2018-2028 WASTEWATER ASSET MANAGEMENT PLAN
He Rautaki Whakahaere Rawa mō Te Wai Paranga

RETICULATION NETWORK
TE TŪHONONGA KŌRERE WAI

VOLUME THREE | PUKAPUKA TUATORU

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

DOCUMENT CONTROL

Document Name	2018-2028 Wastewater Asset Management Plan Volume 3 - Reticulation Network
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1. INTRODUCTION

This volume provides details of the asset lifecycle management for the **Reticulation Network** asset category of the Wastewater 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 and key issues

The purpose of the reticulation network is to collect the wastewater from residential, industrial and commercial properties and convey it to the New Plymouth Wastewater Treatment Plant.

The key issues in relation to the reticulation network are:

- Capacity – with regard to population growth and maximum capacity of the WWTP.
- Compliance – in relation to environmental impact and minimising the impact of overflows.
- Performance – in respect of controlling and minimising inflow and infiltration.
- Renewals – aging network.

1. INTRODUCTION

Levels of Service

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

Future Demand

Over the period of this AMP we plan to conduct further studies of potential future growth to ascertain system capacity limits and produce a Wastewater Master Plan.

During the planning stages of specific new land developments e.g. Area Q, the capacity of the existing reticulation systems will be assessed to ensure additional wastewater generated can be catered for. Planned renewals are also assessed for potential future capacity requirements at the planning stage.

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

2. LIFECYCLE MANAGEMENT PLAN

2.1 General

2.1.1 Asset Data

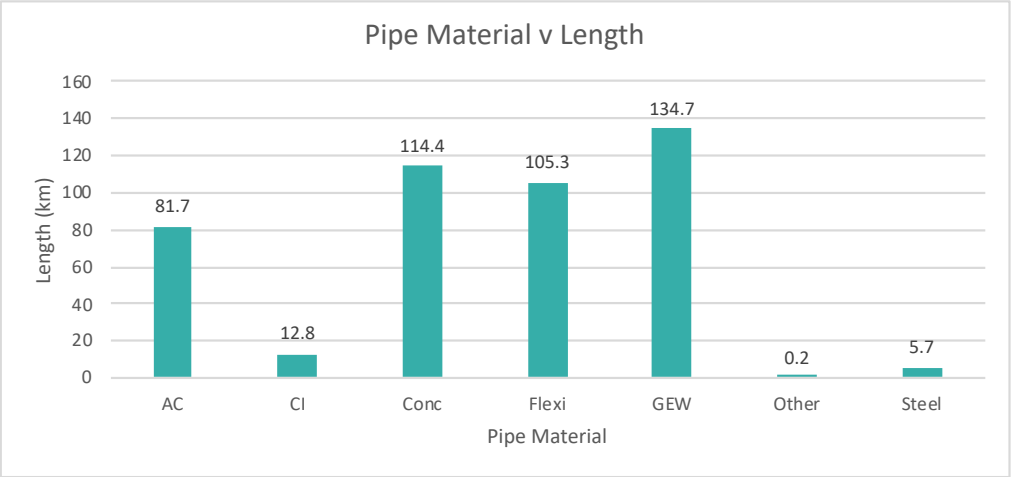
Table 2 Asset summary

Pipe type	Purpose	Quantity
Overflow	Emergency overflow from pump stations	0.5 km
Rising mains	Wastewater mains operating under pressure	53 km
Reticulation mains	Wastewater mains operating by gravity	363 km
Trunk mains	Wastewater mains collecting wastewater from various rising mains and/or reticulation mains	38 km
	Total (Mains)	454.5 km
Laterals (Services)	Conveys wastewater from individual buildings/properties to a common gravity wastewater line	190 km

The wastewater network consists 454 km of reticulation mains made up of a variety of materials reflecting the history of the construction of the system. From the early 1900s GEW and concrete pipes were used. During the 1960-70s, asbestos cement pipes were introduced. These became less popular as polyethylene and PVC pipes became cheaper and stronger. In some instances steel pipes were used.

The network also contains, valves, manholes, laterals (wastewater service connections). The mains assets are summarised in Figure 1 and all assets summarised in Table 3 based on the 30 June 2016 valuation data.

Figure 1 Mains pipes material v length



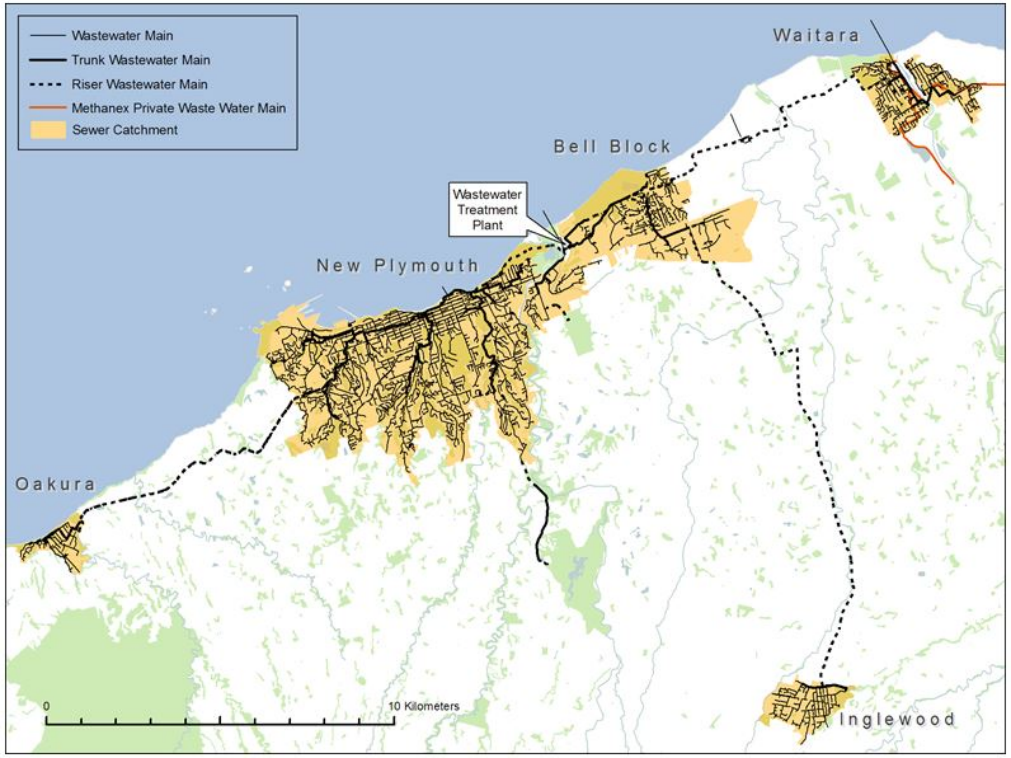
2. LIFECYCLE MANAGEMENT PLAN

Table 3 Asset summary with values

Description	Quantity	Expected Life (years)	Gross Current Replacing Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
Valves	199 No	50	337,876	277,077	6,758
Manholes	7,280 No	80	25,362,503	14,072,435	253,628
Lateral	190 Km	100	36,562,739	22,056,227	321,832
Mains	454 Km				
• GEW	135 Km	120	46,120,503	18,376,147	392,333
• AC	82 Km	70	32,939,391	14,433,601	470,563
• DI	13 Km	110	4,183,748	3,832,834	41,833
• Concrete	114 Km	80	56,062,031	21,872,662	700,201
• Steel	6 Km	70	5,715,852	3,782,918	58,764
• Flexible pipes	94 Km	100	33,192,610	27,885,135	347,059
• Other and unknown	10 Km	80	4,484,465	3,756,739	45,131
Pipe bridges	Tbc		Tbc	Tbc	Tbc
Total			240,477,252	126,589,036	2,592,971

The location of the reticulation system in the district is shown in Figure 2.

Figure 2 Asset location map



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 Condition

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

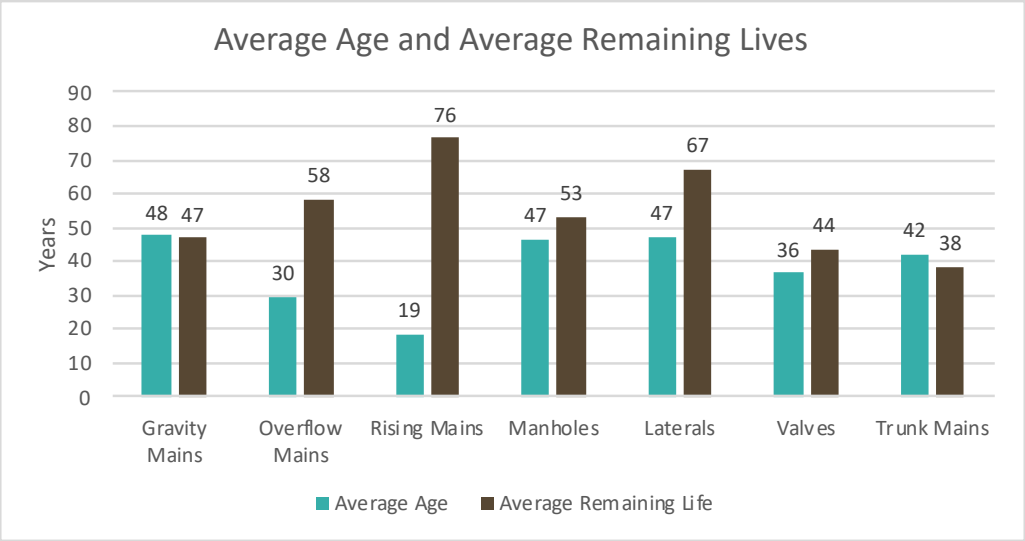
The condition of our wastewater main assets has either been assessed by desk-top modelling using available historical data, knowledge and experience or directly assessed from internal CCTV inspection. Desk-top condition grades have been assessed using information on material performance, asset age, failure 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. 52% of our wastewater 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.**

2.1.3 Asset Remaining Lives

Based on recorded asset installation dates and expected lives as at 30 June 2016, the wastewater network assets are on average, 44% through their aggregated expected lives. The aggregate asset life at the previous valuation dated 30 June 2013 was 46%. This indicates that the rate of asset depreciation is higher than the rate of renewals. The average ages of the assets and their average remaining lives are shown in Figure 3.

Figure 3 Average asset age and remaining life



2.1.4 Asset Valuation

The most recent valuation of assets 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. A summary of values is shown in Table 3 and individual asset category values in subsequent sections.

2.1.5 Asset Renewal Plans

Our renewal and lining programmes are mainly determined by analysis of CCTV information. The CCTV programme targets mainly glazed earthenware and concrete pipes.

The factors we consider when deciding on the priority, method and size for renewing pipes are listed below.

a. Diameter of the pipe
b. Depth of cover of the pipe
c. The number and concentration of defects from CCTV reports
d. Criticality rating calculated and tabulated in ECM#988741
e. Defect Scores from CCTV reports including defects where lining would not be possible
f. Structural Peak ratings from CCTV reports to give indication of worst sections
g. Structural Mean from the CCTV reports to give average score for total pipe length
h. Final overall rating calculated by combining the Structural Peak, Structural Mean and Criticality rating.
i. Future capacity requirements
j. Geographical grouping

We use these principles to produce a realistic renewal programme, recognising asset condition and guarding against the unnecessary and premature replacement of assets.

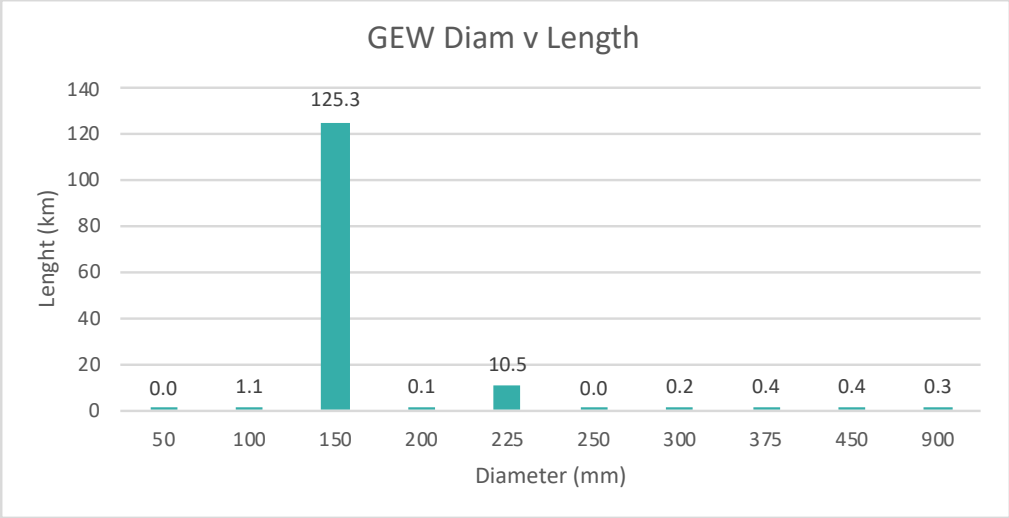
2.2 Asset Categories

2.2.1 GEW (Glazed Earthen Ware) Pipes

Asset Data

There are 135 km of GEW pipes in the network, approximately 30% of the total length of reticulation mains. Figure 4 shows the lengths of pipe by diameter.

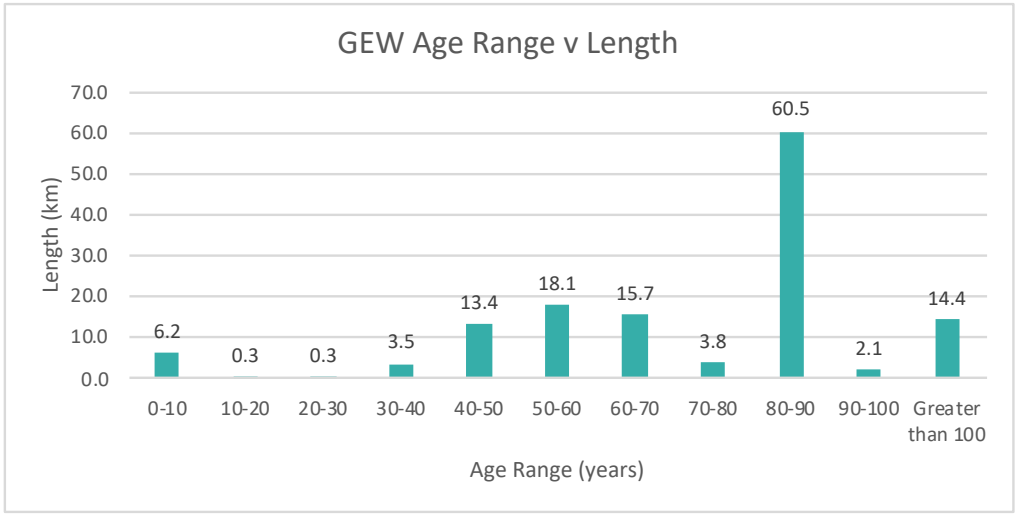
Figure 4 GEW pipes diameter v length



Asset Condition and Remaining Lives

Traditionally, a glazed earthenware pipe is a basic clay pipe with glazed internal and external surfaces to render it impervious to liquids. After firing, the glazed surfacing is transparent. Overall GEW pipes have an expected life of 120 years. They are targeted in our CCTV condition assessment surveys due to their age. The age range by length of pipe is shown in Figure 5.

Figure 5 GEW pipe age range v length



Asset Valuation

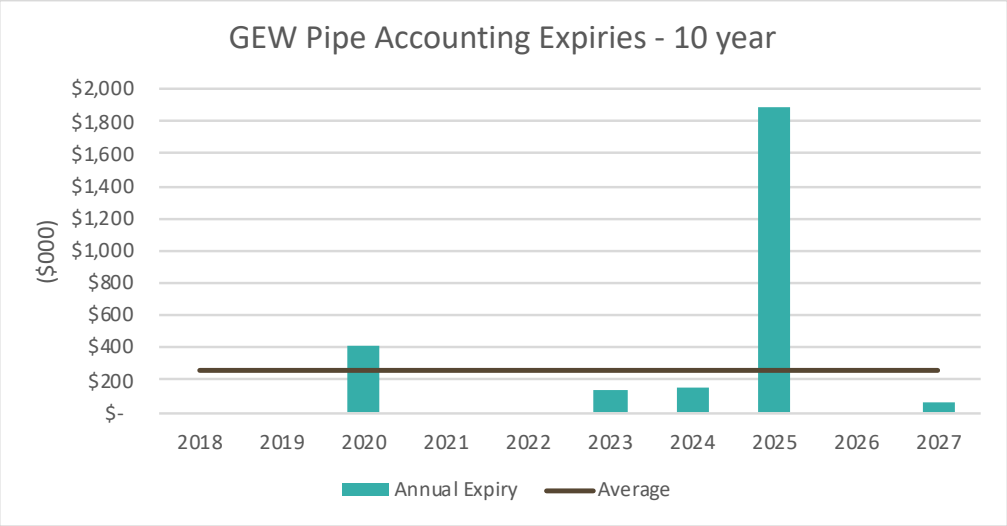
Table 4 GEW pipes asset valuation

Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
46,120,503	18,376,147	392,333

Asset Renewal Plans

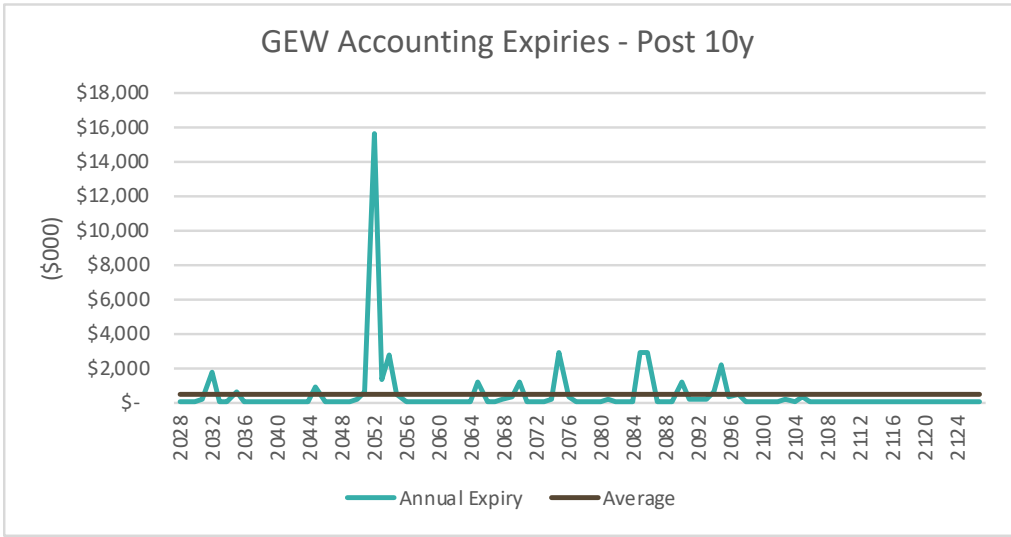
The expenditure profile based on renewing the assets when they reach the end of their expected life is shown in Figure 6. This would require a total expenditure of $2.7m over the next ten years at an average of $270k/year.

Figure 6 GEW pipes accounting expiries 10Y



To complete the full renewal of the GEW pipe stock, a further $43.4m of expenditure is forecast beyond 2027/28 through to 2119 at an average of $430k per year. This is shown in Figure 7. Dependent on the actual rate of renewal in the years prior to 2028/29, this may need to be reviewed and modified accordingly.

Figure 7 GEW pipe accounting expiries post 10Y

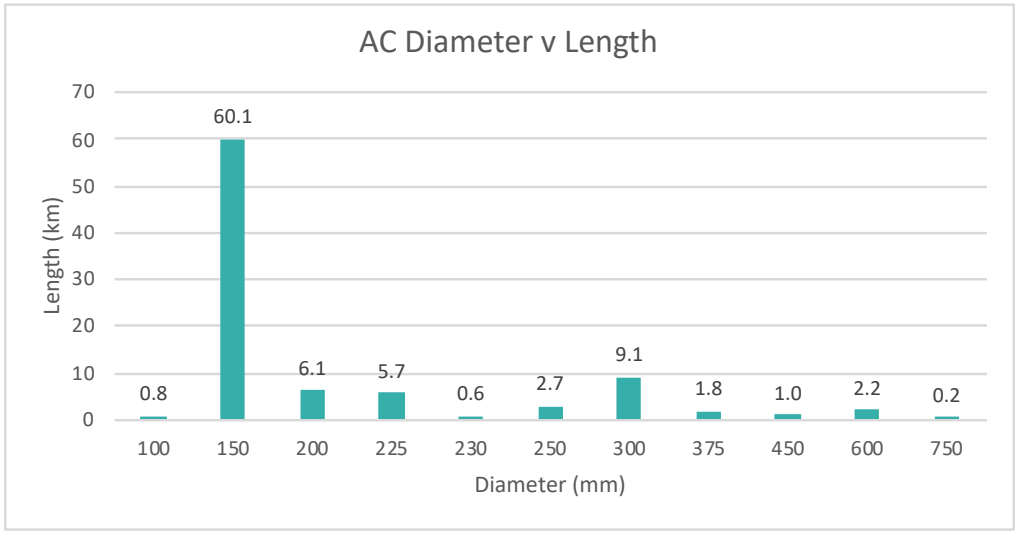


Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.2 Asbestos Cement (AC) Pipes Asset Data

There are 82 km of AC pipes in the network, approximately 18% of the total length of reticulation mains. Figure 8 shows the lengths of pipe by diameter.

Figure 8 AC pipes diameter v length



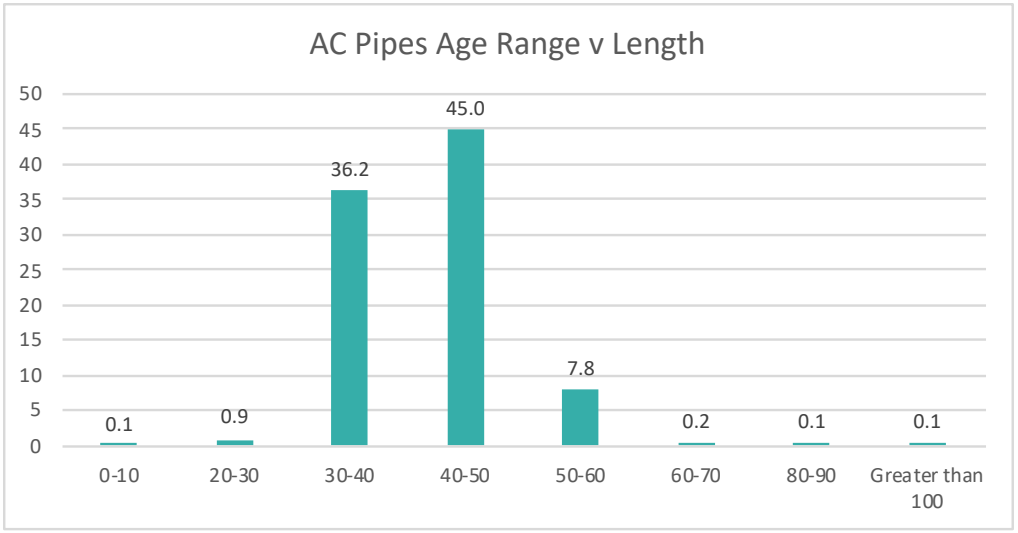
Asset Condition and Remaining Lives

AC pipes carrying wastewater deteriorate differently to AC pipes carrying clean water. The external surface of the pipe is affected by the aggressiveness of the soil, with silt material containing more acidity than stony, sandy material. This is an important factor when predicting the relative priorities of the renewal works programme. The pipe will deteriorate more rapidly internally than externally, with the bottom of the pipe deteriorating faster because of flow characteristics. However, unlike in water supply pipes, water is not pressurised and fluid velocities are slower. This means deterioration will occur more slowly in wastewater pipes.

The expected life for wastewater AC pipes is 70 years. Almost all wastewater AC pipes were installed in the 1950s–1970s. At 30 June 2016, 57% of AC pipes (47Km) have reached an age of 40 years or greater. Figure 9 shows the age range by diameter.

The average age of asbestos pipe assets was 39.8 years at 30 June 2016. The average age of asbestos pipe assets at 30 June 2013 was 36.8 years

Figure 9 AC pipes age range v length



Asset Valuation

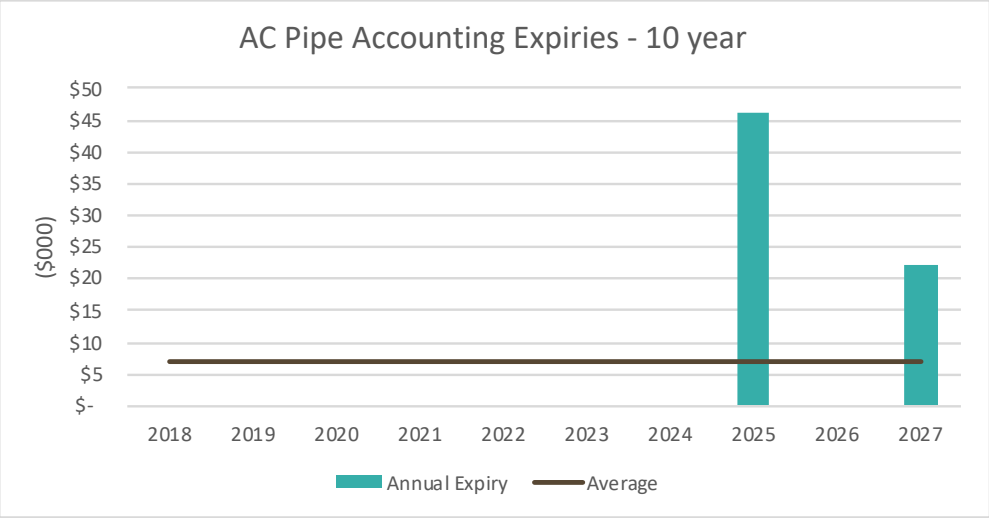
Table 5 AC pipes asset valuation

Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
32,939,391	14,433,601	470,563

Asset Renewal Plans

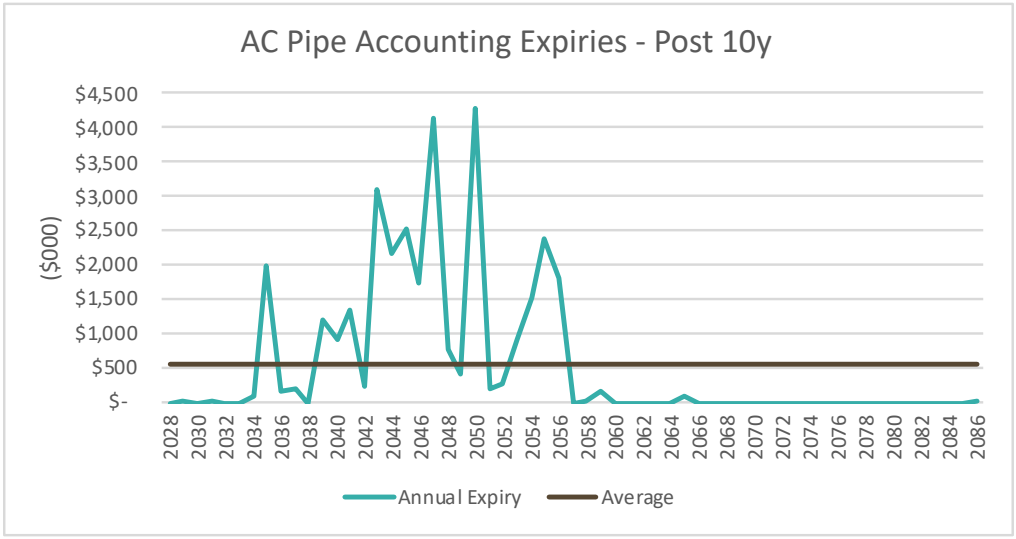
The expenditure profile based on renewing the assets when they reach the end of their expected life is shown in Figure 10. This would require a total expenditure of $70k over the next ten years, at an average of $7k/year.

Figure 10 AC pipes accounting expiries 10Y



As shown in Figure 11, to complete the full renewal of the AC pipe stock a further $32.2m of expenditure is forecast beyond 2027/28 through to 2086, at an average of $500k per year. Depending on the rate of renewal in the years prior to 2028/29, this may need to be reviewed and modified accordingly.

Figure 11 AC pipes accounting expiries post 10Y



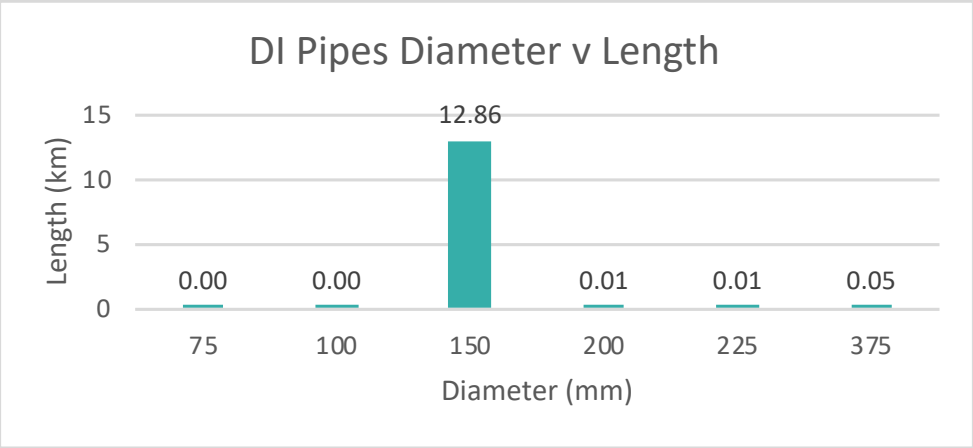
Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.3 Ductile Iron (DI) Pipes

Asset data

There are 13 km of DI pipes in the network, approximately 3% of the total length of reticulation mains. Figure 12 shows the lengths of pipe by diameter.

Figure 12 DI pipes diameter v length

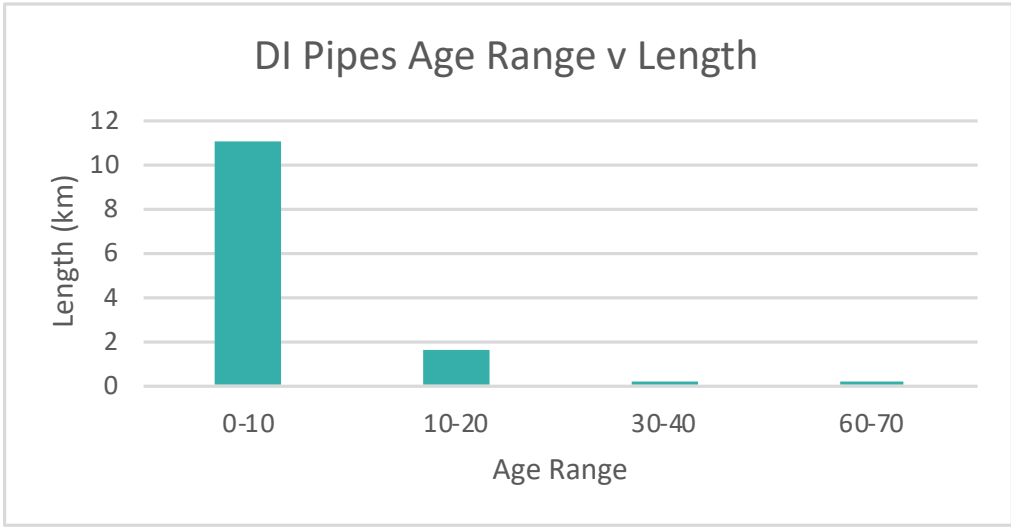


Asset Condition and Remaining Lives

DI pipes include ductile iron (DI) pipes and concrete lined ductile iron (CLDI) pipes. The average expected life is 110 years. The majority of DI pipes have been installed as riser mains over the last ten years. The age range by length is shown in Figure 13.

As at 30 June 2016 the average age of the DI pipe assets is 10.4 years. The average age of DI pipe assets at 30 June 2013 was 7 years.

Figure 13 DI pipes age range v length



Asset Valuation

Table 6 DI pipes asset valuation

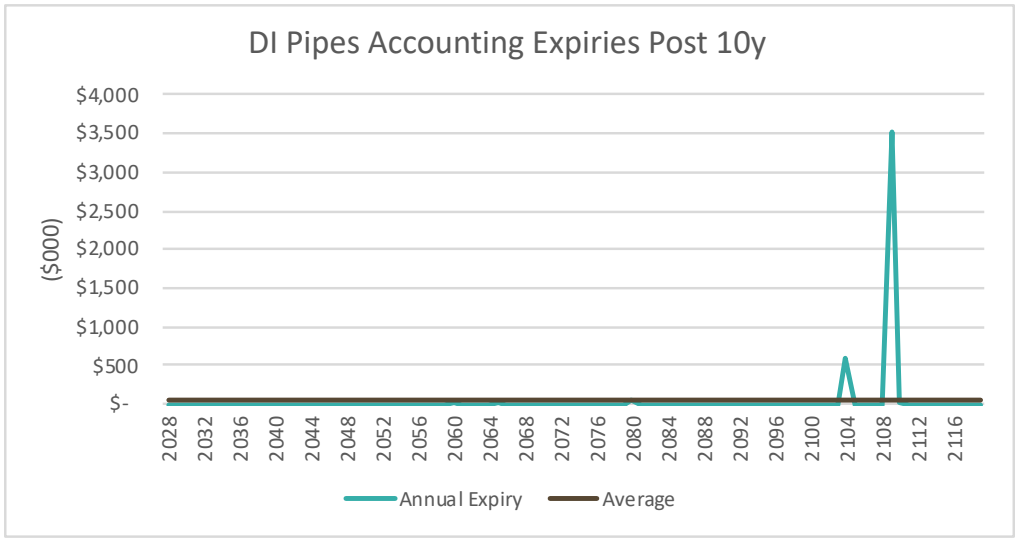
Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
4,183,748	3,832,834	41,833

Asset Renewal Plans

There is no replacement required for the next 10 years.

As shown in Figure 14, to complete the full renewal of the DI pipe stock a further $4.1m of expenditure is forecast beyond 2027/28 through to 2119, at an average of $410k per year. However, the age profile and life expectancy of these pipes mean we do not expect renewals to be required until after 2100.

Figure 14 DI pipes accounting expiries post 10Y



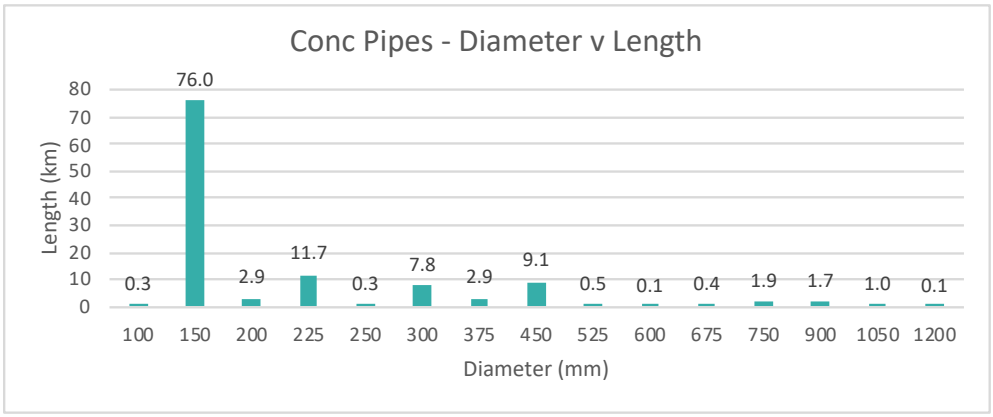
Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.4 Concrete Pipes

Concrete piping is one of the earliest forms of conduit used in reticulation systems, with installation commencing in the early 1900s. The majority of concrete pipes are reinforced and strengthened depending on their use.

There are 114 km of concrete pipes in the network, or approximately 25% of the total length of reticulation mains. Figure 15 shows the lengths of pipe by diameter.

Figure 15 Concrete pipes diameter v length

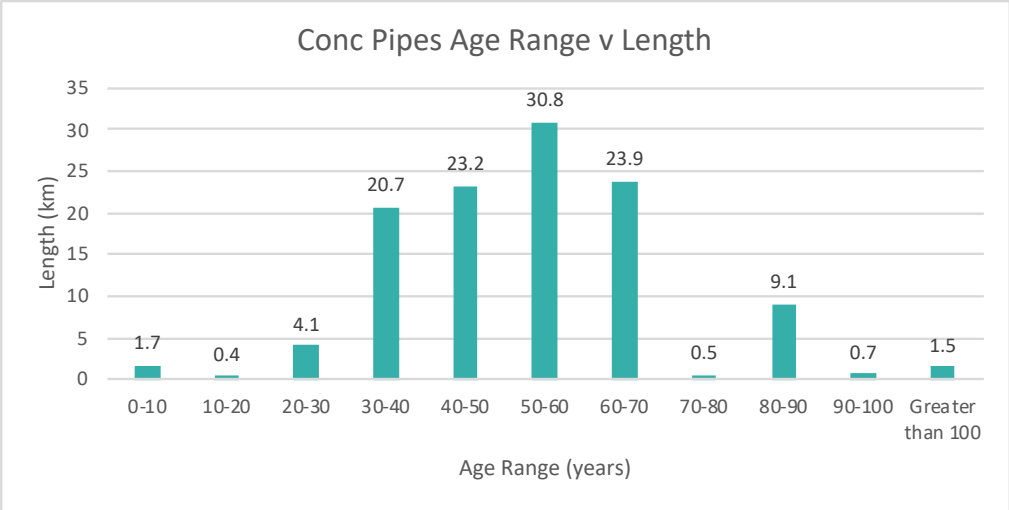


Asset Condition and Remaining Lives

The concrete pipe population includes lined/unlined concrete pipes, and RCRRJ (reinforced concrete rubber ring jointed) pipes. The average expected life for concrete pipes is 70 years. The majority of concrete pipes were installed from 1960 onwards as the reticulation system grew.

The average age of the concrete pipe assets was 51.6 years at 30 June 2016. The average age of concrete pipe assets at 30 June 2013 was 48.8 years. Figure 16 shows the concrete pipe age range by length.

Figure 16 Concrete pipes age range v length



Asset Valuation

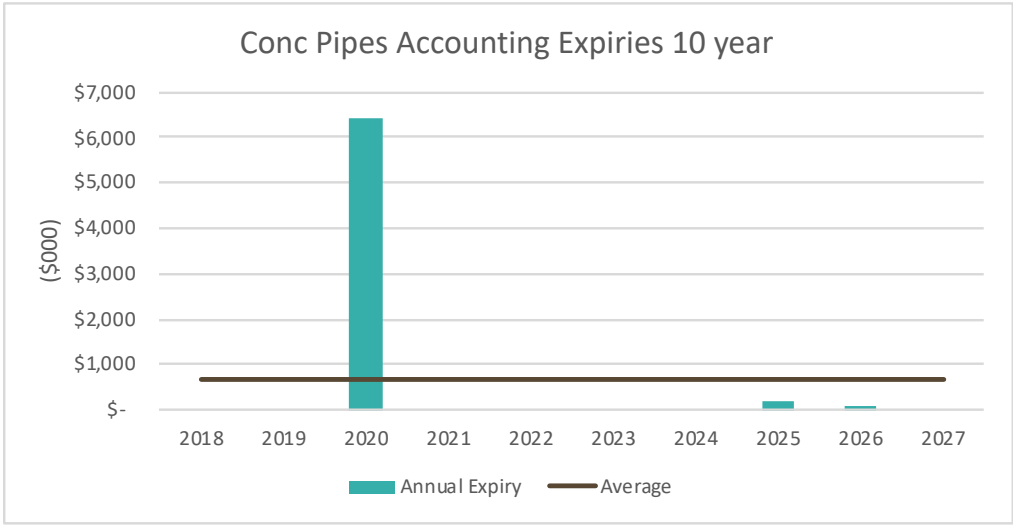
Table 7 Concrete pipe asset valuation

Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
56,062,031	21,872,662	700,201

Asset Renewal Plans

The expenditure profile based on renewing these assets when they reach the end of their expected life is shown in Figure 17. This would require a total expenditure of $6.7m over the next ten years, at an average of $670k per year.

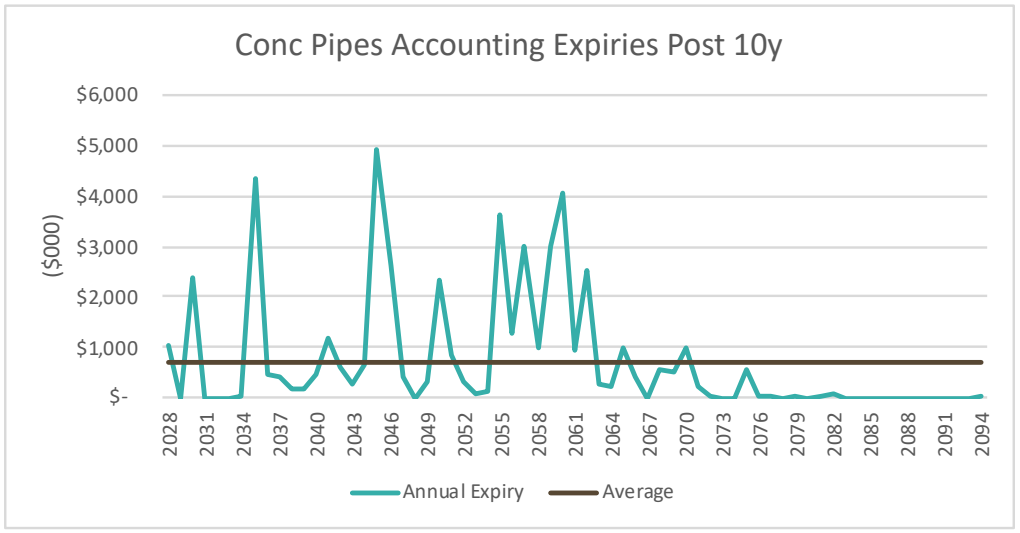
Figure 17 Concrete pipes accounting expiries 10Y



2. LIFECYCLE MANAGEMENT PLAN

As shown in Figure 18, to complete the full renewal of the concrete pipe stock a further $49.3 of expenditure is forecast beyond 2027/28 through to 2110, at an average of $500k per year. Depending on the rate or renewal in the years prior to 2028/29, this may need to be reviewed and modified accordingly.

Figure 18 Concrete pipe accounting expiries post 10Y



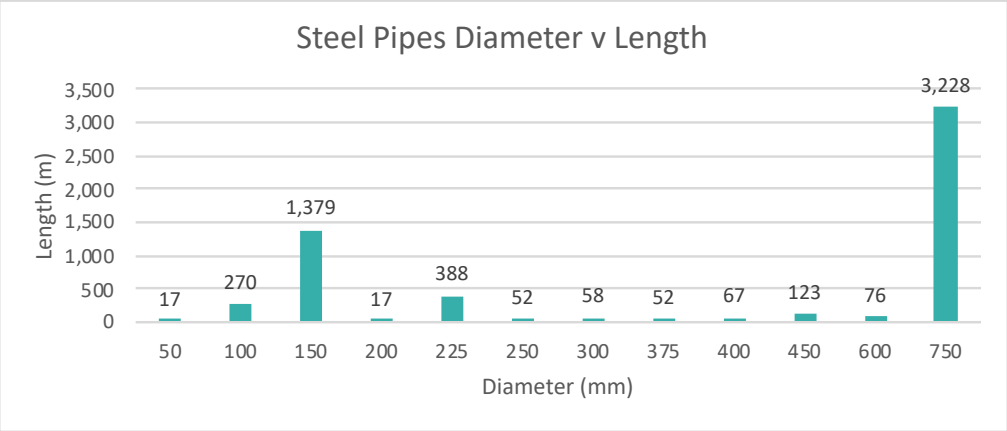
Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.5 Steel Pipes

Asset Data

There are 6 km of steel pipes in the network, approximately 1% of the total length of reticulation mains. Figure 19 shows the lengths of pipe by diameter.

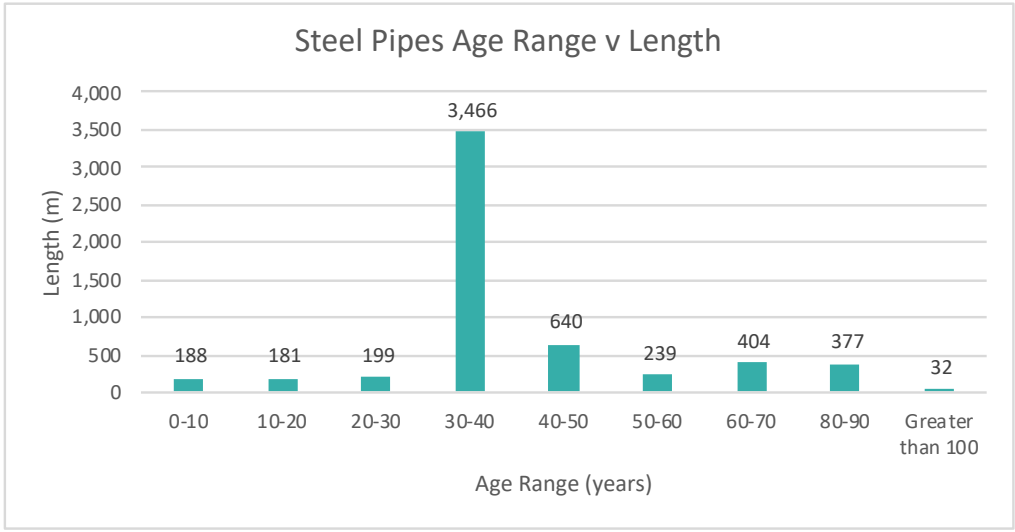
Figure 19 Steel pipes diameter v length



Asset Condition and Remaining Lives

Steel pipes include steel, concrete lined steel (ST-CL) and spiral welded seem steel (ST-SWS) pipes , all of which have an expected life of 70 years. The average age of the steel pipe assets was 37.9 years at 30 June 2016. The average age of the steel pipe assets at 30 June 2013 was 34.9 years. Figure 20 shows the steel pipe age range by length.

Figure 20 Steel pipes age range v length



Asset Valuation

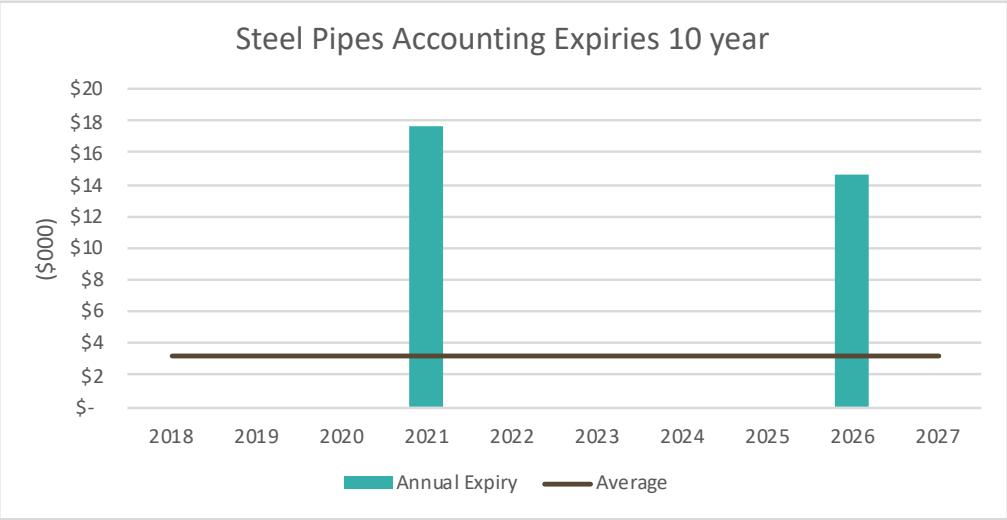
Table 8 Steel pipes asset valuation

Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
5,715,852	3,782,918	58,764

Asset Renewal Plans

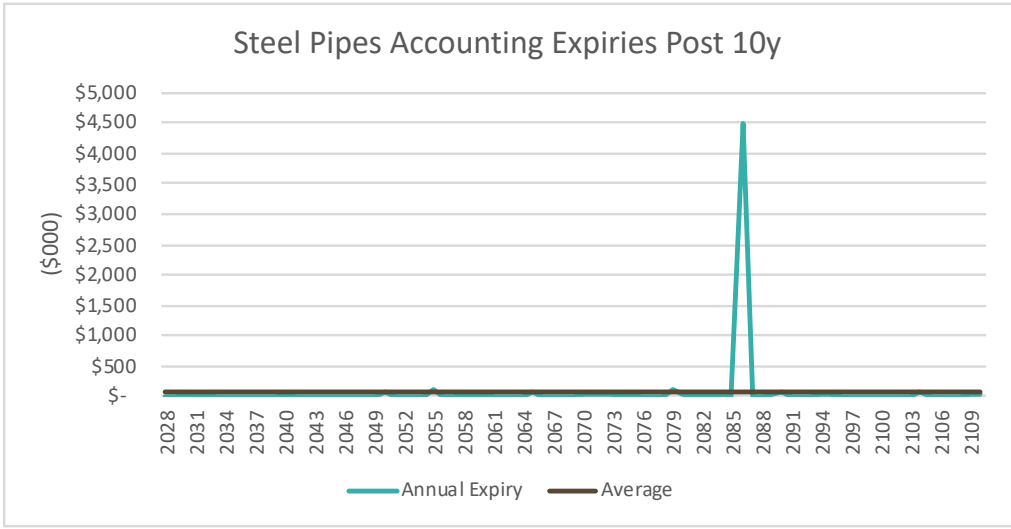
The expenditure profile based on renewing the assets when they reach the end of their expected life is shown in Figure 21. This would require a total expenditure of $33k over the next ten years at an average of $3k/year.

Figure 21 Steel pipes accounting expiries 10Y



As shown in Figure 22, to complete the full renewal of the concrete pipe stock a further $5.7m of expenditure is forecast beyond 2027/28 through to 2110, at an average of $57k per year. Depending on the rate or renewal in the years prior to 2028/29, this may need to be reviewed and modified accordingly.

Figure 22 Steel pipes accounting expiries post 10Y



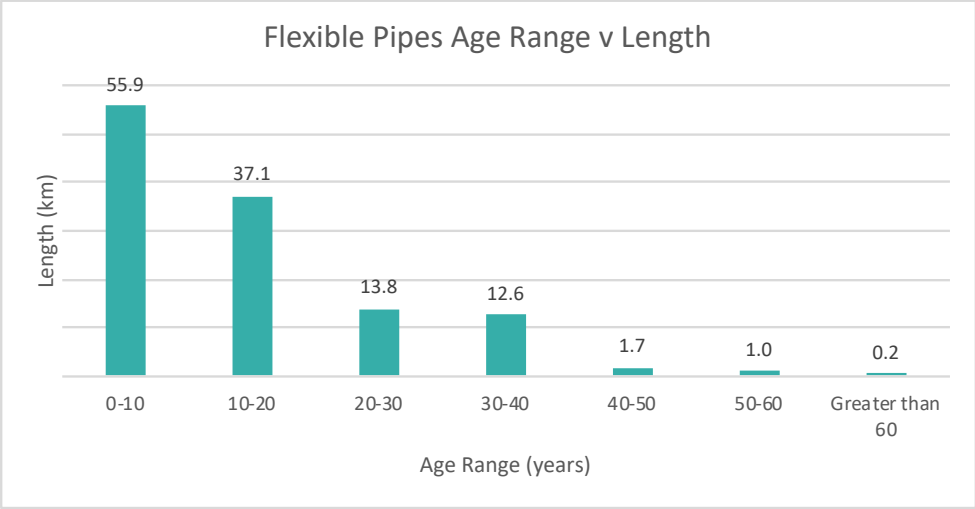
Optimised asset renewal profiles based on the information above are included in Section 2.4.

2.2.6 Flexible Pipes

Asset Data

There are 94 km of flexible pipes in the network, or about 21% of the total length of reticulation mains. Figure 23 shows the lengths of pipe by diameter.

Figure 23 Flexible pipes diameter v age



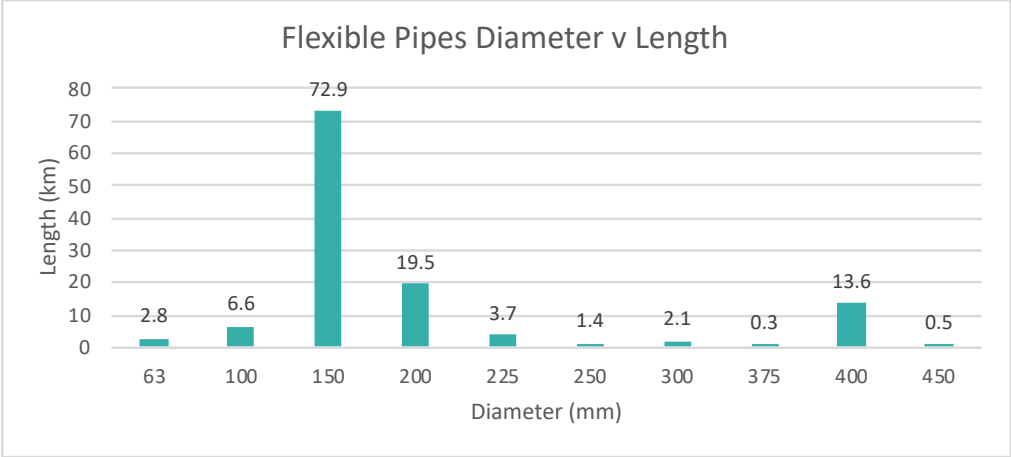
Asset Condition and Remaining Lives

Flexible pipes are the youngest pipes in the networks and their expected life is 100 years. However, plastic pipes have not yet been installed for that long anywhere in the world so this may change when more information about the long term degradation mechanisms of flexible pipe materials is available. Flexible pipes have been in use in the New Plymouth District for the last 30-40 years.

Flexible pipes include the different types of polyethylene (POLY-H, POLY-M, and POLY-L) and polyvinyl chloride (UPVC). The average age of flexible pipe assets as at 30 June 2016 was 21 years. The average age of flexible pipe assets at 30 June 2013 was 18 years.

Figure 24 indicates that some flexible pipes are greater than 60 years age range. This is because pipe installation dates have not been updated during renewal projects. **This is an asset data integrity issue and is included as an action in Section 5 – Improvement and Monitoring Plan.**

Figure 24 Flexible pipes age range v length



Asset Valuation

Table 9 Flexible pipes asset valuation

Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
33,192,610	27,885,135	347,059

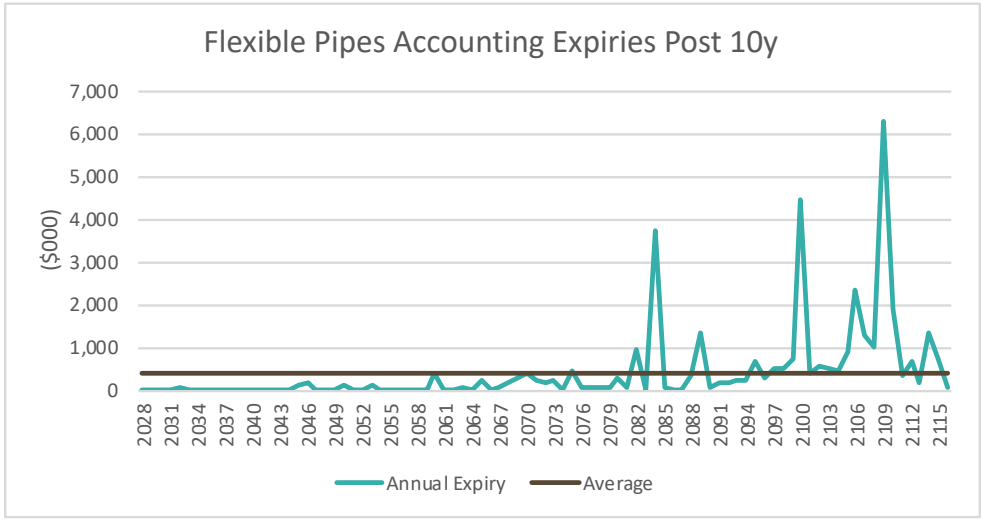
2. LIFECYCLE MANAGEMENT PLAN

Asset Renewal Plans

Our plans to renew flexible pipes are based on them reaching their expected life of 100 years. Because of their age profile, no expenditure is forecast for flexible pipe assets in the period 2018 – 2028. We anticipate that any expenditure after this this period will not be required until 2084 and beyond.

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

Figure 25 Flexible pipes accounting expiries post 10Y



2.2.7 Pipe Bridges

Asset Data

To cross features such as rivers, roads and streams, wastewater 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 a number specifically built structures that support the wastewater reticulation network assets. 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 wastewater 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.

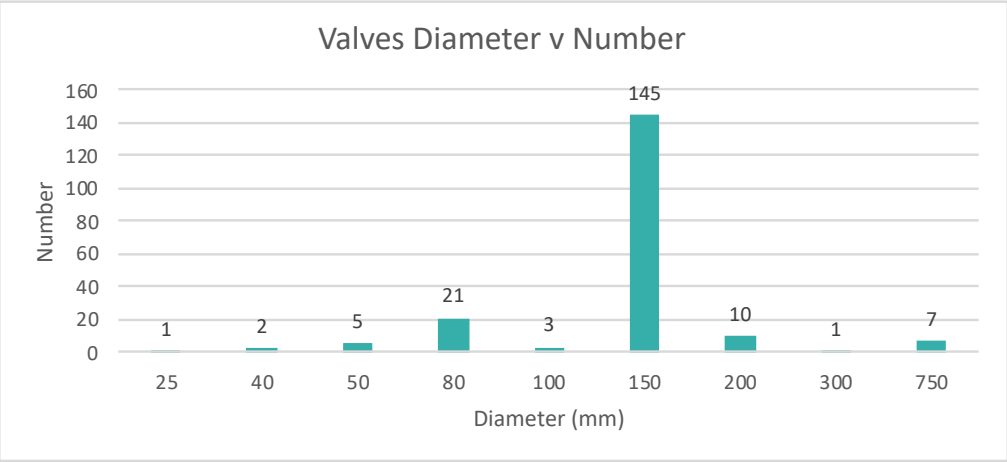
Following the failure of the pipe bridge carrying a water supply trunk main close to NPWTP during Cyclone Gita in early 2018 and the issues identified above, it is proposed to conduct a detailed study of our pipe bridge assets and produce a management plan. The plan will include a risk assessment for 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.**

2.2.8 Valves

Asset Data

There are 199 valves in the waste water reticulation network. The majority are scour and air valves with a few isolation valves. Most isolation valves are installed in rising mains and are normally set in the open position. Figure 26 shows the number of valves by diameter.

Figure 26 Valves diameter v number



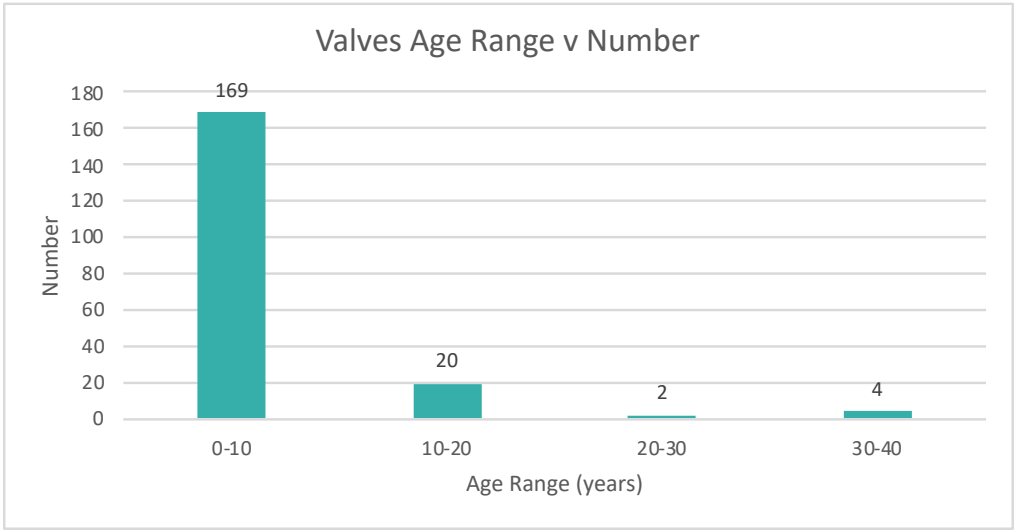
Asset Condition and Remaining Lives

The condition of valves is assessed during scheduled 3, 6 or 12 monthly visual inspection/ maintenance and performance checks. In general, valves are found to be in good condition but may require repairs to stem 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 the valves is shown in Figure 27.

Figure 27 Valve age range v number



The average age of valve assets was 7.95 years as at 30 June 2016. The average age of valve assets at 30 June 2013 was 5 years.

Asset Valuation

Table 10 Valves asset valuation

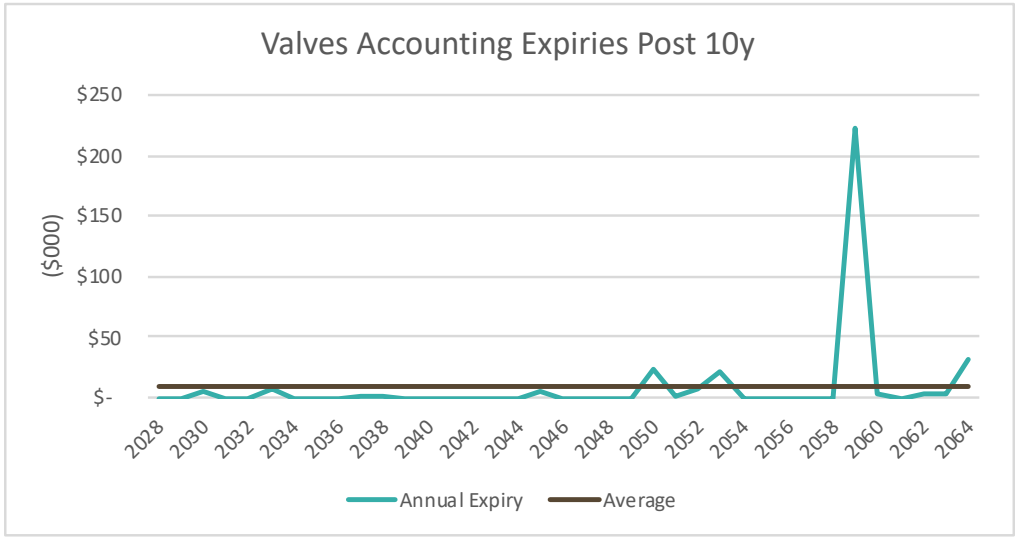
Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
337,876	277,077	6,758

2. LIFECYCLE MANAGEMENT PLAN

Asset Renewal Plans

Our planned renewal of valves is based on them reaching their expected life of 80 years. Because of their age profile, no expenditure is forecast for valve assets in the period 2018 -2028. As shown in Figure 28, we anticipate expenditure after this period will not be required until 2030 and beyond.

Figure 28 Valve accounting expiries post 10Y



2.2.9 Manholes

Asset Data

There are 7,280 manholes in the waste water reticulation network, providing access to the wastewater pipes for inspection, CCTV surveys, and maintenance. They are sometimes used to vent wastewater gases. Manholes can also facilitate vertical and horizontal angles in otherwise straight pipelines.

Manholes are generally installed for the following situations:

- Change in direction of flow
- Change in pipe size or material
- Change in grade
- Intersections of mains
- On straight sections at intervals not exceeding 120 metres
- Pipe terminations
- Pressure wall discharge points

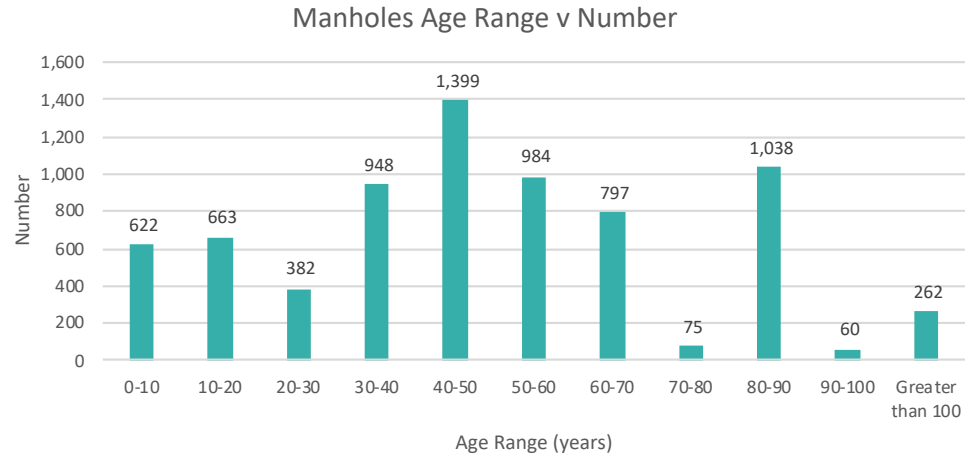
Most wastewater manholes are precast with cast iron covers and frames.

The majority are between 2 to 2.9 metres deep (21%) and 1 to 1.9 metres deep (18%). For a significant proportion of manholes (27%) depths are unknown.

Asset Condition and Remaining Lives

We assess the condition of a sample of trunk main manholes annually, by visual inspection. Manholes are mainly located at the side of roads making their inspection easier. The graph below shows the number of manholes by age.

Figure 29 Manholes age range v number



Asset Valuation

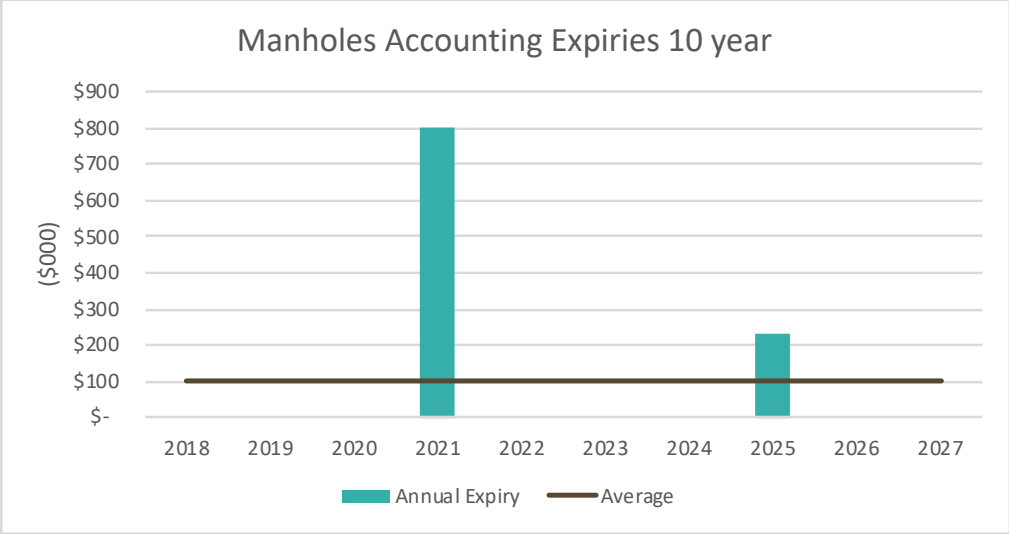
Table 11 Manholes asset valuation

Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
25,362,503	14,072,435	253,628

Asset Renewal Plans

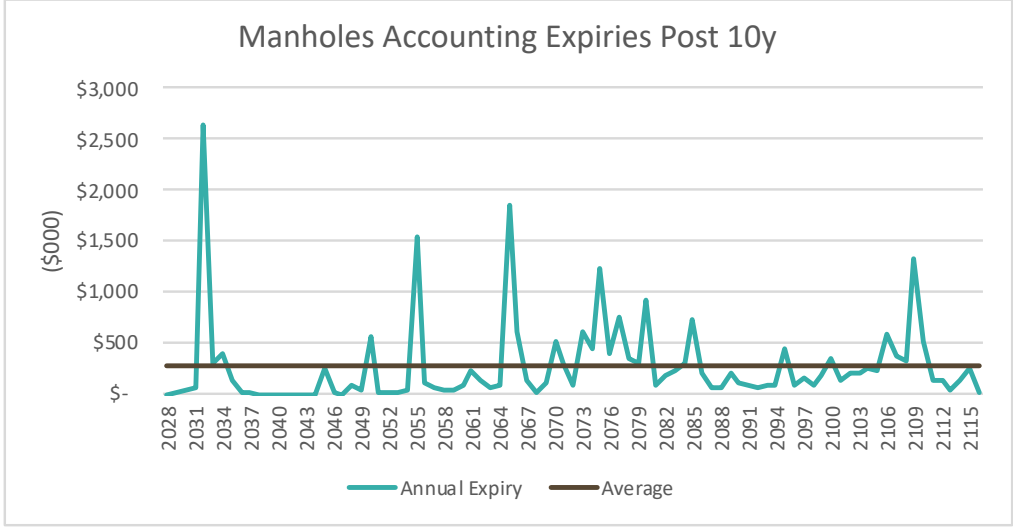
The expenditure profile based on renewing the assets when they reach the end of their expected life of 100 years is shown in Figure 30. This would require a total expenditure of $1.0k over the next ten years at an average of $100k/year.

Figure 30 Manholes accounting expiries 10Y



As shown in Figure 31, to complete the full renewal of manholes a further $24.3m of expenditure is forecasted beyond 2027/28 through to 2116, at an average of $273k per year. Depending on the rate or renewal in the years prior to 2028/29, this may need to be reviewed and modified accordingly.

Figure 31 Manholes accounting expiries post 10Y



An optimised asset renewal profile is included in Section 2.4.

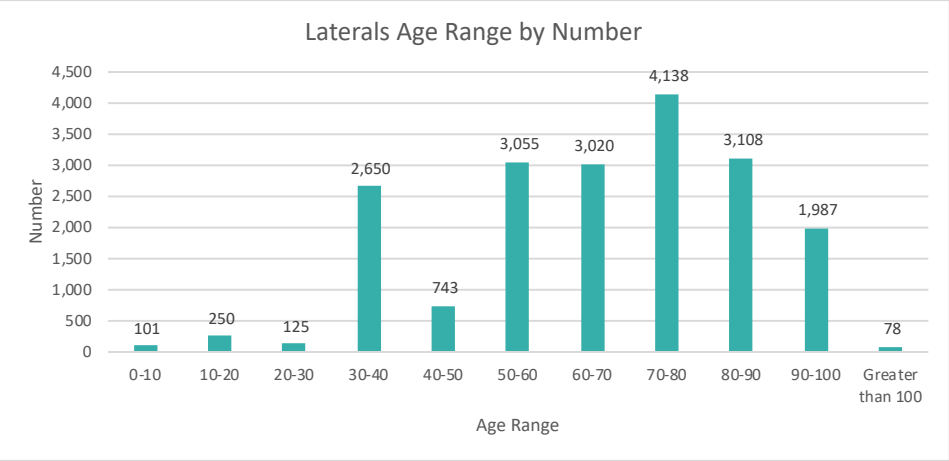
2.2.10 Laterals
Asset Data

Laterals, or service connections, comprise the mains connection and the small diameter pipework that conveys wastewater from customer owned pipework to our wastewater system. There are 25,204 laterals connected to the wastewater reticulation network, having a total length of 190 km.

Laterals range from 20mm to 100mm in diameter and are constructed from a variety of materials. Some laterals larger in diameter service industrial and extraordinary connections. There are smaller diameter laterals for small privately owned pump stations at properties at lower elevations.

Figure 32 shows the length of service connections by age.

Figure 32 Laterals age range v number



Asset Condition and Remaining Life

Service connections are renewed when found to be in a poor state or reported by customers as faulty. Renewals also take place when the CCTV programmes shows an existing service to have problems in the joint to the mains.

Laterals components are made up of materials including polyethylene - UPVC (26%), GEW (73%) and small amounts of AC. The life expectancy of laterals weighted by length is 95 years. At 30 June 2016, 1.7% (3.5 km) of laterals had reached an age of 100 years or greater.

The average age of laterals was 73 years at 30 June 2016. The average age of laterals at 30 June 2013 was 70 years.

Asset Valuation

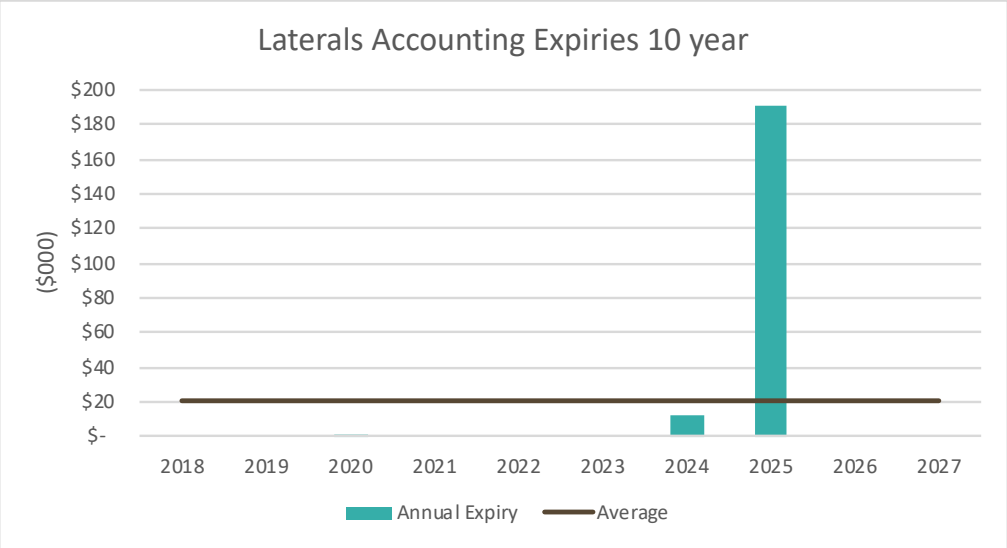
Table 12 Laterals asset valuation

Gross Current Replacement Cost (GCRC) ($)	Optimised Depreciated Replacement Cost ($)	Annual Depreciation ($)
36,562,739	22,056,227	321,832

Asset Renewal Plans

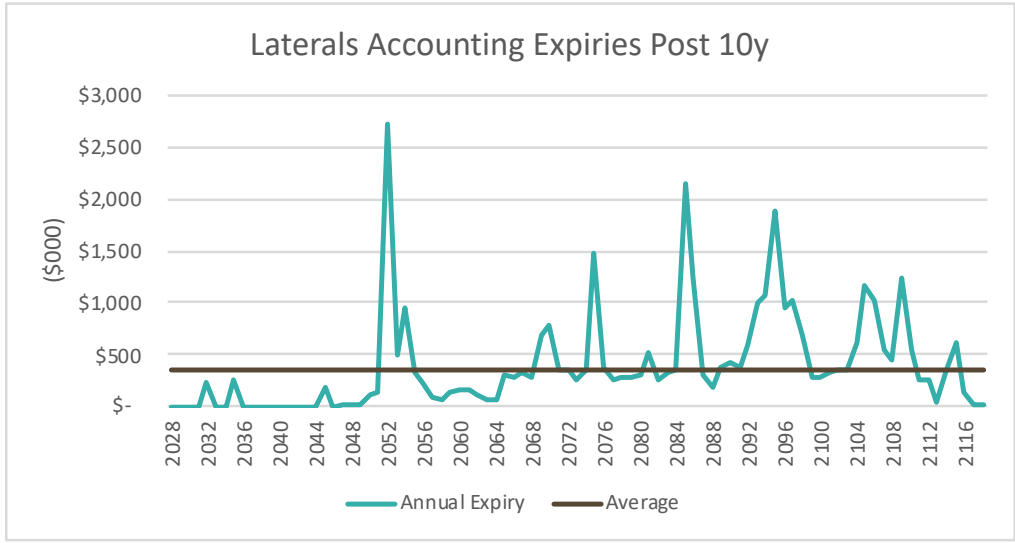
The expenditure profile based on renewing the assets when they reach the end of their expected life is shown in Figure 33. This would require a total expenditure of $200k over the next ten years at an average of $20k/year. We propose that expenditure will correspond with this profile to ensure customer supplies are maintained. This will be reviewed annually to ensure the rate of renewal matches expectations for levels of service and risk.

Figure 33 Laterals accounting expiries 10Y



As shown in Figure 34, to complete the full renewal of the service connection stock a further $36.3m of expenditure is forecast beyond 2027 through to 2118, at an average of $363k per year.

Figure 34 Laterals accounting expiries post 10Y



An optimised asset renewal profile is included in Section 2.4.

2.3 Operations and Maintenance

2.3.1 Operations

Typical wastewater reticulation system operations activities include:

- Response to customer service request e.g. for blockages, pipe repairs.
- Flushing pipes.
- Investigating pipes

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 below.

Table 13 Reticulation maintenance activities

Waste Water Reticulation Maintenance Schedule	
Activity	Frequency
Reticulation Pipes	
Preventative Maintenance	
Trunk Main Inspections	12 monthly (sample based)
Wastewater Main Flushing	1, 2, 3, 6 and 12 monthly
Valves Exercising	3, 6 and 12 months
Manholes Inspections	6 yearly (to be implemented in 2018/19)
Unplanned (Reactive) Maintenance	
Blockages repairs	By Customer service request
Installing new connections	When required
Valve Repairs	When required
Manhole Repairs	When required

Preventative and predictive maintenance schedules are stored against each asset in the Enterprise Asset Management system (Technology 1) and we produce monthly schedules for internal staff and contractors.

To assist with maintenance optimisation and renewal planning, we record and monitor the details and costs of completed maintenance activities.

Corrective (reactive) maintenance activities include the following.

- Rising wastewater mains with pressure problems
- Valves exercise (specific procedure to be follow for some of them)
- Repair of blockages
- CCTV programme in place
- Maintenance/repair activities identified during pipe bridge inspections
- BeforeUdig Locate and mark water pipes.

Detailed locations of the wastewater trunk main maintenance are in ECM_6713454.

2.3.3 Critical Spares

We have identified and procured critical spares for the wastewater reticulation network. The majority of spares are held by contractors and used for day-to-day repairs of the reticulation system.

2.3.4 Opex Forecast

The general 10-year Opex forecast for wastewater assets is included in the Wastewater General Volume. It includes the Opex forecast for the maintenance and operation of reticulation network assets.

2.4 Renewals Plan

Our general approach to asset renewal is included in Section 4.3 of the Asset Management Strategy.

The asset renewal profiles based on accounting expiries for AC, CI and Steel mains shown in sections 2.1 indicate an aggregate renewal profile of $10.0m being required for the period of the AMP (excluding valves, manholes, laterals, part provision for upgrade schemes and resolving infiltration issues).

We have produced an optimised renewal plan based on a combination of historical expenditure requirement profiles and risk based factors such as criticality ratings, failure mode analysis and geographic groupings. This optimised plan will deliver value for money at a tolerable level of risk in an affordable manner. The detailed work programmes showing the individual sections of mains for renewal 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. water supply mains, 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.

The Capex forecast for the renewal of the reticulation network is summarised in Table 14.

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

In addition to the planned renewal programme, we have included project WW1006 in the AMP period. This project aims to renew the wastewater reticulation network at Urenui domain and retain the existing pipework for stormwater disposal. This will reduces inflow and infiltration, reduce pumping costs and minimise the risk of septic tank treatment process failure. It is also planned to include WW1024 to install an interceptor wastewater main along Carey Street diverting several blocks from Richmond Street pump station to the gravity system.

Table 14 Renewals expenditure forecast

Reticulation 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
WW1006 - Urenui Domain wastewater mains renewals	-	-	-	1,612	-	-	-	-	-	-	1,612
WW1024 - Carey Street Wastewater Improvements	-	-	-	-	66	-	-	-	-	-	66
WW1035 - Planned Wastewater Reticulation Network Renewals	1,458	1,499	1,526	1,559	1,593	1,624	1,669	1,709	1,752	1,798	16,187
WW1036 - Emergency Wastewater Reticulation Network Renewals	50	52	158	161	165	168	173	177	181	186	1,471
Total	1,508	1,551	1,684	3,332	1,824	1,792	1,842	1,886	1,933	1,984	19,336

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

Demand generated by growth requires new or upgraded wastewater assets to cater for future additional wastewater from existing properties and from new development areas. The projects identified to meet anticipated growth are summarised below.

- WW2003 – we do not have a Wastewater Master Plan or current hydraulic models of our wastewater network. Therefore, it is not possible to identify the network's capacity to accommodate future growth and where system upgrades are required. As part of this project a Wastewater Master Plan and Wastewater Network Modelling Management Plan will be prepared to embed processes and ensure models are updated in the future as required. This project will provide more certainty for planning and better decision making regarding land zoning to accommodate growth. It will also give us the ability to combine wastewater network upgrades with scheduled renewals to reduce costs.

- WW2006 – As urban areas are extended, opportunities for subdivisions and development are created. In some instances there are no wastewater services in these areas and developers are expected to extend wastewater services across vast distances to dispose of sewage from proposed subdivisions. This can discourage them from proceeding. These funds to extend wastewater services can be utilised on an as and when required basis to encourage development.

- WW2009 – In the past 5 years new subdivisions have been developed adjacent to Fernbrook Drive. These subdivisions dispose of wastewater in the Huatoki Valley wastewater trunk main. Additional phases of the Fernbrook development which have been recently consented, will also be disposing wastewater to this trunk main. Other future subdivisions, i.e. Balance Street, Fernbrook Stage 7, subdivisions between Fernbrook Stage 7 and Atkinson Road, etc. will also dispose wastewater into the Huatoki Valley wastewater trunk main. Our calculations show the Huatoki Valley wastewater trunk main will reach its maximum capacity once the existing and consented subdivisions are fully developed. In order to allow any more development in the Huatoki Valley, the wastewater network needs to be upgraded.

- WW2010 - Wastewater model updating is not currently budgeted but models are assets and essential tools to optimise the capital works programme, particularly service level and growth. This project will follow on from WW2003 to establish a new network model and manage/update it in accordance with a new Waste Water Network Modelling Management Plan.

- WW2019 - Construct Trunk wastewater main and PS and rising main to provide wastewater service to Area N. This main will also provide ability to divert wastewater from Inglewood, Tegel & McKechnie Aluminium Solutions relieving the load and potential overflows at Mangati PS. This project also includes upgrading some existing pipework in Katere Road and communications with Glen Avon PS to ensure Area N stops pumping if there is a fault.

- WW2022 – Upgrade of existing wastewater reticulation network to service the anticipated growth area at Junction Street.

The Capex forecast for growth projects is summarised in the table below.

Table 15 Growth expenditure forecast

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
WW2003 – Wastewater Master Plan Network Modelling	1,514	-	-	-	-	-	-	-	-	-	1,514
WW2006 - Provision of Wastewater Services For Subdivisions In Un-Serviced	50	52	53	54	55	56	58	59	60	62	559
WW2009 - Upgrading of Huatoki Valley Wastewater Main	-	206	-	-	-	-	-	-	-	-	206
WW2010 - Wastewater Model Build and Maintain (Renew)	-	26	26	27	27	28	29	29	30	31	253
WW2019 - Eastern Wastewater Network Realignment	-	-	-	8,599	-	-	-	-	-	-	8,599
WW2022 - Junction Growth Area Wastewater Upgrade Thames	-	-	-	-	275	-	-	-	-	-	275
Total	1,564	284	79	8,680	357	84	87	88	90	93	11,406

Levels of Service

No specific level of service projects are planned during the period of the AMP. However, general expenditure on network resilience to maintain and improve levels of service is planned as described in section 3.3 and in section 6.3 of the General Wastewater volume.

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 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 of wastewater reticulation mains using the process and scoring system contained in ECM#988741 - Water, Wastewater and Stormwater Mains Criticality and Renewals Prioritisation Process. Primarily used to select mains for renewal purposes, critically ratings 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

Asset criticality ratings are recorded 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 the development of the Wastewater Master Plan we will consider the criticality and resilience of the system, taking into account the plans to construct new assets to meet growth projections and maintain levels of service. When our condition and criticality assessments have been completed we will undertake further resilience planning to identify any potential improvements.

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

4. FINANCIAL SUMMARY

The Capex forecast for the reticulation network is shown in Table 16.

Table 16 Capex forecast summary

Reticulation 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
Renewals	1,508	1,551	1,684	3,332	1,824	1,792	1,842	1,886	1,933	1,984	19,336
Service Level	-	-	-	-	-	-	-	-	-	-	-
Growth	1,564	284	79	8,680	357	84	87	88	90	93	11,406
Total	3,072	1,835	1,763	12,012	2,181	1,876	1,929	1,974	2,023	2,077	30,742

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

5. IMPROVEMENT AND MONITORING PLAN

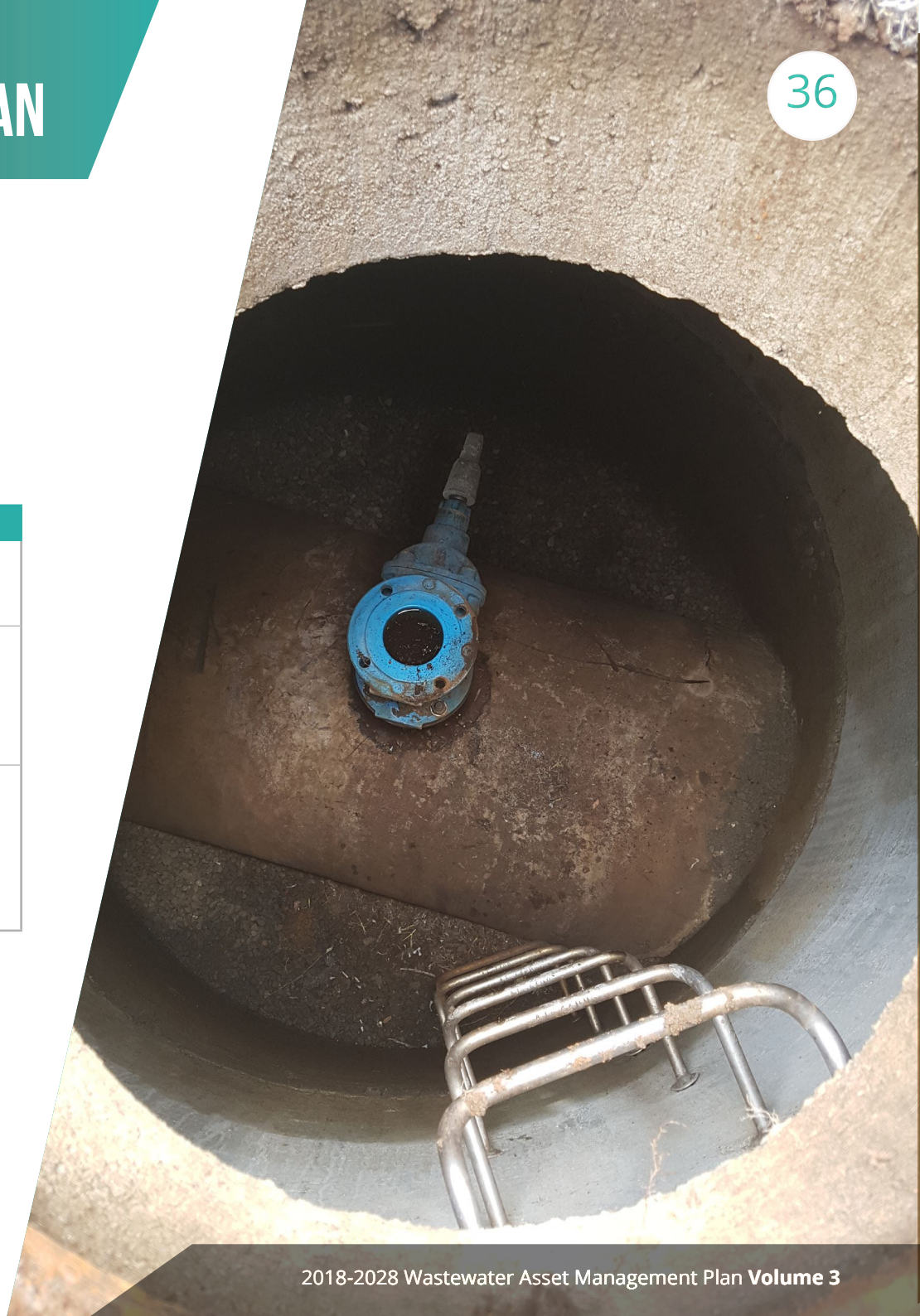
Our general Asset Management Maturity Improvement Plan is included in the Asset Management Strategy.

General improvements to Wastewater assets are included in the Wastewater General Volume.

The specific areas of improvement identified for treatment plant assets are listed in Table 17.

Table 17 Improvements summary

No	Improvement Area	Owner	Start Date	End Date
1	Assess asset condition 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 for the structures constructed to specifically support pipes and owned/maintained by W&W team.	Asset Operations Planning Lead	Jul-18	Jun-19
3	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 WASTEWATER ASSET MANAGEMENT PLAN

He Rautaki Whakahaere Rawa mō Te Wai Paranga

RETICULATION NETWORK

TE TŪHONONGA KŌRERE WAI

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