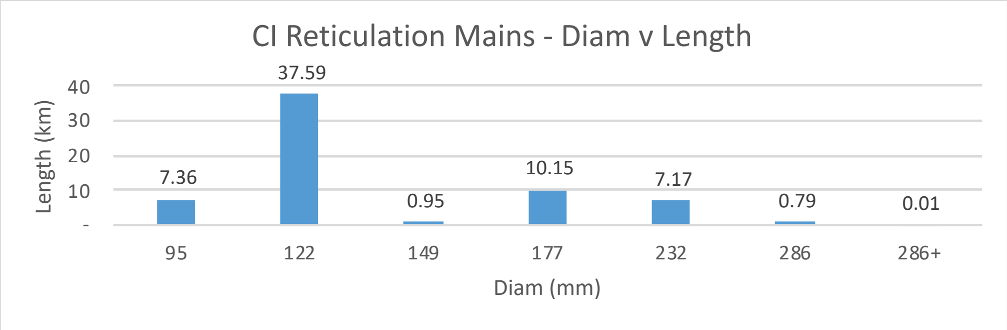
Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.2 Cast Iron (CI) Pipes

Asset data

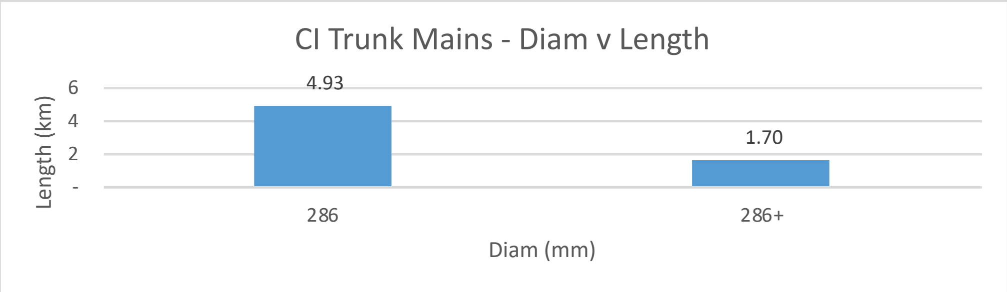
There are 65 km of CI reticulation mains in the water supply network, approximately 10% of the total reticulation mains length. Figure 12 shows the lengths of pipe by diameter.

Figure 12 CI reticulation mains diameter v length



The 7km of CI trunk mains comprise approximately 4.8% of the total trunk main length. Figure 13 shows the lengths of pipe by diameter.

Figure 13 CI trunk mains diameter v length



Asset Condition and Remaining Lives

We use the rate of required repairs and the failure mode causing the need for repair as an indicator of CI pipe condition. Contractors record this information and enter it into our asset management systems for analysis. We also use samples of CI pipes obtained during renewal or repairs to ascertain their condition.

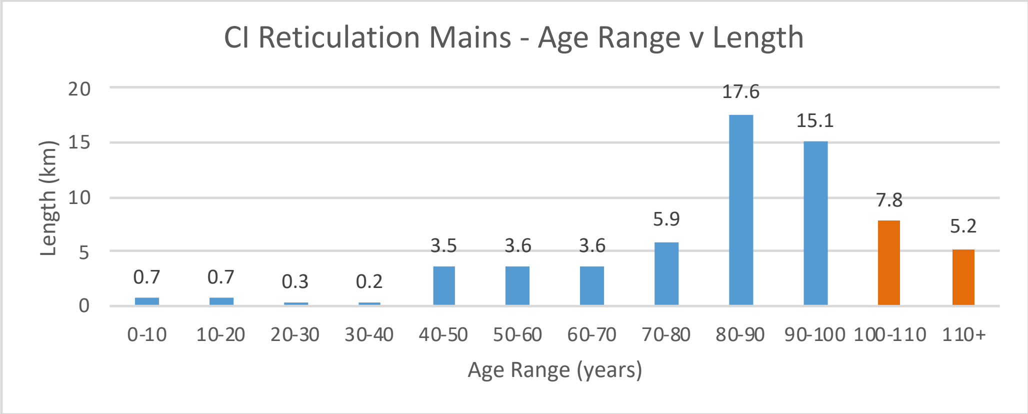
During reactive maintenance we conduct a general visual inspection where we gather and record data about the overall condition of pipes identifying coating failures, corrosion, pipe wall anomalies and other features.

CI pipes include both ductile iron (DI) and concrete lined ductile iron (CLDI) pipes. The average expected life for these types of pipes, weighted by length, is 107 years. Almost all CI pipes were installed between 1900 and 1940.

At 30 June 2016, 8.3% (5.6km) of CI reticulation mains had already reached an age of 107 years or greater. Over the next ten years a further 11% (7.4km) of CI reticulation mains will reach or exceed an age of 107 years as shown in Figure 14.

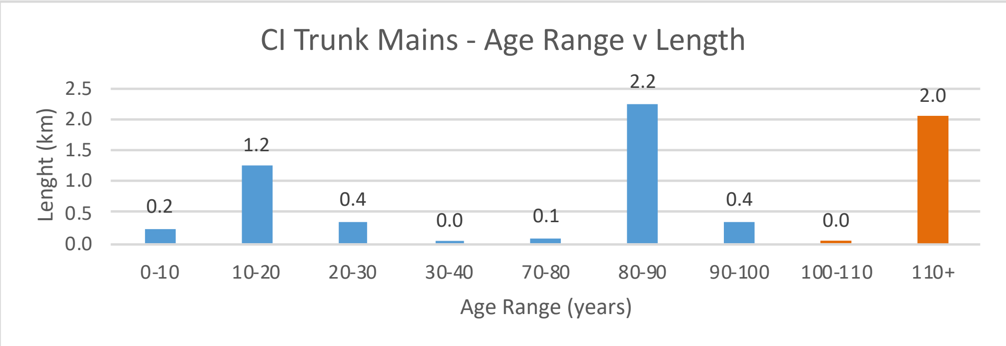
The average age of the CI reticulation mains was 82 years on 30 June 2016. The average age of CI reticulation mains on 30 June 2013 was 79 years.

Figure 14 CI reticulation mains age range v length



At 30 June 2016, 30% (2.1km) of CI trunk mains had already reached an age of 107 years or greater. Over the next 10 years a further 5% (0.35km) will reach or exceed an age of 107 years as shown in Figure 15.

Figure 15 CI trunk mains age range v length



The aggregate average age of the CI trunk mains on 30 June 2016 was 82.0 years. On 30 June 2013 the aggregate average age was 80.8 years.

Asset Valuation

As at 30 June 2016, the value of CI reticulation and trunk mains is shown in Tables 6 and 7.

Table 6 CI reticulation mains asset valuation

CI Reticulation Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
13,520,182	146,228	3,416,929

Table 7 CI trunk mains asset valuation

CI Trunk Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
2,286,736	23,330	455,898

Asset Renewal Profiles

The expenditure profiles based on renewing the assets when they reach the end of their expected life are shown in Figures 16 and 17. These renewals would require a total expenditure of approximately $3.3m over the next ten years, at an average of $330k/year.

Figure 16 CI reticulation mains accounting expiries 10Y

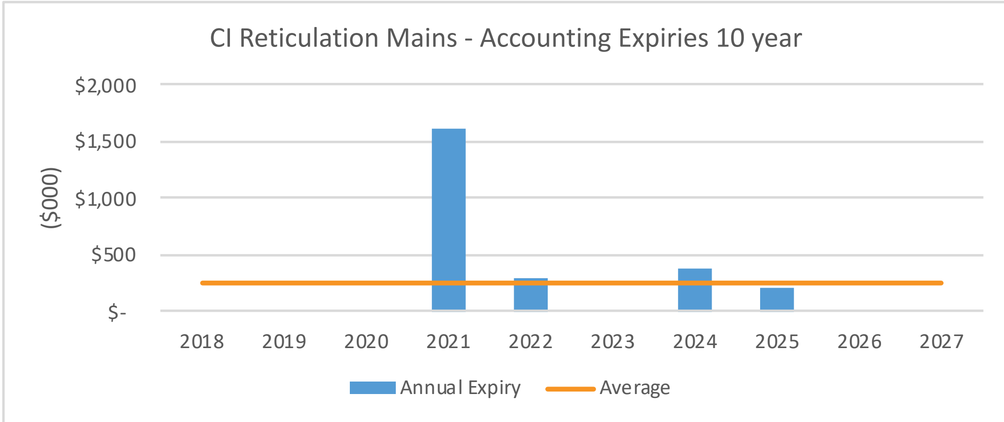
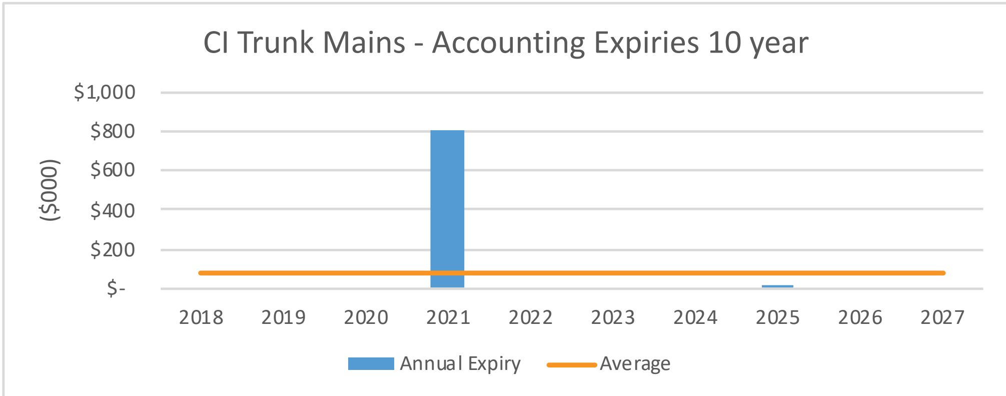


Figure 17 CI trunk mains accounting expiries 10Y



2. LIFECYCLE MANAGEMENT PLAN

To complete the full renewal of CI pipe stock, a further $17.0m of expenditure is forecast beyond 2027/28 through to 2114, at an average of $200k per year. This is shown Figures 18 and 19. Depending on the rate of renewal in the years prior to 2028/29, this may need to be reviewed and modified accordingly.

Figure 18 CI reticulation mains accounting expiries post 10Y

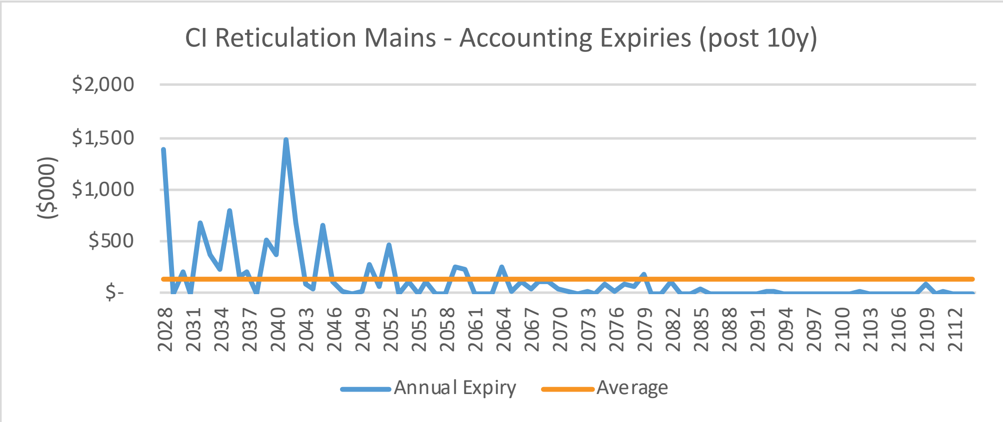
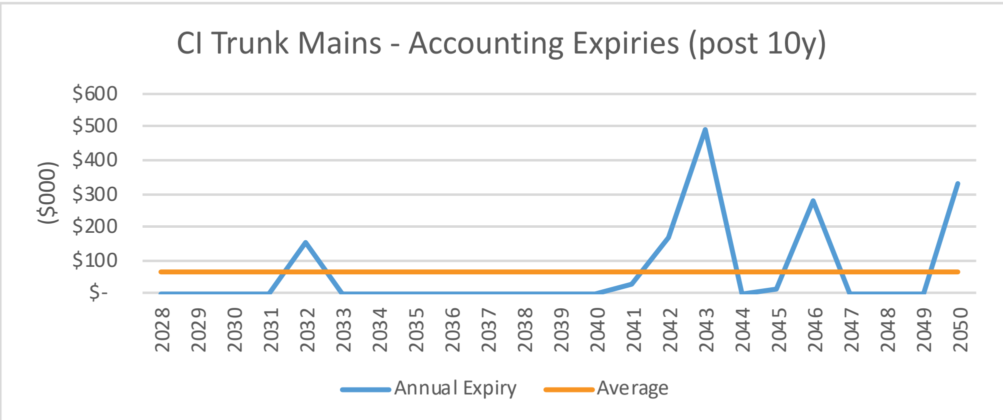


Figure 19 CI trunk main accounting expiries post 10Y



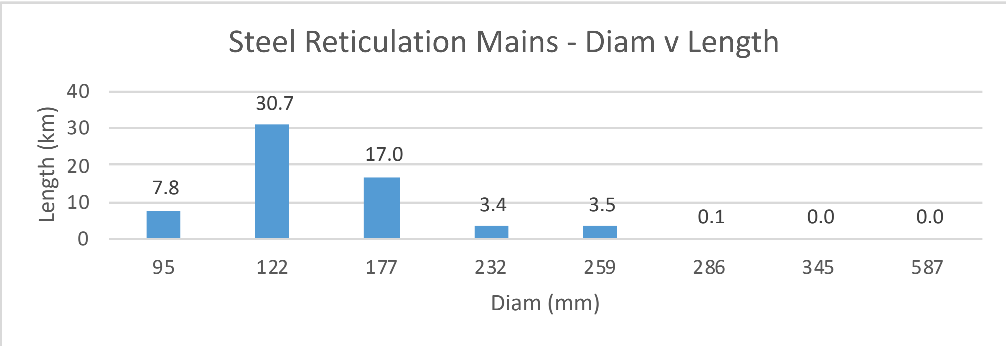
Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.3 Steel Pipes

Asset Data

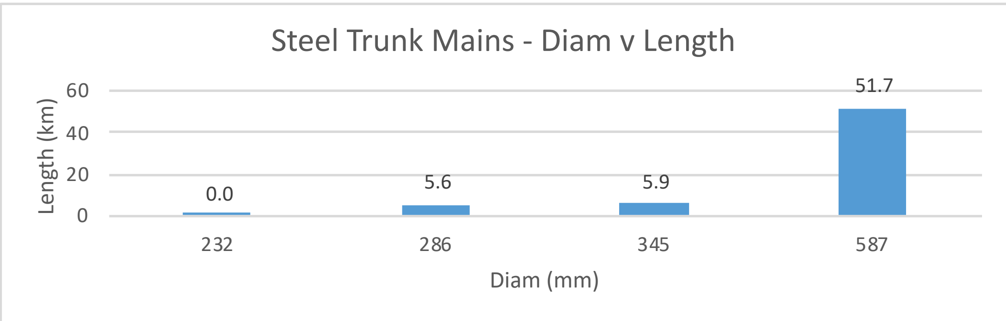
There are 66 km of steel reticulation mains in the water supply network, or approximately 10% of the total length of reticulation mains. Figure 20 shows the lengths of pipe by diameter.

Figure 20 Steel reticulation mains diameter v length



There are 63 km of steel trunk mains comprising 41% of the total length of the trunk mains. Figure 21 shows the lengths of pipe by diameter.

Figure 21 Steel trunk mains diameter v length



Asset Condition and Remaining Lives

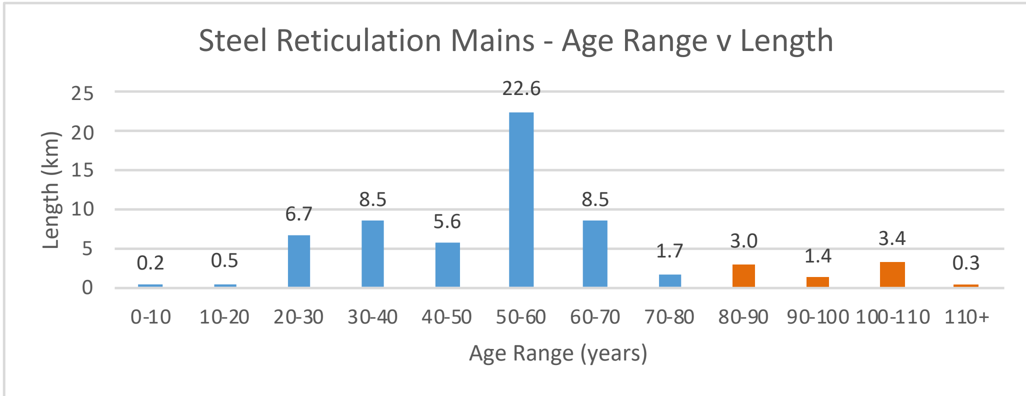
We use the rate of required repairs and the failure mode causing the need for repair as an indicator of steel pipe condition. Contractors record this information and enter it into our asset management systems for analysis. We also use samples of steel pipes obtained during renewal or repairs to ascertain their condition.

During reactive maintenance we conduct a general visual inspection to ascertain data about the overall condition of the pipe, identifying coating failures, corrosion, pipe wall anomalies and other features.

Steel pipes include concrete lined steel (ST-CL) pipes, galvanised steel (ST-GST) pipes, spiral welded seem steel (ST-SWS) pipes and Mannesmann steel (MANN) pipes. The average life expectancy of these pipes, weighted by length, is 83 years. Steel pipes were introduced to NZ in the 1940s.

At 30 June 2016, 10.7% (6.95km) of steel reticulation mains had already reached an age of 83 years or greater. Over the next ten years a further 3% (2km) of steel reticulation mains will reach an age of 83 years or greater as shown in Figure 22.

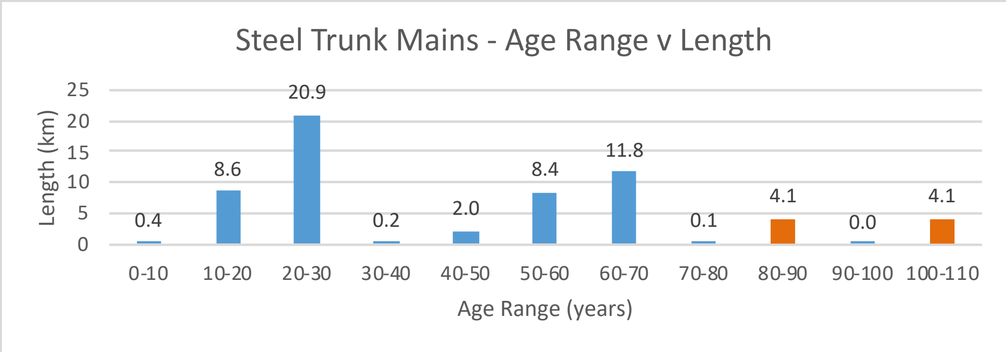
Figure 22 Steel reticulation mains age range v length



The average age of steel reticulation mains, weighted by length, was 53.5 years as at 30 June 2016. The average age of steel reticulation mains as at 30 June 2013 was 50.5 years.

At 30 June 2016, 313% (8.0km) of steel trunk mains had already reached an age of 83 years or greater. Over the next 10 years a further 8% (5.0km) will reach or exceed an age of 83 years as shown in Figure 23.

Figure 23 Steel trunk mains age range v length



The aggregate average age of steel trunk mains on 30 June 2016 was 47.4 years. On 30 June 2013 the aggregate average age was 44.5 years.

Asset Valuation

As at 30 June 2016, the value of steel reticulation and trunk mains is shown in Tables 8 and 9.

Table 8 Steel reticulation mains asset valuation

Steel Reticulation Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
10,408,664	126,431	3,798,319

Table 9 Steel trunk mains asset valuation

Steel Trunk Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
46,027,961	551,422	22,898,922

Asset Renewal Profiles

The expenditure profile based on renewing the assets when they reach the end of their expected life is shown in Figures 24 and 25. This would require a total expenditure of $5.5m over the next ten years at an average of $550k/year.

Figure 24 Steel trunk mains accounting expiries 10Y

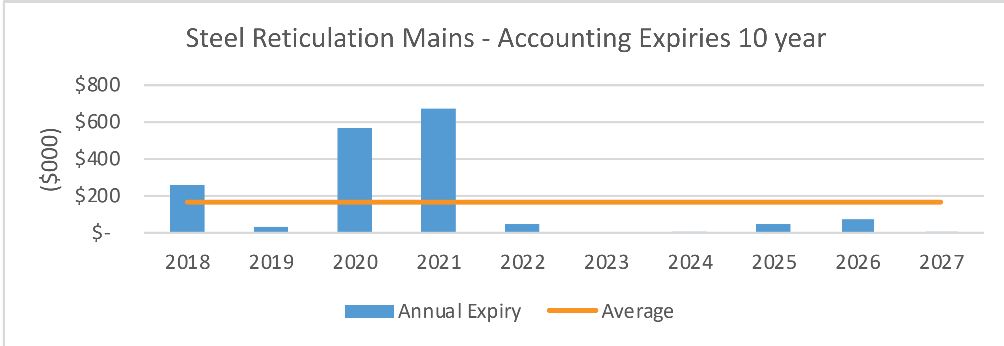
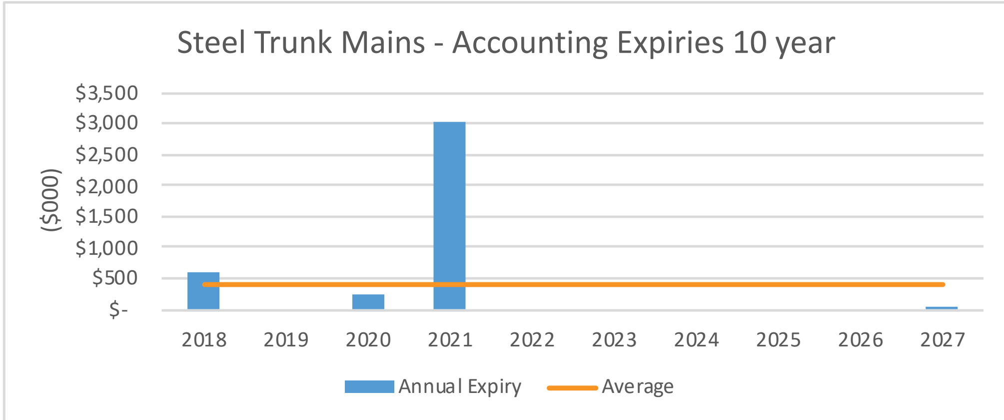


Figure 25 Steel reticulation mains accounting expiries 10Y



2. LIFECYCLE MANAGEMENT PLAN

To complete the full renewal of steel pipe stock, a further $17.4m of expenditure is forecast beyond 2027/28 through to 2131, at an average of $250k per year. This is shown in Figures 26 and 27. Depending on the actual rate of renewal in the years prior to 2028/29 this may need to be reviewed and modified accordingly.

Figure 26 Steel reticulation mains accounting expiries post 10Y

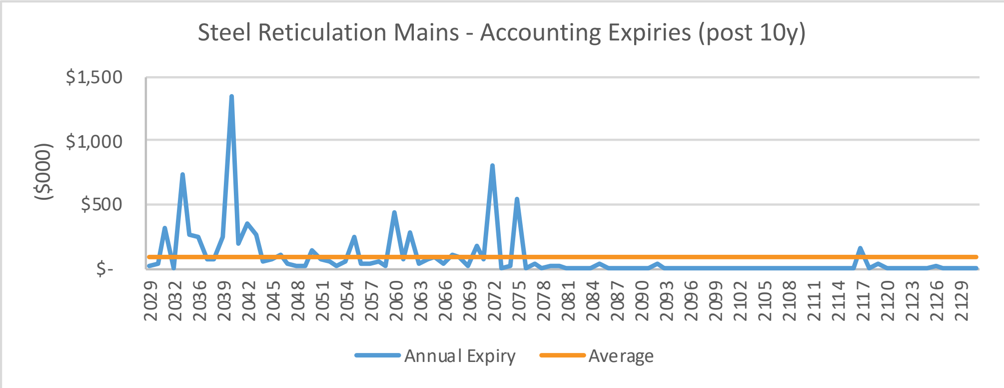
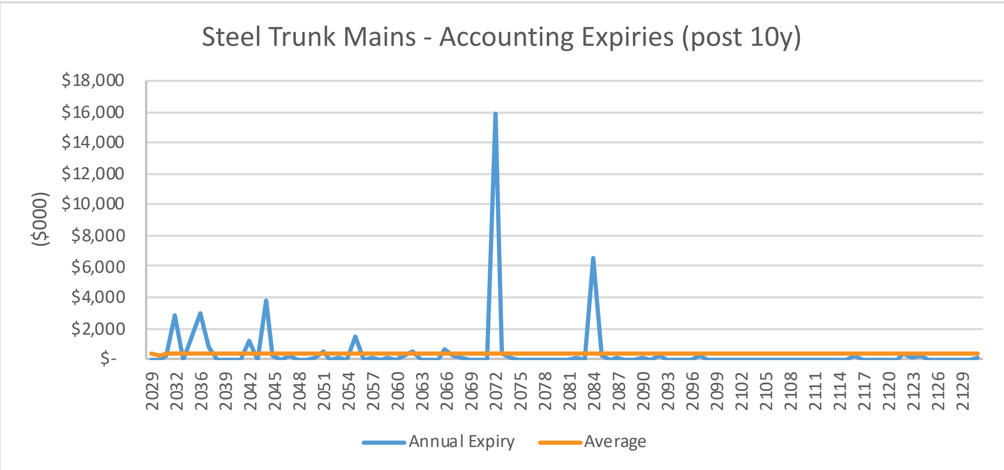


Figure 27 Steel trunk mains accounting expiries post 10Y



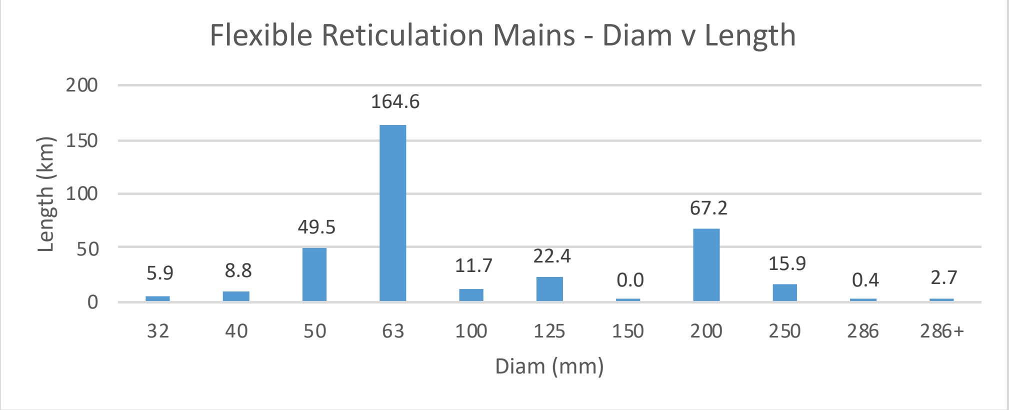
Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.4 Flexible Pipes

Asset Data

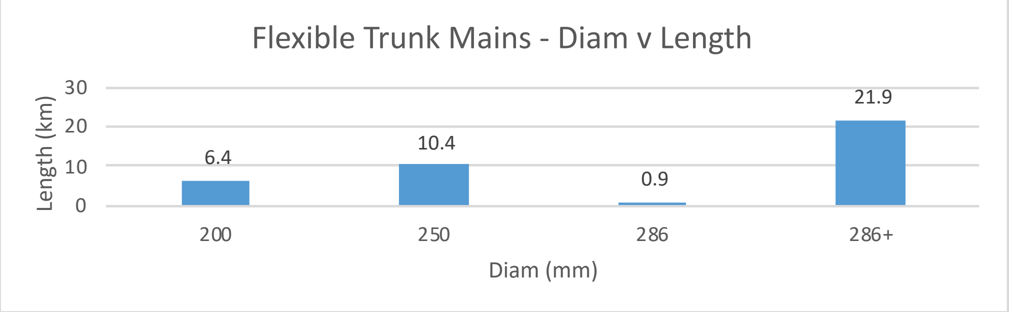
There are 355 km of flexible reticulation mains in the water supply network, or about 55% of the total reticulation main length. Figure 28 shows the lengths of pipe by diameter.

Figure 28 Flexible reticulation mains diameter v length



There are 40 km of flexible trunk mains, which is about 26% of the total length of trunk mains. Figure 29 shows the lengths of pipe by diameter.

Figure 29 Flexible trunk mains diameter v length



Asset Condition and Remaining Lives

We use the rate of required repairs and the failure modes causing the need for the repairs as an indicator of pipe condition. This information is recorded by contractors and entered into our asset management systems for analysis.

We also conduct general visual inspections during reactive maintenance, gathering and recording information on pipe condition that identifies coating failures, corrosion, pipe wall anomalies and other features.

The life expectancy of flexible pipes is 100 years. However, plastic pipes have not been installed for that long anywhere in the world. When more information is available about the long term degradation mechanisms of flexible pipe materials, estimations of life expectancy may change.

Flexible pipes have been in use in the New Plymouth district for the last 30-40 years. As at 30 June 2016 none of the flexible pipe assets have reached an age of 100 years or greater and as shown in the graph below, none will reach an age of 100 years or greater the next ten years.

Flexible pipes include the different types of polyethylene (POLY-H, POLY-M, and POLY-L) and polyvinyl chloride (UPVC, OPVC and MPVC). As at 30 June 2016, average age of flexible pipe assets, weighted by length, was 20.1 years. The average age of flexible pipe assets at 30 June 2013 was 17.7 years.

Figures 30 and 31 show the age range of the flexible pipe assets. These indicate that some flexible pipes are in the 40-70 years age range. This is a data accuracy issue related to the pipe installation dates not being updated during renewal projects. **This is included as an action in Section 5 – Improvement and Monitoring Plan.**

Figure 30 Flexible reticulation mains age range v length

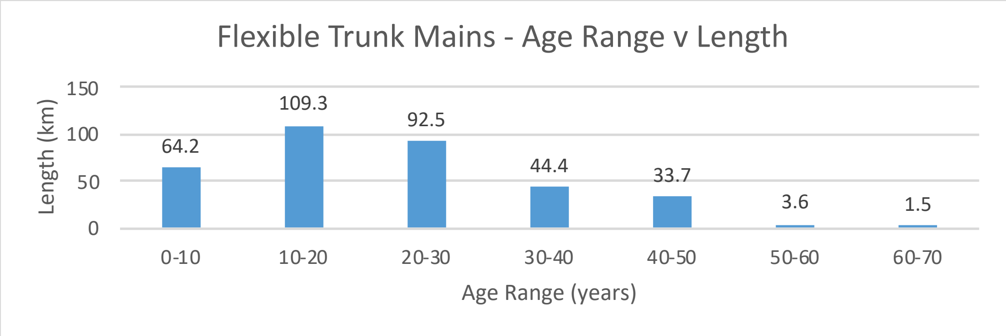
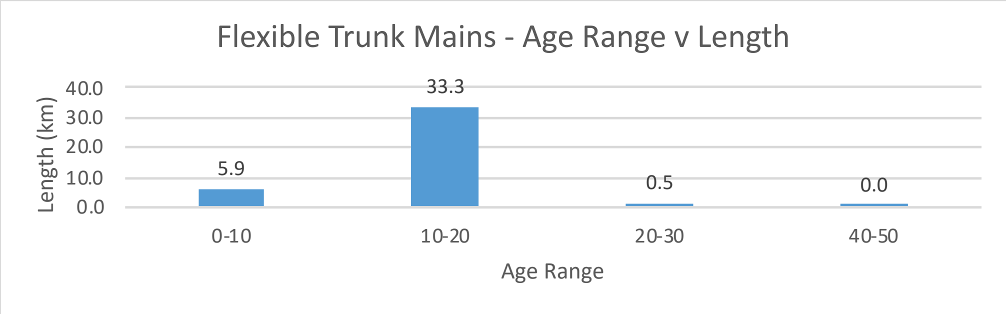


Figure 31 Flexible trunk mains age range v length



Asset Valuation

As at 30 June 2016, the value of flexible reticulation and trunk mains is shown in Tables 10 and 11.

Table 10 Flexible reticulation mains asset valuation

Flexible Reticulation Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
39,321,156	393,212	31,738,549

Table 11 Flexible trunk mains asset valuation

Flexible Trunk Mains		
Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
15,791,909	157,919	13,893,746

Asset Renewal Profile

No renewal of flexible pipes is planned during the period of the AMP.

2.2.5 Pipe Bridges

Asset Data

To cross features such as rivers, roads and streams, water reticulation and trunk mains can be buried beneath the feature, attached to bridges by self-supporting spans or attached on structures built specifically to support the pipe. While bridges are installed, owned and maintained by other groups e.g. Transportation services, we own 14 specifically built structures that support the water reticulation network. These assets and their ages are not recorded in the EAM asset inventory. **This is an asset data integrity issue that needs to be addressed.**

Asset Condition and Remaining Lives

We inspect all exposed pipes that cross features on an annual basis. The inspection data generates a table of condition for the pipe and its associated brackets, bolts, blocks, paint, structure, vegetation, barriers, abutments, joints, gibaults, wrapping, moss and access. The items identified during inspections are generally Opex maintenance activities. This is covered in the section 2.3 – Operations & Maintenance. All crossings and supporting structures are in good or average condition. Expected lives have not been assessed and these assets are not recorded in the EAM asset inventory. **This is an asset integrity issue that needs to be addressed.**

Asset Valuation

None of the pipe bridge structures installed and owned by us for the sole purpose of supporting water reticulation and trunk mains have been created as individual assets on the asset inventory. Therefore, they have not yet been valued. **This is an asset data integrity issue that needs to be addressed.**

Where pipes are either supported on structures/bridges installed/owned/maintained by others or are self-supporting spans, the value of these assets has been included with the pipe values in sections 2.2.1 to 2.2.4.

Asset Renewal Profile

No renewal of pipe bridges is planned during the period of the AMP.

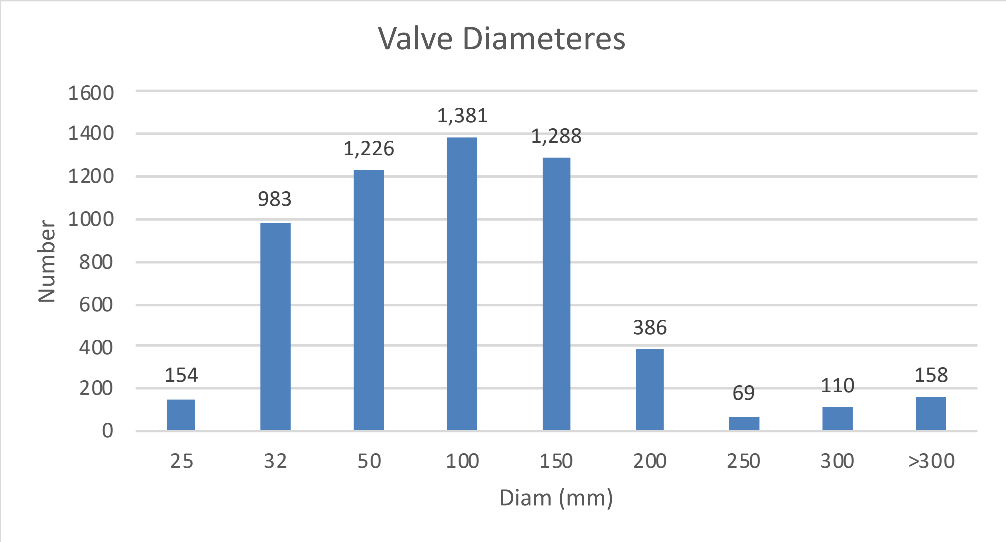
Following the failure of the pipe bridge close to NPWTP during Cyclone Gita in early 2018 and the issues identified above, it is proposed to conduct a detailed study of our pipe bridge assets and produce a management plan. The plan will include a risk assessment for the existing assets, measures to remediate the issues identified above, documented scheduled maintenance and inspection regime and plans for future renewal or reinforcement of any assets considered to be exposed to intolerable risk to improve resilience. **This is an asset integrity issue and is recorded as an action in Section 5 – Improvement and Monitoring Plan.**

2.2.6 Valves

Asset Data

There are 5,782 valves in the water reticulation network. The majority of these are gate valves, used to isolate small areas of the network for maintenance purposes. There are also a small number of non-return valves, air release valves, reflux valves, pressure reducing valves and pressure sustaining valves. Most valves within the pipe network are usually open to allow water to pass through the mains. The number of valves by size is shown in Figure 32. The sizes of valves have been recorded inconsistently giving a wide range of different diameters.

Figure 32 Valve diameter v number

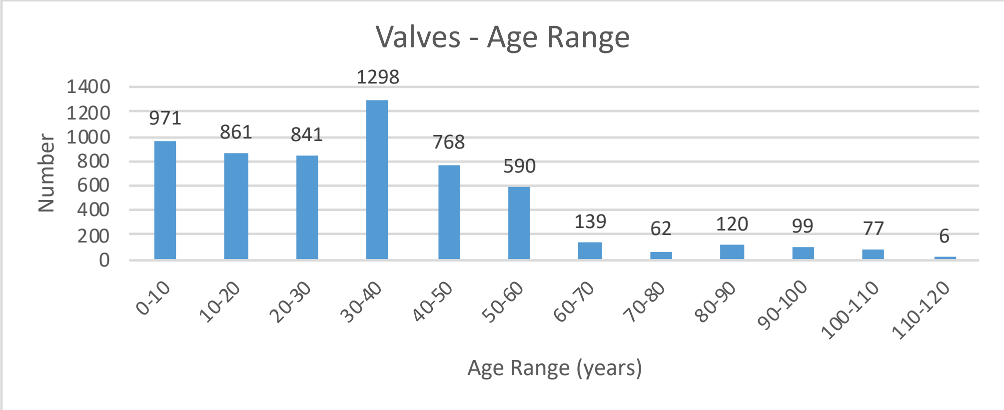


Asset Condition and Remaining Lives

We assess valve condition during scheduled 6-yearly visual inspection/maintenance and performance checks. In general, valves are in good condition, sometimes requiring repair due to leakage caused by vibration from traffic.

Valves have an expected life of 80 years but are generally renewed when the parent main is renewed, regardless of their condition, age or remaining life.
The age profile for valves is shown in Figure 33.

Figure 33 Valve age profile



As at 30 June 2016, the average age of valve assets was 33 years. The average age of valve assets at 30 June 2013 was 31 years.

Asset Valuation

As at 30 June 2016, the value of valves is shown in Table 12.

Table 12 Valves asset valuations

Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
7,443,083	95,195	4,369,648

Asset Renewal Profile

An optimised asset renewal profile is included in Section 2.4.

2.2.7 Manholes

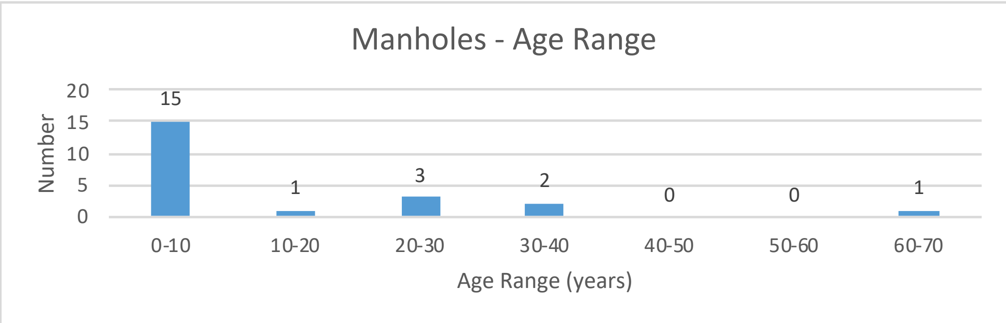
Asset Data

There are 23 manholes installed in the water reticulation network. Their purpose is to protect devices such as PRVs and valves, etc.

Asset Condition and Remaining Lives

We assess the condition of manholes annually by visual inspection. Manholes are mainly located at the side of roads, making inspections easier. These assets are in generally good condition. Manholes have an expected life of 100 years. The asset ages are shown in the graph below.

Figure 34 Manholes age range



The average age of manhole assets was 14 years as at 30 June 2016. The average age of manhole assets as at 30 June 2013 was 13 years.

Asset Valuation

As at 30 June 2016, the value of manholes is shown in Table 13.

Table 13 Manholes asset valuation

Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
96,975	970	84,177

Asset Renewal Profile

No renewal of manholes is planned during the period of the AMP.

2.2.8 Fire Hydrants

Asset Data

There are 3,613 fire hydrants in the water reticulation main network. They provide a point of supply for firefighting and for firefighter training. Fire hydrants are typically positioned within the road reserve and are marked by a yellow cast iron lid. They are also identified by roadside markings.

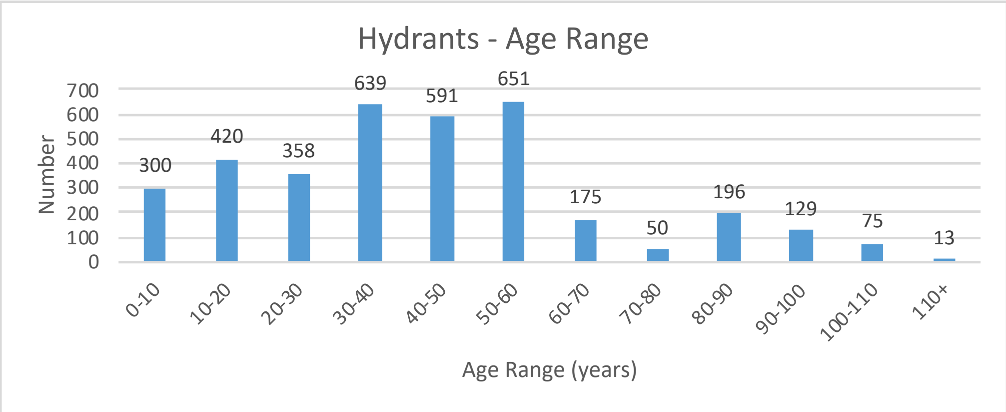
Asset Condition and Remaining Lives

We assess the condition of fire hydrants during scheduled 6-yearly visual inspection/ maintenance and performance checks. In general fire hydrants are found to be in good condition, with some repairs required due to leakage caused by vibration from traffic.

Fire hydrants have an expected life of 90 years but are generally renewed when the parent main is renewed regardless of their condition, age or remaining life.

The age profile for the fire hydrants is shown in Figure 35.

Figure 35 Hydrants age range



As at 30 June 2016, the average age of hydrant assets was 42 years. The average age of hydrant assets at 30 June 2013 was 40 years.

Asset Valuation

As at 30 June 2016, the value of hydrants is shown in Table 14.

Table 14 Hydrants asset valuation

Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
7,599,900	84,443	4,095,714

Asset Renewal Profile

An optimised asset renewal profile is included in Section 2.4.

2.2.9 Service Connections

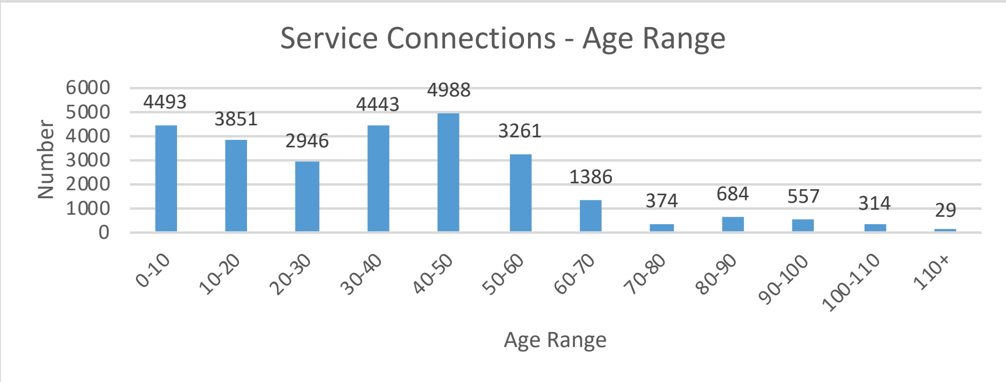
Asset Data

Service connections (or laterals) comprise the mains connection and the small diameter pipework, toby, manifold, flow restrictor and associated surface box that convey water from our system to the customer owned pipework. There are 28,037 water services connected to the water reticulation and trunk main network in the district, a total length of 208 km.

Service connections diameters range from 15mm to 32mm and are constructed from a variety of materials. Some larger diameter service connections are used for supplying industrial and extraordinary connections (including those with firefighting requirements).

Figure 36 shows the number of service connections by age.

Figure 36 Service connections age range



Asset Condition and Remaining Life

We renew service connections when they are found to be in a poor state of repair, either individually through reported leakage or during mains renewals. We also renew them when we find existing services are constructed of an inferior material e.g. galvanised steel or low density polyethylene.

Service connections materials include polyethylene, copper and steel. They have an average expected life, weighted by length, of 95 years.

At 30 June 2016, 1.6% (3.0 km) of service connections had reached an age of 95 years or greater. Over the next ten years a further 3.1% (5.8 km) of service connections will reach an age of 95 years or greater.

The average age of service connection assets was 35 years at 30 June 2016. The average age of service connection assets at 30 June 2013 was 32 years.

Asset Valuation

As at 30 June 2016, the value of service connections is shown in Table 15.

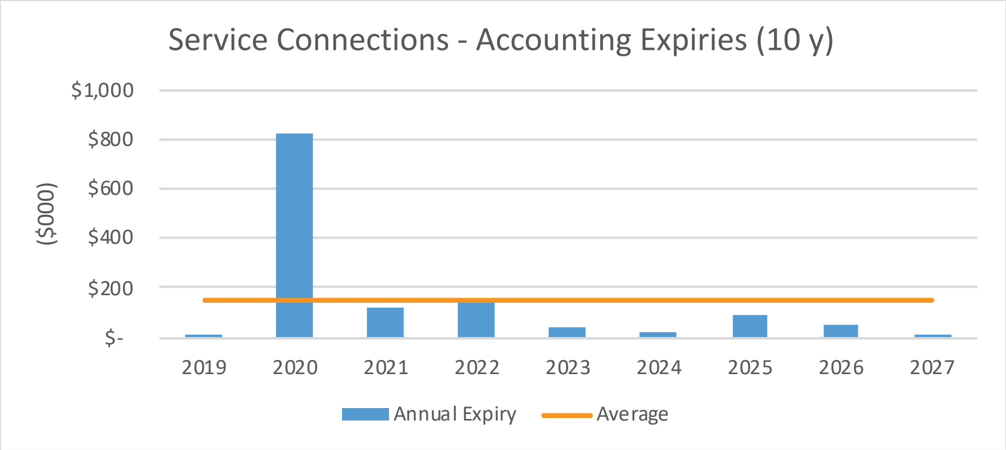
Table 15 Service connections asset valuation

Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
20,914,362	236,042	12,541,608

Asset Renewal Profile

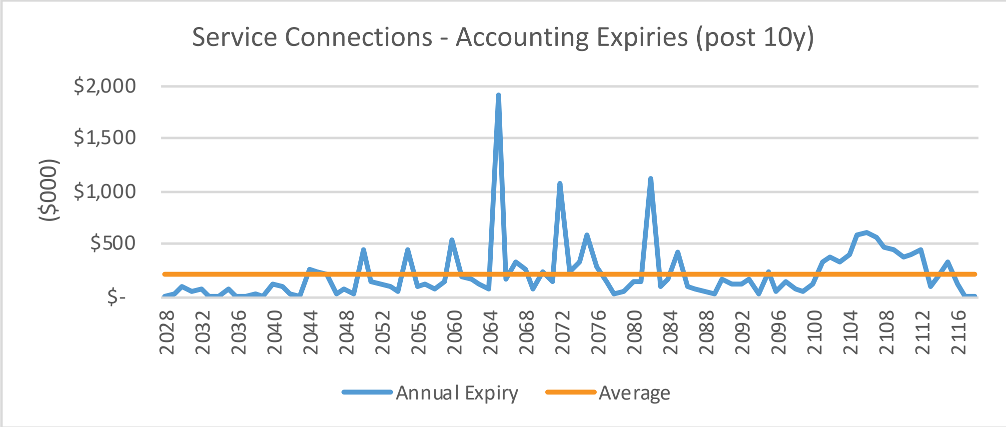
The expenditure profile based on renewing the assets when they reach the end of their expected life is shown in Figure 37. This would require a total expenditure of $1.3m over the next ten years at an average of $130k/year. We propose that expenditure will correspond with this profile to ensure customer supplies are maintained. This will be reviewed annually to ensure the rate of renewal matches expectations for levels of service and risk.

Figure 37 Service connections accounting expiries 10Y



Beyond 2027 a further $19.6m of expenditure is forecast at an average of $216k per year through to 2118. This is to complete the full renewal of the service connection stock, as shown in Figure 38.

Figure 38 Service connections accounting expiries post 10Y



Provision for renewal of service connections based on the above profile is included in section 2.4.

2.2.10 Backflow Preventers

Asset Data

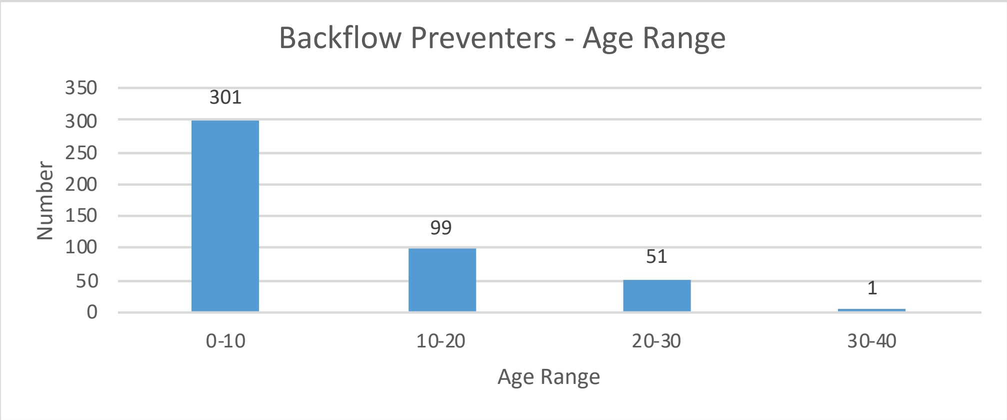
There are 459 backflow preventers in the reticulation network. Operating the same way as a non-return valve, backflow preventers protect the water supply from undesirable contaminants in customer systems entering our water supply network. They also prevent customer's pipework from losing pressure in instances where mains pressure reduces quickly and will also prevent syphoning of customer pipework.

Asset Condition and Remaining Life

We test backflow preventers annually and generally find them to be operating well and in good condition.

Backflow preventors have an expected life of 50 years. At 30 June 2016 no backflow preventers have reached 50 years or older and none will reach 50 years or older in the next ten years. The age range of our backflow preventers is shown in Figure 39.

Figure 39 Backflow preventers age range



The average age of backflow preventers was 9.5 years as at 30 June 2016. The average age of backflow preventers at 30 June 2013 was 9 years.

Asset Valuation

As at 30 June 2016, the value of backflow preventers is shown in Table 16.

Table 16 Backflow preventers asset valuation

Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
591,676	11,834	482,387

Asset Renewal Profile

We do not plan to replace any backflow preventers over the next ten years.

2.2.11 Meters

Asset Data

There are 3,193 meters installed on the water reticulation network. Meters measure the volume of water taken by the connected customer. Metering data is used for billing and/or consumption monitoring purposes. Metering is compulsory for commercial and industrial customers and certain special use customers but is currently optional for domestic users. We read most meters quarterly with a few large water consumers being read monthly.

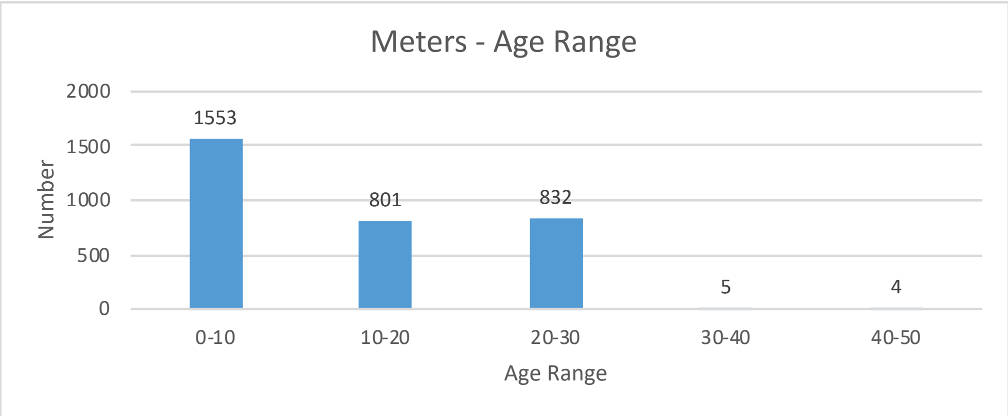
In anticipation of a future universal metering policy, manifold assemblies are now installed at all new domestic water connections and at existing domestic connections when tobies are replaced. To date, approximately 20% of domestic connections are now installed with manifold assemblies. Since 2015, meters have also been installed at all newly installed manifold assemblies.

Asset Condition and Remaining Life

We inspect meters visually during meter reading rounds and find them to be in generally good condition.

Meters have an expected life of 20 years and their accuracy deteriorates over time. At 30 June 2016, 25% of meters (832) had reached an age of 20 years or greater. Over the next ten years a further 25% of meters (801) will reach an age of 20 years or greater as shown in Figure 40.

Figure 40 Meters age range



The average age of meters was 11 years as at 30 June 2016. The average age of meters as at 30 June 2013 was 12 years.

Asset Valuation

As at 30 June 2016, the value of meters is shown in Table 16.

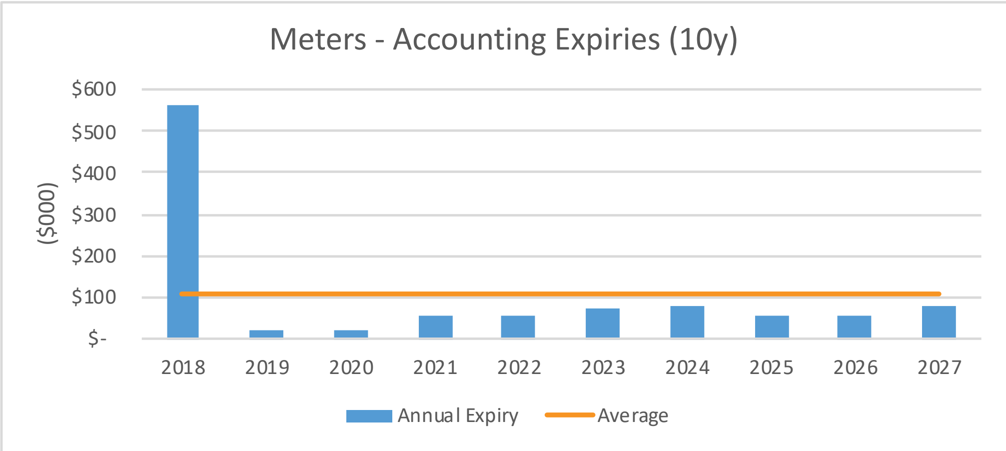
Table 17 Meters asset valuation

Gross Current Replacement Cost (GCRC) ($)	Annual Depreciation ($)	Optimised Depreciated Replacement Cost (ODRC) ($)
1,915,800	95,790	948,382

Asset Renewal Profile

The expenditure profile based on renewing the assets when they reach the end of their expected life is shown in Figure 41. This would require a total expenditure of $1.06m over the next ten years at an average of $130k/year. We propose that expenditure will correspond with this profile to ensure meter accuracy is maintained. This will be reviewed annually to ensure the rate of renewal matches expectations for levels of service and risk.

Figure 41 Meters accounting expiries 10Y



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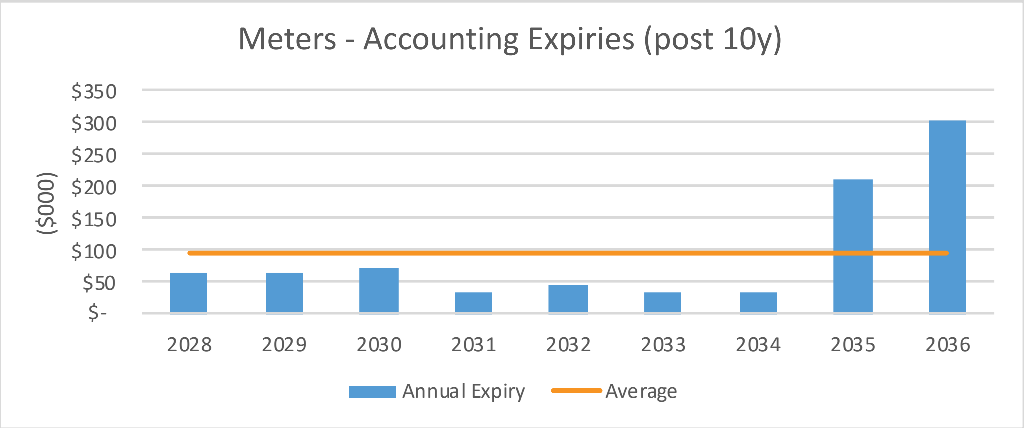
Version: 1, Version Date: 11/09/2018

2. LIFECYCLE MANAGEMENT PLAN

Beyond 2027 a further $859K of expenditure is forecast at an average of $95.5k per year through to 2036. This is to complete the full renewal of the service connection stock as shown in Figure 42.

Figure 42 Meters accounting expiries post 10Y



When universal water metering is introduced in 20/21 and 21/22 (in accordance with the Water Master Plan) there will be increased requirement for meter renewals. This will result in additional renewal expenditure of $4.7m being required over the years 40/41 and 41/42.

Provision for renewal of meters based on the above profile is included in section 2.4.

2.3 Operations and Maintenance

2.3.1 Operations

Typical reticulation and trunk mains operations activities include:

- Response to customer service requests.
- Meter reading.
- Investigating faults and testing water quality.
- Repairing/replacing leaking water trunk mains and/or in the reticulation.
- Locating and marking pipelines.
- Stand over where third parties are excavating in close proximity to trunk mains.

2.3.2 Maintenance Plan

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

The preventative and predictive (proactive) maintenance activities for each asset type are detailed in Table 18.

Table 18 Preventative maintenance schedule

Activity	Frequency
Reticulation Pipes	
Water main refresh (flushing at dead-end hydrants)	3-monthly
Flow & pressure audit	As required
Leakage detection survey	Various depending on area
Water quality testing	As required
Inspect restrictors	Annual
Dudley Rd raw water supply flush	Weekly
Pipe Bridges	
Condition inspection	Annual
Valves	
Inspect pressure zone valves	Annual
Clean, exercise and paint	6-yearly
Inspect and service pressure reducing valves	Annual
Clear or spray vegetation around valves	6-monthly
Coating of pressure zone and scour valves	6-yearly
Install concrete pad	As required
Hydrants	
Inspect, clean, paint and flow test	6-yearly
Service Connections	
Flow & pressure audit on water manifold	Annual at 51 selected locations with known pressure/flow issues
Backflow preventers	
Inspection and testing	Annual
Manholes	
Paint water manhole lid	6-yearly

Recent improvements in the water treatment plant processes and renewal of some older sections of pipes has resulted in a decrease in the number of reports regarding water taste, odour and colour. Therefore, we are currently reviewing how frequently we need to refresh water mains. Reducing the frequency of mains refreshing will reduce total system water loss.

We store preventative and predictive maintenance schedules against each asset in the Enterprise Asset Management system (Technology 1) and issue monthly schedules to internal staff and contractors. We also record and monitor the details and costs of completed maintenance activities to assist with maintenance optimisation and renewal planning.

Corrective (reactive) maintenance activities include:

- Investigating reports of no water or low pressure.
- Repairing leaking water mains.
- Repairing leaking services/tobies.
- Repairing/replacing leaking/faulty valves.
- Repairing/replacing leaking/faulty pressure reducing valves.
- Investigating water quality problems.
- Identifying maintenance/repair activities during pipe bridge inspections
- Locating and marking water pipes.

The network maintenance contract schedule for reticulation can be found in the Appendices of the 12/PM01 contract Section H, ECM_6713455.

2.3.3 Critical Spares

We have identified and procured critical spares for the water supply reticulation network. The majority of spares are held by contractors and used for day-to-day repairs of the reticulation system. Larger and/or atypical spares are stored at the New Plymouth Water Treatment Plant. The spares inventory is detailed in ECM#7235967.

2.3.4 Opex Forecast

The general 10-year Opex forecast for water supply assets is included in the Water Supply General Volume. This includes the Opex forecast for maintaining and operating reticulation network assets.

2.4 Renewals Plan

The asset renewal profiles based on accounting expiries for AC, CI and Steel mains detailed in section 2.2 indicate that an aggregate renewal profile of $39.8m is required for the period of the AMP (excluding valves, hydrants, service connections and meters). Using risk based factors such as criticality ratings, failure mode analysis and geographic groupings, we have produced an optimised renewal plan that will deliver value for money at a tolerable level of risk in an affordable manner.

We have selected AC, CI and Steel reticulation and trunk mains for renewal based on the criteria described in section 2.1. We have selected all trunk mains and category 3 and 4 distribution mains for renewal based on criticality ratings. The consequences of rider mains and criticality 1 and 2 distribution mains failing are low, so these will be repaired/renewed as they fail.

We have prioritised AC mains over metallic mains based on our records of failure modes exhibited. We expect a widespread deterioration of AC mains as opposed to the localised corrosion or fracture we expect for steel and CI mains respectively. We have grouped clusters of higher criticality materials mains geographically to optimise the renewal plan and to form the most effective/economical work programme. The detailed work programmes showing the individual sections of mains for renewals are stored and updated as controlled documents in ECM. A list of the documents can be found at Reticulation Renewals Programmes.

We will consider further optimisation prior to the final confirmation of the work programme. This will ensure we coordinate the timing of planned renewals with other asset classes to maximise efficiency and minimise disruption e.g. renewing reticulation assets at the same time as waste water mains work or road resealing. We will also review our renewal plans as more information is gained from AC pipe sampling and we establish more accurate condition ratings.

A general provision for emergency renewals is included in the expenditure forecast. This is to cover the renewal of small sections of failed water mains not included in the planned renewal programme.

We have also included provision for the renewal of valves and hydrants in the expenditure forecast. This has been calculated by taking the length of mains planned for renewal each year and allocating a value based on the average number of valves (6 per km) and hydrants (4 per km) contained in the network per km.

We may require additional expenditure if some valves and hydrants require replacement because of condition and/or leakage. We have included a general provision for emergency renewals in the expenditure forecast which also covers the renewal of valves or hydrants not included as part of the planned mains renewal programme.

The Capex forecasts for the renewal of the reticulation network are summarised in Table 19.

Table 19 Renewals expenditure forecast

Water Reticulation Mains Renewals 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
WA2022 - Emergency Water Reticulation Renewals	50	51	316	322	330	337	345	354	362	372	2,839
WA1022 - Water reticulation Renewals	2,565	2,616	3,039	3,476	3,903	3,332	3,366	3,627	4,150	5,779	35,853
Total	2,615	2,667	3,355	3,798	4,233	3,669	3,711	3,981	4,512	6,151	38,692

2.5 Acquisition and Augmentation Plan

Acquisition

When developers install new assets to serve new domestic and non-domestic developments, the assets are usually vested with us. Assets are built to the NZS4404: 2010 – Land Development and Subdivision Standard. Our specific requirements are defined in the New Plymouth District Council (NPDC) and South Taranaki District Council (STDC) adopted standard for Land Development and Subdivision Infrastructure, which is based on NZS 4404:2010 with local amendments. We assume full responsibility for any assets vested with us, and include them included in our operations, maintenance and future renewal plans.

Growth

To meet levels of service and future demand requirements, the reticulation network requires new assets. The Water Master Plan identifies the assets required to meet future growth of the district, as summarised in Section 4 of the Water Supply General AMP.

Our existing trunk mains cannot accommodate future growth. This is because they are undersized to cater with increased demand and will be unable to supply treated water at a rate to keep key reservoirs sufficiently stocked. We have assessed the options for increasing pipe capacity and consider it more cost effective to duplicate the main with a second pipe, rather than replace the existing reticulation with larger diameter pipes. Duplicating the main pipe also improves the resilience of the reticulation system, particularly with regard to future planned and emergency maintenance shutdowns of parts of the system.

To provide a strategic supply to the Mangorei Road, Henwood Road, and Mountain Road reservoirs and the Tikorangi reservoir via Mountain Road, we need to increase the capacity of the trunk main between WTP Reservoir #1 and the Henwood reservoir. The first component of this project is to install a duplicate WTP outlet and central feeder main at a cost of $4,184k in 2020/21. This will be followed by a parallel trunk feeder to increase capacity and provide security of supply to the eastern supply zones. Stage 1 of the Eastern Feeder at a cost of $3,473k is included in 2021/22. Stage 2 at $3,526k is spread evenly over 2023/24 and 2024/25.

As part of the Water Master Plan we have also included a provision of $15,190k, spread over the three years 2022/23 to 2024/25, to install universal water metering. This will assist in reducing water demand on the network. It is likely that the effective demand management resulting from this project will mean components of the Water Master Plan will either no longer be required or will be deferred.

As urban areas are extended, opportunities for subdivisions and development are created. In some instances there are no water services in these areas and developers are expected to extend water services across vast distances to supply proposed subdivisions with water. This can discourage them from proceeding. To encourage and stimulate development, we have included a general annual provision to extend water services in identified growth areas.

Our water loss reduction programme is based primarily on managing water pressure by zones. The national trend in regard to water pressure is to move towards a maximum working pressure of 900kPa. Our levels of service for pressure were amended in 2009 to a maximum desirable pressure of 900kPa. This will be achieved progressively, as the supply areas and demand management procedures are implemented. We plan to decrease the maximum pressure for most zones within New Plymouth City using zone isolation valves and pressure reduction valves on the feeds into the zone. Some zones at higher elevations (typically on the outskirts of the city) will have pressure sustaining valves to ensure minimum pressures stay above the minimum level of service wherever possible (300kPa for urban properties and 200kPa for rural properties). The average pressure of Inglewood's supply has reduced by approximately 450kPa (from 900kPa), which has resulted in a 15% reduction in the total water supplied.

We do require improvements in the reliability of data sets collected from zone meters so we can better analyse and understand leakage rates and locations.**This is recorded as an action in Section 5 – Improvement and Monitoring Plan.** We also require further hydraulic modelling of the water network to better understand where improved water pressure is required. **This is recorded as an action in Section 5 – Improvement and Monitoring Plan.** We have included an annual provision for building and maintaining water models.

The Capex forecast for growth projects is summarised in Table 20.

Table 20 Growth expenditure forecast

Water Reticulation Growth 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
WA2006 - Provision of Water Services For Subdivisions In Un-Serviced Areas	50	52	53	54	55	56	58	59	60	62	559
WA2010 - Water Model Build and Maintain (Renew)	15	16	16	16	17	17	17	18	18	19	169
WA2019 - Universal Water Metering (WMP)	-	-	-	-	4,856	5,077	5,257	-	-	-	15,190
WA2017 - Duplicate WTP Outlet and Central Feeder (WMP)	-	-	4,184	-	-	-	-	-	-	-	4,184
WA2018 - Eastern Feeder Stage 1 (WMP)	-	-	-	3,473	-	-	-	-	-	-	3,473
WA2020 - Eastern Feeder Stage 2 (WMP)	-	-	-	-	-	1,742	1,784	-	-	-	3,526
Total	65	68	4,253	3,543	4,928	6,892	7,116	77	78	81	27,101

The Water Master Plan includes options and cost estimates for growth projects beyond the period of the AMP.

Levels of Service

The requirement for firefighting flows is governed by the New Zealand Fire Service (NZFS) Water Supplies Code of Practice SNZ PAS 4509:2008, which details the minimum required flows and pressures for firefighting. In accordance with this standard, our targeted level of service is fire water classification FW3. However this is to be reviewed collaboratively with the Fire Service to ensure practical and suitable levels of service are provided across different areas.

To better understand the capacity of the system to meet firefighting demands, we require hydraulic modelling of our water network. This may highlight some areas that not meet the minimum standard e.g. areas with pipes of smaller diameter than necessary to deliver the required amount of water at the required pressure. **This is recorded as an action in Section 5 – Improvement and Monitoring Plan.**

To meet current levels of service for firefighting capacity and maintenance of minimum pressure requirements, augmentation is required. We have included an annual provision for improvements identified as required to meet levels of service. We have also included an annual provision for minor miscellaneous network upgrade projects to maintain existing levels of service as required.

To comply with the fire service code of practice, we have included an annual for the first five years of the plan to install Raised Reflective Pavement Markers (RRPMs) to aid identification of fire hydrants at night.

A summary of the level of service forecast expenditure is shown in Table 21.

Table 21 Level of service expenditure forecast

Water Reticulation Levels 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
WA1025 - Water reticulation minor augmentation programme	60	62	63	65	66	67	69	71	73	74	670
WA1014 - Firefighting reticulation improvements across network	128	132	134	137	140	143	147	150	154	158	1,423
WA1026 - Water reticulation raised reflective pavement markers (RRPM)	10	11	11	11	11	-	-	-	-	-	54
Total	198	205	208	213	217	210	216	221	227	232	2,147

The Water Master Plan includes options and cost estimates for level of service projects beyond the period of the AMP.

2.6 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)

No asset disposals are planned over the 10 year AMP period.

2.7 Annual Work Plans

A renewals programme based on the asset renewal selection criteria described in section 2.4 is recorded and updated in a separate documents stored in the ECM. A list of the documents can be found at Reticulation Renewals Programmes.

3. RISK MANAGEMENT PLAN

3.1 Critical Assets

We assess the criticality scores for water supply reticulation mains using the process and scoring system detailed in ECM#988741 – Water, Wastewater and Stormwater Mains Criticality and Renewals Prioritisation Process. Primarily used to select mains for renewal purposes, the critically ratings allocated are based a number of factors including:

- Diameter i.e. number of customers supplied
- Location e.g. proximity to hospital
- Depth
- Material
- Age
- Condition
- Repair & maintenance history

We record asset criticality ratings in the Enterprise Asset Management system (Technology 1).

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

During development of the Water Master Plan we investigated opportunities to assess and enhance asset resilience, allocating investment where appropriate. An example of this is the Eastern Feeder Trunk Mains Stage 2 project, which includes plans to install a parallel trunk main to provide additional capacity, rather than replace the existing trunk main with larger sized pipe. This parallel pipe will provide the additional capacity required and will enhance resilience by allowing an uninterrupted supply in the case of an emergency event or scheduled maintenance.

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.

The Capex forecast for the reticulation network is shown in Table 22.

Table 22 Expenditure forecast summary

Water Reticulation Mains Forecast Expenditure ($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	2,615	2,667	3,355	3,798	4,233	3,669	3,711	3,981	4,512	6,151	38,692
Service Level	198	205	208	213	217	210	216	221	227	232	2,147
Growth	65	68	4,253	3,543	4,928	6,892	7,116	77	78	81	27,101
Total	2,878	2,940	7,816	7,554	9,378	10,771	11,043	4,279	4,817	6,464	67,940

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 Water Supply General Volume

5. IMPROVEMENT AND MONITORING PLAN

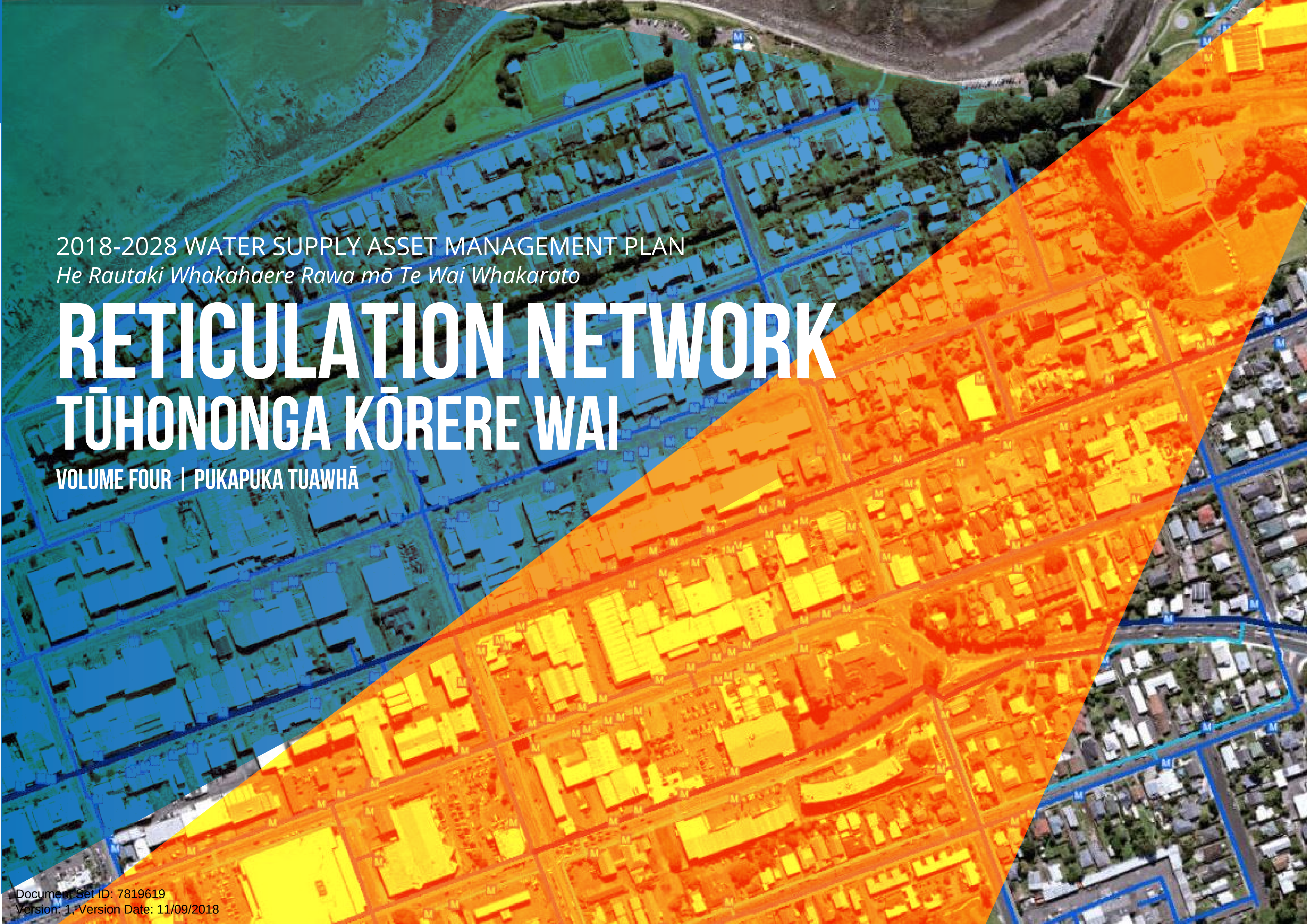
The general asset management maturity improvement plan is included in Strategic Asset Management Plan.

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

The specific areas of improvement identified for reticulation network assets are listed in Table 23.

Table 23 Improvements summary

No	Improvement Area	Owner	Start Date	End Date
1	Conduct asset condition assessment for non-pipeline assets and record results in EAM	Asset Operations Planning Lead	Jul-18	Jun-19
2	Include pipe bridges/values on asset inventory i.e. for 14 structures constructed to specifically support pipes and owned/maintained by W&W team.	Asset Operations Planning Lead	Jul-18	Jun-19
3	Conduct study to identify any improvements required to meet firefighting capacity level of service.	Manager Three Waters	2018	2020
4	Improve data collection and analysis from zone meters to assist understanding of leakage rates and potential improvements.	Manager Three Waters	2018	2020
5	Conduct study to identify any improvements required to meet pressure delivery level of service.	Manager Three Waters	2018	2020
6	Conduct analysis of existing asset data to identify and correct any obvious errors or omissions. This will form part of the Asset Data Quality Plan to be developed with the IS team.	Asset Operations Planning Lead	Jul-18	Jun-19



2018-2028 WATER SUPPLY ASSET MANAGEMENT PLAN

He Rautaki Whakahaere Rawa mō Te Wai Whakarato

RETICULATION NETWORK
TŪHONONGA KŌRERE WAI

VOLUME FOUR | PUKAPUKA TUAWHĀ

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