Three Waters Renewals Funding Report

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

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Introduction and Executive Summary

The New Plymouth District Council has a strong pedigree when it comes to leading three waters practice in New Zealand including:

- The New Plymouth Wastewater Treatment Plant built in 1984 was the first of its kind in New Zealand
- NPDC led the developed the first Trade Waste Bylaw which became the model for other New Zealand local authorities
- NPDC is the only local authority in New Zealand that uses a Thermal Drying Facility (TDF) to produce a commercially successful fertilizer called BioBoost™. All other TDFs send their dried biosolids (sludge) to landfill.

In this regard, New Plymouth District can be considered to have developed some of the best infrastructure in the country. However, as this report goes on to outline, the substantiative issue of today is that this infrastructure has not been properly maintained over the last decade due to material reductions in operating and capital renewals budgets.

The years since the Global Financial Crisis, starting in 2007, were a period defined by economic turmoil, fiscal constraint and financial austerity by national governments the world over. In response to this, and the impacts on its Perpetual Investment Fund, NPDC made significant cuts to its levels of service in order to reduce operating costs. Indeed, the 2015 Long Term Plan speaks of how annual operational expenditure had been reduced by almost $9m over the preceding 5 years and how the plan would reduce the rates requirement by a further $79m over the coming 7 years.

Looking at the budgeting history for the last 20 years, it is apparent that the three waters annual operating budgets have been cut in real terms, with a reduction of $13.68million due to not keeping pace with the increasing size of the networks and inflation. This represents a considerable reduction in buying power that will have only been possible by reducing levels of service

Furthermore, Three Waters renewals budgets have been cut by approximately 65% compared to the 2012 levels of funding. These reductions were not applied evenly across the three waters and some were reduced more than others. Storm water in particular was particularly hard hit with a 97% reduction since 2012.

Funding reductions to “sweat” assets is possible over a short term period, so long as there is a relatively quick reinstatement of funding. Over the longer term, this sort of asset management strategy is unsustainable and tantamount to a controlled collapse, with the increasing risk of major asset failure compounding year on year.

Due to this sustained period of underfunding, it is estimated that there is now a backlog of approximately $126 million of assets that have reached the end of their operating lives. Current renewals budgets average $7.1 million per year which is less than half the current depreciation expense for these assets.

In order to address the backlog of deferred renewals and appropriately fund the ongoing forecast renewals requirements, budgets will need to increase to somewhere between $19.7 million and $31.1 million per year for the next 10 years. Where in this range the council chooses to fund its renewals programme will depend on its appetite for the risk of asset failure.

The rates that NPDC charges for Three Waters services are relatively low; indeed, all three water services added together total less than the typical cost of a household broadband internet service. Three waters rates currently account for 0.98% of the average household income in Taranaki. This is strongly favourable compared to international benchmarks that state that affordability risks start to emerge when households spend more than 3% of their income on water utilities. These benchmarks are used by the United Nations and other international jurisdictions, such as OFWAT, the economic water regulator in the United Kingdom, suggesting that there is some headroom to increase NPDC’s three waters rates.

When considering future funding requirements, the issue of affordability needs to be debated alongside our community’s priorities. This will be all the more important in a post-COVID19 world. If our community’s household income is under pressure then, as a society, do our priorities sit with high speed broadband so we can enjoy luxuries such as Netflix or do they sit with maintaining our three waters infrastructure so that drinking water stays clean and safe, wastewater doesn’t overflow into our rivers and stormwater doesn’t flood people’s homes.

Section 1: Background

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

Photo: King Street Sewer Pipe Deterioration

1.1 General Background

The New Plymouth District Council owns and operates Drinking Water, Wastewater and Storm Water systems that have a gross replacement value of approximately $1.36 billion. Collectively these three infrastructure systems are referred to as the "Three Waters". Table 1 summarises the value of each of the three waters systems and their impact on the Council's annual depreciation expense.

Infrastructure Class	Asset Type	Replacement Cost	Annual Depreciation
Drinking Water	Reticulation Network	$260,046,340	$3,145,577
Drinking Water	Plant & Equipment	$74,970,454	$1,412,494
Wastewater	Reticulation Network	$512,767,408	$5,483,525
Wastewater	Plant & Equipment	$137,244,038	$2,834,284
Storm water	Reticulation Network	$350,143,519	$3,697,061
Storm water	Plant & Equipment	$1,444,196	$34,951
Flood Protection	Detention Dams & Diversion Tunnels	$21,324,393	$53,735
	Total:	**$1,357,940,348**	**$16,661,627**

Table 1 – 2019 Infrastructure Asset Valuation

Since 2016, the council's infrastructure management team has undertaken a number of activities aimed at establishing an overview of the District's Three Waters infrastructure. These activities include:

- Data gathering exercises
- Asset inspections
- Asset failure investigations
- Population growth and future demand forecasting
- Engaging with key sectors of our community and important stakeholders on three waters issues
- Exploring asset performance issues and developing an understanding of where our infrastructure fails to meet the councils stated levels of service

This work has also assessed the maturity of NPDC's asset management practices against the International Standard for Asset Management (ISO55000) which has been used by the management team to systematically drive a continuous improvement programme.

The output of this work is vast and contained in a myriad of reports and other documents. Through this collective work council officers have highlighted many issues that will need to be addressed if our three waters infrastructure is to live up to the expectations our community has.

Summarising the full depth and range of this work a single report would result in an unwieldly, impenetrable document. As such, this report focuses on the key issue of the increase in funding that will be necessary in order keep the district's three waters services fit for purpose. This includes funding the ongoing maintenance activities as well as replacing the assets that have worn out and reached the end of their operating lives.

The reason for highlighting this issue in isolation is due to the significant financial implications it has for our community that set it apart from any other individual issue that has been discovered through this work.

1.2 Key Conclusions

The conclusions of this report are summarised as follows:

1. Three Waters operating budgets have not kept pace with the increasing size of the networks and inflation. As such, they have been reduced in real terms by approximately $13.68 million per year.

2. Three Waters renewals budgets were reduced, starting in the year 2012, with the current renewals funding approximately 65% lower than pre 2012 funding levels.

3. Renewals budget cuts were not applied evenly across each of the three waters, with Storm Water budgets being cut by 97% compared to 2012 funding levels.

4. Material improvements have been made to NPDC's asset management capability since 2016; however further improvement

is required. In order to realise these improvements, further investment will be required; particularly regarding asset inspection, condition rating and scheduled preventative maintenance.

5. Three waters renewals budgets currently total $71 million over the 10 years of the 2018-28 Long Term Plan. Based on the latest renewals forecasting, this funding will need to be increased to somewhere within the range of $197 million and $311 million over the next 10 years.

1.3 The National Context and Changing Expectations

New Zealand local authorities own three waters infrastructure assets with a combined replacement cost of $51.4 billion. Across the country, this core infrastructure is facing pressure. This includes challenges relating to funding the replacement of aging infrastructure and accommodating population growth.

Furthermore, there a number of drivers that are progressively increasing the performance expectations placed on Three Waters service providers and their infrastructure. For example LGNZ estimates that up to $14.1 billion of council owned infrastructure is at risk of sea level rise over the next 100 years. The effects of climate change will continue to move the goal posts on three waters infrastructure over the coming decades as drinking water supplies need to be adapted to cope with more frequent droughts and more intense rain storms erode storm water levels of protection.

Other drivers of increasing expectations are regulatory in nature. In 2016 the Havelock North drinking water contamination event resulted in approximately 5,500 people becoming ill and up to 4 people dying as a result of drinking water from a “secure” bore that had become contaminated by Camplyobacteriosis from sheep faeces.

A central government Inquiry into the events at Havelock North highlighted a number of systemic issues within the Drinking Water sector. In particular, the weak regulatory regime was criticized along with the fact that compliance rates with New Zealand Drinking Water Standards (NZDWS), which have been mandatory under the Health Act since 2012 remained low with only about 80% of the population of New Zealand drinking water that was demonstrably safe.

Following the findings of the Inquiry, the Department of Internal Affairs (DIA) commenced a review of the three waters sector. Through this work new legislation, Taumata Arowai – the Water Services Regulator Bill is progressing through Parliament. Furthermore, technical reviews have placed the cost estimate of achieving national compliance with the current NZDWS at between $309 and $574 million for capital improvements and would also result in an additional $11 to $21 million of annual operating costs.

It is expected that the new regulator will continue to drive further changes to NZDWS and that further regulatory change associated with the Resource Management Act and the National fresh water reforms will increasingly impact the three waters sector.

Kiwi’s aspiration to live up to our international image of “clean & green” are also bringing new funding pressures to the three waters sector. Estimates by the DIA’s Three Waters Review place the national cost of meeting the National Policy Statement for Freshwater (at B grade) in the range of $1.4 to $2.1 billion of capital improvements and $60 to $90 million of additional annual operating costs.

The DIA’s work to date on wastewater has only considered the wastewater treatment plants that discharge to freshwater. Further work is commencing to establish an understanding of the facilities what discharge to land and oceanic environments as well as investigating the feasibility of developing a national containment standard for wastewater pump stations.

In the area of storm water management, new community expectations have emerged regarding the need to pre-treat storm water which were not present when much of the country’s current infrastructure was first built. Before it is discharged into water courses contaminants that, for example, may have been picked up from road surfaces need to be removed. However, how this is to be achieved, and more importantly, paid for has not yet been fully understood by either the community nor Three Waters service providers.

Storm water management at a national level does not have a complete understanding of the flood risks and the approach of many councils remains reactive, as highlighted by the Auditor General’s December 2018 report into the management of stormwater systems by District Councils. This conclusion appears to be well justified when considering the national annual

damage assessment. From 2013 the mean annual insured losses due to extreme weather and flooding is $145 million per year according to the insurance council NZ.

Within this national context, it is clear that there is mounting pressure for change and that this change is likely to materially increase the cost of owning and operating three waters infrastructure on behalf of our communities.

1.4 The Local Context

The New Plymouth District Council has a strong pedigree when it comes to leading three waters practice in New Zealand. For example:

- The New Plymouth Wastewater Treatment Plant was the first of its kind in New Zealand
- NPDC developed the first Trade Waste Bylaw in the New Zealand which became the model for other local authorities
- NPDC is the only local authority in New Zealand that uses a Thermal Drying Facility (TDF) to produce a commercially successful fertilizer called BioBoost™. All other TDFs send their dried biosolids (sludge) to landfill.

In this regard, New Plymouth District can be considered to have developed some of the best infrastructure in New Zealand. As this report goes on to outline, the substantiative issue is that this infrastructure has not been properly maintained over the last decade due to material reductions in operating and capital renewals budgets.

Photo: Collapsed Storm Water Culvert at Waiwaka Terrace

Section 2: The Value of Water Services

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

Photo: Leaking Pumping equipment at NP Wastewater Treatment Plant

2.1 The Value of Water and Affordability Benchmarking

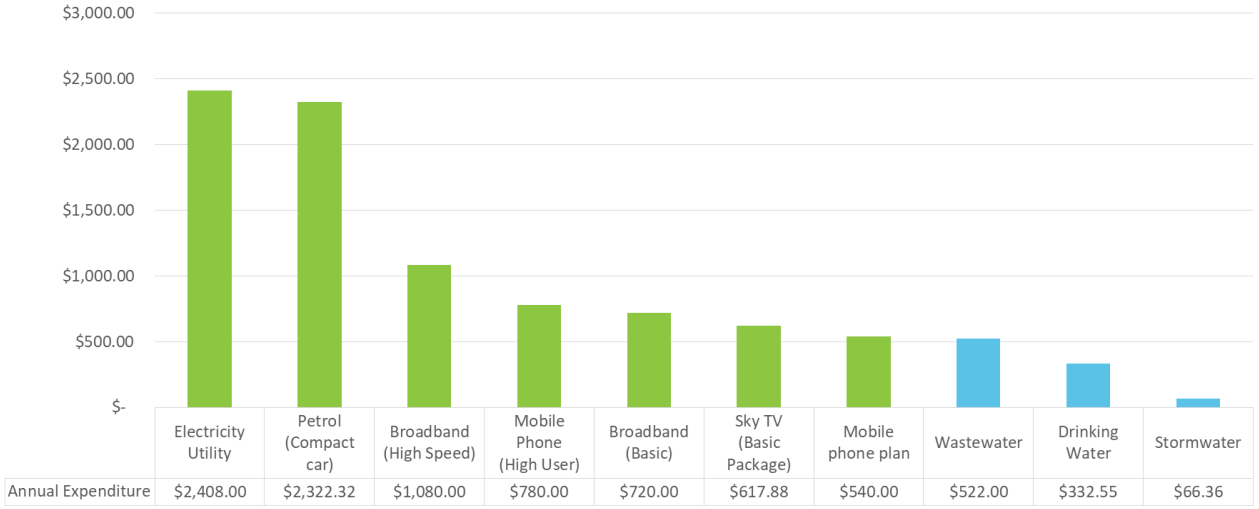
Despite water being acknowledged as Taonga and a natural resource that is essential for sustaining life and the economy, New Plymouth District's water consumption remains stubbornly high. Average residential usage per capita is still more than double that of most European nations. This is likely a symptom of the fact that NPDC does not currently operate a volumetric user pays tariff model. Instead Council charges annual targeted rates that allow unrestricted consumption for a fixed price. As a result, the connection between consumption and cost remains weak with our customers.

Figure 1 provides a comparison of typical household costs including the rates NPDC charges for its three waters services. As can be seen, three waters rates are relatively low; indeed, all three water services added together total less than the typical cost of broadband internet. When considering future funding requirements, the issue of affordability needs to be debated alongside our community's priorities. If our community's household income is under pressure then, as a society, do our priorities sit with high speed broadband so we can enjoy luxuries such as Netflix or do they sit with maintaining our three waters infrastructure so that drinking water stays clean and safe, wastewater doesn't overflow into our rivers and stormwater doesn't flood people's homes.

A study by OFWAT (the economic regulator of the water sector in England and Wales) reports that Three Waters affordability risk emerge when a household spends more that 3% of their income on water utility bills. This is a benchmark that is mirrored by the United Nations Development Programme.

Average household income in Taranaki in 2018 was $93,400 (latest data available from MBIE household income survey). Three waters rates account for 0.98% of the average household income. On this basis it can be argued that the current rates NPDC charges for its three waters services can be considered as affordable for our community and that there is sufficient headroom to increase these charges in order to undertake the necessary maintenance and renewals work that is going to be required over the next 10 years.

It is acknowledged that many households within the district will have incomes less than the average. Reliable data on the distribution of household incomes is not yet available from the 2018 census. However, a household earning a single full time minimum wage of $18.90/hr would not exceed the 3% affordability benchmark.



	Electricity Utility	Petrol (Compact car)	Broadband (High Speed)	Mobile Phone (High User)	Broadband (Basic)	Sky TV (Basic Package)	Mobile phone plan	Wastewater	Drinking Water	Stormwater
Annual Expenditure	$2,408.00	$2,322.32	$1,080.00	$780.00	$720.00	$617.88	$540.00	$522.00	$332.55	$66.36

Figure 1 Comparison of Three Waters Rates with other Typical Household Costs

Section 3: Budget History & Cost Cutting

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

Photo: Heavily corroded pipes in the filtration gallery at NP Water Treatment Plant

3.1 Historic Budgeting Decisions

The last decade has been a period of economic turmoil starting in 2007 with the Global Financial Crisis (GFC). The global response to the GFC was a period of fiscal constraint and financial austerity by national governments the world over, including New Zealand.

NPDC also experienced the after effects of the GFC and it is important to maintain perspective regarding the austerity measures the council evoked and keep the context of the day in mind.

One of the clearest indicators of the financial pressures New Plymouth District Council experienced during this period is the funds released from the Perpetual Investment Fund (PIF). Figure 2 illustrates how the value of the PIF reduced by approximately $124m as investment returns dropped and funds were released over successive years from 2008 to 2014. It is clear that this level of reliance on the PIF to offset council rates could not be sustained in the long term.

In order to halt the depletion of the PIF, significant cuts to the council's levels of service were required in order to reduce operating costs. Indeed, the 2015 Long Term Plan speaks of how annual operational expenditure had been reduced by almost $9m over the preceding 5 years and how the plan would reduce the rates requirement by a further $79m over the coming 7 years.

Without these reductions in expenditure the community of New Plymouth District would undoubtedly had faced large increases to their rates bill.

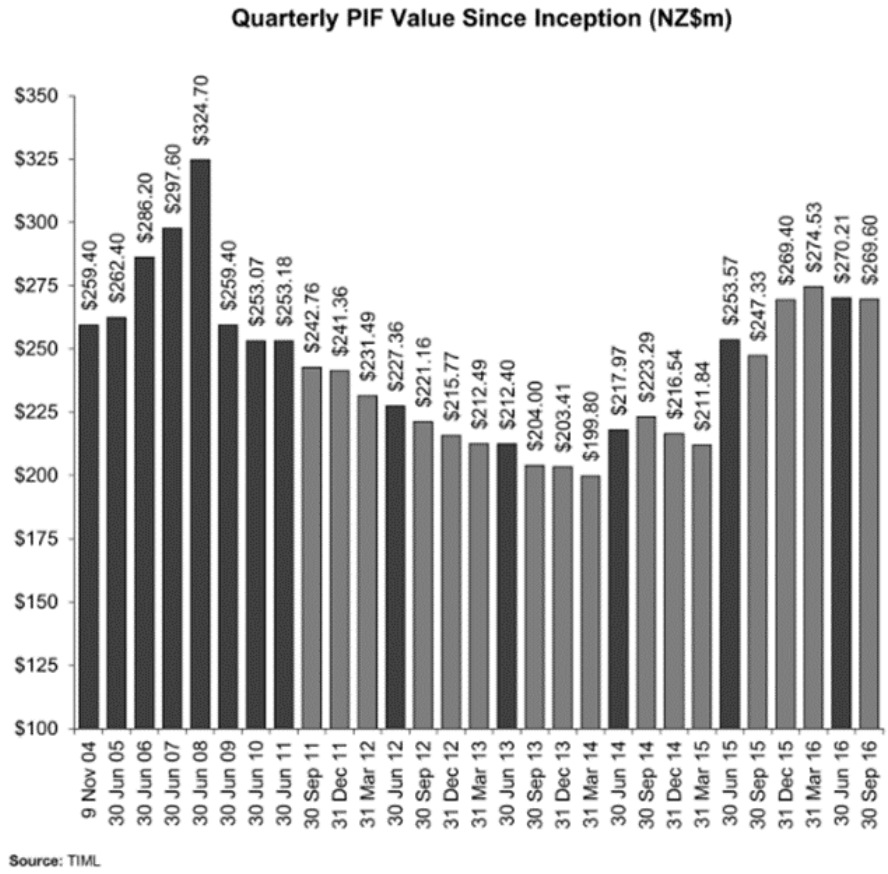


Figure 2 – Quarterly PIF Values **(Data Quality Grade: Highly Reliable)**

3.2 Operational Budget History

In order to understand the adequacy of the current operation and maintenance budgets it is necessary to look back at the history of the council's three waters networks.

Figure 3 show the Three Waters annual operating budget for the year 2000 adjusted over time to account for the effect of growth in the size of the three waters networks and inflation. It also shows the actual annual operating budgets as approved in each of NPDC's Long Term Plans and Annual Plans.

As of the 2019/20 financial year, the three waters operating budgets are $13.68m/yr. lower than the 2000 budget adjusted for growth and inflation. This represents a considerable reduction in buying power that will have only been possible by reducing levels of service.

Whilst the actual budgets appear to have always lag behind, they track reasonably close to the line of growth and inflation until about the 2008 when the effects of the global financial crisis start to be felt. After which, there is a progressive divergence as actual operating budgets drop further and further behind the effects of inflation and growth in the size of the network. It is not until the 2018 Long Term Plan, when the additional $44 million of Three Waters investment commenced that the gap started to narrow.

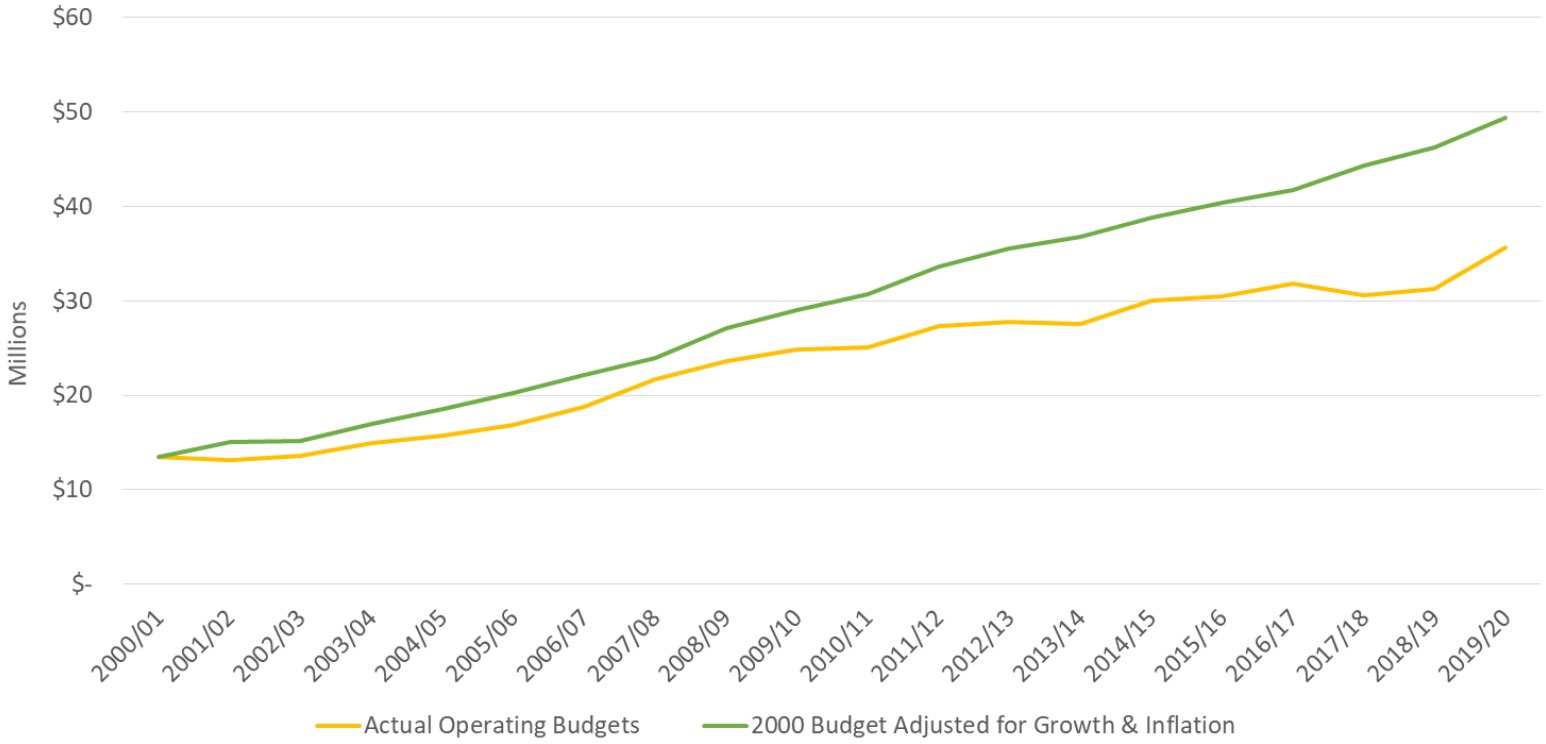


Figure 3 – Effect of Inflation and Growth on Operating Budgets

Since the year 2000 the combined length of the three waters network has increased by about 90% from 829km to 1573km. This reflects the rapid expansion of the three water networks as service provision was expanded to some of the smaller townships within the district.

Most of the cost components, such as maintenance and depreciation expense, that make up the operational budgets are directly proportional to the size of the network. In addition, because the growth in the size of the network was largely debt funded the budgeted annual debt repayments, which are also a component of the operational budgets, have increased by 94% from $2.41m per year to $4.68m.

As such, it is not unreasonable to expect operating budgets to scale up proportionally to the size of the network. This would mean that an average budget increase of 4.72% per year for the 20 years since the year 2000 would have been required just to keep up with the growing network size.

Furthermore, the Producers Prices Index for civil construction works (PPI.SQUEE1200) is a measure of inflation specific to the construction industry. The PPI index provides a more relevant index for infrastructure spending than the Consumer Prices Index (CPI) as it specifically tracks changes in costs of construction materials and construction labour costs rather than household items. This is an important distinction as the general rate paying community often only associate CPI as the measure of inflation.

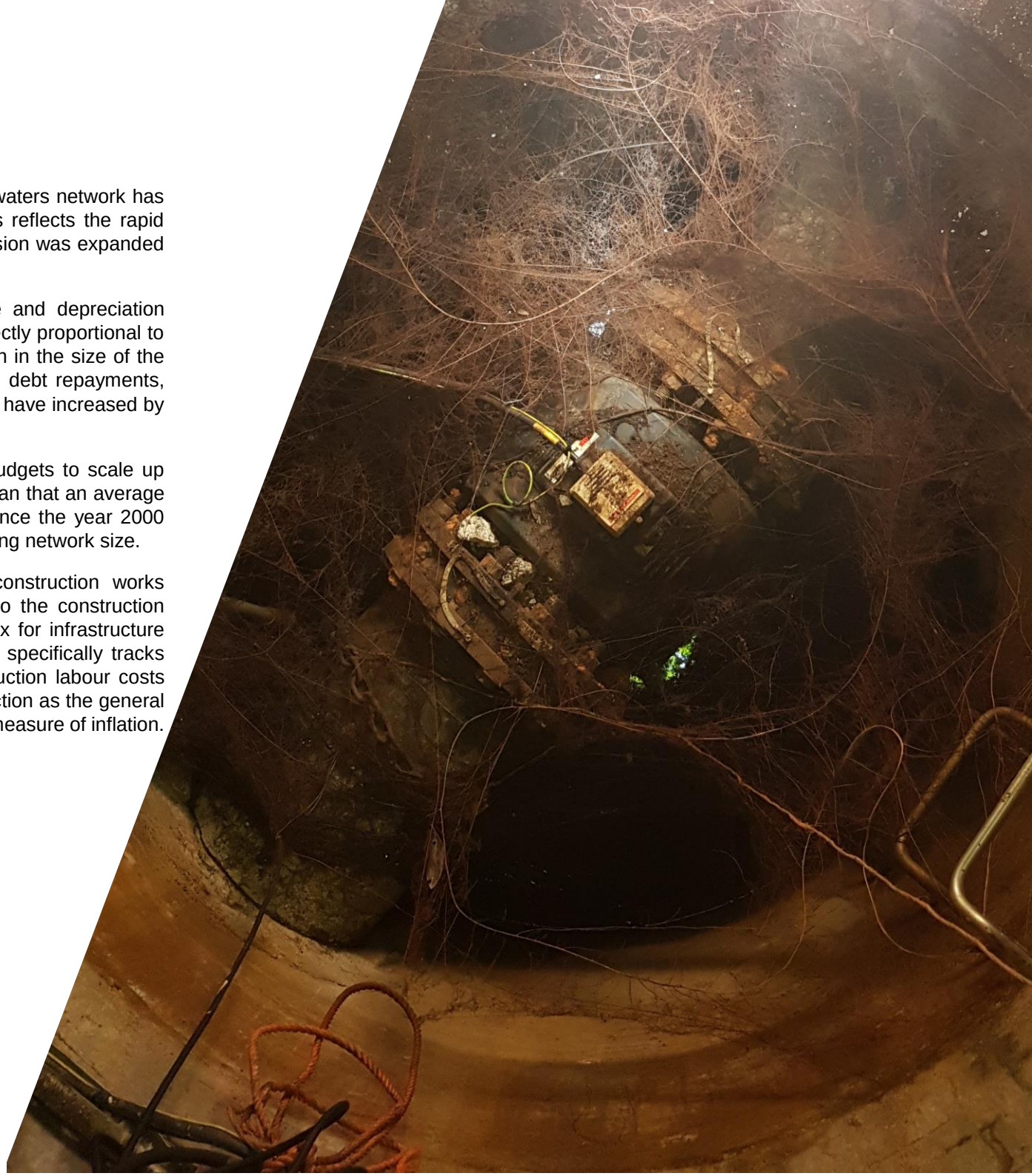


Photo: Tree Root Intrusion in a valve chamber at the Waitara Industrial Water Supply Inlet Works

3.3 Asset Valuation History

The value of NPDC's three waters infrastructure, is measured as the cost to rebuild it, excluding the cost of any land. This is referred to as the Gross Current Replacement Cost (GCRC), and it is important for two main reasons:

1. The GCRC is used to determine the appropriate annual depreciation expense.
2. The GCRC is used to forecast future budgets required to replace old and worn out infrastructure.

By using the same growth and inflationary effects outlined in the previous section of this report it is possible to measure how the asset valuation has tracked over time. Figure 4 shows that the asset valuation has experienced relatively long plateaus despite the growth in the size of the network and PPI escalation increasing the unit costs of replacing assets. It should be noted that during the 2016 and 2019 asset revaluations the valuation methodology was updated and a thorough bottom-up cost estimation of the value of NPDCs infrastructure assets was undertaken. In addition, the supporting unit cost rates were updated so that they reflected current market rates from competitively tendered construction contracts.

As a result in this change, there were substantial increases to GCRC and the associated annual depreciation expense. The current asset valuation now closely aligns with the 2000/01 inflation adjusted valuation. Whilst this in of itself doesn't prove the GCRG is now accurate, it is a correlating reference that provides confidence.

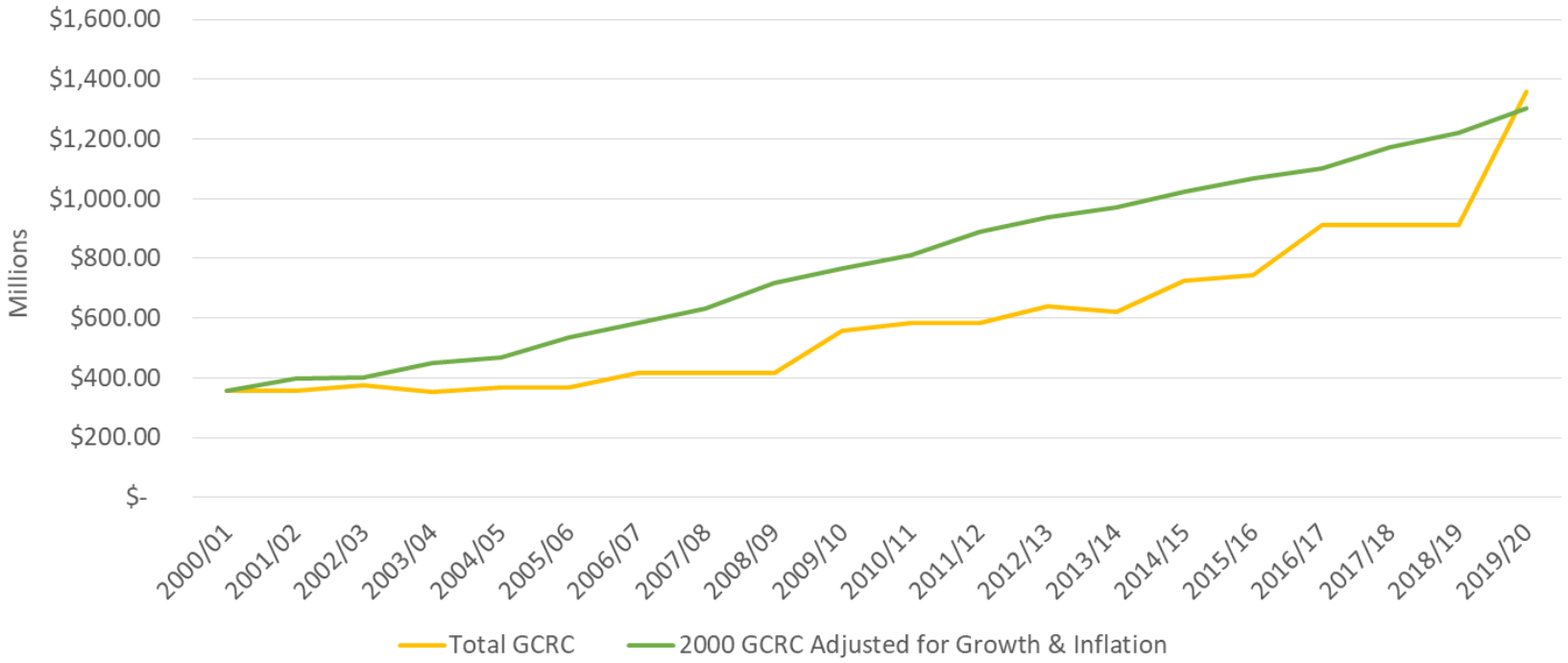


Figure 4 – Three Waters infrastructure GCRC compared to 2000/01 valuation adjusted for inflation and Growth over time.

3.4 Renewals Budget History

The capital budgets for the replacement of aging and worn out three waters assets appear to have been particularly affected by the council's response to the Global Financial Crisis. Figure 5 shows how, up until the 2011/12 financial year the levels of renewal funding tracked reasonably closely to the line of growth and inflation. Had budgets continued on a similar trajectory then the renewals budgets for 2019 would have been approximately $16.45 million which correlates very closely with the 2019 annual depreciation expense rate of $16.6m.

However, in the years following 2012 the total renewals funding for three waters was cut by 65%. From the 2015/16 financial year the levels or renewals funding partially recovered. This recovery was, in part, due to the large Wai Tātari project to upgrade and increase the capacity of the wastewater treatment plant that required the replacement of the inlet works and mechanical dewatering equipment as well as the additional renewals funding included in the 2018 Long Term Plan in response to ex-cyclone Gita.

It should be noted that the budget reductions were not equally applied across each of the three waters; for example, the storm water budgets were actually reduced by 97% from 2012. At current funding levels, individual storm water assets would need to last on average 1,695 years before they could be replaced. Whilst it may be possible to "sweat" assets over a short period of time in response to a crisis, in the long term such a low level of funding is clearly unsustainable.

Figure 5 also shows how a backlog in excess of $60m of deferred renewals will have rapidly accumulated after the 2012 budget reductions. It should be noted that this is based on the assumption that the 2000/01 renewals budgets were appropriate. It is important to note that over the last 20 years actual expenditure of renewals budgets has been variable and has typically been significantly below the budgeted amount. In fact, in some years as little as 55% of what was budgeted for asset renewals was actually delivered. As a result, the actual accumulated backlog is likely to be materially higher still that shown in Figure 5.

Photo: Corroded pipe joint bolts at the Okato Water Treatment Plant

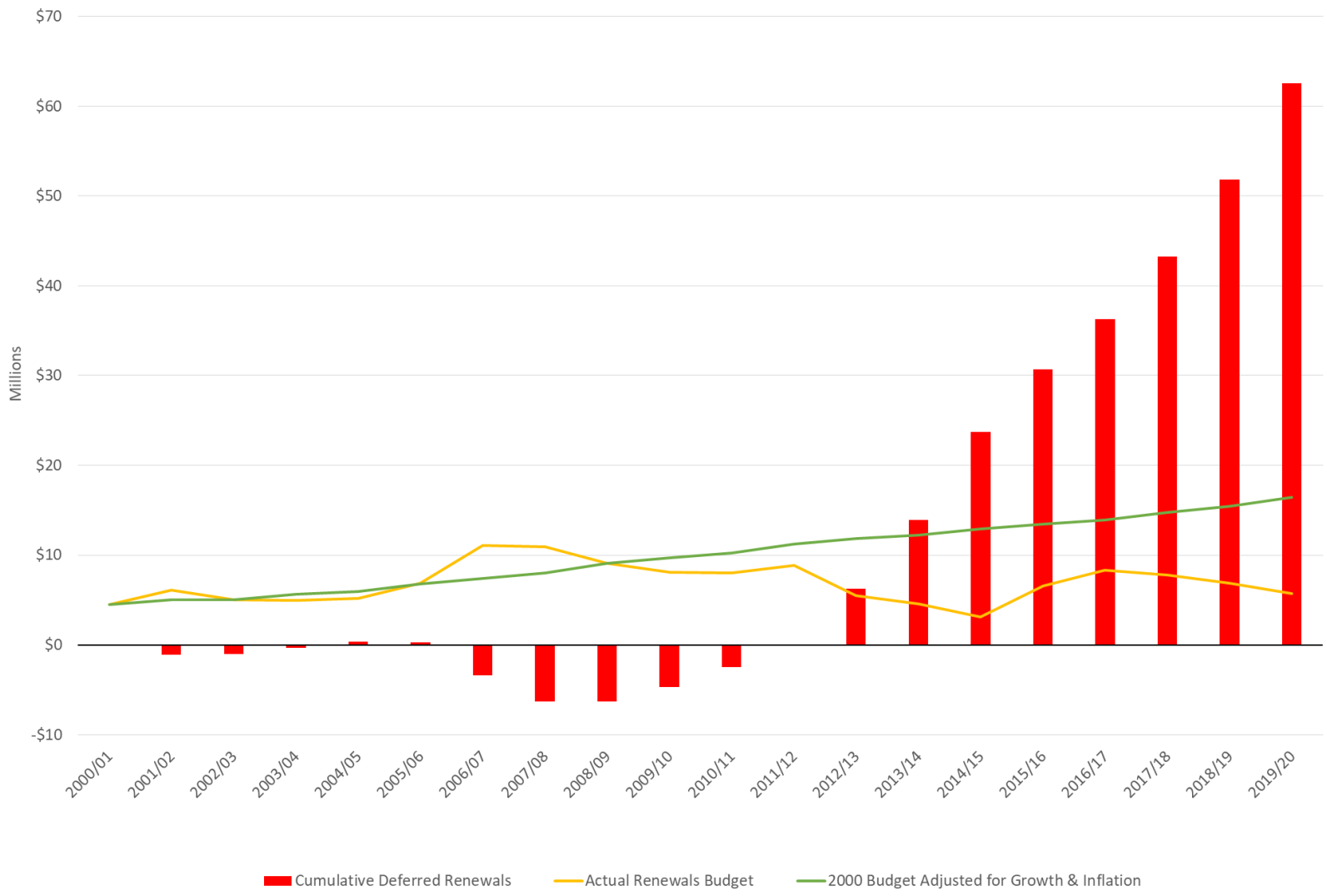


Figure 5 – Capital Budgets compared to the 2000 budget adjusted for growth and inflation as well as the cumulative value of deferred renewals.

Section 4: Asset Management Strategy

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

Photo: Asbestos Cement Drinking Water main Pipe burst, Waitara

4.1 Asset Management Framework

Given NPDC owns three waters infrastructure worth more than $1.4billion and invests tens of millions of dollars each year to maintain and replace aging assets, it is prudent to follow international good practice in the discipline of asset management. As such, the infrastructure management team has set an ambitious goal of implementing an asset management framework that complies with the requirements of the ISO 55001 international standard for Asset Management.

In early 2016, at the commencement of developing the asset management framework and supporting policies, strategies and plans, a capability assessment was undertaken against the requirements of the ISO 55001 standard. This assessment used a maturity level scale of 0 to 4 as summarised in figure 6

Figure 6 Asset Management Maturity Rating Scale

This initial capability assessment indicated a very low level of organisational maturity with significant gaps across the board, such as:

- No organisational asset management policy in place
- No asset management competency framework
- The asset management software being used was out of date and had not been supported by the vendor for several years
- An inconsistent use of business cases to support asset management and investment decision making
- An absence of data standards, effective quality controls that has resulted in poor quality and incomplete asset inventories
- A loss of institutional knowledge and intellectual property due to inappropriate outsourcing strategies
- An absence of any formal processes for the investigation of asset failures
- No routine internal auditing or management reviews of the asset management system

This gap analysis was used to initiate a continuous improvement programme, with the capability assessments being repeated annually in order to track progress and drive further improvement. Figure 7 provides a comparison between the 2016 initial capability assessment and the latest January 2020 assessment. As can be seen, material progress has been made; however, further improvement is still required in order to achieve core competence across the full breadth of the ISO Standard.

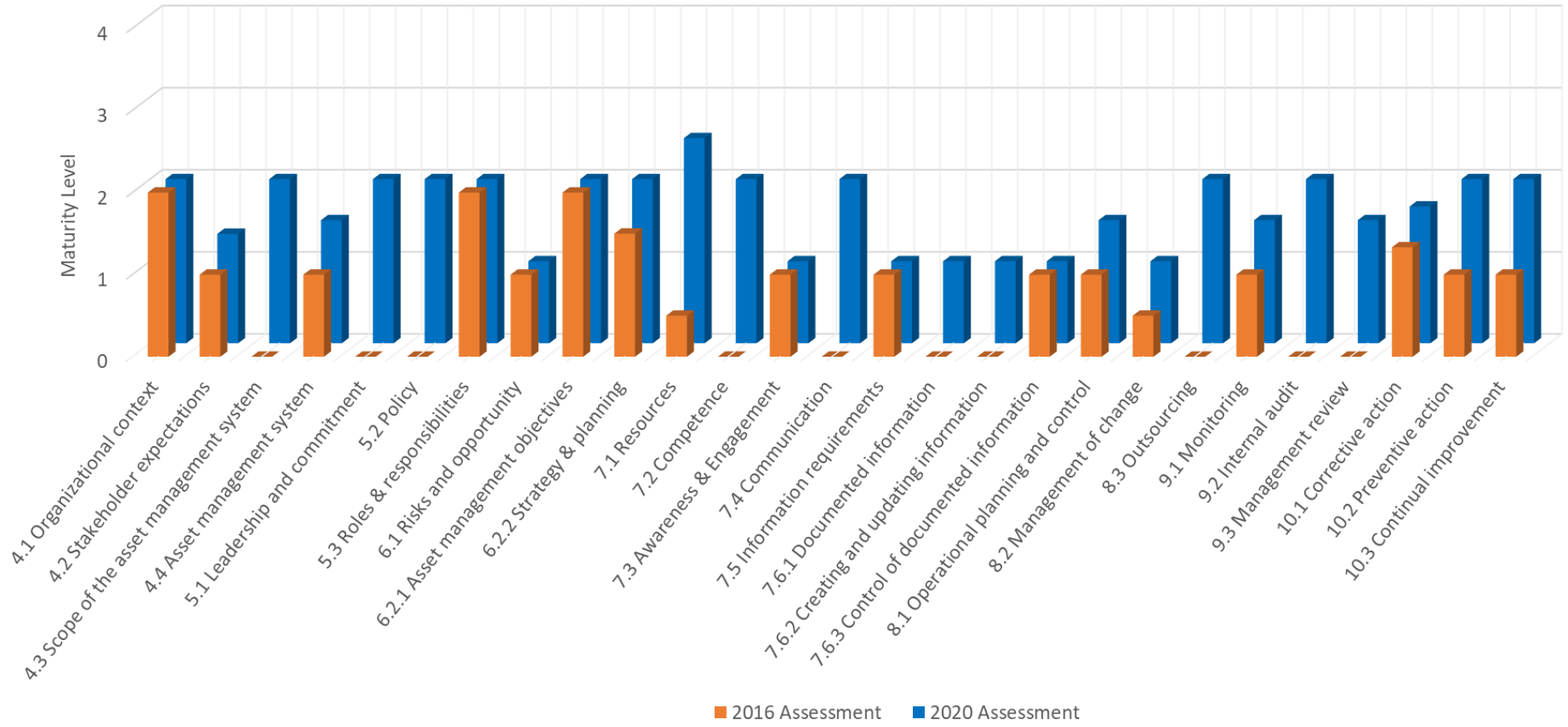


Figure 7 Comparison of 2016 and 2020 Asset Management Capability Assessments

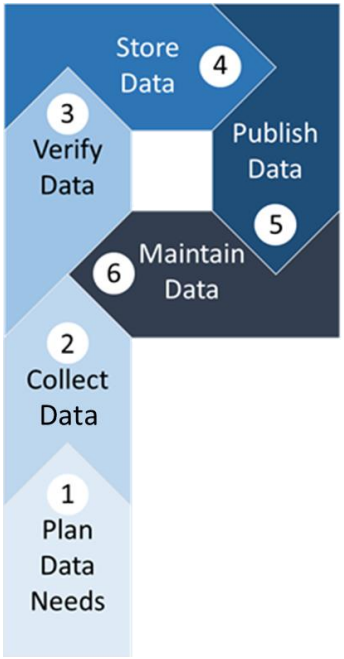
4.2 Data Quality, Reliability & Completeness

As the council's asset management strategy is executed, one of the most important areas for improvement is regarding the collecting, storing and updating of documented information. Asset management is a discipline that relies extensively on data; however, there are a number of known issues with the data NPDC holds in its asset inventories. Typical issues include:

- The location of assets are recorded in the wrong place (i.e. pipes shown as being on the wrong side of a road)
- Construction dates of assets are missing
- Attribute details about assets, such as the material type and invert levels are missing
- The condition of many assets is not known and/or recorded
- The condition of assets deteriorate over time so any condition data we do have will progressively become out of date

When considering why these issues exist it is important to recognise the history of our assets. Many assets were created many decades ago and their construction pre-dates technology such as GPS location so inaccurate locations should be anticipated. Likewise, the ownership history of our assets covers events such as the amalgamation of borough councils into the current district councils. For example during flood events in the 1970's a lot of the paper asset records held by the Waitara Borough Council were damaged and lost and, as a result the records NPDC now holds for these assets is incomplete.

Going forward, it is going to be increasingly important for NPDC to treat its asset data as an asset in its own right. As with any asset, it will require investment to manage, maintain and replace as it ages. This approach is illustrated in figure 8.



1. **Plan** – development of a metadata standards that sets out what data we need and the format it is needed in to enable our asset management activities
2. **Collect** – through various methods the required data is gathered
3. **Verify** – before data is accepted it needs to be checked to ensure it meets our data quality standards
4. **Store** – data is then stored in the right system and in a way that meets legislative requirements such as the Public Records Act
5. **Publish** – data is made available internally and, where appropriate, with other organisations to allow asset management activities to be undertaken
6. **Maintain** – the processes and controls associates with the updating or disposal of outdated information.

Figure 8 – Data management lifecycle

Asset inspections are the main sources of collecting data. Checks can also be carried out to maintain the safety of the assets, identify emerging maintenance issues and to plan for the replacement of exhausted assets.

Due to the reduced operational budgets over the last 10 years many assets are not covered by an appropriate inspection regime. Some progress has been made since cyclone Gita, including:

- Inspection of the 4 water treatment plants
- Inspection of all drinking water storage reservoirs
- Employment of mechanical fitters that have started inspection of plant and equipment

In addition, the Draft Annual plan 2020/21 budget reintroduces $100k of funding to reinstate storm water CCTV inspections. This funding will be sufficient to inspect approximately 5% of the network each year with individual pipes being checked at a frequency of once every 20 years.

Despite this progress there are still large numbers of assets that do not have an appropriate inspection regime in place.

- The current maintenance fitter resource is insufficient to cover all plant and equipment assets
- Our water intakes are in unknown condition and are not routinely inspected
- Our marine outfalls are in unknown condition and are not routinely inspected
- Our drinking water reservoirs only have superficial visual inspections and don't have routine structural inspections
- We have installed a large number of backflow preventers that legally must be tested annually so more resource will be required
- We have over 12,000 storm water and wastewater manholes that are not structurally inspected
- Our pipe bridges only receive superficial inspections and don't have routine structural inspections.
- Our underground water pipelines have no inspection program.

Many assets do not need to be inspected annually. When inspection and testing plans are developed, Council officers take a risk based approach. The frequency of inspections are determined based on the risk and consequence of the asset failing as well as manufacturers recommendations. For example:

- Older pipes will be inspected more frequently than newer pipes
- Pipe bridges will have a visual inspection once every 2 years and a structural inspection once every 6 years (as per NZTA bridge inspection manual)
- Plant and equipment will be inspected and serviced as per the manufacturers requirements in order to protect warrantees

At the time of writing this report it is not possible to provide a reliable cost estimate for the reintroduction of suitable inspection regimes; however, early indications place it in the range of $500k to $900k year annum.

4.3 Competency Framework

In order to effectively execute the Council's asset management strategy, the organisation needs to ensure it has competent personnel. To support this, the infrastructure management team has adopted and started to implement an asset management competency framework. This framework is an adaption of the national asset management competency framework used by the New Zealand Transportation Agency.

Figure 9 shows an excerpt from the competency framework that shows how competency levels are assessed. Figure 10 shows another excerpt that illustrates some of the typical skills and capabilities that are expected of asset management personnel. This framework is relatively new to the organisation and it is intended to be used in several ways, including; supporting recruitment decisions, informing professional development and training of staff as well as planning for succession of key staff.

		Knowledge	Standard of work	Autonomy	Coping with Complexity	Perception of Context
0	Not Relevant to Role					
1	Novice	minimal or "textbook" knowledge without connecting it to practice	Unlikely to be satisfactory unless closely supervised	Needs close supervision or instruction	Little or no conception of dealing with complexity	Tends to see actions in isolation
2	Beginner	Working knowledge of key aspects of practice	Likely to complete straight forward tasks to an acceptable standard	Able to achieve some steps using own judgement, but needs supervision for overall task	Appreciates complex situations but only able to achieve partial resolution	Sees actions as a series of steps
3	Competent	Good working and background knowledge of practice area	Fit for purpose, though may lack refinement	Able to achieve most tasks using own judgement	Copes with complex situations through deliberate analysis and planning	Sees actions at least partly in terms of longer-term goals
4	Proficient	Depth of understanding of discipline and area of practice	Routinely achieves fully acceptable standard	Able to take full responsibility for own work (and that of others where applicable)	Deals with complex situations holistically; decision making is more confident	Sees overall "picture" and how individual actions fit within it.
5	Expert	Authoritative knowledge of discipline and deep tacit understanding across area of practice	Achieves excellence with relative ease	Able to take responsibility for going beyond esisting standards and creating own interpretations	Holistic grasp of complex situations; moves between intuitive and analytical approcahes with ease	Sees overall "picture" and alternative approaches; vision of what may be possible.

Figure 9 Asset Management Competency Assessment Matrix.

2.1 Define processes and methods employed in managing assets of their life cycles	
2.1.1	Identify and evaluate appropriate life-cycle cost models
2.1.2	Forecast costs of key stages of an asset life cycle
2.1.3	Identify asset-related risks and opportunities
2.1.4	Identify responses to mega trends for critical asset activities
2.1.5	Define and justify asset class strategies

Figure 10 – Asset Management Competencies excerpt.

Having a competency framework is only the beginning and it needs to be effectively implemented and supported with appropriate financial and non-financial resources. The infrastructure Group currently has a total annual budget of $309k per year for people training and development. Whilst this may appear a large sum it is apportioned across at total of 184 personnel. This equates to an annual training allowance of about $1680 per person per year.

Most personnel in the infrastructure group are required to routinely visit active construction sites and/or operational facilities such as our pump stations and treatment plants. In order to do so they must have some core health and safety qualifications as summarized below:

- Traffic Control level1
- Fire Extinguisher Operations
- First Aid
- Manual Handling
- Hazard Identification and Risk Assessment
- Permit to Work
- Chemical Handling and Spill Management
- Reversing Vehicle Spotter

The current training budget is just sufficient to provide this core health & safety training and provide refresher training on an ongoing basis as each qualification expires. However, some personnel, such as the water and wastewater treatment plant operators require further safety training for high risk activities such as working at height or in confined spaces. For these staff, the cost of maintaining current core Health and Safety qualifications is as high as $4,550 per year.

As can be seen, the current training budget is insufficient to cover core health and safety requirements. Indeed, in recent years there have been instances where the Infrastructure Manager has had to issue a “stop works” instruction restricting NPDC staff from carrying out certain high risk operations (e.g. confined space entry and working at height) due to expired health and safety training qualifications.

Given maintaining compliance with core health & safety requirements is challenging, there is little scope for ongoing professional development of staff in technical fields, including asset management. As such, it should be noted that in order to give effect to the Asset management Competency Framework and to continue to improve the organisations asset management maturity, more investment in staff training and development will be required.

Photo: The soffit of the Connett Road Sewer completely corroded due to H_2S attack

Section 5: Long Term Plan Renewals Forecasts

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

Photo: Corroded pumping plant in the NP Wastewater Treatment Plant Disinfection Building

5.1 Maintenance scheduling

NPDC's three waters infrastructure includes a total of 23,164 items of plant and equipment. Plant and equipment is a broad category of assets that ranges from pumps and valves to computer control panels and analytical sensors.

Manually scheduling routine maintenance works on such a large portfolio as assets is not humanly possible without the aid of a computerised maintenance management system (CMMS). The CMMS can be used to automatically generate work instructions according to pre-determined schedules so that maintenance fitters know what items of plant and equipment are due for servicing. The principal is similar to the automatic email reminders you might receive from a car dealership to remind you that the service on your car is due.

Since the current CMMS was implemented in 2016 there has been a steady programme of creating maintenance schedules for individual items of plant and equipment. However, at the time of writing this report only 54% (12,582 individual items) of plant & equipment have maintenance schedules loaded into the CMMS. Of these, typically about 90% of the schedules are successfully carried out by maintenance fitters and contractors each year. This means that approximately half of the council's plant and equipment assets are not receiving routine servicing and preventative maintenance. This puts at risk the reliability of the items of plant and equipment as well as potentially voiding manufacturer warrantees.

The progress with creating maintenance schedules is demonstrated by tracking the ratio of proactive maintenance to reactive repairs. In 2016 for every $1.00 NPDC spent on proactive maintenance approximately $4.00 was spent reacting to breakdowns and repairing broken equipment. As of the 2019/20 financial year, this ratio has dropped to 1:1 as more proactive maintenance is carried out resulting if fewer breakdowns.

Whilst this is promising progress, it is slow due to resource constraints limiting the speed at which the outstanding maintenance schedules are created. Furthermore, as the current operational budget is typically fully expended each year, an increase in funding will be required to cover the cost of the maintenance activities once the schedules are created. Some progress has been made with additional budget allocation in the 2020/21 Annual Plan budget to increase maintenance of plant and equipment.

5.2 Renewals Forecasting

As detailed earlier in this report, there are a number of indicators warning that NPDC is underinvesting in the replacement of its infrastructure assets. Another such indicator is the annual depreciation expense which can be considered as a suitable analogue of how much of an asset's useful life has been consumed.

The Office of the Auditor General in their report on council's 2018-28 Long Term Plans highlighted that across New Zealand the amount Councils plan to spend replacing infrastructure assets remains below the level of depreciation expense. The Auditor General warns that if councils do not invest enough in their existing infrastructure then they run an increased risk that critical infrastructure assets will fail. They also note that this is an issued that they have repeatedly raised concerns about in previous reports.

Based on the 2019 asset revaluation, the depreciation expense for three waters assets is $16.6 million per year. By comparison the average amount budgeted for the replacement of three waters assets over the 10 years of the 2018-28 Long Term Plan is only $7.07 million per year.

Preparation work for the 2021-31 Long Term Plan is currently underway, which includes preparing new asset renewals budget forecasts. Figure 11 shows the early outputs of this work for all three waters assets. As can be seen from the chart, there is a backlog of approximately $126.7 million worth of assets that have already reached the end of their design lives and a further $206.2 million of assets that are forecast to expire within the next 10 years giving a total potential renewals funding requirement of $332.98 million over the next 10 years.

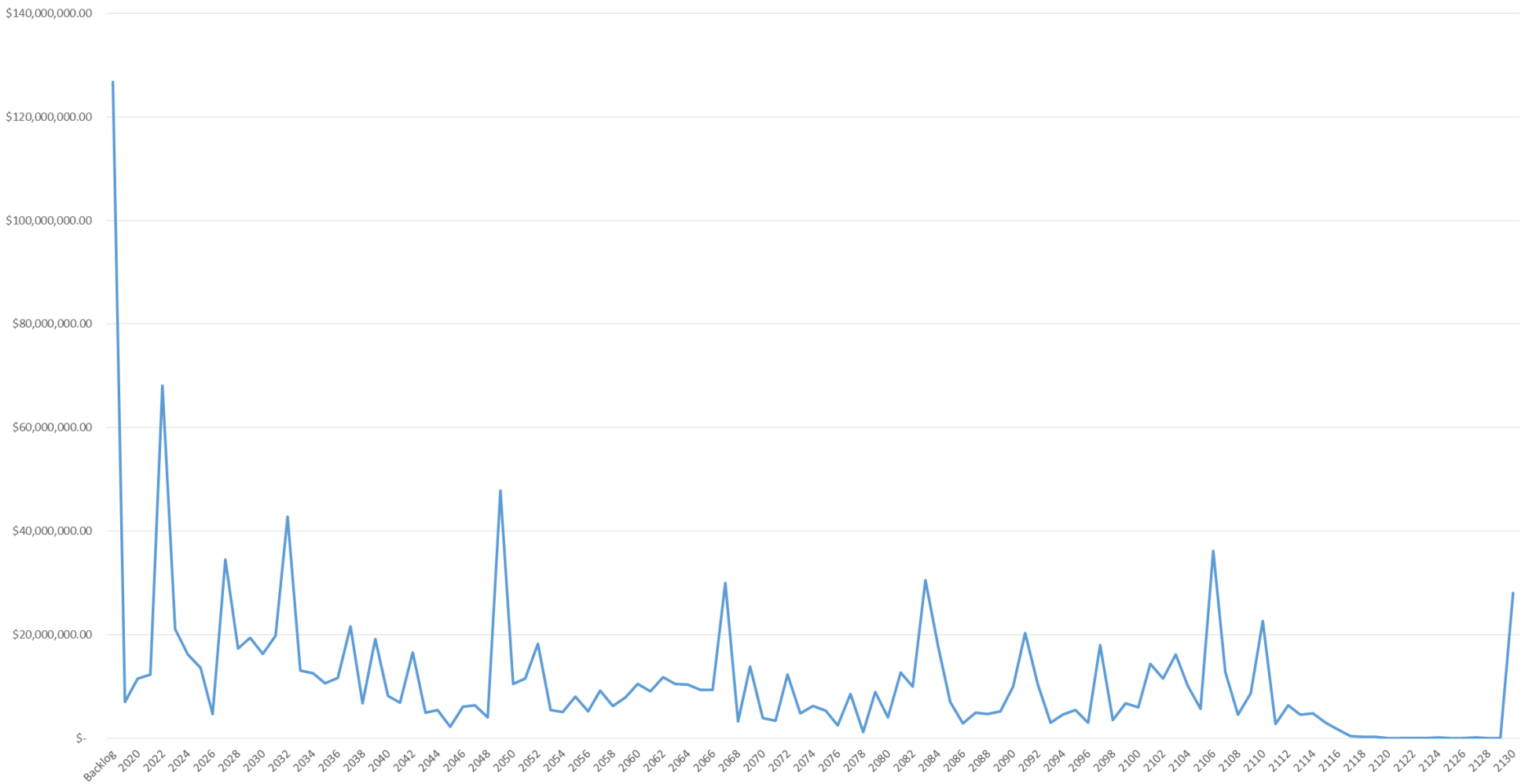


Figure 11 – Long Term Renewals Forecast (based on remaining useful lives data).

Asset age is one of the most complete and reliable data sets NPDC has, with age recorded for 99.4% of assets (by GCRC). However age is not always a reliable measure of when an asset needs to be replaced. Assets can be subject to environmental factors that cause them to deteriorate faster than expected. Conversely, some assets can remain in a relatively good condition far beyond their design live expectancy.

Understanding the condition of our infrastructure assets allows the replacement of worn out assets to be optimised. NPDC currently uses a variety of approaches for condition rating its assets as follows:

- Wastewater Pipes – CCTV surveys are used to visually inspect pipes using the International Infrastructure Management Manual (IIMM) supporting by the New Zealand Gravity Pipe Inspection Manual. Because this condition rating data is based on observations from inspections it has a relatively high confidence rating.
- Drinking Water Pipes – drinking water pipes are harder to inspect without potentially introducing sources of contamination to the water supply. Instead of CCTV surveys, NPDC currently uses pipe burst and repair history as an analogue for condition. Because these condition ratings are based on a proxy measure, this data has a moderate confidence rating.
- Storm water pipes – NPDC is about to reinstate a CCTV inspection programme that will follow a similar methodology as wastewater pipes. Currently we have almost no condition rating data so any renewals forecast must rely on the pipe age data.
- Manholes, plant and equipment – NPDC currently has limited inspections programmes for these assets so has minimal condition rating data. As such, this data is considered to have a low confidence rating and renewals forecasting must rely on age data.

The condition rating scale is summarised in Table 2. And the distribution of three waters reticulation assets in each condition grade is shown in Figure 12 split between each of the three waters. In total 26% of reticulation assets, with a Gross Current Replacement Cost (GCRC) of $261.5 million are identified as being in a poor or very poor condition and due for replacement within the 10 year timeframe of the current Long Term Plan.

By comparison, the current 2018-28 Long Term Plan only includes a total budget of $52.1 million (uninflated) for three waters reticulation renewals. This would indicate that the Council will under invest in the replacement of worn out assets to the order of approximately $210 million of the next 10 years.

36.5% of reticulation assists with a GCRC of $364.6 million do not have any reliable condition data and forecasting the renewals requirements for these assets will have to be based on age data. The majority of these are storm water assets where there has been no routine CCTV pipe inspection programme in place for over a decade.

Grade	Condition	Remaining Useful Life	Planning Cycle
1	Excellent	More than 50 years	Outside 30 year infrastructure strategy
2	Good	30 to 50 years	Outside 30 year infrastructure strategy
3	Average	10 to 30 years	Inside 30 year infrastructure strategy
4	Poor	3 to 10 years	Inside 10 year planning cycle of the Long Term Plan
5	Very Poor	Less than 3 years	Inside 3 year planning cycle of the Long Term Plan
6	Unknown	N/Z	N/A

Table 2 Asset Condition Rating Scale for pipe assets

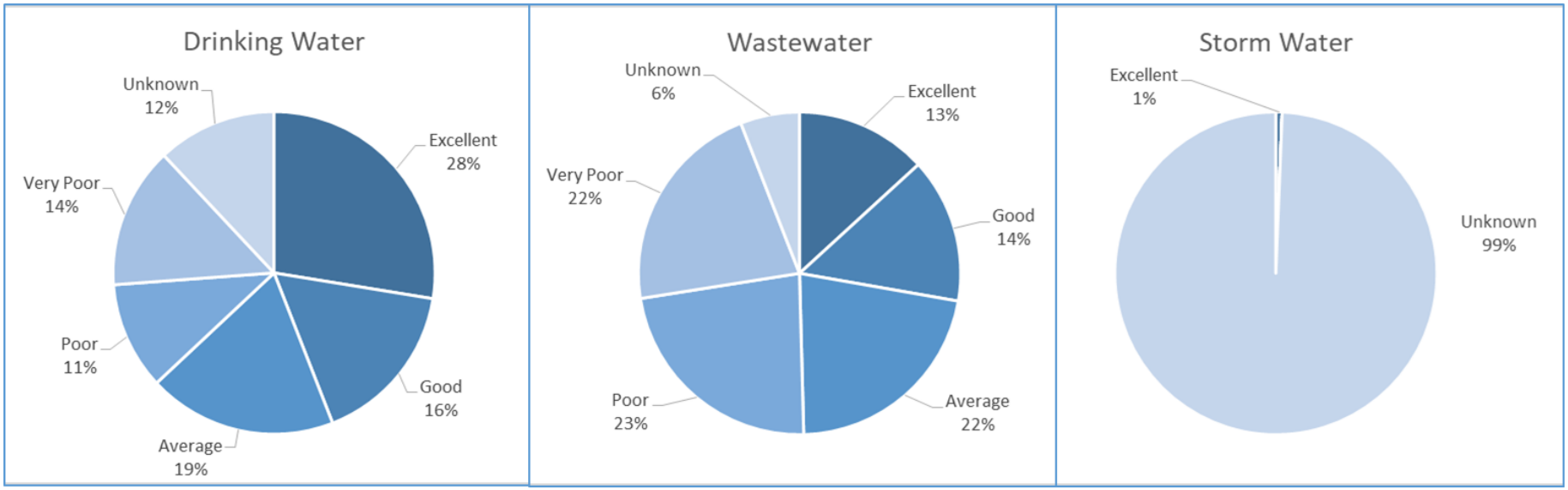


Figure 12 Pipe Asset Condition Ratings (based on Gross Current Replacement Cost)

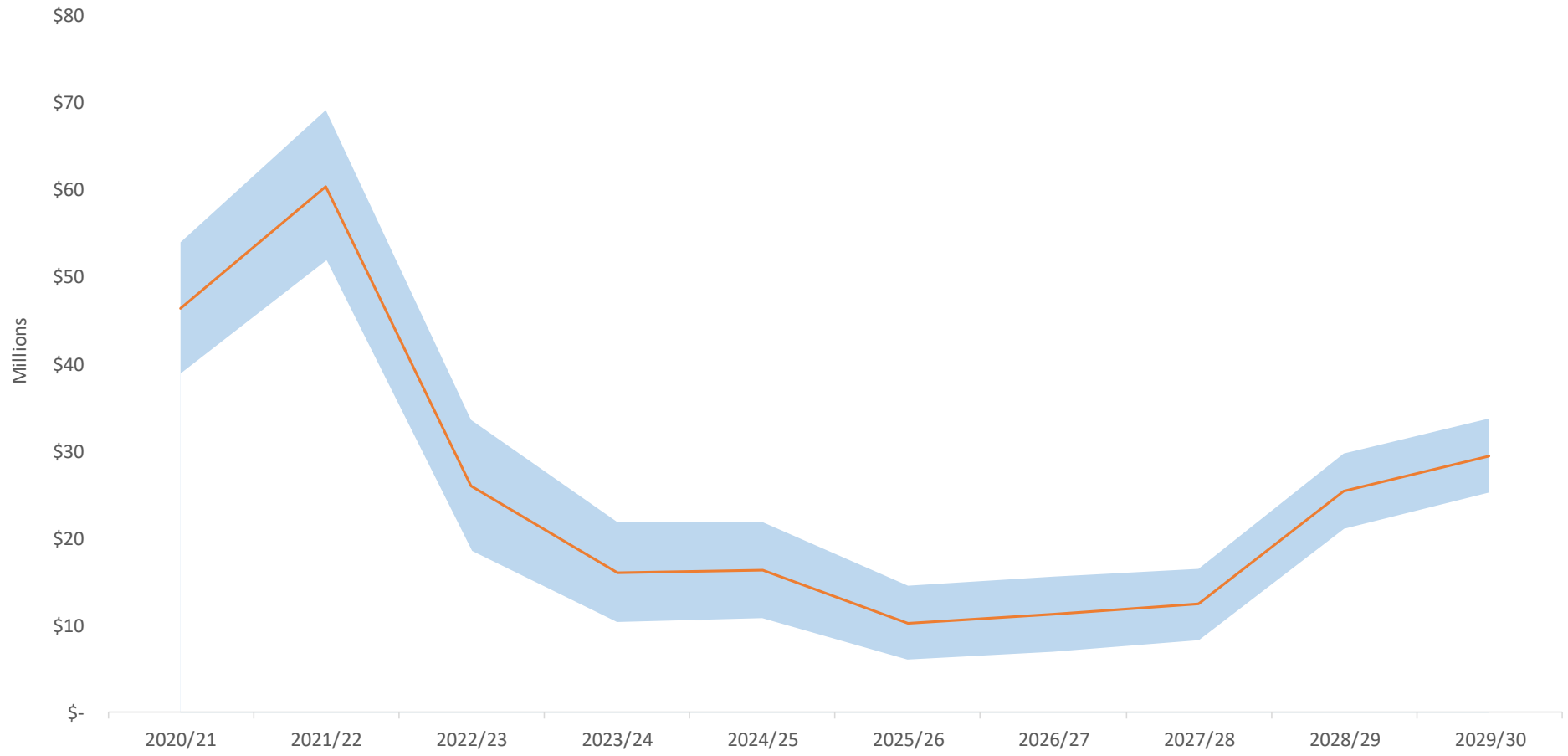
As the Council's asset management capabilities continue to mature, more sophisticated techniques are being introduced to improve the accuracy and reliability of its renewals budget forecasting. This includes the introduction of Monte Carlo risk simulations. These simulations are mathematical statistical techniques used to understand the impact of risk and uncertainty in financial forecasting models. This allows a risk based approach to be taken that accounts for multiple the criticality of assets.

This allows for critical assets, where the consequence of failure is high, to be proactively replaced in order to minimise risk. Conversely, non-critical assets with a low consequence of failure can be allowed to "sweat" by delaying their replacement in order to extract maximum value from these assets. This allows risk to be appropriately managed without taking such an overly conservative approach that replacing our infrastructure becomes unaffordable.

Figure 13 brings together all of the forecasting methodologies to provide the 10 year budget forecasts for the next Long Term Plan. Being able to mix and match the forecasting method allows the most reliable method to be used for each asset type based on the quality of the underlying data. Figure 13 is an unconstrained forecast. As the 2021 Long Term Plan is developed, and any constraints such as the ability to fund/finance work programmes are confirmed then a constrained forecast will need to be produced as well as a risk management strategy for any renewals demands that ultimately do not get funded in the Long Term Plan.

Because the forecast incorporates an assessment of risk, it is presented as a minimum and maximum range. Where within this range the council ultimately choses to set its funding is a question of the organisation's risk appetite and the degree of confidence it wishes to have that it has provided sufficient funding to replace all assets that reach the end of their useful lives.

In summary, over the next 10 years, the average annual renewals funding requirement ranges between $19.7 million and $31.1 million per year. This compares to the 10 year average in the current 2018 long term plan of $7.1 million. It should be noted that these figures are based on the 2019 asset valuation, so they will need to be adjusted for inflation up to the 2021 Long Term Plan.



Minimum	$ 38,864,000	$ 51,820,000	$ 18,490,000	$ 10,260,000	$ 10,768,000	$ 6,023,000	$ 6,951,000	$ 8,309,000	$ 21,065,000	$ 25,151,000
Midpoint	$ 46,451,500	$ 60,479,000	$ 26,066,000	$ 16,056,000	$ 16,336,500	$ 10,285,000	$ 11,278,500	$ 12,413,000	$ 25,401,500	$ 29,464,500
Maximum	$ 54,039,000	$ 69,138,000	$ 33,642,000	$ 21,852,000	$ 21,905,000	$ 14,547,000	$ 15,606,000	$ 16,517,000	$ 29,738,000	$ 33,778,000

Figure 13 – 10 Year Renewal Forecast bringing together Remaining Useful Lives, Condition and Criticality where reliable data is available.

Section 6 - Conclusions

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

Photo: Collapsing Culvert, Pukearuhe Road

6.1 Conclusions

It is apparent that budget cuts made in order to manage the economic aftermath of the Global Financial Crisis have resulted in reductions in the levels of service for the Council's Three Waters services and allowed a significant backlog of deferred maintenance and renewals to accumulate.

By applying a risk based approach to renewals demand forecasting it is likely that the council will need to invest between $197 million and $331 million over the next 10 years. This represents a material increase in funding compared to the $70 million included in the current (2018-28) Long Term Plan.

Where in the proposed funding range the Council choses to fund its three waters asset renewal programmes will depend on its appetite for risk. Once this is confirmed, the infrastructure management team will be able to finalise the next version of the Asset Management Plans. These will document how any residual risks that arise as a result of funding constraints will be managed and mitigated.

Appendix A – Asset Summary

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

Appendix A. Asset Summary

Table 4 summaries the Council's three waters asset inventories. This data is considered to be of a reliable quality as it is actively managed by the NPDC Asset Operations & Planning teams; however, there are known instances of assets not being registered in the inventories. The implications of this are that

- Assets are not accounted for in the computerised maintenance scheduling system so do not get proactively being maintained,
- Assets that are not in the inventories are not insured for material damage
- Assets that are not in the inventory are not depreciated and their replacement is not proactively funded.

Infrastructure Class	Description	Quantity
Drinking Water	Treatment Plants	4 Number
	Reticulation Pipes	650Km
	Trunk Mains	155km
	Pump Stations	6 Number
	Fire Hydrants	3,613 Number
	Valves	5,782 Number
	Backflow Preventers	459 Number
	Pipe Bridges	14 Number
	Water Meters	3,252 Number
	Reservoirs	17 Number (63,120m^3)
Wastewater	Treatment Plants	1 Number
	Reticulation Pipes	454 Km
	Lateral Pipes	190 km
	Pump Stations	38 Number
	Manholes	7,280 Number
	Valves	199 Number
Storm water & Flood Protection	Manholes	4,911 number
	Reticulation pipes	284km
	Lateral Connections	12km
	Pump Stations	1 number
	Inlets	7,518 number
	Outlets	1,599 number
	Detention Dams	3 number
	Detention Bunds	8 number
	Diversion Tunnels	3 number

Table 3 Asset Inventory Summary **(Data Quality Grade: Reliable)**