Wastewater Asset Management Plan 2018 - 2028

Nelson City Council
te kaunihera o whakatū

Quality Assurance Statement

Version No.	Date	Description	Prepared by	Reviewed by	Approved by
1	8/17	Draft for Council W&I Committee	Various	A Louverdis	SLT
2	24/8/17	Draft adopted by W&I Committee Council to inform LTP 2018-28	Various	Councillors	Councillors
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4 Final	15/11/18	Adopted by Council	Various	Councillors	Council

Cover Photo

Nelson Waste Water Treatment Plant

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Executive summary

i The purpose of the plan

The Wastewater Asset Management Plan outlines the current and future operational requirements needed to meet customers' needs in a cost effective manner.

This plan focuses on ensuring assets are operated and maintained to provide the desired level of service, and to meet the current and future community outcomes in a sustainable manner.

The Goal of the Wastewater Activity is to provide a wastewater system that will prevent harm to people and property, contribute to community wellbeing and protect the environment from harm related to uncontrolled wastewater discharges.

The overall objective of Asset Management planning is to:

Meet a required level of service, in the most cost effective manner, through the management of assets for present and future customers.

This plan will provide the substantiation for budget forecasts put forward in the Long Term Plan (2018-2028) for wastewater.

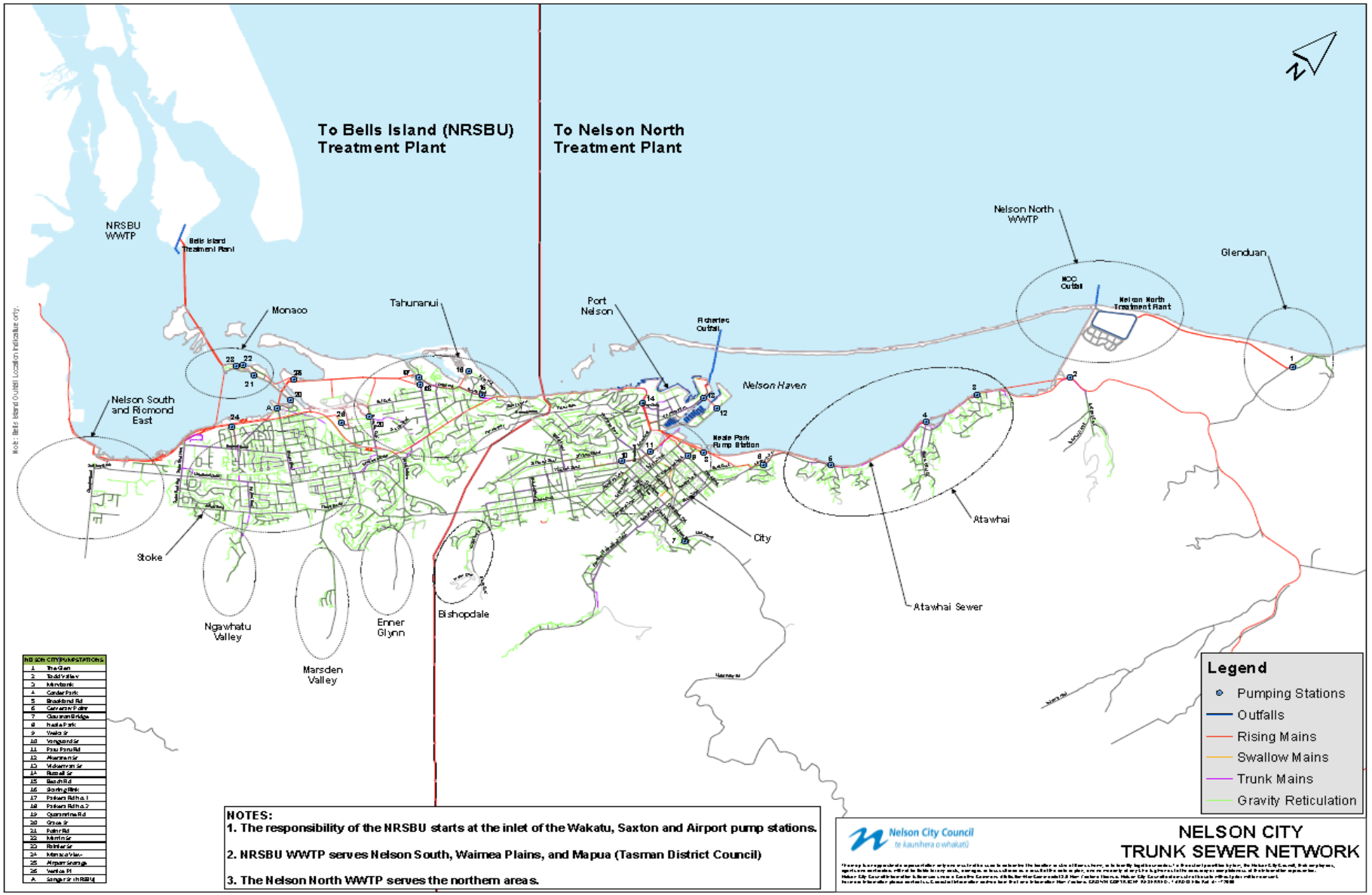
ii Asset description

The inventory of public wastewater services assets owned by Nelson City Council and managed by the Infrastructure division as at June 2016 is shown in Table ES1-1.

Table ES-1: Summary of Wastewater Activity Assets

Asset Category	June 2016	
	km	units
Reticulation Pipes	325.2	
Trunk Mains	36.3	
Swallow Mains	5.6	
Rising Mains	25.9	
Access points		924
Manholes		6,780
Tanks		11
Valves		152
Neale Park Detention Tank		1
Pump Stations		25
Nelson Treatment Plant		1

Figure ES-1: Nelson City Trunk Sewer Network



iii Key issues

Council's priorities between 2018 and 2028 for the wastewater activity will focus on the following areas:

- ***Sustainable development.***

  This needs to be the focus of all parts of the wastewater activity in order to ensure the city can accommodate future growth affordably while recognising the wider environmental, cultural and social values that the community identify as making Nelson a special place. The following are some of the current initiatives that this asset management plan can build on:

  - *Continuing to investigate high e-coli readings in water samples and repair any damage in the public network.*
  - *Additional effort to reduce stormwater flow into the wastewater system to reduce sewer overflows and reduce pumping costs*

    Eliminating the discharge of untreated wastewater into the environment where it can enter streams and rivers is the best way the wastewater activity can contribute to freshwater quality. This is accomplished by providing a public drainage network across the city and continuing to address dry and wet weather overflows from the network.
  - *Streams and rivers to be free of manufactured obstructions that impede fish passage.*

    Ensure that wastewater lines that are installed in the bed of streams and rivers do not impede fish passage.

- ***Inflow and Infiltration***

  Unintended/accidental dry weather overflows and wet weather discharges from the network result in wastewater discharging to land and then to fresh water and the coastal environment. Dry weather overflows typically occur at manholes in the network and are the result of broken pipes, high fat levels, tree roots or materials flushed into the network such as nappies or wet wipes. Wet weather overflows occur when stormwater and ground water enter pipes during heavy rain.

  A multi-year project began in 2015 to investigate the inflow and infiltration issues across the whole city and develop a strategy for reducing them. The first area to be surveyed was the central business district using a combination of individual property visits and closed circuit television. As a result of this work a number of sections of the network were found to be in poor condition. Work to renew these sections will begin in 2017/18.

- ***Pump Station and Network Storage, wet weather overflows***

  Linked to inflow and infiltration. Pump stations are the collection points for large parts of the city network. It is important to have adequate storage in the network to provide some security against overflows in case faults develop at pump stations. A project is currently underway to evaluate the storage available in the wider network of pipes and manholes to help quantify the risk to different areas. Further investigations are also proposed in 2018/19 to test the opportunities for constructing larger underground detention tanks or upgrades to key mains and pump stations to reduce the volume of wastewater that overflows during wet weather.

- ***Growth and Intensification***

  Growth in the city relies on both wastewater reticulation being available at the right locations and having sufficient capacity in the wastewater treatment plant(s) to cater for increased volumes. Wet weather inflow and infiltration impacts on growth by taking the network capacity that could be used by these new areas. Any upgrading of the public network will be undertaken to support growth areas (co-ordinated with other utility upgrades in the same area) and directed by the results of the inflow and infiltration investigations. A lesser driver for network upgrades is to reduce the risk of nuisance issues from any on-site disposal techniques such as septic tanks.

- ***Neale Park and Corder Park Pumping Station Upgrades***

  Corder Park and Neale Park pump stations are the two key stations in the Nelson City network. The upgrade of Corder Park pump station was completed in 2016/17 to renew the older pump station on the site and help reduce the pressures in the Atawhai rising main. Approximately 120m of new rising main was also installed in conjunction with the pump station construction to address areas where failures have occurred in the original concrete pipeline in recent years.

  Design for the redevelopment of the Neale Park site was a feature of the 2015-25 long term plan and became a priority as a result of damage to the pumps at Neale Park during the December 2011 extreme rain event. The two pumps now at Neale Park are able to cope with current flows but lack the necessary pumping security of backup pumps. Additionally the building housing the pumps and electronic drive equipment is considered to be earthquake prone and must be strengthened or demolished at some point in the future.

  The proposed redevelopment of the Neale Park Pump Station will allow for the construction of new larger wastewater collection wells (wet wells), with some ability to pre-screen wastewater and upgrade odour control. Odours from the wet wells and open grit channels are a feature of the existing station, particularly in the summer months. Construction is programmed for 2017/18-2018/19.

- ***Atawhai Rising Main***

  The Atawhai Rising Main was constructed in the mid 1960's from reinforced concrete pipes with approximately 50mm thick walls. Failure of this pipe in the early 1990's from sulphuric acid attack on the underside of the top of the pipes (soffit) lead to a comprehensive inspection and remediation project to extend the rising main's service life. Remediation works consisted of replacing the worst affected pipes with fibreglass pipes, relining others with acid resistant fibre reinforced resin sleeves and grouting pipe joints. The remediated pipeline was expected to have a service life out to 2046.

  In 2012/13 -2016/17 five failures occurred in the main. Two from pipe failures in the section immediately downstream of Corder Park, one adjacent the Marybank injector station in an air valve take off point, one North of Marybank at Clifton Terrace from a person access port in the main and one from a displaced rubber ring joint in a pipe close to Founders Park on Atawhai Drive.

  An additional budget of $100,000 was approved by Council for 2014/15 to carry out a non-destructive inspection of the full length of the rising main, focussing on identifying hydrogen sulphide gas pockets. Proprietary "smart ball" technology using a spherical sensor encased in a sponge exterior was used in 2015/16 to identify any areas where gas pockets may have become established,

allowing sulphuric acid to develop. The investigation confirmed that no permanent gas pockets were present in the rising main.

The two failures related to services penetrations of the pipe lead to the view that an ongoing risk of wastewater discharge exists from other similar features. A further programme of inspections of all other services connections is proposed in this plan. Remedial works may be required as a result of the investigations.

- *Development of **resilient infrastructure** to address climate change predictions and to handle extreme weather events.*

  As a result of geographical constraints the bulk of wastewater pump stations in the network are concentrated at the bottom of the catchments close to the coast. These are vulnerable to both flooding and sea level rise. Current advice from both the Ministry for the Environment and the National Institute for Water and Atmospheric studies is that climate change will lead to a greater number of extreme weather events into the future with the prospect of more flooding, particularly in these lower areas of the city. All new pump stations are designed to withstand expected sea level rise predictions for the service life of the pump station.

- ***Natural Hazard Security** of the network in light of the recent Canterbury and Kaikoura Earthquakes and various storm events.*

  Further work is proposed in this asset management plan to build on the hazard vulnerability studies carried out by Treasury in 2016/17 in response to the recent Canterbury and Kaikoura Earthquakes and multiple flood events across the country.

  On 1 & 20 February 2018 the remnants of two tropical cyclones hit the Nelson Tasman region. Both caused extensive damage.

  On 1 February the storm surge from ex-tropical cyclone Fehi added an extra 60cm to the expected tide level and seawater damaged buildings on Rocks Road and back flowed through sumps in low lying areas. Significant surface flooding occurred particularly at The Glen, Monaco, the Wakatu Industrial Estate, Hathaway Terrace and Wakatu carpark.

  Ex-tropical cyclone Gita mostly affected the Motueka/Takaka Hill area on 20 February.

- ***Awatea Place – Pumping Station, Rising Main and Trunk Main upgrades***

  In the Stoke/Tahuna area the twin pump stations in Parkers Road are programmed to be replaced with a single new pump station in Awatea Place. The current pump stations are close to the end of their service life and being situated very close to residential buildings have their own odour control issues. The new pump station will connect to the Nelson Regional Sewerage Business Unit pump station at Nelson Airport via a new rising main. Upgrades to the trunk mains will be required to link the existing pipework with the new pump station. Installing a single larger pump station in Awatea Place will significantly reduce operating and maintenance costs, allow for the installation of modern odour control equipment and provide a level of storage in event of emergency - Parkers No. 1 and No. 2 pump stations will stay within the reticulation network as extra emergency storage.

- ***Reticulation renewal strategy and programmed maintenance***

  Council renews components of the wastewater network as they reach the end of their service life. The rate of asset renewal is intended to maintain the overall

condition of the asset system at a standard which reflects its age profile, and ensures that the community's investment in the city's wastewater infrastructure is maintained.

The gravity pipe network is made up of a variety of materials with different service lives. Where pipes remain in good condition it is anticipated that lives of 80-100 years can be achieved. Current renewal strategies focus on renewing pipelines that show high infiltration rates and/or a history of multiple repairs. A constant renewal programme is undertaken to even out the rate of renewal and avoid the need for very high expenditure in the years when the pipes reach the end of their service lives.

- ***Rising Mains and Swallows (gravity pressure main) renewals strategy***

The main feature of these pipes is that they are constantly full of wastewater under pressure. Swallows are gravity pressure mains where the pipes are generally full, but at a lower pressure. It is difficult to inspect these mains and assess the condition as they are in continuous use, which makes renewal programming challenging. Historically this has meant that monitoring has not been possible on a regular basis and failures are likely to be the first indication of problems. This is common throughout New Zealand and has been demonstrated by the recent failures of the Atawhai rising main.

Some investigations of the upper sections of swallows have been undertaken with closed circuit television. A more detailed condition assessment and renewal strategy is required. The first area investigated will be the central city to align with intensification proposals and the inflow and infiltration strategy.

The rising mains will be more difficult to inspect and investigation for renewals will focus on pipeline materials, such as concrete, that are likely to be at greater risk of chemical attack. Each assessment will require careful planning as it is likely a section of the pipeline will have to be taken out of operation for short periods of time. This brings with it a risk of overflows that can be addressed by timing to coincide with low flows and the use of suction trucks.

- ***Nelson Wastewater Treatment Plant: resource consent renewal(Expires 1 Dec 2024), treatment plant/wetland renewals, sludge disposal***

The waste water treatment plant upgrade, substantially completed in 2008, was designed to comply with the requirements of the 2004 resource consent. The design of the new plant has allowed for better management of variable inflows and allows adjustments in operation to be made to reduce the negative effects of winter conditions on the pond operation. The treatment concept for the waste water treatment plant is based on:

  - *Removing gross solids through the inlet works;*
  - *Pre-treating the influent flow to remove Biochemical oxygen demand;*
  - *Pond based treatment for the removal of Biochemical oxygen demand and total suspended solids to the consent criteria;*
  - *Disinfection using the maturation ponds;*

- *Final "polishing" of effluent via passage through a constructed wetland.*

In order to address odour issues the plant operator and consultants have focussed on the levels and distribution of sludge in the oxidation pond compartments. Maintenance dredging was completed in 2014 to remove excess sludge with a resulting reduction of odour complaints. As the sludge reaches acceptable levels of moisture content it will be trucked to the landfill in York Valley commencing 2017/18 with completion in 2020/21.

The resource consent for the operation of the plant, the marine outfall and the discharge of treated effluent expires 1 December 2024. As this is a critical operating authority, renewal planning will begin in 2020/21. Climate change impacts on the site and changing community expectations around the discharge of treated sewerage to the sea are expected to figure strongly in the re-consenting process.

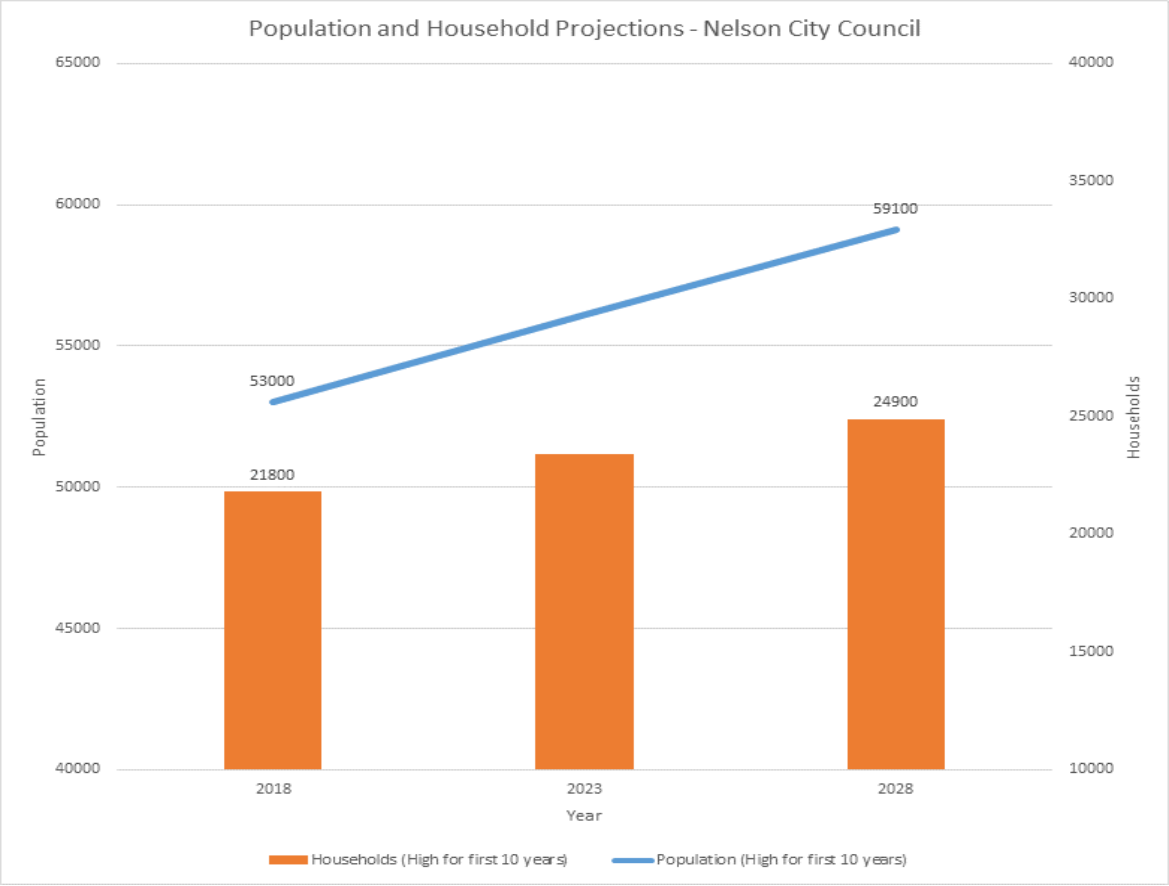
- *Compliance with **National Policy Statement for Freshwater Management** and other Central Government freshwater reforms such as the Clean Water Package.*

  Council, iwi and the wider community are developing environmental standards for streams and rivers in Nelson based on the requirements of the National Policy Statement. These standards are expected to be the basis of rules in the proposed Whakamahere Whakatū Nelson Plan and will set the scene for water quality improvements into the future. Although rules are yet to be finalised, activities that impact fresh water will need to take note of any changes to rules from the date of notification of the proposed plan.

- ***National Policy Statement Urban Development Capacity***

  The National Policy Statement for Urban Development Capacity (NPS-UDC) requires local authorities to ensure there is sufficient development capacity to meet demand in the urban environment in the short term (within 3 years), medium term (3-10 years) and long term (10-30 years). Short-term capacity must be feasible, zoned and serviced while long-term capacity must be feasible, with servicing planned but does not need to be zoned yet. The following graph is based on statistics New Zealand growth projections for the city out to 2028. An increase of approximately 12% in population over this time is expected.

Figure ES–2: Population and household projections (high), 2018-2028, Nelson



- ***Inflow and Infiltration***

  These discharges can occur in a range of situations. Dry weather overflows are generally the result of one or more of the following issues:

  - *pipes or pump stations develop faults*
  - *tree roots block pipes*
  - *fats and oils are discharged into the network and block pipes*
  - *when bulky materials such as nappies, gloves or 'wet wipes' are flushed into the network*
  - *High ground water levels, tidal and river effects. As sea levels rise and an increasing interest in low impact urban design develops it is anticipated that inflow and infiltration will need an expanded effort to minimise adverse effects arising from it.*

  During wet weather stormwater and ground water enters the wastewater network through a number of sources such as:

  - *faults in pipes (public and private), manholes and pump stations (cracks, poor connections of laterals, joints dislodged, joints no longer watertight)*
  - *use of wastewater fittings such as gully traps for stormwater discharge*
  - *cross connections between private stormwater pipes and the sewer network*

- *on site stormwater soakage systems poorly located*

Monitoring of flows during rain events has shown that infiltration of ground water can lead to peak flows in the order of 4-6 times average dry weather flow. As a result overflows due to wet weather occur within the system. Also additional volumes during wet weather lead to an increase in pumping and treatment costs.

The following figures are outputs from the wastewater model that show the areas within the city where overflows are likely to occur after heavy rain events.

Figure ES-3: Flooding – Nelson South

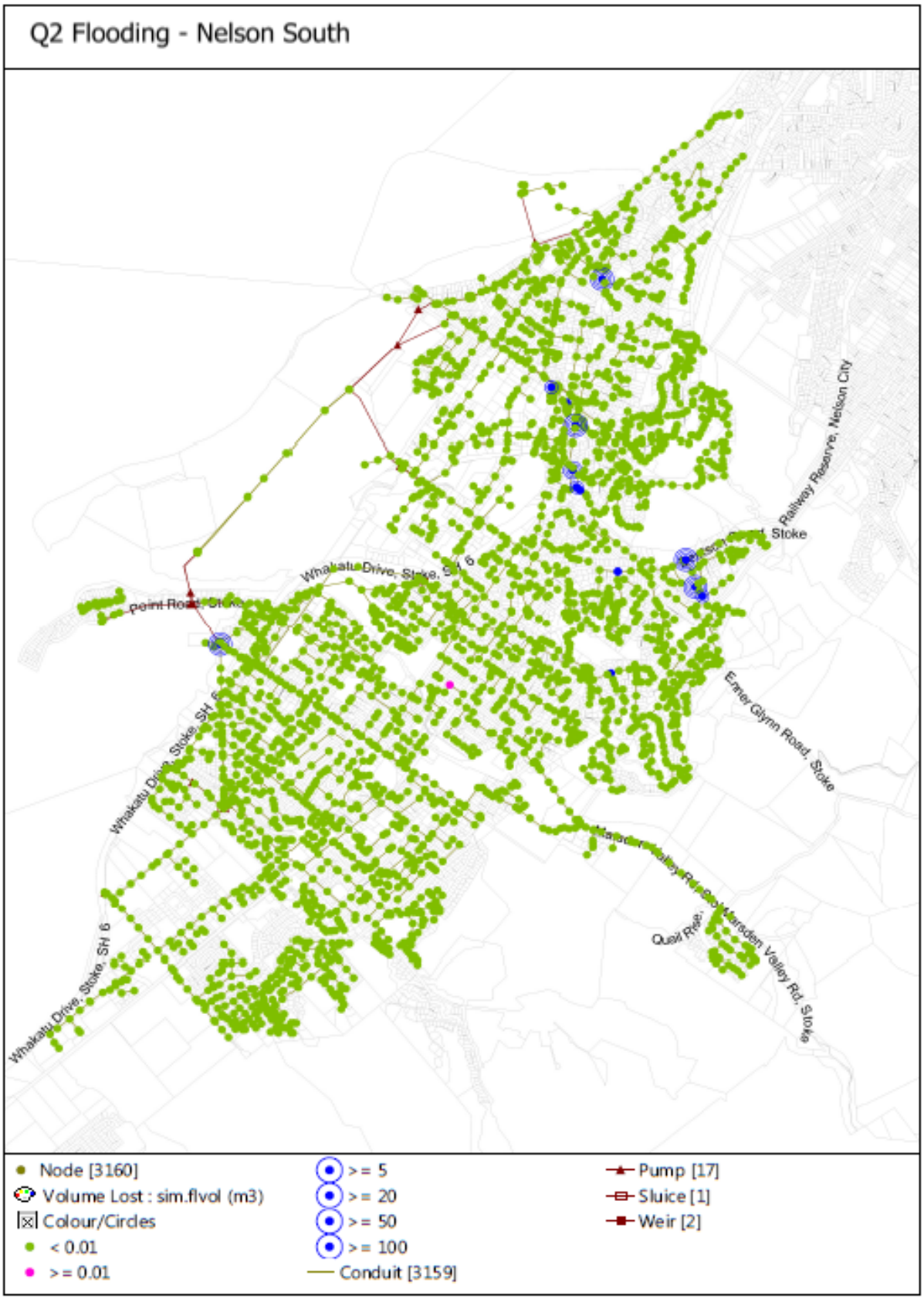
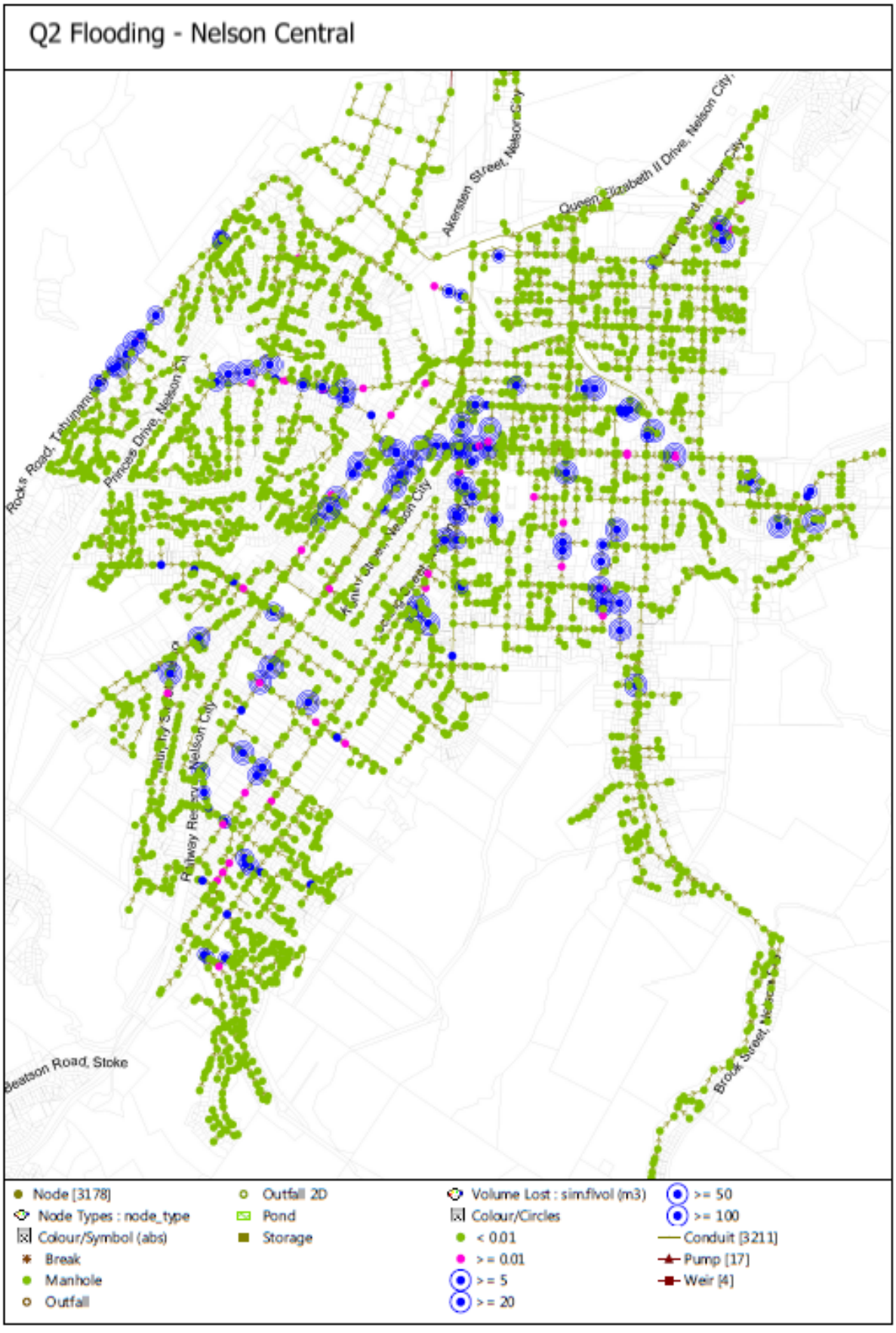
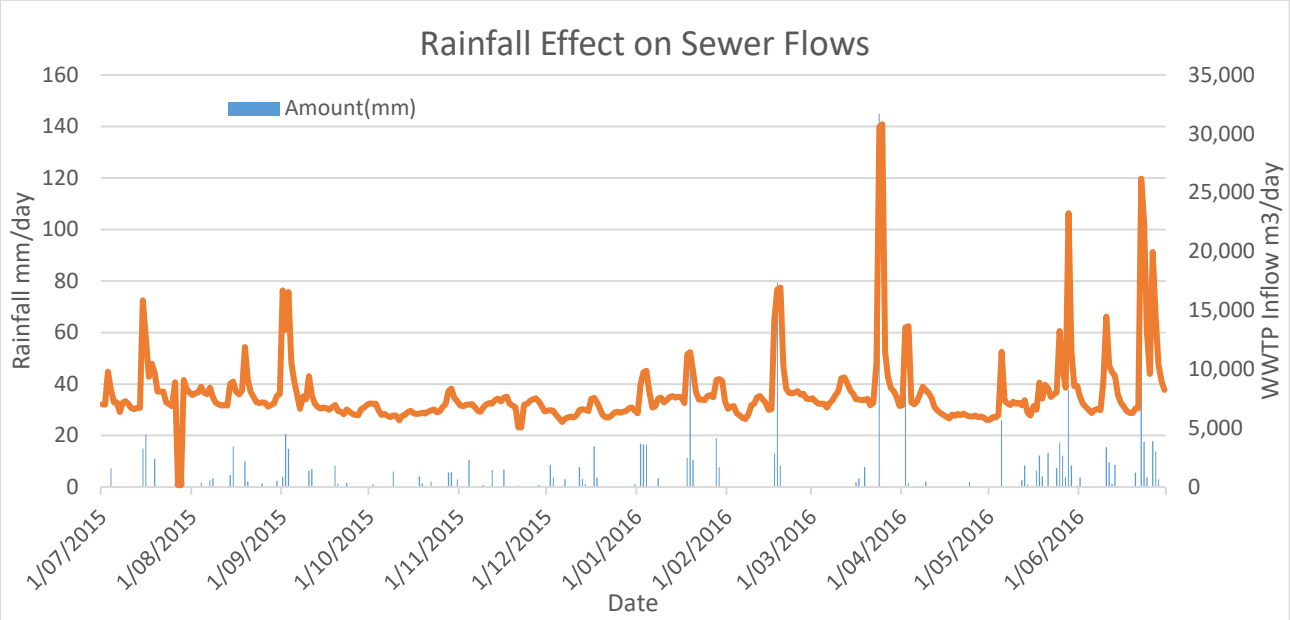


Figure ES-4: Flooding – Nelson Central



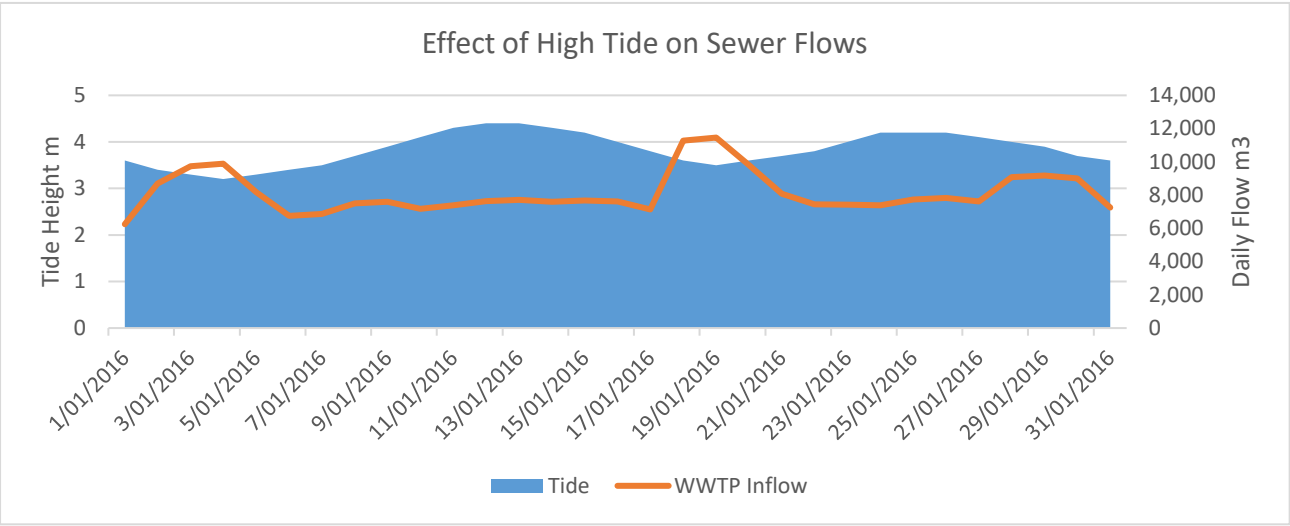
The following figure details the impact of rainfall on wastewater flows recorded at the Nelson waste water treatment plant during the period July 2015 - June 2016 (flows increased from 7,500m3/day to 30,000m3/day following a significant rainfall event).

Figure ES-5: Rainfall Effects on Sewer Flows



Tidal influences on wastewater flows to the Nelson Waste Water Treatment Plant have also been recorded and may account for the recorded increase in flows. Figure ES-6 below details the high tide levels and the changing flows to the treatment plant during January 2016. This indicates the likely influence the height of the tide has on ground water levels and associated infiltration. Daily flows increase by approximately 1000m3/day from a 3.4m tide to a 4.4m tide.

Figure ES-6: Effect of High Tides on Sewer Flows



- ***Reducing the Amount of Inflow and Infiltration***

  Controlling inflow and infiltration is a long term commitment and reductions in wet weather flows are likely to be gradual.

Inflow and infiltration reduction receives financial commitment in:

- *Wastewater repairs within existing reticulation;*
- *Sewer renewal programmes (dependant on age profile);*
- *Ongoing inflow and infiltration investigations involving site visits, dye testing reticulation and checking key parts of the network in wet weather to identify issues;*
- *Wastewater detention tanks or trunk main upgrades. To minimise the volume of wastewater discharged to the wider environment during wet weather events a series of detention tanks or trunk main upgrades is proposed. Detention tanks can be located in appropriate locations to capture excess flow for the duration of a storm event and return it to the network when inflow levels reduce. In some locations it may be more appropriate to upgrade reticulation and provide future growth capacity as inflow and infiltration reduction programmes produce results.*
- *Gracefield to Quarantine Road catchment beheading. This project will redirect a significant portion of the upper Wakatu/Enner Glynn catchment away from Gracefield Street and redirect it to Quarantine Road.*

iv Levels of service

Table ES-2: Levels of Service table 2018 – 2028

				Performance Target			
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2018/19 (Year 1)**	**2019/20 (Year 2)**	**2020/21 (Year 3)**	**2021/22 t-2027/28 (Year 4-10)**
Our infrastructure is efficient, cost effective and meets current and future needs	**Reliability** ^A fully operational wastewater treatment system	Level of compliance of treatment plant with resource consent conditions 1	100% compliance in 2016/17 15 odour complaints 2015/16 year	100% compliance			
		Number of dry weather overflows from the sewerage system, per 1000 connections* 2	8 in 2016/17 (down from 12 dry weather overflows in 2015/16)	Fewer than 15 per 1000 connections.			
Our region is supported by an innovative and sustainable economy	**Response** ^Appropriate response to reported network issues	These median response times are measured for overflows resulting from a blockage or other fault in the sewerage system: a) attendance time: from when notification is received to the time service staff reach the site b) resolution time: from the time notification is received to the time service staff confirm resolution of the blockage or other fault* 2	Steady over past two years Median response time of 21 minutes in 2016/17 Median resolution time of 202 minutes in 2016/17	Contractor to attend in median time of 60 minutes or less Contractor to resolve issue in a median time of 480 minutes or less			
Our unique natural environment is healthy and protected	**Quality** ^Environmental protection	Compliance with territorial authority's resource consents for discharge from the sewerage system measured by number of: a) abatement notices	100% compliance i.e. none of the listed actions were identified by regulatory section	100% compliance			

				Performance Target			
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2018/19 (Year 1)**	**2019/20 (Year 2)**	**2020/21 (Year 3)**	**2021/22 t-2027/28 (Year 4-10)**
		b) infringement notices c) enforcement orders d) convictions in relation to those resource consents* 1	in 2016/17, also none in 2015/16				
		The total number of complaints received about any of the following: a) sewage odour b) sewerage system faults c) sewerage system blockages, and d) Council's response to issues with the sewerage system, expressed per 1000 connections to the sewerage system* 2	16 complaints per 1000 connections in 2016/17 (slightly fewer, was 19 the previous year)	No more than 20 valid complaints a year per 1000 connections			

^L.O.S. included in LTP

* Performance measures with an asterisk reflect the wording of the Non-Financial Performance Measures of the Department of Internal Affairs (DIA) incorporated into sec261B Local Government Act 2002. This is to allow the DIA to compare these measures across councils. Targets have been adjusted where necessary to align.

Measurement procedures:

1. Council RMA infringement records at 1 July
2. Report from SR system at 1 July

v Future demand

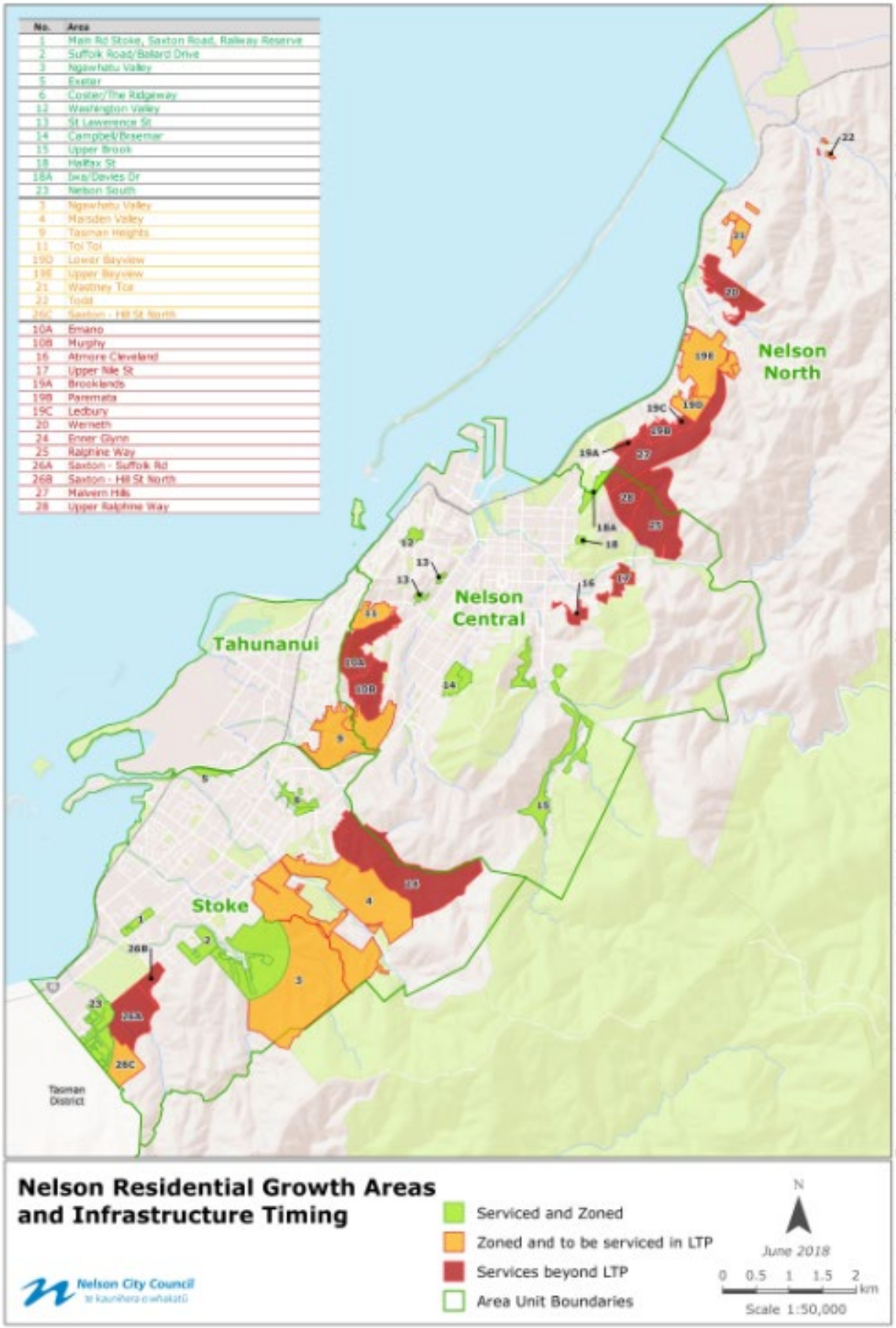
Investigations to date confirm that the dry weather capacity of the wastewater network is quite robust. Much of the proposed residential growth in the city can be accommodated for the next 5-10 years without major network upgrades. As the network is renewed some opportunity for increasing the pipe diameters is also available. Likewise the reduction of inflow and infiltration also improves the available capacity. The largest unknown is the potential for future 'wet' processing industries to establish in the city.

Table ES-3: Future Demand

Wastewater Demand Drivers	Changes to Wastewater Activity
Significant population growth and residential expansion into greenfield areas	New development areas on the periphery of the city and increased density in some existing developed areas leading to increased wastewater production.
New 'wet' industries	Growth in the commercial sector that involves wet processing activities increases the demand for wastewater services.
Reduction in house occupancy	Activities such as operating washing machines and dishwashers can generate as much wastewater for single person dwellings as those that house couples.
Changes in Customer Expectations	Customer expectations are increasingly tending towards higher Levels of Service for reliability and response to complaints.
Community Expectation	Community expectations are increasingly focussed on both the reduction of extent and frequency of wastewater overflows on property and roads during and after storms, as well as enhanced wastewater discharge quality. Some criticism also exists of discharging wastewater to the marine environment.
Climatic Changes	In recent years, there has been an increase in the incidence of extreme weather events around the world. The general future expected trend for Nelson is of winters being wetter and the other seasons being drier. More frequent heavy rainfall events have been predicted which will impact negatively on wet weather overflows from the network.
Legislative National Policy Statements: • Freshwater Management and • Urban Development Capacity	• Freshwater Management is a cornerstone central government initiative to improve the quality of freshwater bodies in New Zealand. This is expected to impact on discharges to waterways and require an enhanced response to overflows from the network. • Urban Development Capacity will ensure each territorial authority makes adequate provision for future population growth in their areas. This will require Council to undertake strategic growth studies and identify the impact on the demand for wastewater services.
Organisational Policies Environmental Sustainability	Development of sustainability strategies that include reduction of exfiltration and overflows from the wastewater network.

INFRASTRUCTURE PLANNING PROCESS FOR GROWTH PROJECTS

Figure ES-7: Nelson Growth Areas and Infrastructure Timing



vi Lifecycle management plan

Assets have a lifecycle as they move through from the initial concept to the final disposal. Depending on the type of asset, its lifecycle may vary from 10 years to over 100 years.

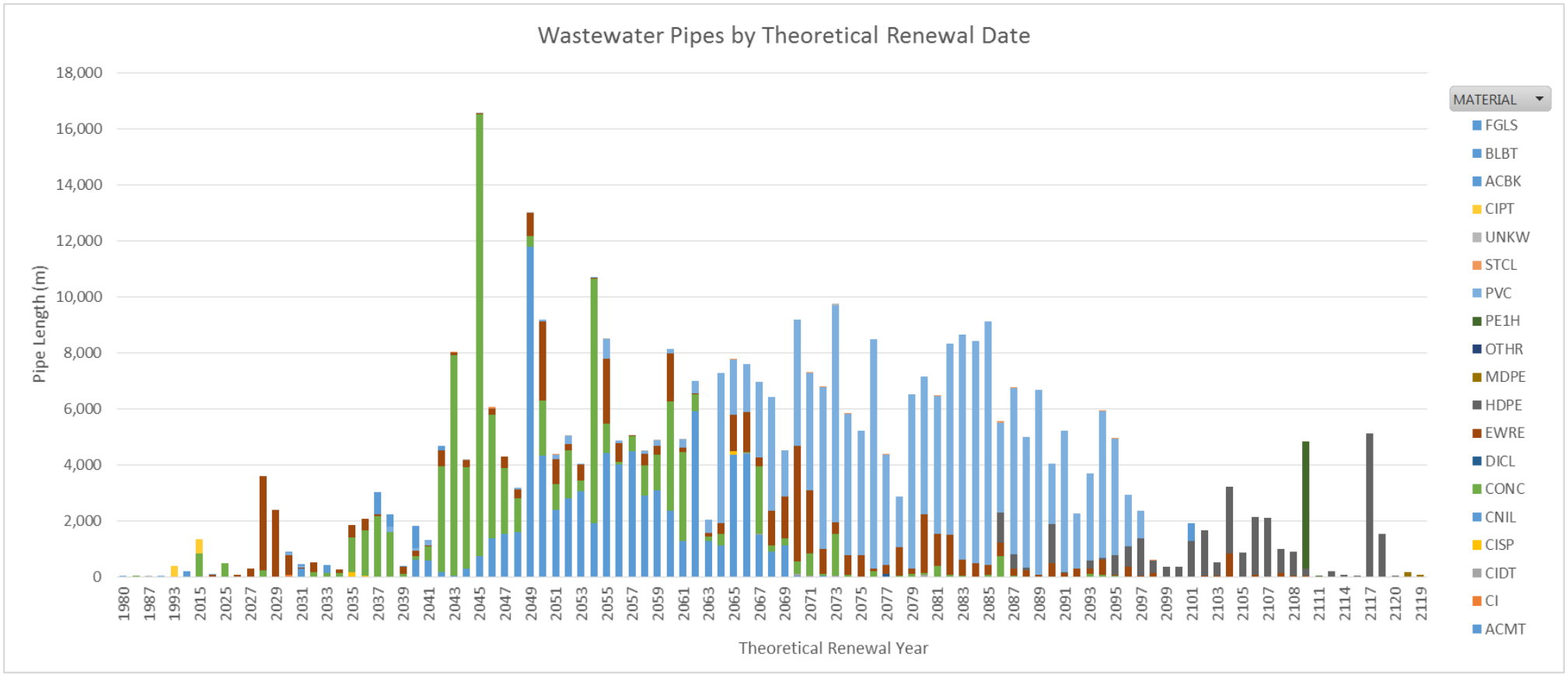
Table ES-4: Pipe Asset Lives from new

Material	Good Soil (Yrs)	Average Soil (Yrs)	Poor Soil (Yrs)	Pressure (Yrs)
Black Asbestos Cement	80	70	65	40
Asbestos Cement	80	70	65	40
Blue Brute Pipe	80	80	80	
Ductile Cast Iron	65	55	50	40
PitCast Iron	85	75	70	40
Spun Cast Iron	90	80	75	40
Concrete (InsituFORM lined)				40
concrete	85	75	70	45
Earthenware	120	110	105	
Fibreglass				105
HDPE	105	105	105	105
PE1H (Pe 100 Material)	105	105	105	105
PVC	80	80	80	80
Steel Concrete Lined	85	75	70	45
Unknown	85	75	70	
Atawhai Rising Main Life				72

Soil condition
- Poor refers to low lying sandy areas, subject to salt water infiltration.
- Average soil conditions are gravel areas
- Good soil condition are clay areas

The following figure shows the theoretical renewal year of the pipe assets based on renewal by age:

Figure ES-8: Wastewater Theoretical Renewal Year / Material Distribution



vii Risk management plan

Nelson City Council is committed to using risk management principles and techniques to understand and appropriately manage all internal and external factors and influences which affect the achievement of its objectives. Doing this will:

- Provide a reliable basis for sound decision making
- Increase the likelihood of achieving objectives
- Provide an agreed basis for prudent risk taking
- Enable the organisation to understand the level of risk associated with each decision as well as the Council's aggregate exposure to risk
- Improve accountability and assurance of control
- Enable the Council to avoid threats and seize opportunities
- Foster an organisational culture based on reasonable foresight and responsible hindsight.

The Council's standardised risk assessment method explicitly follows the process part (section 5) of AS/NZS 31000:2009.

Risk analysis involves consideration of the sources of risk, their consequences and the likelihood that those consequences may occur.

The following consequences are considered:

- Safety
- Health
- Asset performance/Service Delivery
- Environmental/Historical/Cultural
- Financial
- Political/Community/Reputational
- Relationship with Iwi
- Legal compliance
- Information/Decision support

Consequences of an event are rated 1 - 5 (Insignificant to Extreme). Likelihood is then rated 1 – 5 (Rare to Almost certain) to calculate a risk level rated 1 – 5 (Very Low to Very High).

The objective of risk analysis is to separate the low impact risks from the major impact risks, and to provide data to assist in the evaluation and treatment of the risks.

The specific objectives that guide the Wastewater risk analysis are taken from the Wastewater levels of service:

- Environmental Protection for the built and natural environment from wastewater discharges
- Reliability – an operational wastewater network

- Contractor response – provide a prompt, reliable and timely response to service requests and system failures

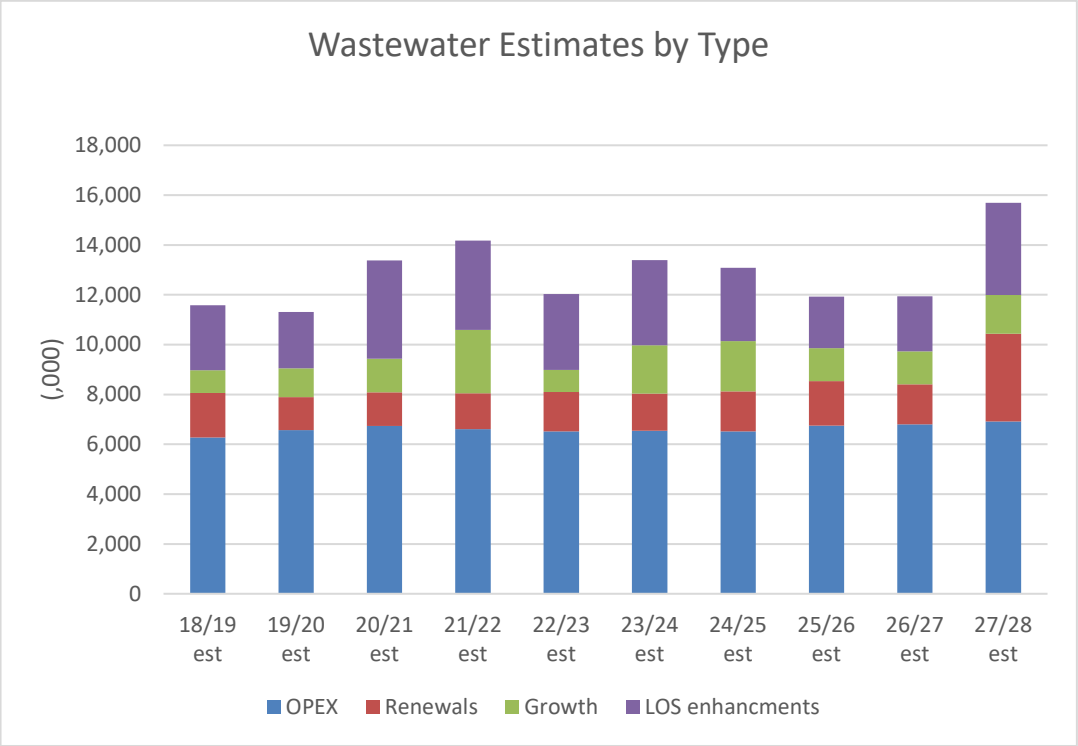
As noted in the priority section, uncertainty around possible future LOS changes (eg Freshwater NPS) and the risk-based decision framework feature in this area.

viii Financial summary

Wastewater Expenditure

The following graphs chart the proposed expenditure for the next ten years.

Figure ES-9: Proposed expenditure for the next ten years



Expenditure for the wastewater activity is relatively constant over the term of the plan. Renewals expenditure is proposed to increase, reflecting the greater emphasis on addressing inflow and infiltration. The slight spike in year 2027/28 relates to two larger construction projects (Halifax Street and Rutherford St) coinciding in the same year. As both of these projects are best constructed with road upgrades the final timing of them may change over the next ten years.

Table ES-5: Wastewater Expenditure Years 1-10 of the 2018/28 Long Term Plan ($000)

Group Account	2018/19 LTP Final Uninflated	2019/20 LTP Final Uninflated	2020/21 LTP Final Uninflated	2021/22 LTP Final Uninflated	2022/23 LTP Final Uninflated	2023/24 LTP Final Uninflated	2024/25 LTP Final Uninflated	2025/26 LTP Final Uninflated	2026/27 LTP Final Uninflated	2027/28 LTP Final Uninflated
6405 Wastewater	**14,436.9**	**13,879.9**	**15,977.1**	**16,427.8**	**14,125.6**	**15,409.4**	**15,161.4**	**14,190.7**	**14,037.8**	**19,785.9**
Expenses	**7,338.2**	**7,810.9**	**7,997.0**	**7,415.6**	**7,013.8**	**7,068.7**	**6,980.2**	**7,241.1**	**7,307.3**	**7,475.4**
Base Expenditure	4,648.3	4,781.4	4,937.4	5,251.7	5,459.8	5,473.8	5,499.8	5,713.3	5,753.3	5,801.4
Unprogrammed Expenses	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0
Programmed Expenses	1,069.9	1,239.8	1,254.8	806.9	502.0	522.5	465.2	488.9	502.0	562.0
Capital Expenditure	**7,098.7**	**6,069.0**	**7,980.1**	**9,012.2**	**7,111.8**	**8,340.7**	**8,181.2**	**6,949.6**	**6,730.5**	**12,310.5**
Renewals	1,785.2	1,327.2	1,345.3	1,439.3	1,589.3	1,489.3	1,607.0	1,779.8	1,601.8	3,526.8
Capital Growth	912.0	1,144.2	1,347.5	2,542.1	882.7	1,942.1	2,016.1	1,327.0	1,327.0	1,557.0
640576102884. Gracefield Beheading	80.0	162.2	540.5	1,540.5	0.0	0.0	0.0	0.0	0.0	0.0
640576102891. Network Capacity Confirmation for Growth Areas	0.0	0.0	0.0	0.0	54.1	54.1	108.1	500.0	500.0	0.0
640576103162. Hill Street sewer upgrad	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640576103163. Saxton Road sewer upgrade	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	750.0
640576152876. Ngawhatu Valley TM - Stage 2	0.0	0.0	0.0	194.6	21.6	1,081.0	1,081.0	0.0	0.0	0.0
64057691. Vested Assets	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0
640576913161. Elm st sewer upgrades	0.0	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640576913162. Hill St sewer upgrade	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Increased LOS	2,616.3	2,270.6	3,942.1	3,591.5	3,050.5	3,420.0	2,951.1	2,063.1	2,200.0	3,700.0
640577203147. Quarantine Road Sewer Pump Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	1,500.0
640579102890. Natural Hazards Risk Remediation	0.0	0.0	54.1	54.1	108.1	208.1	208.1	0.0	0.0	100.0
640579103148. Wastewater Network Upgrades	0.0	0.0	0.0	0.0	0.0	50.0	50.0	500.0	500.0	500.0
640579201187. Neale Park PS	2,116.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640579201716. Awatea Place Pump station	300.0	2,000.0	3,500.0	1,000.0	0.0	0.0	0.0	0.0	0.0	0.0
640579201914. Pump Station Storage	129.8	54.1	175.7	1,000.0	1,000.0	1,000.0	1,000.0	0.0	0.0	0.0
640579202885. Atawhai Pump Stations (Brooklands & Marybank)	0.0	86.5	82.4	82.4	432.4	432.4	216.2	0.0	0.0	0.0
640579301191. Capital: NN Waste water plt Up	0.0	30.0	30.0	20.0	10.0	250.0	0.0	0.0	100.0	100.0
640579503230. System Performance Improvements	100.0	100.0	100.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0
64057997. LoS: investigation, options, testing, engagement	-30.2	0.0	0.0	-64.9	0.0	-20.5	-23.2	-36.9	0.0	0.0

ix Asset management practices

Information systems

All asset information is stored on Arcinfo (a computer based geographical information system) and Infor Asset Management System.

The Council has a number of information systems (Infor, InTouch, Network Model, and closed circuit television archive) that are not integrated. The ongoing integration of these systems will assist in the optimisation of operations, renewals and the ongoing development of the wastewater activity.

Accounting and Financial Systems

The Nelson City Council uses integrated computer software supplied by MagiQ

Geographical Information System

Data captured is required to be accurate to within a tolerance of +/- 0.3m. In inaccessible areas, it is not considered economic to search for buried fittings and the best estimated position has been entered with the accuracy limitation flagged. Procedures are in place to update new data into the Geographical information system on a monthly basis via Nelson City Council engineering staff.

Data on assets associated with renewal and upgrade capital are now updated into the asset register by Nelson City Council Engineering and Finance staff. This ensures a high level of reliability.

Modelling

Currently modelling covers the Stoke/Tahuna catchment and the central Nelson City catchment for the pumping and reticulation components of the wastewater system.

Pumping: The EPANET model is used in the majority of cases to calculate different pumping scenarios (especially in linked pump stations) and maximum flow rates from pump stations.

Reticulation: The modelling software package used is InfoWorks v.8 with external consultants used to carry out the modelling requirements.

To assist the modelling data requirements the Council uses portable flow meters and permanent flow meters that are installed at pump stations. Rain gauges are installed at most pump stations and other key sites within the city and linked to the Supervisory control and data acquisition system.

Nelson City Council will develop more detailed models in areas with high infiltration levels to accurately identify the location and quantity of infiltration within a catchment.

Closed Circuit Television

Closed Circuit Television condition inspections are carried out by an external contractor as required, with subsequent condition assessment used to determine whether to repair or replace stormwater mains. The Infor system is used to assist in the selection of pipes to be checked.

The Closed Circuit Television inspection records are inputted into the Infor system via Cleanflow.

Asset management Recording System - Infor

The use of the Infor system has enabled the following:

- Customer enquiries being logged directly and sent immediately to the contractor for action.
- Contractor directly enters resolution confirmation at completion of job.
- Tracking of expenditure on assets to allow assets that have a disproportionately high maintenance cost to be identified - upgrade or renewal can then be prioritised.

x Monitoring and improvement programme

The Nelson City Council Wastewater Asset Management Plan is a regularly revised and evolving document and will be reviewed annually and updated at least every three years to coincide with the Annual and Long Term Plans and to incorporate improved decision making techniques, updated asset information, and Nelson City Council policy changes that may impact on the levels of service.

The Asset Management Plan will be improved throughout its life cycle as further information about the wastewater system assets are collected in terms of condition, performance and service delivery. Nelson City Council is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the Nelson City Council assets.

Nelson City Council will report variations in the adopted annual plan budgets against the original asset management plan forecasts and explain the level of service implications of budget variations.

Internal Reviews

Internal reviews will be taken every three years to assess the effectiveness of the plan in achieving its objectives. The internal audit will also assess the adequacy of the asset management processes, systems and data.

Statutory Audit

The Local Government Act requires that an independent, annual audit of the operations of the Nelson City Council be carried out.

Benchmarking

Benchmarking (trending) of the activity through Audit NZ, Local Government NZ and Water NZ benchmarking initiatives is carried out at the request of these organisations to give increased understanding of:

- The efficiency and efficiency variations of individual activities.
- Effects of any programmes instigated by the Asset Management Plan.
- Operating costs over range of individual activities.

Examples of types of benchmarking that are to be considered include tracking progress, responsiveness to service calls, operation costs i.e. $/m/year and energy costs. As data is obtained and implications understood the benchmarking can be used for additional or revised Levels of Service and can be incorporated into a graphical display.

In 2014 Nelson City Council participated in a Local Government New Zealand benchmarking exercise for water based utilities.

The effectiveness of the Asset Management plan will be monitored by the following procedures:

- Financial expenditure projections prior to year end
- Resource consent monitoring as required by consents
- Operations and Maintenance reports on a monthly basis
- The ongoing updating of the asset register of the pipe assets when repairs are carried out and the attributes are compared with the asset register attributes
- The development of modelling for the reticulation on a catchment by catchment basis

Table ES-6: Improvement Programme

Improvement Programme
Improve accuracy of data through review and modification of collection, storage, and auditing
More detailed strategy for maintenance and workaround of critical assets in the event of emergency
Expand focus on inter-relationship of network components and development of improved strategies for renewals and replacement based on criticality and actual condition
Expand sustainable practice throughout the wastewater activity
Ongoing refinement of lifecycle decision making and financial forecasts
Investigate a process to distinguish private overflows from public. It is believed that a large proportion of the overflows are on private property.
Better reporting options need to be investigated regarding number of dry weather sewerage overflows
Reporting need improving regarding median response times to network issues. For 2015/16 median response times were based on 88% of the total requests and median resolution times were based on 99% of the total requests
Complete the investigation of the storage capacity of pump stations and reticulation and develop a strategy to respond to emergencies requiring back up electricity generation.
Review asset lives using NAMs– NZ Infrastructure Asset Valuation and Depreciation Guidelines
Improve accuracy of condition assessments
Systematic processes will be introduced for the collection and upgrading of essential data based on asset criticality including: Asset attribute information Asset performance data Asset condition data
More robust framework for identification of critical assets
A methodology for determining asset criticality to a component level, along with options, to be determined to integrate criticality into the ongoing operation, maintenance, renewals and capital programme
Ensure appropriate funding mechanisms are in place such as Development Contributions Valuation forecasts
Levels of service and cost linkage to be better defined
Better use of future demand modelling
Create matrix of lifecycle decision frameworks/strategic objectives/levels of service
Set time frames for risk mitigation measures
Extend natural hazard assessment throughout the network

Review operational contracts to ensure optimisation and development of programmes and processes
Update emergency management response plan
Improve monitoring of operational KPI's
Improve resourcing to ensure better scope and cost estimates for inclusion in capital projects budget forecasting
Get wider range of tendered rates for asset valuations
Create wider range of reference material for supporting assumptions and forecasting methodology
More trend analysis to optimise decision making
Improve use of AMP content to be more user friendly and appropriate
Training for Information Systems re: analysis and reporting
Better documentation of gap analysis identification of improvement tasks, prioritisation with allocation of resources/timeframes/deliverables, project scope/brief development for major improvement tasks, regular monitoring of progress against the asset management improvement programme and reporting to management

1. Introduction

1.1. Background

1.1.1. Purpose of the plan

The purpose of this Wastewater Asset Management Plan is to support the goal of the wastewater activity by ensuring that assets are operated and maintained to provide the required level of service and to meet community outcomes for present and future customers in a sustainable and cost effective manner.

The content of the Asset Management Plan further supports the purpose by:

- Demonstrating responsible, sustainable management and operation of wastewater assets which represent a significant, strategic and valuable asset belonging to Nelson City.
- Justify funding requirements.
- Demonstrating regulatory compliance under, Section 94(1) of the Local Government Act 2002 which in summary requires the Long Term Council Community Plan to be supported by:
- Quality information and assumptions underlying forecast information.
- Framework for forecast information and performance measures are appropriate to assess meaningful levels of service.
- Demonstrating clear linkage to community agreed outcomes with stated levels of service.

The Goal of the Wastewater Activity is to provide a wastewater system that will prevent harm to people and property, contribute to community wellbeing and protect the environment from harm related to uncontrolled wastewater discharges.

The contribution of wastewater services to the Community Outcomes and Asset Management objectives will be seen through:

- Meaningful stakeholder consultation to establish service standards through the Long Term Plan.
- Continuing a programme of inspections and monitoring of the network to assess asset condition and performance.
- Undertaking a risk based approach to identify operational, maintenance, renewal and capital development needs, and applying multi-criteria analysis techniques to select the most cost effective and sustainable work programme.
- Ensuring services are delivered at the right price and quality.
- Achieving the appropriate level and quality of asset management practice.
- Continuing programme of capital works.
- Futureproofing and resilience

The overall objective of Asset Management planning is to:

> Deliver the required level of service to existing and future customers in a sustainable and cost effective manner.

This plan will provide the substantiation for budget forecasts put forward in the Long Term Plan (2018-2028) for wastewater.

1.1.2. Relationship with other planning documents

Infrastructure Strategy

In 2014 the Local Government Act 2002 was amended to include section 101B - a requirement for local authorities to prepare an infrastructure strategy as part of the Long Term Plan. The strategy is expected to look at least thirty years into the future and detail the issues that the local authority can reasonably foresee. The office of the Auditor General has provided guidance documents for authorities to use when developing the strategy. The National Policy Statement – Urban Development Capacity impacts on the Infrastructure Strategy. It requires local authorities to ensure there is sufficient development capacity to meet demand in the short, medium, and long term (10 – 30 years) with projects required to be identified.

Much of the work required for the strategy comes from the development of this asset management plan and in order to avoid un-necessary duplication this plan focusses on the first ten years of the thirty year strategy timeframe.

Proposed Whakamahere Whakatū Nelson Plan

By their nature wastewater activities are constructed to directly service the community and to contain wastewater within an imperfectly sealed system. The network has developed alongside centres of human habitation and commerce and has often been constructed close to or alongside streams, rivers and the sea. Overflows from the network can enter the stormwater system and eventually be discharged to streams and rivers or the sea. Treated wastewater is also discharged to the sea via a marine outfall. The proposed Whakamahere Whakatū Nelson Plan is currently being developed by the Nelson City Council as the replacement for the Nelson Resource Management Plan. While the impact of the plan on the operation of the wastewater network will become clearer as the proposed plan rules are developed it is expected that there will be an increased emphasis on water quality as the proposed plan responds to the National Policy Statement for Fresh Water Management. Any future wastewater activities will need to meet the requirements of the proposed Whakamahere Whakatū Nelson Plan when it becomes operative, with cost implications identified in future asset management plans as they become obvious. The proposed plan will also include Council's response to the requirements of the NZ Coastal Policy Statement and the National Policy Statement Urban Development Capacity.

Current Nelson Resource Management Plan

The Nelson Resource Management Plan (NRMP) is the operative plan established under the Resource Management Act 1991. The NRMP is a regulatory document that covers both district and regional activities. Council seeks to operate the current network in compliance with this document. To that end Council holds a range of resource consents for both global and site specific activities. On 1 April 2012 a global resource consent (RM105388A) was granted for unintended/accidental discharges from all parts of the network. The consent duration is 20 years. The consent considers the impact the wastewater has on the receiving environments particularly where the pump stations are located.

The resource consent for the operation of the Nelson Wastewater Treatment Plant, the marine outfall and the discharge of treated effluent expires 1 December 2024. As this is a critical operating authority, renewal planning is proposed to begin in 2019/20.

Environmental Activity Management Plans

Fresh water quality is a key component of the central government environmental programme for New Zealand. The National Policy Statement for Fresh Water Management is expected to halt the decline in fresh water quality and lead communities to the point of actively improving it.

Council's investigations of water quality show very good results in upper catchments where undisturbed native bush predominates and lesser quality through farm/forestry areas and urban sections of the catchment.

Freshwater quality improvements will be maximised where the source of the negative impacts can be addressed rather than the community relying on 'end of pipe' treatment techniques.

Community Engagement – Environmental Activity

Council funds a variety of non-regulatory environmental programmes which contribute to environmental enhancement of freshwater and coastal areas, and encourage the community to play their part in reducing contaminants to freshwater. Programmes include Nelson Nature; Healthy Streams; Rainwater Harvesting; Only Rain Down Drains; Riparian Planting; water conservation education; citizen science stream monitoring; advocacy for consumer options such as copper free brake pads and zinc free roofing materials; and behaviour change programmes related to littering, disposal of dog poo, car-washing and fly tipping behaviours.

An ongoing programme of permitted activity condition monitoring in Nelson's industrial precincts also identifies potential contaminant sources entering streams via stormwater and encourages best practice with a combination of support, advice and enforcement.

Water & Sanitary Services Assessment: Is a long-term assessment, carried out under the Local Government Act 2002, of the sanitary services provided by a local authority. These services include wastewater treatment, stormwater, public toilet facilities, disposal from wastewater disposal systems, cemeteries and crematoria and landfills. The main focus of this assessment is to ensure that public health is maintained. Council prepared this assessment in 2005. No significant change to the delivery of services has occurred in the intervening period and there are no plans to review the document in the next three years.

Bylaws, Standards and Policies: These tools for asset creation and subsequent management are needed to support asset management tactics and delivery of service. Councils Wastewater Bylaw became operative in 2014. The bylaw sets out standards that must be met by customers wishing to discharge wastewater to the NCC network.

Ngā Taonga Tuku Iho Ki Whakatū Management Plan: It is a collective initiative involving five of the six local iwi (Ngati Rarua, Ngati Kuia, Ngati Toa Rangitira, Ngati Te Atiawa, Ngati Koata and Ngati Tama) gives a big picture approach to the management of nga taonga tuku iho (the treasured resources).

Trade Waste Management Plan: aims to ensure that contamination of the environment is minimised; assigned discharge volumes are in keeping with the capacity of the system; tariffs are set at equitable levels and the necessary charges levied; forward planning is current and realistic and that discharges to the wastewater system are regularly monitored. This plan has a specific emphasis on Trade Waste and sits as an operational plan under the Wastewater Asset Management Plan. It was last reviewed in 2004.

Inflow and Infiltration Strategy/Exfiltration

Unintended/accidental and wet weather discharges from the network allow wastewater to discharge to land and then to fresh water and the coastal environment. During rain events stormwater enters the wastewater network through faults in pipes, use of wastewater fittings such as gully traps for stormwater discharge and as a result of cross connections between private stormwater pipes and the sewer network. When the volume of wastewater within the reticulation exceeds the design capacity, discharges can occur from the wastewater pump stations and some manholes throughout the network.

Controlling inflow and infiltration is a long term commitment and a key project in this plan.

In addition to the direct impact of inflow and infiltration is the concurrent issue of exfiltration from faults in the pipe network. Material from the wastewater network can leave the network and enter ground or surface waters and impact negatively on the quality of these water bodies. Investigating the network for sources of infiltration also provides a clearer picture of the areas where repairs or renewal programmes should be targeted.

Long Term Plan 2018-28

A plan required by the Local Government Act 2002 to cover a period of at least 10 years. This asset management plan supports Council in the development of the Long Term Plan 2018-28 by providing the substantiation for budget forecasts put forward in the Draft Long Term Plan for wastewater collection, treatment and disposal. As the AMP presents the recommendations of the authors for the future operations, maintenance and capital works necessary to meet the levels of service of the utility the Long Term Plan consultation is the means for the community and Council to provide direction on priorities and affordability for the next ten years.

Annual Plan

On an annual basis Council reviews the work programme and budgets for the following year and when changes are required Council will prepare an Annual Plan for public submissions. The Proposed Annual Plan is measured against the current AMP work programmes and priorities before being adopted.

Future Development Strategy

In response to the National Policy Statement on Urban Development Capacity Nelson City and Tasman District Council (TDC) are both developing strategies for accommodating projected growth in population and households, as well as the attendant business and other demands this growth will bring. The impact on wastewater activity for these future growth areas is one of the key focus areas for this asset management plan.

Land Development Manual

The Land Development Manual 2010 is the document that sets out Council's engineering requirements for developments under the Nelson Resource Management Plan and is the basis of Council's requirements as a network utility operator under the Building Act 2004. A review of the Land Development Manual 2010 is currently underway. The proposed new manual is being developed jointly with Tasman District Council and community stakeholders. As a document that is referenced in the proposed Whakamahere Whakatū Nelson Plan it will be subject to a public notification and submission process.

The wastewater section continues with the current approach of ensuring a good quality wastewater network is installed in urban development areas.

1.1.3. Infrastructure assets included in the plan

The Nelson City Council provides wastewater services from Glenduan in the north to Stoke in the south with approximately 20,000 connected properties. Sewage from Stoke and Tahunanui is treated at the Nelson Regional Sewerage Business Unit Treatment Plant on Bells Island (details of Nelson Regional Sewerage Business Unit are shown in the Nelson Regional Sewerage Business Unit Wastewater Asset Management Plan 2018-28). Fish processing water from factories at Port Nelson is screened and discharged beyond the Boulder Bank into Tasman Bay through the industries fisheries outfall. Effluent from the remainder of the city is treated at the Nelson Wastewater Treatment Plant to the North of the city.

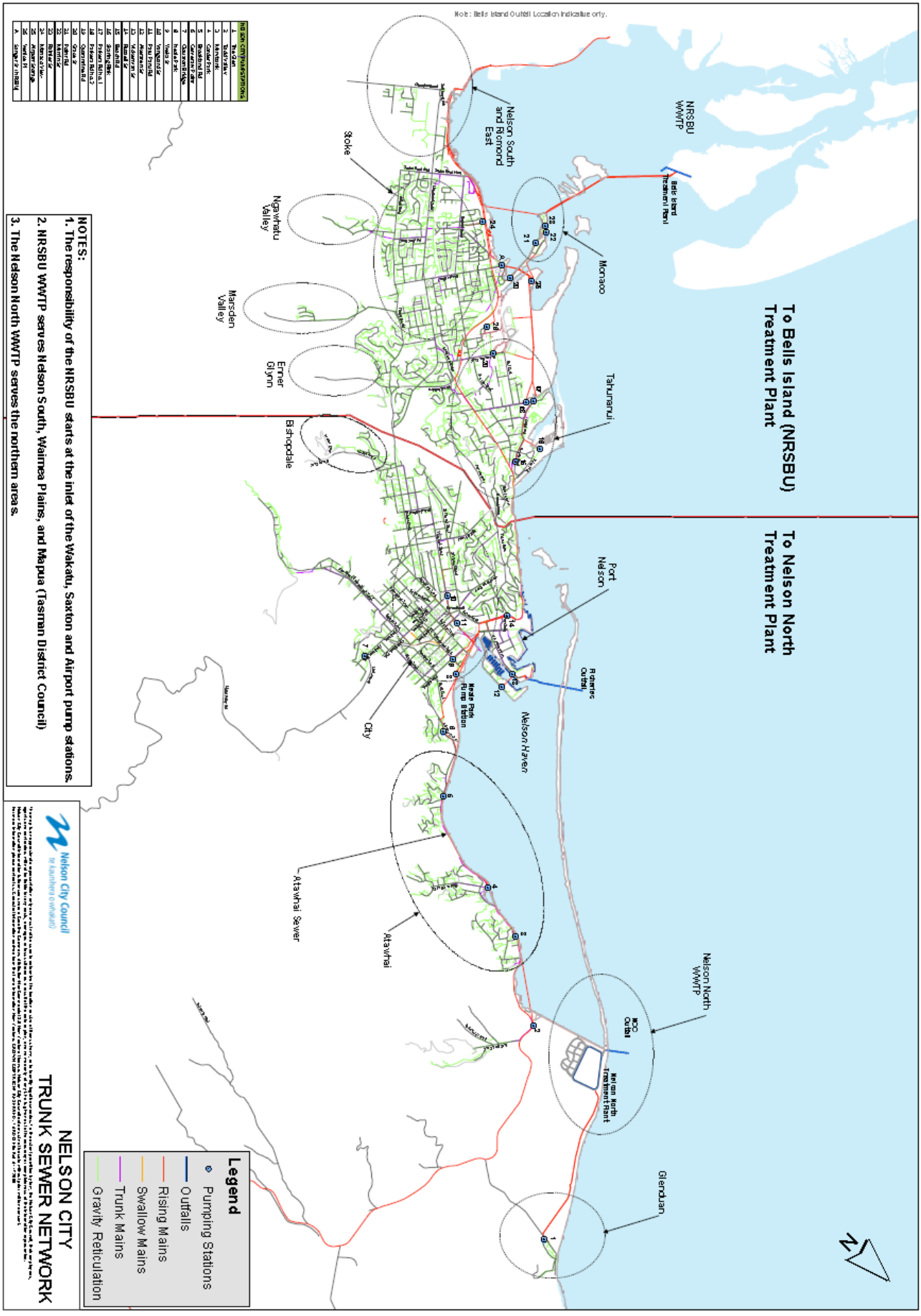
The Nelson Regional Sewerage Business Unit is a joint committee of the Tasman District Council and the Nelson City Council and was instigated to look after the owner's (the two Council's) interests in the Regional Sewerage Scheme. It became a business unit in October 2000 after previously operating as the Nelson Regional Sewerage Authority. A Memorandum of Understanding that was signed by the two Mayors and Chief Executive's in December 2000 governs the operation of the Nelson Regional Sewerage Business Unit. Nelson City Council is a contributor to the Nelson Regional Sewerage Business Unit for the Nelson South area and has a quantity and quality based agreement detailing Nelson City Council existing and future requirements. With the completion of the upgrade to the Nelson Waste Water Treatment Plant, sludge from the treatment plant is trucked to Bell Island for further processing.

The inventory of public wastewater assets, owned by Nelson City Council and managed by the Infrastructure division as at June 2016 is shown is shown in Table 1-1

Table 1-1: Summary of Wastewater Activity Assets

Asset Category	June 2016	
	km	units
Reticulation Pipes	325.2	
Trunk Mains	36.3	
Swallow Mains	5.6	
Rising Mains	25.9	
Access points		924
Manholes		6,780
Tanks		11
Valves		152
Neale Park Detention Tank		1
Pump Stations		25
Nelson Treatment Plant		1

Figure 1-1: Nelson City Wastewater Scheme



Key partners and stakeholders in the plan

The plan recognises the following external and internal key partners and stake holders:

Table 1-2: Key Partners and Stake Holders

Key Partners and Stakeholders	Main Interests
Key Partners	
Tangata Whenua comprising of regional iwi	Environment, cultural heritage
External Partners and Stakeholders	
Residents and ratepayers	Public health and safety, service reliability, environment, cost
Industrial and commercial users	Public health and safety, service reliability, environment, cost
Nelson Marlborough District Health Board	Public health and safety, environment
Nelson City Council (unitary authority)	Environment
Tasman District Council	Joint Partner in the NRSBU. Part of South Nelson development adjacent Champion Road discharges to the TDC network.
Government agencies (MoH, MfE, Audit NZ)	Public health and safety, service reliability, environment, cost
Consultants, Contractors and suppliers	Procurement, technical, projects/programmes
Internal Stakeholders	
Councillors and Sub-committees	Public health and safety, service reliability, environment, cost
Staff	Public health and safety, service reliability, environment, cost

Organisation structure

Council has an activity based structure with operations, maintenance and asset management functions for wastewater assets provided by a separate operations and asset management team. Capital projects are managed by specialist project managers in a separate service delivery team.

The day to day operations and maintenance of the network are carried out by an external contractor managed by the team leader – utilities.

Asset management functions are undertaken by separate asset engineers.

1.2. Goals and Objectives of Asset Ownership

1.2.1. Reasons and Justifications for Asset Ownership

Council is responsible for the provision of reticulation, treatment and disposal along with strategic planning and management functions.

Council also has a role in regulation and enforcement of the existing legislative and regulatory framework (including bylaws) to ensure members of the community act appropriately.

History of Nelson City Council Wastewater System

The Nelson City Council has been responsible for wastewater disposal in the city since the first piped combined stormwater/sewer disposal system was placed in approximately 1907. The city has expanded by amalgamation of adjoining areas since. Tahuna Board joined the City in 1950, Stoke was transferred from Waimea County Council in 1958, Atawhai in 1968. Whangamoa Riding and the South Nelson area from Saxton Road to Champion Road were further additions in 1989.

The role of Council

The Nelson City Council manages the provision of the public wastewater network for the residents of Nelson City in a way that minimises adverse health impacts from waterborne disease to most urban properties, helps promote commercial and industrial development through providing a tradewaste network and addresses infiltration of stormwater into the wastewater system.

The role of Council in the wastewater activity is influenced by the following legislative requirements.

The Local Government Act:

The Local Government Act 1974: Provides the authority for Nelson City Council to construct, operate and maintain the Wastewater, Water and Stormwater System.

The Local Government Act 2002: Defines the purpose of local authorities as enabling local decision-making by and on behalf of the community. The Nelson City Council is a local authority established under the Local Government Act 2002 (the Act) with purpose and responsibilities set out in the Act, in particular 10(1)(b), 10(2) and 14(1)(h).

The Health Act 1956:

Places an obligation on Council to improve, promote and protect public health within the District. The provision of wastewater services helps to promote and improve public health.

This Asset Management Plan is written on the basis that wastewater services are an ongoing core responsibility of Council.

1.2.2. Links to organisation vision, mission, goals and objectives

Vision

Nelson is the Smart Little City

Mission statement

We leverage our resources to shape an exceptional place to live, work and play

Community outcomes

Councils are required by the Local Government Act 2002 to have Community Outcomes – a statement of the measures of success that Council is working to achieve for the community. Council has eight current community outcomes in the Long Term Plan 2018-2028 that are summarised below.

- Our unique natural environment is healthy and protected
- Our urban and rural environments are people-friendly, well planned and sustainably managed
- Our infrastructure is efficient, cost effective and meets current and future needs

- Our region is supported by an innovative and sustainable economy
- Our communities are healthy, safe, inclusive and resilient
- Our communities have opportunities to celebrate and explore their heritage, identity and creativity
- Our communities have access to a range of social, educational and recreational facilities and activities
- Our Council provides leadership and fosters partnerships, a regional perspective, and community engagement

Of these eight the first five have direct links with the wastewater activity and are discussed in more detail in the Levels of Service section.

1.2.3. Plan framework and key elements

The framework of the Wastewater Asset Management Plan 2018-28 follows the generic layout identified in section 4.2 of the International Infrastructure Management Manual 2015.

The plan has the following key elements:

- Why we need a plan (Introduction)
- What we provide (Levels of service)
- Planning for the future (Future demand)
- How we provide the service (Lifecycle management)
- Dealing with uncertainty (Risk management plan)
- What it will cost and how we pay for it (Financial summary)
- What we're doing to improve (Plan improvement and monitoring)

1.3. AM Maturity

Asset Management is recognised as a critical component of Infrastructure Management globally and this sector has benefited from initiatives to formalise the practice of asset management since November 1996. The Association of Local Government Engineering New Zealand (Inc) and the Institute of Public Works Engineering of Australia have lead the development of the International Infrastructure Management Manual (IIMM) that forms the basis of Infrastructure Asset Management Practices at Nelson City Council.

The IIMM provides an AM Maturity Index. The Nelson City Council Asset Management Policy sets the level of maturity per activity. Refer to the Plan Improvement and Monitoring – Status of AM Practices section of this plan for details about this activity's current maturity status and target levels of maturity.

2. Levels of Service

Asset Management Plans set out the level of service Council seeks to provide the community for the respective activity.

Levels of service are the standards Council aims to meet when providing a facility or service in support of community outcomes. They are the measurable effect or result of a Council service, described in terms of quality, quantity, reliability, timelines, cost or similar variables.

It should be noted that levels of service are not intended as a formal customer contract, rather, Council's responsibility is initially to aim to achieve these levels and then to achieve them more cost effectively through a process of improvement where it can be met within current budgets.

The levels of service provision for the wastewater activity, the current performance and the performance measures and targets by which these will be assessed are defined in this section.

This section also contains information on customer research undertaken, strategic and corporate goals and the legislative requirements adhered to in arriving at the levels of service.

Changes to the levels of service may significantly change funding requirements in some instances.

Performance measures that are included in the Long Term Plan are reported on annually, through the Annual Report.

Council uses the Significance and Engagement Policy to determine the level of engagement required for a particular issue e.g. levels of service change.

2.1. Customer research and expectations

While the Long Term Plan consultation process incorporates the levels of service associated with the wastewater activity, Nelson City Council has also undertaken a range of consultation processes in the past specifically targeted at gathering information on preferred levels of service or the extent of infrastructure that Council has/will be required to install. The extent of the historical and additional proposed consultation is detailed in Table 2-1 below.

Table 2-1: Wastewater Consultation Processes

Consultation Processes	Date	Reasons for Consultation	Extent of Consultation	Applicable to Which Customer Value
Historical				
Water and Sanitary Services Assessments	2005	To meet sanitary services assessment criteria of Local Government Act 2002	Consultation via the Long Term Council Community Plan for acceptance of the original assessment. Consultation with Medical officer of Health and local iwi and the community for any future review.	Reliability Capacity
Residents Survey	Most years since 1998	Rate satisfaction with services provided by Council	300 - 400 residents surveyed by telephone	N/A
Treated Wastewater discharge consent*	2004	Upgrade of waste water treatment plant and associated discharges	Working party that included representatives from industry, iwi, Environmental and Council representatives Extensive consultation with residents/property owners, local business and trade waste operators on the options for upgrading waste water treatment plant	Sustainability
Wastewater Bylaw	2014	Legislative requirement	Public, business and industry submissions requested. Advertising in local papers.	Sustainability Capacity

Consultation Processes	Date	Reasons for Consultation	Extent of Consultation	Applicable to Which Customer Value
		criteria of LGA 2002	Submissions heard and considered	
Long Term Plan process	Every 3 years	Legislative requirement criteria of Local Government Act 2002	Public, business and Industry submissions requested. Advertising in local papers	Sustainability Reliability Capacity Responsiveness
Annual Plan process	Each year that changes to the Long Term Plan are proposed	Legislative requirement criteria of Local Government Act 2002.	Public, business and Industry submissions requested. Advertising in local papers.	Sustainability Reliability Capacity Responsiveness

*For the waste water activity Council is required to obtain consents under the Resource Management Act for the discharge of waste water to receiving waterways. These consents set the legal minimum level of service for values such as odour, quality and volume of water discharged. Where these applications are publicly notified the opportunity is given for any person to make a submission on the proposal.

Water and Sanitary Services Assessments

The aim of the Water and Sanitary Services Assessments was to enable Council to gain an overview of the water and sanitary services within its district to help plan and prioritise for any improved level of service and to consider its obligations as a Unitary Authority. Council completed this assessment in 2005. No significant change to the delivery of services has occurred in the intervening period and there are no plans to review the document in the next three years.

Residents' Survey

The purpose of the Residents' Survey is to get statistically representative resident feedback on Council performance which is used to report on performance measures and identify areas for improvement.

Nelson City Council has been conducting annual surveys of residents since the late 1990s, covering a range of topics. Where possible, questions are repeated to enable comparisons over time. Council's current approach to annual residents' surveys is to run a long (20-minute) survey every three years, timed for the year before the Long Term Plan (LTP), for example, 2017. This allows a wider range of topics to be covered to inform LTP decision-making. In the intervening years, such as in 2016, shorter surveys (up to 10 minutes) are undertaken. These focus on collecting data to report on LTP performance measures and to inform Asset and Activity Management Plans.

2012 Residents' Survey

53% very satisfied or satisfied with Wastewater.

2013 Residents' Survey

In May 2013 a residents' survey on behalf of the Nelson City Council was carried out. This survey was shortened from previous years and did not specifically seek feedback on the wastewater activity.

2014 Residents' Survey

50% very satisfied or satisfied with Wastewater. Issues identified with Wastewater were: disposal, smell of wastewater, drainage and flooding

2015 Residents' Survey

A residents' survey was not carried out in 2015

2016 Residents' Survey

The 2016 residents' survey did not seek feedback on the Wastewater activity.

2017 Residents' Survey

52% very satisfied and satisfied with Wastewater. Issues identified with Wastewater were: smell of wastewater, disposal, drainage and flooding, leaks.

Odour complaints regarding the network are typically traced to pump stations or air release valves in rising mains. All complaints are investigated and resolved where possible. Council has installed activated carbon or ozone odour treatment devices at the larger pump stations and those in close proximity to dwellings. Disposal of wastewater from the network is typically via wastewater treatment plants and finally to marine outfalls. This process has proven to be both effective and economical. The remaining three comments may relate to the overflows from the network that occur when pipes break, become blocked with tree roots or debris that property owners dispose of into the sewers, or through wet weather/ground water inflow or infiltration into the network. Council has an extensive programme to renew aging pipes and fittings and investigate possible weak areas on an annual basis. Tree roots are cleared when Council identifies locations where they are a problem and larger sections of older pipes are prioritised for renewal when needed. Council regularly runs articles in Live Nelson to encourage property owners to dispose of unwanted bulky items in the rubbish rather than into the sewer. Wet weather inflow into the network is being addressed by an extensive programme to check properties in the city for inappropriate storm water disposal and ground water infiltration is being addressed through inspection of the sewer pipes, targeted repairs where isolated problems are found or prioritisation of renewal where longer sections are an issue. In the future Council will investigate the installation of underground detention tanks or upgrades of pipes and pump stations to increase capacity where this is appropriate.

Long Term Plan

Every three years Council sets out the proposed plans for the provision of services to the community for the next ten years. The long term plan covers the operation of the wastewater activity including the reasons for undertaking the activity, levels of service, description of major projects, financial projections and any key risks that have been identified.

Annual Plan

When variations to the long term plan are proposed by Council the Local Government Act requires these be set out in an annual plan for public consultation.

2.2. Strategic and corporate goals

Community Outcomes

Councils are required by the Local Government Act 2002 to have Community Outcomes – a statement of the measures of success that Council is working to achieve for the community. Council's community outcomes are set out in the Long Term Plan 2018 - 2028.

Table 2-2: Link between Community Outcomes and the Wastewater Activity

Community outcomes	How this Council activity contributes to the outcome
Our unique natural environment is healthy and protected	The wastewater network is managed to minimise impacts on the natural environment and provide a healthy living environment for residents and visitors.
Our infrastructure is efficient, cost effective and meets current and future needs	A good quality, sustainable and affordable wastewater network that meets the needs of our current and future community.
Our region is supported by an innovative and sustainable economy	A well-managed wastewater network is essential to the functioning of our regional economy.
Our urban and rural environments are people-friendly, well planned and sustainably managed	Appropriate wastewater disposal options are important for both urban and rural environments
Our communities are healthy, safe, inclusive and resilient	An efficient wastewater network is essential for the prevention of waterborne disease and the health and productivity of the wider community

The community outcomes have been developed to provide a link between community issues and the current wastewater goal.

Table 2-3: Goal of the Wastewater Activity

GOAL OF THE WASTEWATER ACTIVITY
To provide a wastewater system to Nelson City that is capable of collecting, containing and treating wastewater in an efficient, safe and sustainable way whilst ensuring that the ecological, recreational and cultural interests of the community in the waterways and the marine environment are recognised and enhanced

2.3. Legislative requirements

Legislative requirements form the minimum level of service Council and the community are required to comply with.

The wastewater activity is influenced by the following legislative requirements.

Health and Safety at Work Act 2015: Council must ensure the safety of the public and all workers (including contractors) when carrying out works.

The Local Government Act 2002: Defines the purpose of local authorities as enabling local decision-making by and on behalf of the community.

The Nelson City Council is a local authority established under the Local Government Act 2002 (the Act) with purpose and responsibilities set out in the Act, in particular:

10 Purpose of local government

(1) The purpose of local government is-

(b) to meet the current and future needs of communities for good-quality local infrastructure, local public services, and performance of regulatory functions in a way that is most cost-effective for households and businesses.

(2) In this Act, good-quality, in relation to local infrastructure, local public services, and performance of regulatory functions, means infrastructure, services, and performance that are-

(a) efficient; and

(b) effective; and

(c) appropriate to present and anticipated future circumstances

Sec 11A sets out core services that Council must consider in performing role:

In performing its role, a local authority must have particular regard to the contribution that the following core services make to its communities:

(a) network infrastructure:

(b) public transport services:

(c) solid waste collection and disposal:

(d) the avoidance or mitigation of natural hazards:

(e) libraries, museums, reserves, recreational facilities, and other community infrastructure.

14 Principles relating to local authorities

In performing its role, a local authority must act in accordance with the following principles:

(h) in taking a sustainable development approach, a local authority should take into account-

(i) the social, economic, and cultural interests of people and communities; and

(ii) the need to maintain and enhance the quality of the environment; and

(iii) the reasonably foreseeable needs of future generations.

In 2010 an amendment to the Act (sec 261B Local Government Act 2002) required the Secretary for Local Government to make rules specifying non-financial performance measures for local authorities to use when reporting to their communities. These have been developed for wastewater activity and are incorporated into the levels of service in Table 2-8.

The Act also requires that local authorities take a sustainable development approach to everything they do.

The Resource Management Act 1991: The Nelson Resource Management Plan (NRMP) is a regulatory document that covers both district and regional activities. Council seeks to operate the current network in compliance with this document. To that end Council holds a range of resource consents for both global and site specific activities. The NRMP governs all wastewater discharges.

Resource Consents Held for Wastewater

The resource consents associated with the wastewater activity for Nelson City Council are detailed in Table 2-4 below.

Table 2-4: Resource Consents – Wastewater

Consent Number	Consent Type	Consent Expiry Date	Consent Allowance
RM 025169	Consent for costal permit to discharge treated wastewater to Tasman Bay	1 December 2024	The maximum volume shall not exceed 38,000m3/day in a 2 year rainfall return period and a peak 28 day average flow of 21,000m3 per day
	Consent to use, maintain and renew a pipeline and outfall structure, and to occupy the seabed	1 December 2024	
	Consent to deposit in or on the seabed substances from the outfall pipe	1 December 2024	
	Consent to discharge wastewater onto or into land, namely the existing oxidation pond and proposed wetlands and flow buffer storage ponds	1 December 2024	
	Consent to discharge contaminants, namely wastewater treatment plant gases, to air from a wastewater treatment plant	1 December 2024	There shall be no discharges to air from the waste water treatment plant which are objectionable or offensive at any point on or south of SH6
RM 105388 (Discharge Permit)	Accidental discharges from the network. Consent granted 1 April 2012.	1 April 2032	During a wet weather event there shall be no more than 10 overflow events per 12 month period, reducing to 8 overflow events per

RM 105388A (Coastal Permit)			12 month period by 31/03/22 and 5 overflow events per 12 month period by 31/03/32. During dry weather there shall be no more than 2 overflow events per 12 month period until 31/03/23. From 01/04/23 there shall be no dry weather discharges from any pump stations.
RM 155262	Consent to discharge to air non-odorous based components resulting from an odour treatment process associated with the Corder Park pump station. Atawhai Drive, Nelson.	25 August 2050	
RM 165359	Discharge permit to discharge contaminants to air from an industrial premises and from three 400 kilo-Watt stationary internal combustion engines in relation to the upgrade of the Neale Park Pump Station.	25 January 2052	When operating for non-emergency purposes, the three 400 kilo-Watt (kW) diesel fired emergency backup generator shall only be operated: a) one at a time; b) for a duration not exceeding 30 minutes for each generator; and c) between the hours of 10 am and 4 pm.
RM 165353	Land use consent for pump station activities (Network Utility) and structures on a low lying site within the Open Space and Recreation Zone (NP29 (Guppy Park) and NP51 (Peace Grove)) including the storage and use of hazardous substances. Neale Park, Nelson.		
RM 165363	Soil disturbance under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Neale Park, Nelson.		

The resource consent for the operation of the plant, the marine outfall and the discharge of treated effluent expires 1 December 2024. As this is a critical operating authority, renewal planning will begin in 2020/21.

The Health Act 1956: places an obligation on Council to improve, promote and protect public health within the District. The provision of wastewater helps to promote and improve public health. Adequate treatment of sewage is essential for community well-being.

The Nelson City Council Wastewater Bylaw 2014: This Bylaw is a legislative tool for fair and effective management of trade waste entering the Council's Sewerage Systems. The Bylaw was adopted in 2014/15.

Wastewater Bylaw Compliance

The Wastewater Bylaw 2014 has replaced the previous agreements that Council had with its trade waste contributors. The bylaw requires that consent be obtained before trade waste may be discharged to the sewer system. Trade Waste agreements are being entered into with all trade waste users with the larger users being considered first.

For monitoring purposes Trade Waste discharges are split into three categories:

- Category 'A' – High flow/high load discharges. All trade waste 'A' customers are monitored and are generally compliant
- Category 'B' – low flow/low load, but with potentially high risk (e.g. needs silt or oil trap, potentially hazardous waste)
- Category 'C' – low flow/low load/low risk

Currently Category 'B' and 'C' customers are generally only monitored by complaint. These categories are charged on the basis that the amount of wastewater discharged from the premises is assumed to be 80% of the amount of water supplied (all water supply connections are metered).

The risk assessment noted that the current wastewater bylaw prohibits a range of discharges to the plant and that the trade waste sampling and monitoring programme requires enhancement. Additional trade waste monitoring resources are required to ensure compliance with the bylaw requirements.

The Trade Waste Management Plan was instigated in 2004 with a purpose of assisting with achieving the levels of service set out in the Wastewater Asset Management Plan in relation to trade waste. The Trade Waste Management Plan aims to ensure that:

- Contamination of the environment is minimised
- Assigned discharge volumes are in keeping with the capacity of the system
- Tariffs are set at equitable levels and the necessary charges levied
- Forward planning is current and realistic
- Discharges to the wastewater system are regularly monitored
- Minimise the impact of contaminants on the wastewater network

National Policy Statement for Freshwater Management 2014

The NPS-FM sets out how Council's will manage water quality and quantity. The NPS-FM requires them to safeguard:

- The life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water; and
- The health of people and communities, at least as affected by secondary contact with fresh water;

And to ensure the overall quality of freshwater is maintained or improved while:

- Protecting the significant values of outstanding freshwater bodies;
- Protecting the significant values of wetlands; and
- Improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated.

With respect to water quantity the NPS-FM also requires safeguarding of life-supporting capacity, ecosystem processes and indigenous species and ecosystems; while also avoiding further over-allocation and phasing out existing over-allocation, improving and maximising the efficient use and allocation of water, and protecting the significant values of wetlands and outstanding freshwater bodies.

Reducing the wet weather discharge of wastewater from the network is an important part of meeting the requirements of the national policy statement.

2.4. Current Level of Service

Significant Negative Effects

It is a requirement of the Local Government Act 2002 Amendment Act 2010 (2(1)(c)) to outline any significant negative effects that any activity within a group of activities may have on the social, economic, environmental, or cultural well-being of the local community.

Table 2-7 below identifies the negative effects for the Nelson City community that the wastewater activity may have, and states the existing approach or proposed action to address the issue. It indicates the existing approach or proposed action to address these in future.

Table 2-5: Negative Effects – The Wastewater Activity

Effect	Status of Effect		Type of Effect (existing situation)		Impact on Well-Being (existing situation)				Existing Approach or Proposed Action to Address
	Existing	Potential	Negative	Significantly Negative	Social	Economic	Environmental	Cultural	
Wastewater Treatment Plant									
Discharge of treated wastewater to the ocean	Static	Static	√		Mod	Minor	Minor	Mod	Compliance with resource consent
Biosolids disposed to land	Static	Static	√		Minor	Minor	Minor	Minor	High degree of sustainability
Discharge of odour	Dynamic	Increasing	√		Minor	Minor	Minor	Minor	Further investigation and remedial works to ponds proposed
Outfall									
Curtailing of shellfish gathering in immediate area of outfall mixing zones	Static	Reducing	√		Minor	Nil	Minor	Mod	High degree of treatment prior to discharge and testing (both effluent and outfall environment)
Pump stations									
Discharge of odour	Static	Static	√		Minor	Minor	Minor	Minor	Reported and resolved within a short space of time
Overflows	Static	Reducing		√	Mod	Minor	Mod	Mod	Pump station overflows are generally reported and resolved within a short space of time
Noise	Static	Static	√		Minor	Minor	Minor	Nil	High degree of noise mitigation in residential areas
Rising Mains									
Overflows	Static	Reducing		√	Mod	Mod	Mod	Mod	High level of inspections carried out Duplication of the Atawhai rising main

Effect	Status of Effect		Type of Effect (existing situation)		Impact on Well-Being (existing situation)				Existing Approach or Proposed Action to Address
	Existing	Potential	Negative	Significantly Negative	Social	Economic	Environmental	Cultural	
									will reduce the risks of overflows
Discharge of odour	Static	Reducing	√		Minor	Nil	Minor	Minor	Reported and resolved within a short space of time
Network mains									
Overflows	Static	Reducing		√	Mod	Mod	Mod	Mod	High level of inspections carried out Duplication of the Atawhai rising main will reduce the risks of overflows
Growth is constrained by lack of wastewater infrastructure	Static	Static	√		Minor	Mod	Minor	Minor	NPS-UDC work for Nelson urban area guides to prioritise roll out to ensure demand is met.

Table 2-6: Levels of Service table 2015 – 2025

				Performance Target			
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2018/19 (Year 1)**	**2019/20 (Year 2)**	**2020/21 (Year 3)**	**2021/22 t-2027/28 (Year 4-10)**
Our infrastructure is efficient, cost effective and meets current and future needs	**Reliability** ^A fully operational wastewater treatment plant	Level of compliance of treatment plant with resource consent conditions 1	15 odour complaints 2015/16 year	100% compliance	Maintain	Maintain	Maintain
		The number of dry weather sewerage overflows from the sewerage system, expressed per 1000 sewerage connections* 2	12 dry weather overflows per 1000 connections	The number of dry weather sewerage overflows from the territorial authority's sewerage system is less than 10 per 1000 connections.			
Our region is supported by an innovative and sustainable economy	**Response** ^Appropriate response to reported network issues	The following median response times are measured for sewerage overflows resulting from a blockage or other fault in the sewerage system: a) attendance time: from the time notification is received to the time that service personnel reach the site, and b) resolution time: from the time that notification is received to the time that service personnel confirm resolution of the blockage or other fault* 2	Median response time of 20 minutes. 2015/16 Median resolution time of 200 minutes. 2015/16	Contractor to attend in a median time of 120 minutes or less. Contractor to resolve issue in a median time of 480 minutes or less.	Maintain Maintain	Maintain Maintain	Maintain Maintain

				Performance Target			
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2018/19 (Year 1)**	**2019/20 (Year 2)**	**2020/21 (Year 3)**	**2021/22 t-2027/28 (Year 4-10)**
Our unique natural environment is healthy and protected	**Quality** ^Environmental protection	Compliance with the territorial authority's resource consents for discharge from the sewerage system measured by the number of: a) abatement notices b) infringement notices c) enforcement orders, and d) convictions in relation to those resource consents* 1	No contraventions identified by regulatory section 2015/16	100% compliance	Maintain	Maintain	Maintain
		The total number of complaints received about any of the following: a) sewage odour b) sewerage system faults c) sewerage system blockages, and d) Council's response to issues with the sewerage system, expressed per 1000 connections to the sewerage system* 2	19 complaints per 1000 connections 2015/16.	No more than 50 justifiable complaints a year per 1000 connections	Maintain	Maintain	Maintain

^L.O.S. included in LTP

* Performance measures with an asterisk reflect the wording of the Non-Financial Performance Measures of the Department of Internal Affairs (DIA) incorporated into sec261B Local Government Act 2002. This is to allow the DIA to compare these measures across councils. Targets have been adjusted where necessary to align.

Measurement procedures:

1. Council RMA infringement records at 1 July
2. Report from SR system at 1 July

Appropriate response to reported network issues

Generally system failures within the reticulation system are reported by the public. Whatever the means of reporting, it is important that response to failures is prompt to maintain public health and to avoid potential damage to the environment. Table 2-7 sets out the response times for system failures that are detailed in the maintenance contract with Maintenance Contractor as well as the level of compliance since July 2005.

Table 2-7: System Failure Response Times

Description	Investigation & Appraisal	Complete Repair	Target Compliance	Investigation Compliance July 2012 to June 2013	Repair Compliance July2012 to June 2013
Investigations, inspections and reticulation monitoring	By arrangement	N/A			
Minor leaks from fittings and connections	2 hours	1 working day	90%	100%	99.5%
Flow meters	1 working day	5 working days			
Other non-urgent works	N/A	10 working days	90%		96.7%
Burst pipes/major leakage	30 minutes	8 hours	90%	88.9%	88.9%
Pump station failure	30 minutes	24 hours	90%	No recorded events in time period	
Major sewage overflow that could endanger life or property or have an adverse effect on the environment	30 minutes	8 hours	90%	100%	99%
Other emergency works	30 minutes	8 hours 90% of times Nil beyond 48 hours			
Gravity sewer blockage	2 hours	8 hours	90%	100%	95.1%

2.5. Desired level of service

Some changes to the levels of service have been identified through the review process. Levels of service that were previously met with ease have been 'tightened' to provide a more challenging environment for Council and drive incremental improvements and those where levels of service were overly optimistic have been adjusted to reflect realistic targets.

Table 2-8: Levels of Service table 2018 – 2028

				Performance Target			
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2018/19 (Year 1)**	**2019/20 (Year 2)**	**2020/21 (Year 3)**	**2021/22 t-2027/28 (Year 4-10)**
Our infrastructure is efficient, cost effective and meets current and future needs	**Reliability** ^A fully operational wastewater treatment system	Level of compliance of treatment plant with resource consent conditions 1	100% compliance in 2016/17 15 odour complaints 2015/16 year	100% compliance			
		Number of dry weather overflows from the sewerage system, per 1000 connections* 2	8 in 2016/17 (down from 12 dry weather overflows in 2015/16)	Fewer than 15 per 1000 connections.			
Our region is supported by an innovative and sustainable economy	**Response** ^Appropriate response to reported network issues	These median response times are measured for overflows resulting from a blockage or other fault in the sewerage system: a) attendance time: from when notification is received to the time service staff reach the site b) resolution time: from the time notification is received to the time service staff confirm resolution of the blockage or other fault* 2	Steady over past two years Median response time of 21 minutes in 2016/17 Median resolution time of 202 minutes in 2016/17	Contractor to attend in median time of 60 minutes or less Contractor to resolve issue in a median time of 480 minutes or less			
Our unique natural	**Quality**	Compliance with territorial authority's resource consents		100% compliance			

				Performance Target			
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2018/19 (Year 1)**	**2019/20 (Year 2)**	**2020/21 (Year 3)**	**2021/22 t-2027/28 (Year 4-10)**
environment is healthy and protected	^Environmental protection	for discharge from the sewerage system measured by number of: a) abatement notices b) infringement notices c) enforcement orders d) convictions in relation to those resource consents* 1	100% compliance i.e. none of the listed actions were identified by regulatory section in 2016/17, also none in 2015/16				
		The total number of complaints received about any of the following: a) sewage odour b) sewerage system faults c) sewerage system blockages, and d) Council's response to issues with the sewerage system, expressed per 1000 connections to the sewerage system* 2	16 complaints per 1000 connections in 2016/17 (slightly fewer, was 19 the previous year)	No more than 20 valid complaints a year per 1000 connections			

^L.O.S. included in LTP

* Performance measures with an asterisk reflect the wording of the Non-Financial Performance Measures of the Department of Internal Affairs (DIA) incorporated into sec261B Local Government Act 2002. This is to allow the DIA to compare these measures across councils. Targets have been adjusted where necessary to align.

Measurement procedures:

1. Council RMA infringement records at 1 July
2. Report from SR system at 1 July

3. Future Demand

This section outlines the existing demand, demand forecasts, growth and expectations and the demand management strategies that Council utilise.

3.1. Demand drivers

The wastewater network is a complex mix of pipes, pump stations and treatment plants. It is difficult to quickly respond to changes in demand given the cost and regulatory environment it operates within. Planning for future demand is increasingly a key requirement of central government.

Table 3-1 sets out the major drivers for increased demand for the wastewater activity.

Table 3-1: Wastewater Demand Drivers

Wastewater Demand Drivers	Changes to Wastewater Activity
Significant population growth and residential expansion into greenfield areas	New development areas on the periphery of the city and increased density in some existing developed areas leading to increased wastewater production.
New 'wet' industries	Growth in the commercial sector that involves wet processing activities increases the demand for wastewater services.
Reduction in house occupancy	Activities such as operating washing machines and dishwashers can generate as much wastewater for single person dwellings as those that house couples.
Changes in Customer Expectations	Customer expectations are increasingly tending towards higher Levels of Service for reliability and response to complaints.
Community Expectation	Community expectations are increasingly focussed on both the reduction of extent and frequency of wastewater overflows on property and roads during and after storms, as well as enhanced wastewater discharge quality. Some criticism also exists of discharging wastewater to the marine environment.
Climatic Changes	In recent years, there has been an increase in the incidence of extreme weather events around the world. The general trend for Nelson is of winters being wetter and the other seasons being drier. More frequent heavy rainfall events have been predicted which will impact negatively on wet weather overflows from the network.
Legislative National Policy Statements: • Freshwater Management and • Urban Development Capacity	• Freshwater Management is a cornerstone central government initiative to improve the quality of freshwater bodies in New Zealand. This is expected to impact on discharges to waterways and require an enhanced response to overflows from the network. • Urban Development Capacity will ensure each territorial authority makes adequate provision for future population growth in their areas. This will require Council to undertake strategic growth studies and identify the impact on the demand for wastewater services.
Organisational Policies Environmental Sustainability strategies:	Development of sustainability strategies that include reduction of exfiltration and overflows from the wastewater network.

3.2. Demand forecasts

Nelson Population and Household Projections: 2018-2028

Nelson's population projections for the next 10 years are calculated using the Statistics NZ high series projections.

Projections are not predictions and should be used as an indication of the overall trend, rather than as exact forecasts.

Figure 3-1: Population and household projections (high), 2018-2028, Nelson

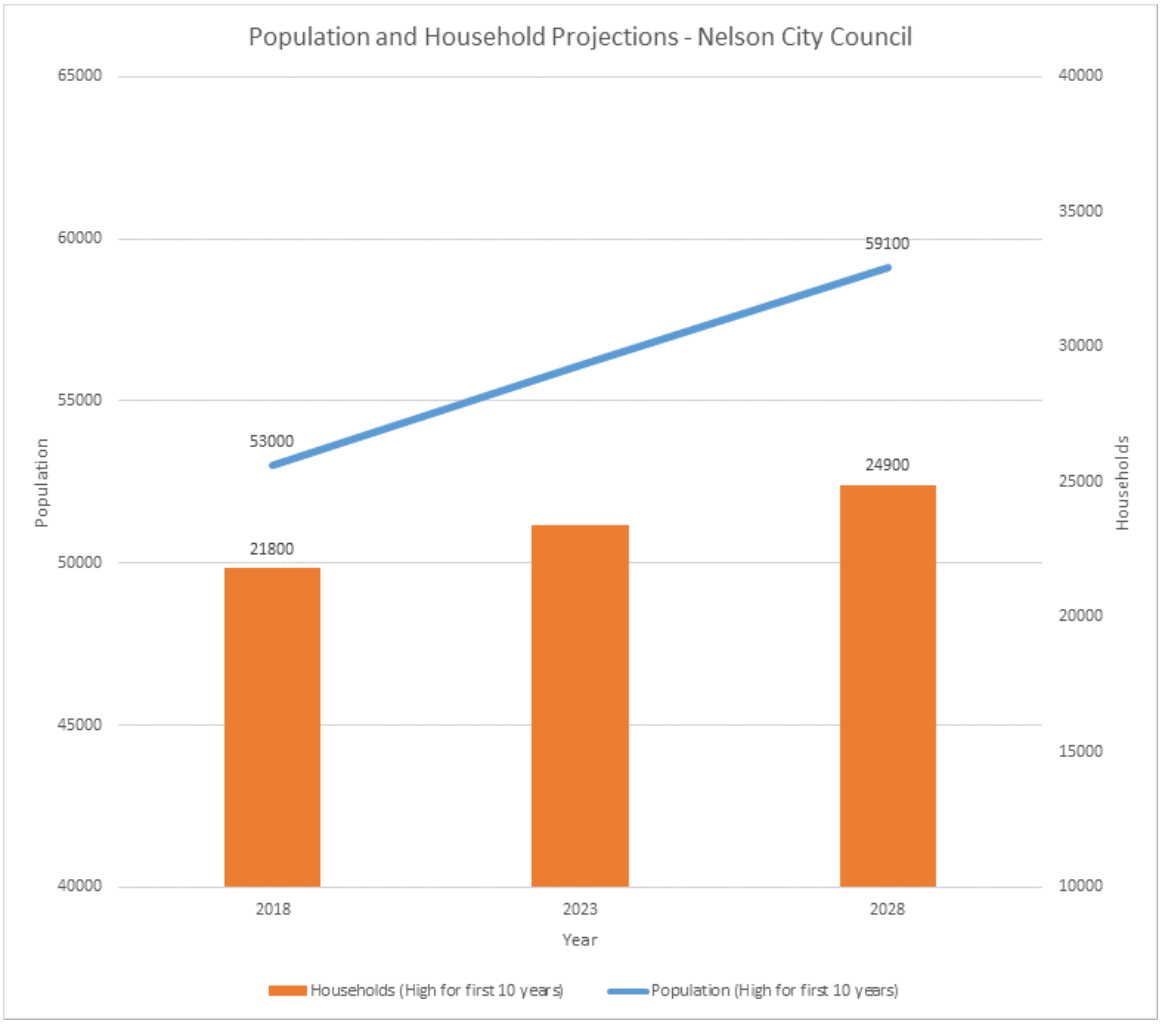
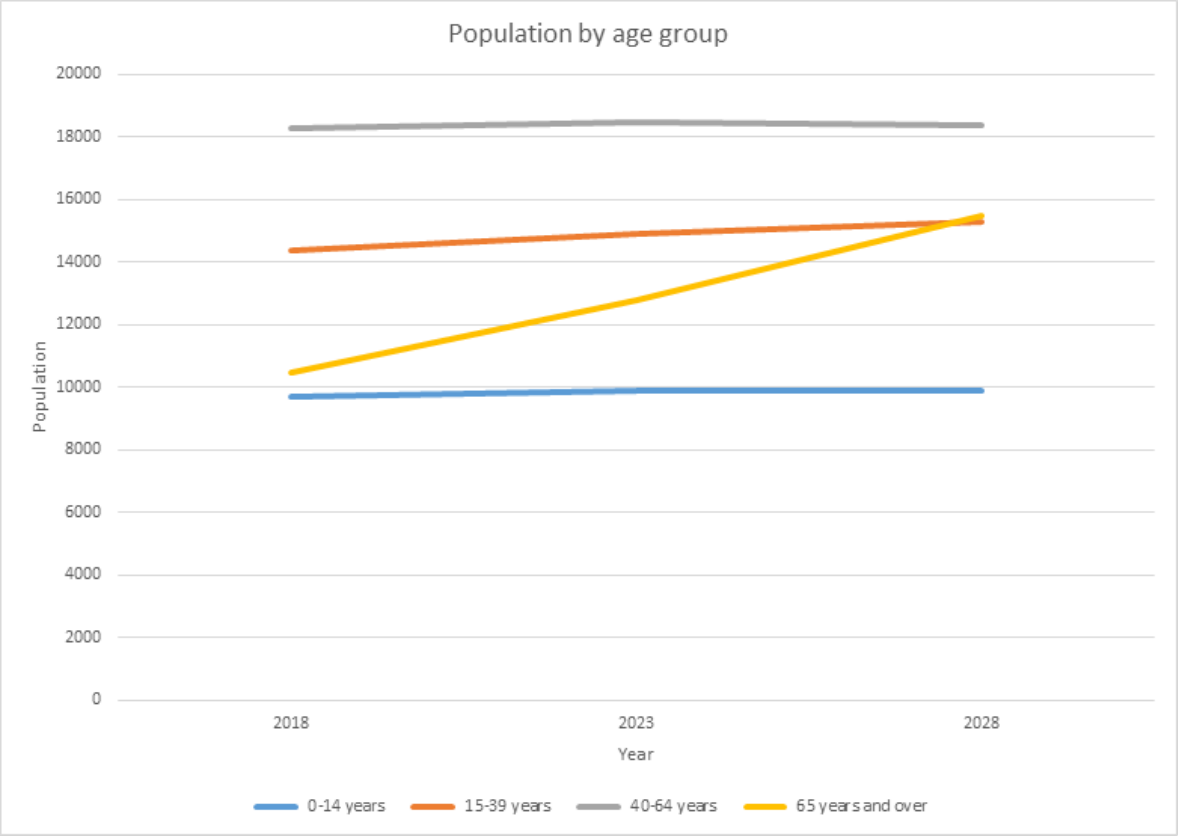


Figure 3-1 shows that, under the high growth scenario, population is projected to increase by 6,100 residents between 2018 and 2028 and the number of households in Nelson will increase by 3,100 households between 2018 and 2028.

One of the key issues facing Nelson is the aging of its population. An aging in the population has a significant impact on what sort of services Council will be required to provide and the ability of future residents to fund rate.

Figure 3-2 shows the projected trends for each age group from 2018-2028.

Figure 3-2: Population Age Trends



Projected demand for National Policy Statement – Urban Development Capacity

The National Policy Statement for Urban Development Capacity (NPS-UDC) requires local authorities to ensure there is sufficient development capacity to meet demand plus an additional margin (Nelson a medium/high growth urban area):

- in the short term (within 3 years) + minimum 20%
- medium term (3-10 years) + minimum 20%
- long term (10-30 years) + minimum 15%

The location of actual growth will depend on where there is capacity for residential growth (residential zoning, infrastructure servicing) and where development is feasible. Residential growth areas and the sequencing of urban development capacity in the short, medium and long term are provided in Appendix I.

Wastewater Discharge Trends

Trending of wastewater flows for the Nelson Waste Water Treatment Plant and the Stoke/Tahuna (Nelson Regional Sewerage Business Unit) area for the last Asset Management Plan period are detailed in Figures 3-4 and 3-5. The trend for both plants is increased flows as the general population increases. Some year to year variability is expected as industrial use fluctuates. The rate of increase in flows to either plant is also influenced by the areas that are being developed at the time.

There is a certain level of inaccuracy in the flow records prior to 2004 from the Nelson North Waste Water Treatment Plant as the ultrasonic meters were not always accurate.

Magnetic flow meters were installed as part of the plant upgrade in 2008/09 and are considered to provide more accurate information.

Figure 3-4: Nelson Waste Water Treatment Plant Average Daily Inflows

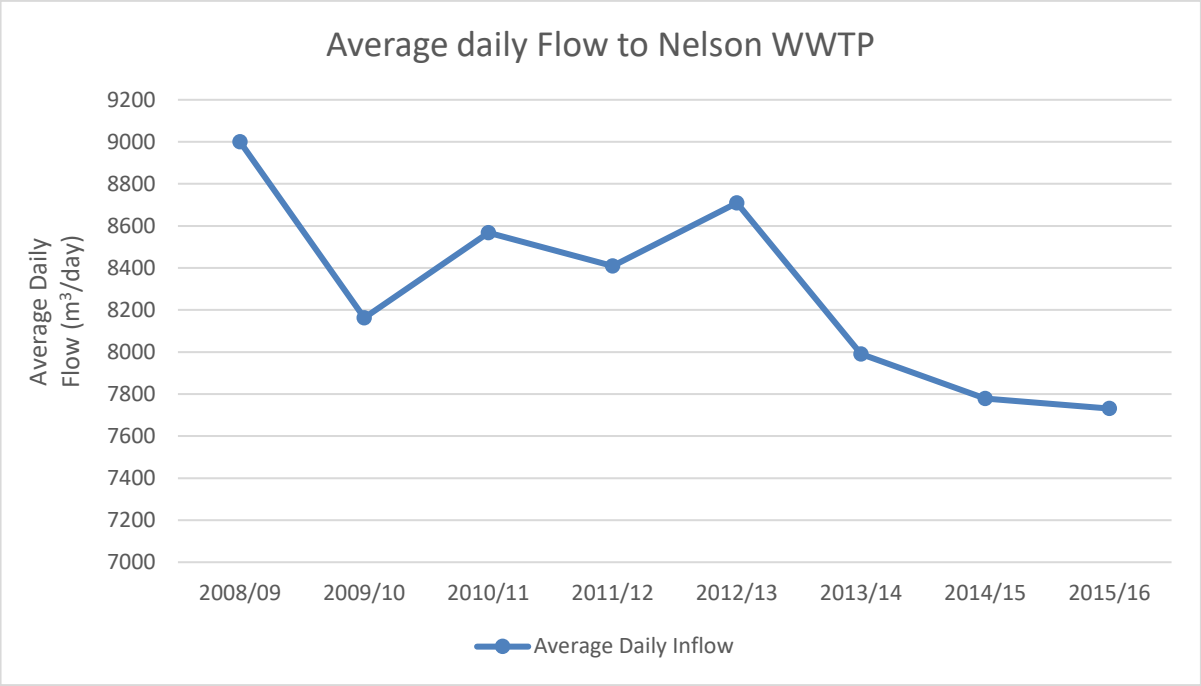


Figure 3-5: Stoke /Tahuna Average Daily flow to Bell Island

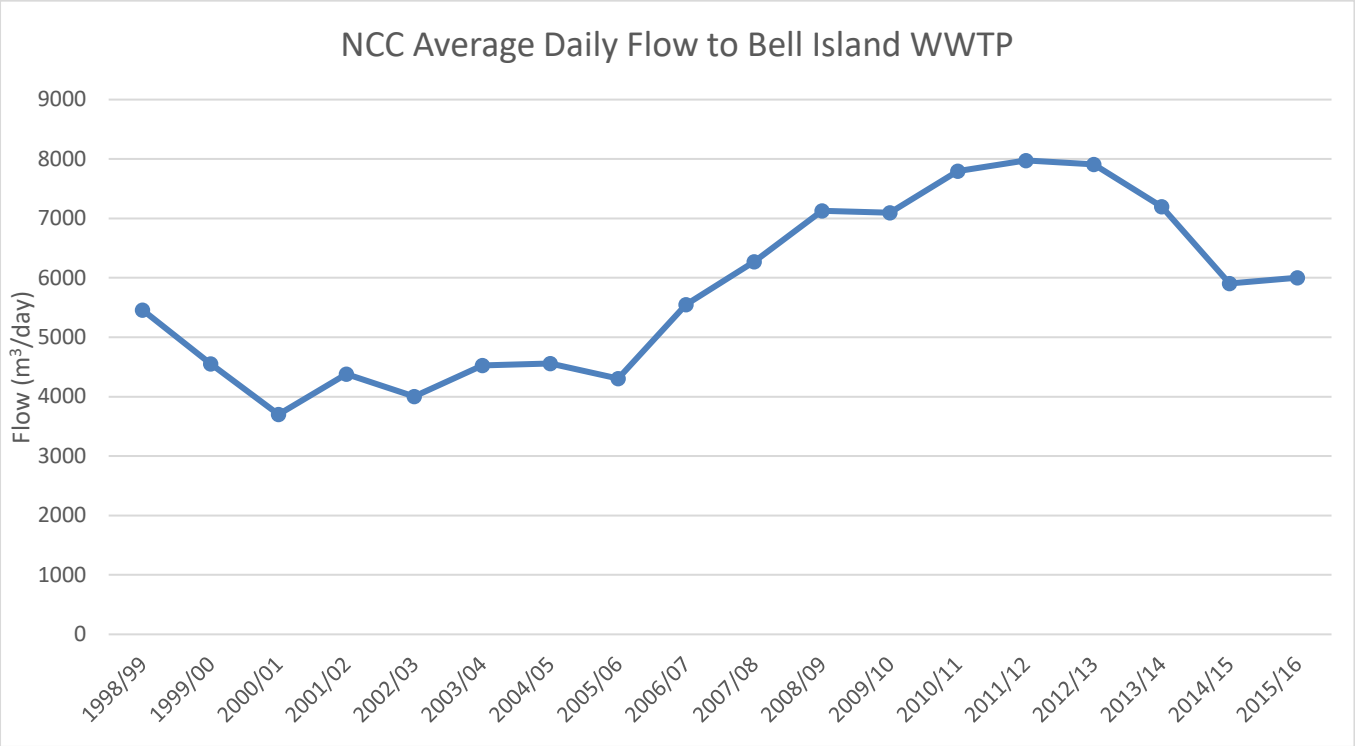


Table 3-2: Flows and Loading to Nelson Regional Sewerage Treatment Plant Bell Island

Nelson City Council 2015/16	Flow m3/day	Peak Flow l/s	BOD kg/day	COD kg/day	SS kg/day	TKN kg/day	TP kg/day
Maximum	13866		3611	12535	7263	460	62
95 percentile	8639	783	2760	7959	4603	447	62
Peak 4 day average	9243	592	4454	11664	10429	506	104
4 Day Average	7342	378	2269	6036	4155	334	50
Limit	10419	605	4707	8413	4627	590	90
Variation average/limit	-30%	-38%	-52%	-28%	-10%	-43%	-44%
Variation 95%/limit	-17%	29%	-41%	-5%	-1%	-24%	-31%

Industrial contributors 2015/16	Flow m3/day	Peak Flow l/s	BOD kg/day	COD kg/day	SS kg/day	TKN kg/day	TP kg/day
Maximum	2733	110	5613	12525	2942	129	48
95 percentile	2452	110	4257	10312	2657	124	43
Peak 4 day average	2242	98	4615	10478	2206	143	56
4 Day Average	1832	80	3160	7692	1602	87	32
Limit	3040	83	3600	11000	2550	190	51
Variation average/limit	-40%	-4%	-12%	-30%	-37%	-54%	-37%
Variation 95%/limit	-19%	33%	18%	-6%	4%	-35%	-16%

3.3. Demand impacts on assets

Modelling of the network suggests that there is currently sufficient dry weather capacity, in the pipes considered to date, for at least the short-medium term. Wet

weather capacity is the greatest challenge and is covered in more detail elsewhere in this plan. The hydraulic model will be updated and calibrated in 2018-19 and used to review demand scenarios and advise on any network upgrading that may be required.

3.4. Demand management plan

Demand Management strategies are used as alternatives to the creation of new assets. They are aimed at modifying system demands to achieve:

- The delivery of cost-effective services
- Defer the need for new assets and optimise the performance/utilisation of the existing assets
- Environmental sustainability in the wastewater activity
- Develop ways to incorporate wider interdepartmental and community involvement

Nelson City Council is working on a range of strategies to manage the demand for wastewater services and therefore the requirement for additional infrastructure.

Table 3-5 below details the demand management strategies that have or will been instigated:

Table 3-3: Demand Management Strategies

Strategy	Objective/ Description
Operations	Reduce direct stormwater entry into the wastewater reticulation system by detection and control Ongoing property inspections programmes will continue to assist in the reduction of direct stormwater entry into the wastewater system thereby reducing overflows in peak wet weather periods and reducing the loadings (and ongoing operations costs) at the treatment plants Installation of inspection ports at private property boundaries to identify inflow and infiltration into the sewer network. From international and national studies it is known that a large component of inflow and infiltration does occur on private property Metering of water supplies to individual properties, implemented in 1998, and has increased the awareness about the need to conserve water with subsequent flow on effect for the wastewater activity Investigations into the condition of lateral pipes at the time of mains replacement are to be instigated (laterals that are found to be faulty are to be replaced, with the cost of lateral replacement covered by the land owner as Nelson City Council is not responsible for the lateral) The provision of adequate public stormwater systems will reduce the likelihood of flooding and therefore inflows of floodwaters into the sewer system through gully traps and manholes Targeted pipe renewal programmes, based on criticality, pipe condition deterioration modelling, closed circuit television inspections and peak flow monitoring (targets the areas most affected by stormwater flooding and infiltration), to replace pipes before failure and reduce groundwater infiltration Use of modelling to ascertain effects and constraints within the systems Increasing storage capacity at priority pump stations
Regulation	The use of the District Plan to control the areas in which development can occur and the associated density that is permitted

Strategy	Objective/ Description
	Integrating growth planning with infrastructure provision via the Urban Development Strategy.
Trade Waste Bylaw	The promotion of on-site pre-treatment for the major industrial contributors Protection of Council's wastewater reticulation and treatment processes, the environment at the point of discharge and ensuring the system capacity is not compromised by high volume or high strength point discharges Requirement of approved management plans for individual industrial contributors that enable Council to achieve the levels of service requirements The provision of economic signals which will influence at what pace industrial users will modify their procedures on a cost-benefit basis to reduce or avoid charges
Education	Continuation of the wastewater conservation programmes aimed at increasing community awareness of the benefits of reducing direct stormwater disposal into the wastewater system. These programmes will include information on the effects of directing stormwater flows to the wastewater system and will be implemented through public signage in key locations and using the print media Encourage use of low flow devices where applicable (i.e. showers, toilets, etc.) Promotion of the Wastewater Bylaw

3.5. Asset programmes to meet demand

Reticulation Capacity

Modelling of the Nelson City and Nelson South catchments has been occurring since 2004 using a computer network model based on the Info Works CS (Collection Systems) software. The programme outputs include a series of capacity and upgrade options reports for the two catchments and more specific modelling of growth areas in particular.

Part of the system performance analysis was to investigate how the system performs with the current population, and with future population projections. Future population growth has been allowed for in green-field development areas currently zoned for residential use both within the city area and on the periphery of the system. Some intensification within the central city and Stoke area is expected to be considered as part of the review of the Nelson Resource Management Plan.

Future development will ultimately be driven by a demand from the community or as a result of wider strategic objectives of Council and network upgrades will follow on.

Maximum flows for design are based on the current development potential of the various catchment zones in accordance with the Nelson Resource Management Plan and urban growth studies carried out on behalf of Council.

Pump Station and Rising Main Capacities

Nelson City Council is nearing the completion of an upgrade programme of pump stations. The upgraded pumps and controls in the network are designed for PWWF plus 10% with a design life horizon of 25–50 years depending on the pump station.

Future upgrades will be linked to the expected flows identified in the wastewater network model and development of areas in line with Council policy.

Nelson City Council has now completed a programme of installing flow meters at all pump stations.

Treatment Capacity

Nelson Waste Water Treatment Plant: The waste water treatment plant main structure was built to take into consideration future upgrades and designed to the following requirements:

- Hydraulic loadings – to year 2050
- Load (Biochemical oxygen demand, suspended solids etc) – to year 2020

The treatment loading and capacity will be closely monitored to ascertain the take up of the capacities.

Approximately half of the city's wastewater is treated by the Nelson Regional Sewerage Business Unit facility on Bell Island. See NRSBU Asset Management Plan for current capacities.

Future Urban Development Strategy: Nelson City and Tasman District Council (TDC) are both developing strategies for accommodating projected growth in population and households, as well as the attendant business and other demands this growth will bring and matching it with infrastructure provision as required by NPS-UDC.

4. Lifecycle Management

Lifecycle Management has a direct impact on the provision of the wastewater services to the residents and businesses of Nelson through the measures that need to be implemented to achieve levels of service. Lifecycle Management will allow Nelson City Council to clearly identify both the short and long term requirements of the wastewater system ensuring that a cost effective service is delivered to the community.

Asset Lifecycle

Assets have a lifecycle as they move through from the initial concept to the final disposal. Depending on the type of asset, its lifecycle may vary from 10 years to over 100 years. Key stages in the asset lifecycle are:

Aging Process and Increasing Risk → Old	**Asset planning**	When the new asset is designed - decisions made at this time influence the cost of operating the asset and the lifespan of the asset. Alternative, non-asset solutions, must also be considered.
	Asset creation or acquisition	When the asset is purchased - constructed or vested in the Nelson City Council. Capital cost, design and construction standards, commissioning the asset, and guarantees by suppliers influence the cost of operating the asset and the lifespan of the asset.
	Asset operations and maintenance	When the asset is operated and maintained - operation relates to a number of elements including efficiency, power costs and throughput. Maintenance relates to preventative maintenance where minor work is carried out to prevent more expensive work in the future and reactive maintenance where a failure is fixed.
	Asset condition and performance monitoring	When the asset is examined and checked to ascertain the remaining life of the asset - what corrective action is required including maintenance, rehabilitation or renewal and within what timescale.

	Asset rehabilitation and renewal	When the asset is restored or replaced to ensure that the required level of service can continue to be delivered.
	Asset disposal and rationalisation	Where a failed or redundant asset is sold off, put to another use, or abandoned.

Asset Failure Modes

Generally it is assumed that physical failure is the critical failure mode for many assets. However the asset management process recognises that other modes of failure exist. The range of failure modes includes:

Structural	Where the physical condition of the asset is the measure of deterioration, service potential and remaining life.
Capacity	Where the level of under or over capacity of the asset is measured against the required level of service to establish the remaining life.
Level of Service Failure	Where reliability of the asset or performance targets are not achieved.
Obsolescence	Where technical change or lack of replacement parts can render assets uneconomic to operate or maintain.
Cost or Economic Impact	Where the cost to maintain or operate an asset is greater than the economic return.
Operator Error	Where the available skill level to operate an asset could impact on asset performance and service delivery.

The Lifecycle Management Programmes cover the four key categories of work necessary to achieve the required outcomes for the wastewater activity. These programmes are:

Management Programme:
Management functions required to support the other Programmes - Developed and Implemented by Nelson City Council

Operations and Maintenance Programme:
To ensure efficient operation and serviceability of the assets so that they achieve their service potential over their useful lives - Developed, Managed and Implemented by Nelson City Council

Renewal Programme:
To provide for the progressive replacement of individual assets that have reached the end of their useful lives - Developed, Managed and Implemented by Nelson City Council

→ Maintaining the service potential of the assets and ensuring that the assets achieve that potential

Development Programme:
To improve parts of the system currently performing below target service standards and to allow development to meet future demand requirements - Developed, Managed and Implemented by Nelson City Council

→ Closing service gaps.
Meeting future demand

Table 4-1 below sets out Nelson City Council Wastewater Management Strategy for the following categories: Strategic Planning, Data Management and Utilisation, Business Processes, Monitoring and Financial Management.

Table 4-1: Management Strategies

Strategy	Objective/ Description
Strategic Planning	
Human Resources	Develop the professional skills of the staff through adequate training and experience Personal Development Plans will be agreed with staff each year and a register maintained to record training history. Staff are encouraged to belong to appropriate professional bodies and to attend appropriate conferences, seminars and training courses
Strategic Alignment	This Asset Management Plan will support the achievement of relevant Community Outcomes for Nelson City Council Community Outcomes for Nelson City Council are set out in the Long Term Plan. The intended contribution of the Nelson City Council wastewater service to the achievement of Community Outcomes is shown in this Asset Management Plan
Service Levels	A clear statement of the wastewater services provided and standards to be achieved that directly link to, and support the stated community outcomes, are shown within this Asset Management Plan
Sustainable Management	Ensures all planning for the management, operation, maintenance, renewal and development of the wastewater activity is compatible with sustainable management principles. Nelson City Council will pursue ways of limiting the use of natural resources including energy, valued landscapes (and other natural heritage) and adverse effects on waterways. This will involve auditing the systems and materials used, and developing ways to incorporate sustainable operation and development principles into Nelson City Council activities.
Data Management and Utilisation	
Network Modelling	Continue the development of computer-based hydraulic model of the reticulation network. Computer models of the wastewater reticulation enable Nelson City Council to: Determine accurately the existing capacity of the system Identify inadequate sections of the system Operate the system in the most efficient and sustainable manner Determine the impact of further development on the system Identify system upgrading requirements Compare options for upgrading the wastewater network
Data Collection	Data collection programmes (condition, performance, asset registers) closely aligned with business needs will be operated in accordance with documented quality processes Data collection, maintenance and analysis are expensive and it is important that programmes and techniques are cost effective and consistent with business needs. Systematic processes will be introduced for the collection and upgrading of essential data based on asset criticality including: Asset attribute information Asset performance data Asset condition data
Geographical Information System Data	Geographical Information System data will be the subject of defined quality assurance processes Nelson City Council has quality processes to ensure that all data entered to the Geographical information system meets defined quality standards and supports Asset Management through connectivity with the asset register and Asset Management data storage
Business Processes	
Asset Management Plan Updates	This Asset Management Plan remains a strategic 'living' document and will be updated as required and reviewed at three yearly intervals to coincide with the Long Term Plan. The scope of the review will be influenced by changes in Community Outcomes for Nelson City Council, service standards, improved knowledge of assets and corporate strategy/ policy and process
Risk Management	Risk Management is an essential part of Asset Management. Wastewater activity risks will be managed by implementing the Risk Management Register for the

Strategy	Objective/ Description
	Wastewater activity and the implementation of risk controls to maintain risk exposure at agreed levels Risk controls will include maintaining appropriate insurance cover, emergency response planning, condition monitoring of critical assets, preventative maintenance, use of Supervisory Control and Data Acquisition, and operations manuals, review of standards and physical works programmes
Infrastructure Asset Valuation	Perform valuations in a manner that is consistent with national guidelines and Nelson City Council corporate policy for valuation cycles which are carried out every 1 – 3 years to reflect international financial activity and align with the Long Term Plan requirements. Asset valuations are the basis for several key asset management processes including asset renewal modelling and financial risk assessments. Valuations of the wastewater system will be carried out based on data from the Asset Management System to ensure audit ability and alignment with other processes.
Monitoring	
Level of Service Standards	Continue with the monitoring procedures to ensure wastewater activity is contributing to the community outcomes as stated and that internal controls (service requests, operational contract requirements) are also monitored and managed
Asset Performance	The performance of the wastewater assets are monitored as an input to asset renewal and asset development programmes. The Monitoring includes: Customer service requests Asset failure records Asset Maintenance records Compliance with Resource Consents Critical asset audits Supervisory control and data acquisition Legislative compliance
Financial Management	
Budgeting	Expenditure programmes for the wastewater activity indicates Council funding and budgets with a 10 year projection Use the Asset Management Plans to provide sufficient detail to demonstrate the decision making process for those 10 year projections.
Financial Management	Manage the wastewater activity budget in accordance with statutes and corporate policy. This involves: Economic appraisal of all capital expenditure Annual review of Asset Management Plan financial programmes Recording of significant deferred maintenance and asset renewals Continuous monitoring of expenditure against budget
Sustainable Funding	Ensure the wastewater activity is managed in a financially sustainable manner over the long term The financial requirements for the provision of the wastewater activity, sustainable and to acceptable standards over the long term will be identified and provided for in the budgets. These financial requirements include: Management of the wastewater activity Operation and maintenance of the wastewater systems Asset replacement Asset development to ensure that the ability of the wastewater activity to deliver an acceptable level of service is not degraded by growth in Nelson City Council

The Operations & Maintenance and Renewal Programmes are focused on maintaining the current service potential of assets, and are primarily driven by the condition of assets although asset performance is often an indicator of asset condition.

The Development Programme is focused on closing service gaps by increasing the service potential of the Wastewater system and is primarily driven by the performance of assets and the need to accommodate growth in the City.

Community infrastructure is installed and maintained on the understanding that the assets are provided in perpetuity for the benefit of future generations. Longevity of an asset is a prime consideration when design and planning is undertaken for new or replacement components in the network. Sustainability has been reflected in the decision making process when designing and constructing the wastewater network.

4.1. Background Data

History of Nelson City Council Wastewater Systems

Nelson City Council has been responsible for wastewater disposal in the city since the first piped disposal system was put in place. The city has since expanded by the amalgamation of adjoining areas. Tahunanui Town Board joined the City in 1950, Stoke was transferred from Waimea County Council in 1958, Atawhai in 1968, Wakapuaka and Stoke rural in 1989. The following details the time line of the wastewater treatment and disposal for the Nelson north area.

- 1872 First drain (sewer and stormwater) draining into Maitai River from Rutherford, Nile, Hardy and Bridge Streets
- 1894 Stormwater and sewer separated
- 1904 Untreated effluent discharged to Boat Harbour
- 1960 Construction of pumping stations in preparation for pumping to Nelson North
- 1969 Water right secured allowing discharge to take place into Tasman Bay followed by construction of Tasman Bay outfall, work completed in 1970
- 1979 Establishment of the current 26-hectare oxidation pond at Nelson North to treat sewage discharge
- 1984 Fisheries discharge channelled through separate outfall, diverting this flow away from the oxidation ponds
- 2007 Existing treatment plant facility extensively upgraded

4.1.1. Physical Parameters

Summary of Assets

Nelson City Council is responsible for a wide variety of assets that constitute the Nelson City Council Wastewater System.

Table 4-2: Summary of Assets

Asset Category	Quantity June 2016	
	km	units
Reticulation Pipes	325.2	
Trunk Mains	36.3	
Swallow Mains	5.6	
Rising Mains	25.9	
Access points		924
Manholes		6,780
Tanks		11
Valves		152
Neale Park Detention Tank		1
Pump Stations		25
Nelson Treatment Plant		1

Table 4-3: Wastewater Mains Lengths by Material as at November 2017

Material	km
Black Asbestos Cement	**2.65**
Asbestos Cement	**80.31**
Blue Brute Pipe	**.02**
Cast Iron	**.1**
Ductile Cast Iron	**.27**
Pit Cast Iron	**.82**
Spun Cast Iron	**.44**
Concrete (InsituFORM lined)	**.2**
Concrete	**85.3**
Ductile Iron Concrete Lined	**.08**
Earthernware	**48.51**
Fibreglass	**.63**
High-density polyethylene pipe	**28.36**
Medium Density Polyethylene	**1.22**
OTHR	**.07**
Polyethylene 100 Material	**4.55**
PVC	**202.76**

Steel Concrete Lined	**.65**
UNKW	**1.79**
Grand Total	**458.73**

Wastewater Treatment and Disposal

The Nelson Wastewater Treatment Plant serves the northern catchment of Nelson City, comprising mainly the city commercial area, domestic residences, and a small percentage of industrial discharges. The wastewater is collected by a reticulation system then pumped from the Neale Park Pump Station along the 9.8 kilometre, 750-900 diameter rising main (Atawhai rising main) to the waste water treatment plant at the northern end of the Nelson Haven. The Nelson Waste Water Treatment Plant currently treats approximately 8,000-9,000 m3 per day of effluent that comprises trade wastes and domestic sewage.

Wastewater Treatment History

Wastewater has been discharged from the outfall at North Nelson into Tasman Bay since 1970. Initially it was untreated, but in 1979 Nelson City Council constructed the present oxidation pond to treat the wastewater prior to discharge.

In 1996 the waste water treatment plant was upgraded by constructing a bund to divide the single oxidation pond into a primary facultative compartment and a secondary maturation compartment. This largely achieved the intended improvement in effluent quality, particularly in regard to faecal coliform reduction. One of the most significant challenges with this type of operation is maintaining a balance between pond loading and available bacteria to process the waste. When the balance is not maintained, either through elevated waste loading or seasonal changes in bacteria action, the pond balance can be altered and another set of bacterial action using anaerobic processes can pre-dominate.

The ponds "crashed" for a three month period in 1999 and it was concluded that the facultative compartment was overloaded during the winter period and the dividing bund was removed in February 2000. This improved the operational capacity of the pond but returned the quality of the effluent to pre-1996 levels.

The waste water treatment plant has been monitored comprehensively since 1999, in terms of flow, load, pond algal condition, and other parameters.

Treatment Plant

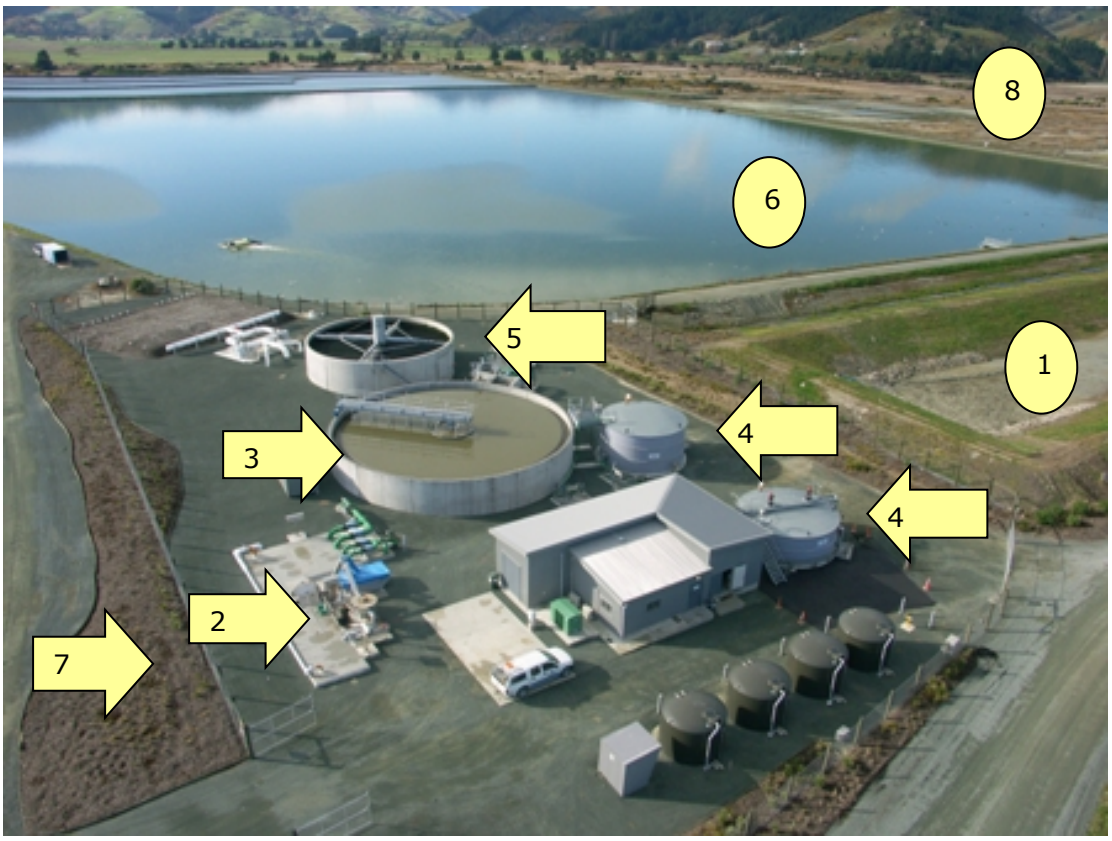
The waste water treatment plant upgrade, substantially completed in 2008, was designed to comply with the requirements of the 2004 resource consent. The design of the new plant has allowed for better management of variable inflows (Biochemical oxygen demand has been shown to vary between 1,250kg Biochemical oxygen demand/day to 2,700kg Biochemical oxygen demand/day) and allows adjustments in operation to be made to reduce the negative effects of winter conditions on the pond operation. The treatment concept for the waste water treatment plant is based on:

- Removing gross solids through the inlet works;
- Pre-treating the influent flow to remove Biochemical oxygen demand;
- Pond based treatment for the removal of Biochemical oxygen demand and total suspended solids to the consent criteria;
- Disinfection using the maturation ponds;
- Final "polishing" of effluent via passage through a constructed wetland.

While improvements in odour generation have been made there are still recurring odour issues that have to be addressed.

Detailed investigations by Councils Network Services Department, the plant operator and consultants have focussed on the levels and distribution of sludge in the oxidation pond compartments. Maintenance dredging was completed in 2014 to remove excess sludge.

Figure 4-1: Nelson North Wastewater Treatment Plant



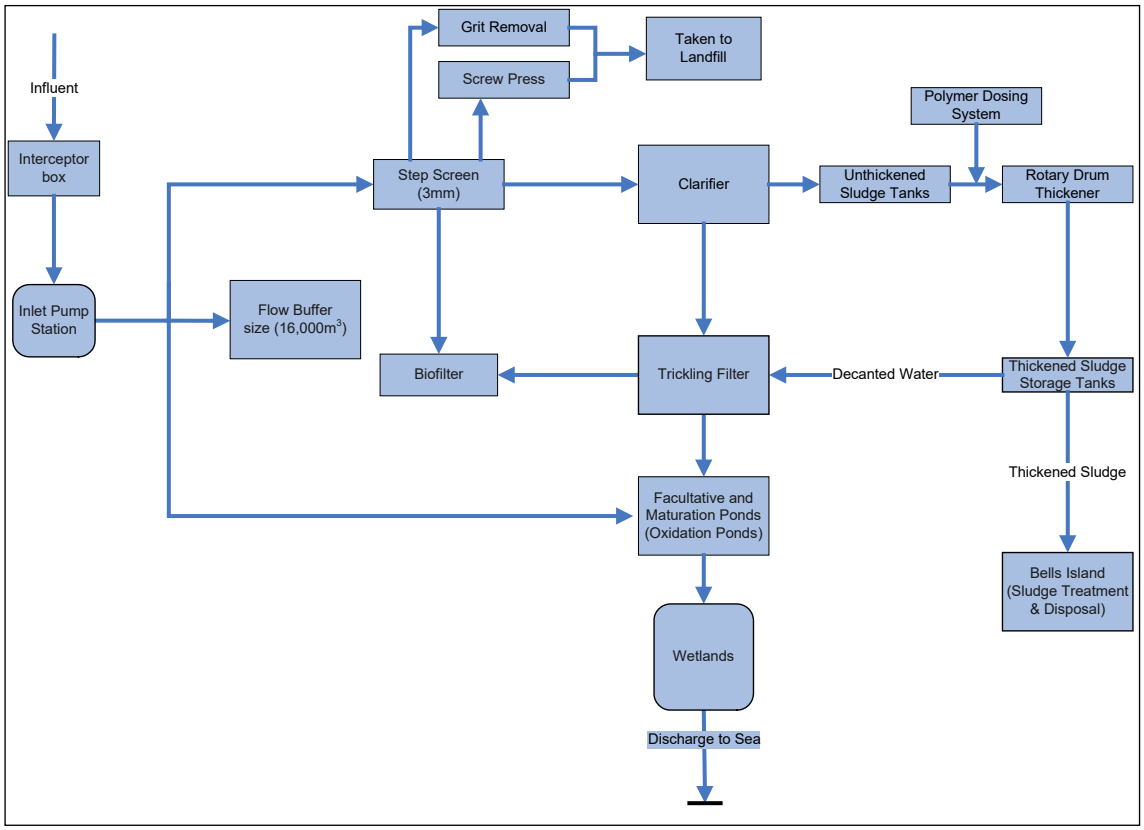
The main components of the waste water treatment plant (as detailed in photo above) are:

- Flow Buffer (1) – during periods of high rainfall, the flow buffer at the front of the treatment plant keeps the system from being overwhelmed
- Screening and Grit Removal (2) - the screening system removes non-organic material from the waste stream. This is compressed and taken to the York Landfill and buried
- Clarifier (3)- Removes readily settleable solids, the organic solids (sludge) settling out of the wastewater are forced to the centre of the tank by scrapers on a revolving mechanical arm inside the tank
- Sludge Tanks (4) - The organic sludge from the clarifier is thickened by mechanical removal of liquid wastewater and then stored for shipment to Bells Island, where it is treated and sprayed as fertiliser on Rabbit Island pine forests
- Trickling Filter (5) – A circular concrete tank which contains plastic media over which the wastewater is distributed from rotating arms. The trickling filter is a fixed growth process designed to reduce the Biochemical oxygen demand load of the wastewater
- Oxidation Pond (6) - The waste water treatment plant has two ponds, a facultative pond and a maturation pond to meet the Biochemical oxygen demand, suspended solids and faecal coliform resource consent criteria
- Bio-Filter (7) – A large 'biofilter', using air, water and bark to neutralise odours,
- Wetlands (8) - Provide a degree of further effluent treatment (or polishing) whilst meeting the cultural aspirations of local iwi (installed in 2008/09)

- Outfall – Outfall pipe that goes 350 m into Tasman Bay

The Schematic of the treatment process is shown in Figure 4-2.

Figure 4-2: Nelson Wastewater Treatment Plant



Treatment Plant Effluent Quality - Performance

The waste water treatment plant became fully operational on the 9 March 2008 and the resource consent took effect from this date. Monitoring results to date indicates the upgraded waste water treatment plant can achieve full compliance with all effluent quality conditions of the consent.

No Odour Events Originating from Wastewater Treatment Plant

The Nelson Waste Water Treatment Plant has had a history of odour complaints. The majority of these complaints originated from the ponds during seasonal changes which tended to produce odours, predominantly during winter months. Prior to the waste water treatment plant upgrade, treatment relied solely on the oxidation ponds. This form of treatment uses naturally occurring bacteria to break down the products of the waste stream in an aerobic process. One of the most significant challenges with this type of operation is maintaining a balance between pond loading and available bacteria to process the waste. When the balance is not maintained, either through elevated waste loading or seasonal changes in bacteria action, the pond balance can be altered and another set of bacterial action using anaerobic processes can pre-dominate. An additional possible source of odour is anaerobic processing of the sludge that forms at the base of the oxidation pond.

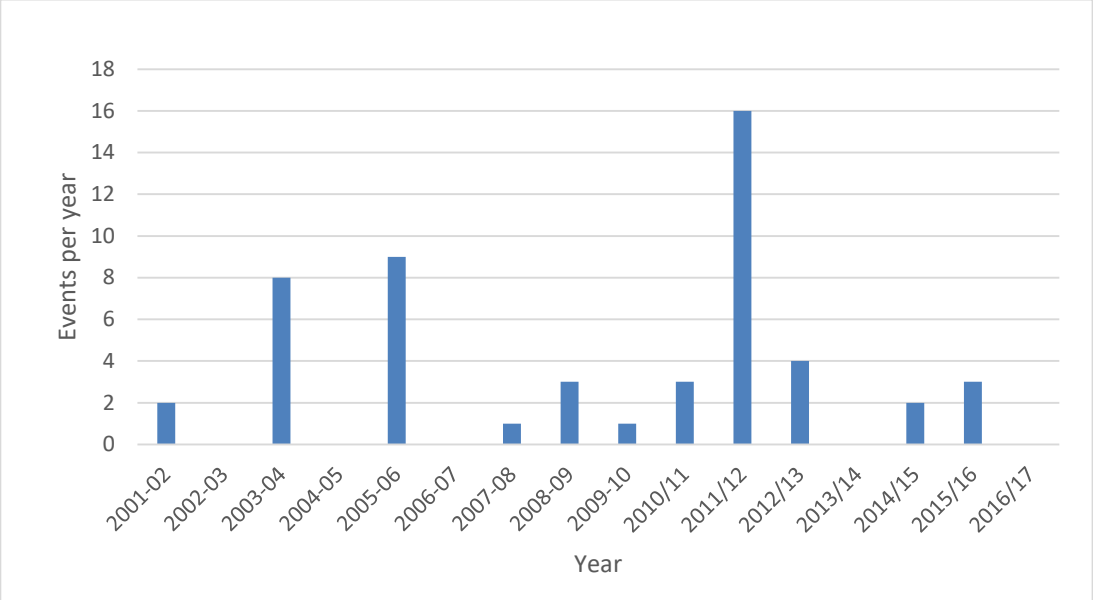
The recent upgrade to the waste water treatment plant has introduced a range of measures that better allow the pond contractor to manage the pond loading by removing solid waste as sludge before it enters the pond. As the contractor becomes

familiar with the active management of the facility the odour levels are expected to meet all resource consent conditions.

The resource consent has the following condition for odours: "There shall be no discharges to air from the waste water treatment plant which are objectionable or offensive at any point on or south of SH6".

To date it has not been possible to continuously comply with this condition. Detailed investigation between Council engineering consultants and the plant operator in 2013-14 centred on the accumulation of sludge in the oxidation pond as a likely source of odour production. In 2014 Council de-sludged the ponds to remove material identified as the source of the odours, resulting from anaerobic decomposition of organic material. A cover was also constructed over the trickling filter. Compliance with the resource consent has improved and will be closely monitored.

Figure 4-3: Odour Events Originating from Waste Water Treatment Plant



Outfalls

Nelson has two outfall structures within its territorial boundaries - the Fisheries Outfall and the Nelson Wastewater Treatment Plant Outfall.

Nelson Wastewater Treatment Plant Outfall: Constructed in 1970 using 900mm diameter reinforced concrete pipes and a multi-point diffuser.

A study by the Cawthron Institute in April 2013 concluded

"In summary the conclusion drawn as far back as the original 1998 assessment (Barter & Forrest 1998) of effects has not changed. That is: "There was no sign of excessive sedimentation on rocky habitat in the vicinity of the diffuser, and there were no obvious patterns in the distribution of species which suggested an adverse impact from the sewage discharge".

Nelson City Council is responsible for the maintenance and repair of this structure.

Fisheries Outfall: The fisheries outfall is owned by the Nelson City Council. However the fish processing companies are responsible for the operating and maintenance costs of the outfall, including the pump station, and therefore it does not have any impact on Council's asset management capital expenditure.

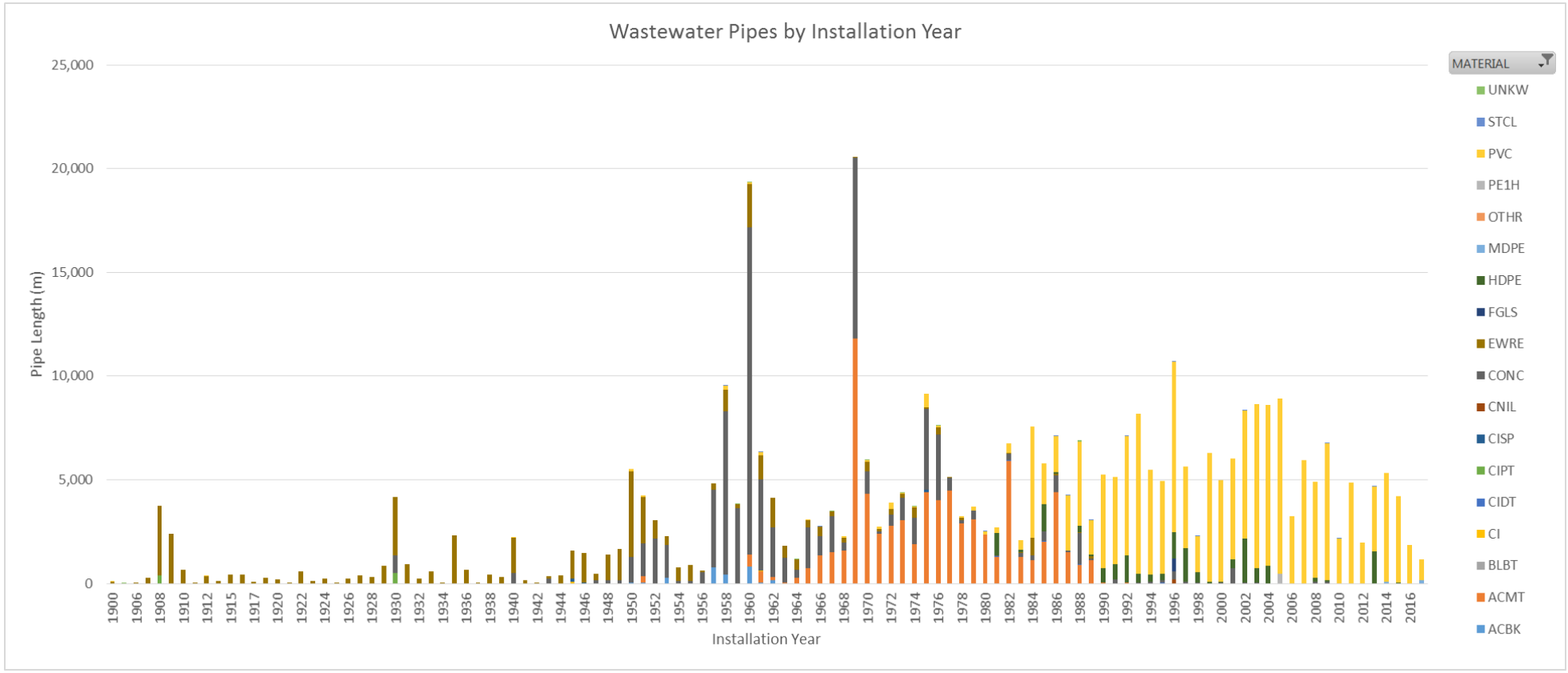
Reticulation

The main purpose of the reticulation system is to take effluent from the customer's point of discharge (Nelson City Council mains) and transport it to the treatment plant. The reticulation system consists of the following key components:

- 100mm diameter lines, typically serving 2-5 households
- 150mm -200mm diameter reticulation mains
- Trunk mains >200mm diameter
- Manholes/LHCE
- Swallow mains (gravity pressure lines)
- Rising mains

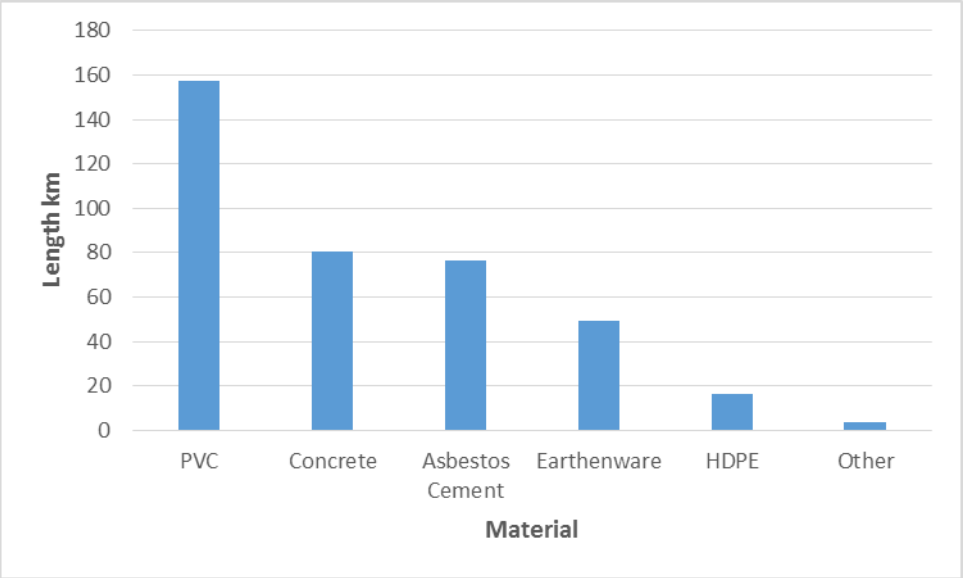
The Nelson City Council has wastewater pipe assets ranging from new to about 110 years of age. The distribution of pipe length verses age can be seen in Figure 4-4.

Figure 4-4: Year of Installation / Material Distribution



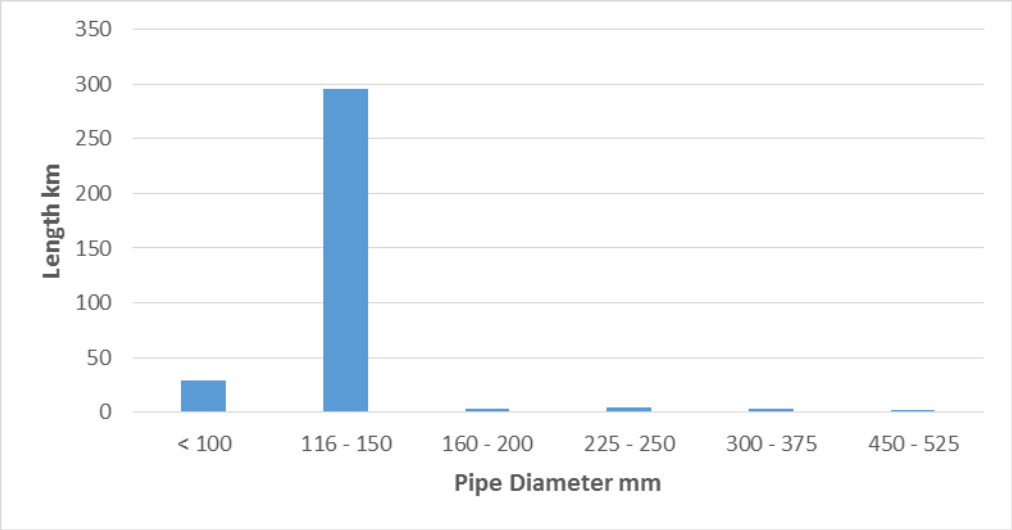
The pipe install date distribution increases at a steady rate for the pipes installed from the 1950's to the present date. This is in line with the population growth in Nelson over the last 60 years. Appendix A details the abbreviations for the pipe materials.

Figure 4-5: Summary of Pipe Materials - 2017



PVC has been the predominant pipe material used and this can be seen in Figure 4-5 where it makes up approximately 40% of the Nelson City Council reticulation. Asbestos Cement and concrete are the next most common material and were a popular choice for distribution mains and some trunk mains in the 1950's to 1980's. The percentage of pipe material that is unknown is very low (0.8%).

Figure 4-6: Gravity Main Length vs Diameter – June 2017



The major proportion of pipe used within Nelson City Council is 150mm diameter (278 km) which has been the standard sewer main used in New Zealand.

Table 4-4 shows typical useful lives of network pipelines.

Table 4-4: Pipe Asset Lives from new

Material	Good Soil (Yrs)	Average Soil (Yrs)	Poor Soil (Yrs)	Pressure (Yrs)
Black Asbestos Cement	80	70	65	40
Asbestos Cement	80	70	65	40
Blue Brute Pipe	80	80	80	
Ductile Cast Iron	65	55	50	40
PitCast Iron	85	75	70	40
Spun Cast Iron	90	80	75	40
Concrete (InsituFORM lined)				40
concrete	85	75	70	45
Earthenware	120	110	105	
Fibreglass				105
HDPE	105	105	105	105
PE1H (Pe 100 Material)	105	105	105	105
PVC	80	80	80	80
Steel Concrete Lined	85	75	70	45
Unknown	85	75	70	
Atawhai Rising Main Life				72

Soil condition
- Poor refers to low lying sandy areas, subject to salt water infiltration.
- Average soil conditions are gravel areas
- Good soil condition are clay areas

Table 4-4 has been derived from industry expectations and local performance data.

Figure 4-7: Theoretical Renewal Year / Material Distribution Estimated Cost

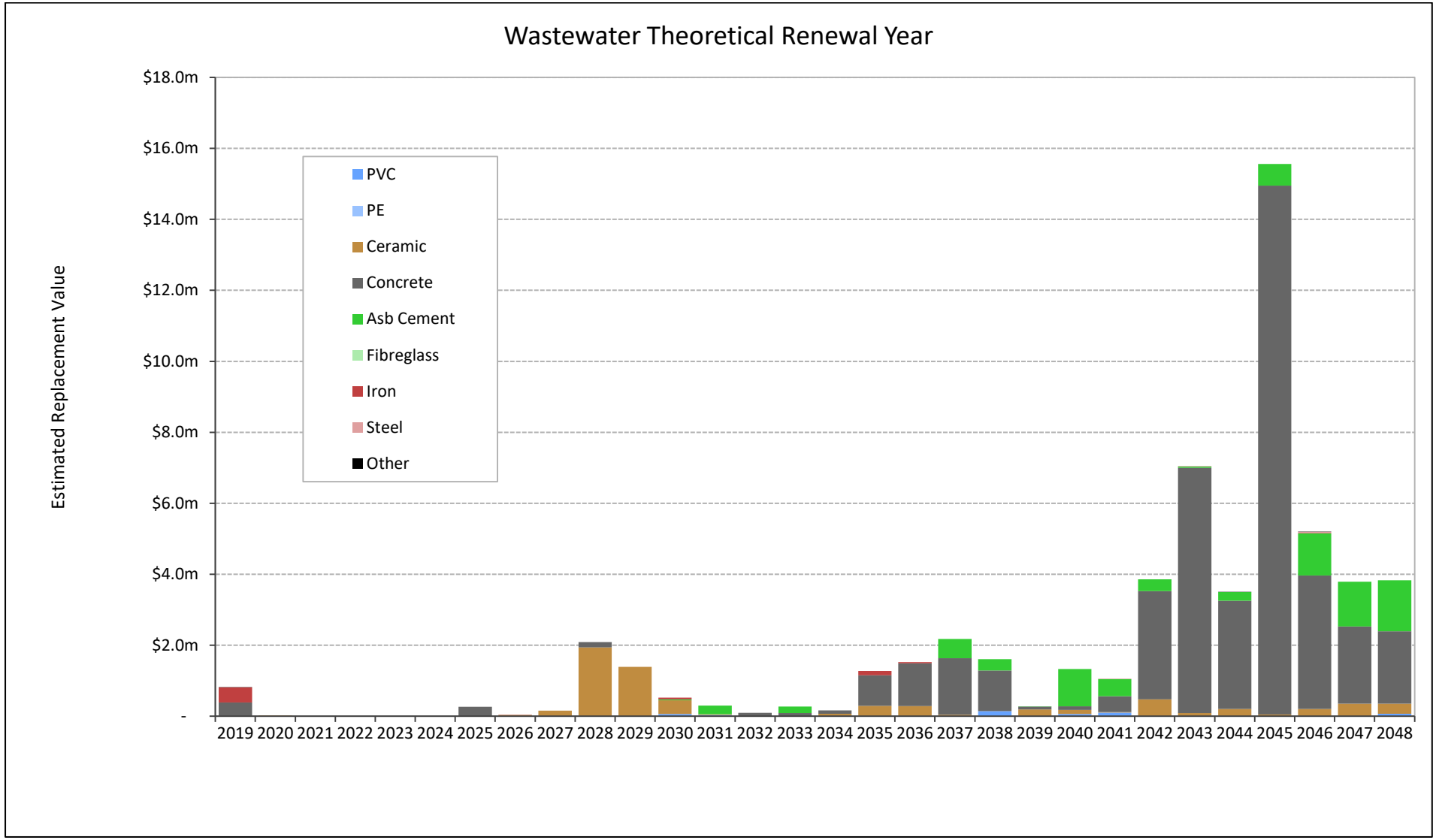


Figure 4-8: Theoretical Renewal Year / Material Distribution

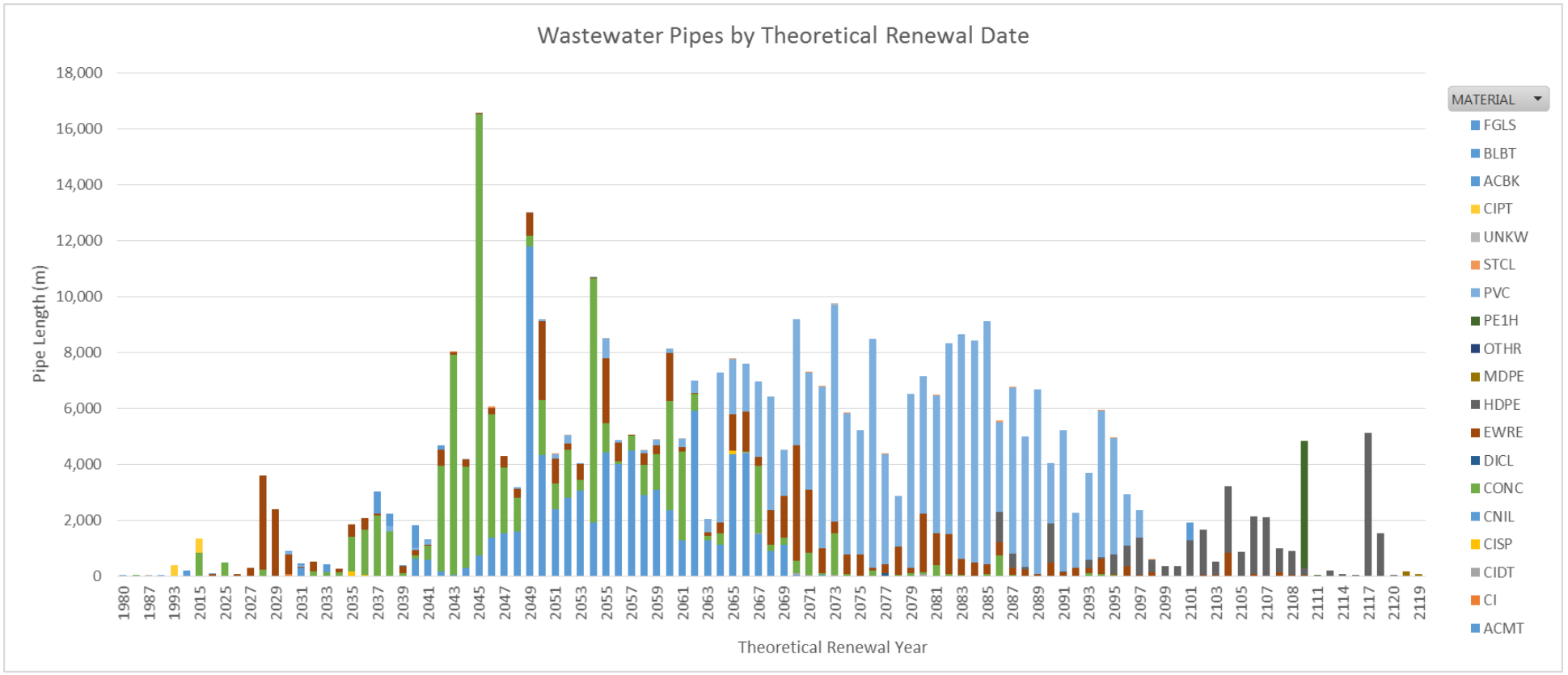


Table 4-3 has been derived from industry expectations and local performance data.

For pipe assets (non-discrete assets) remaining lives are estimated using available condition data for asset groups with similar deterioration drivers (e.g. pipe material, location, etc.) and from factors such as maintenance history and customer issues.

Remaining lives for aboveground assets (discrete assets) have been estimated from condition assessments, maintenance history and customer issues.

Wastewater network odour issues

Odour complaints from different areas of the network do occur. Most complaints come from the operation of pump stations and the Nelson Waste Water Treatment Plant. The majority of the complaints relating to the treatment plant originate from structures such as the trickling filter and the oxidation ponds during seasonal changes, which tend to produce the conditions allowing products of anaerobic (absence of oxygen) processes to be released. The pond sludge is primarily organic material and can create odours as it decays in an anaerobic environment.

The waste water treatment plant upgrade, substantially completed in 2008, was designed to comply with the requirements of a suite of 2004 resource consents. The design of the new plant has allowed for better management of variable inflows and allows adjustments in operation to be made to reduce the negative effects of winter conditions on the pond operation.

Additional works completed to date include removal of sludge from the ponds and the construction of a roof over the trickling filter. The removal of sludge from the pond has been identified as the primary response to the odour issues and will cost approximately $1.5million. The sludge has been removed from the ponds and allowed to dry in specially woven filter socks, to reduce the water content, before being disposed of to landfill over the next three to four years. The total project will be completed by 2020/21.

Odour complaints from pump stations have resulted in the construction of activated carbon filters which have proved to be very successful. Ongoing issues at Neale Park are expected to be addressed with the redevelopment of the site.

Rising Mains

Rising mains are the pressurised lines that transfer wastewater from a low point (i.e. pump station) to a higher point; in the case of Neale Park, to the treatment plant. There are a total of 28.4km of rising mains.

Atawhai Rising Main

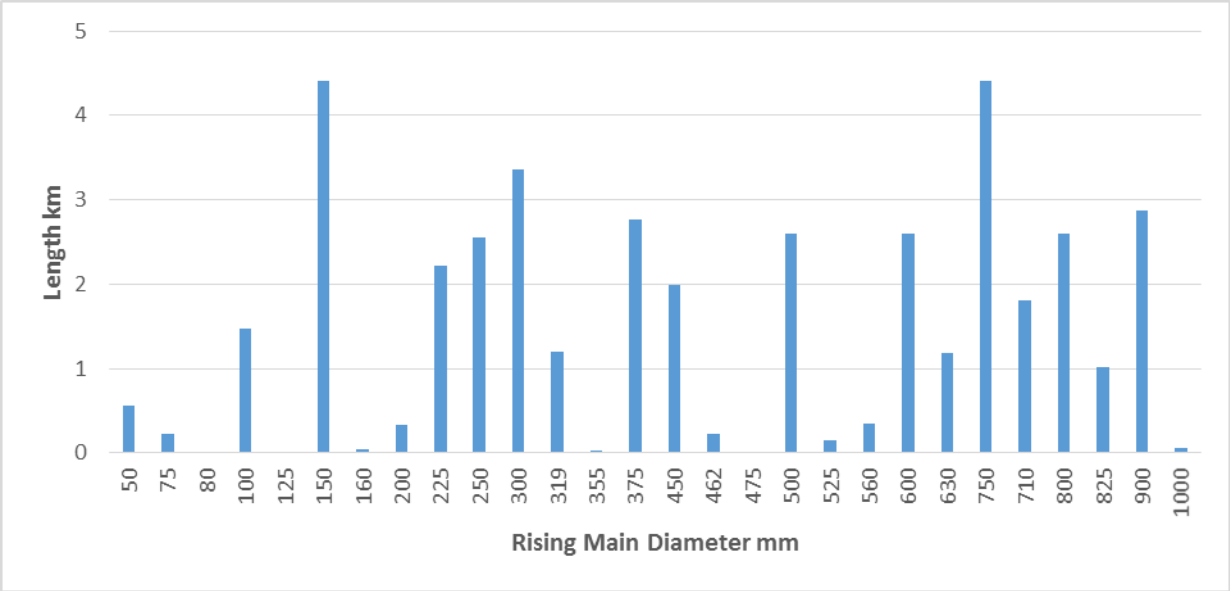
The Atawhai Rising Main was constructed in the mid 1960’s from reinforced concrete pipes with approximately 50mm thick walls. Failure of this pipe in the early 1990’s from sulphuric acid attack on the underside of the top of the pipes (soffit) lead to a comprehensive inspection and remediation project to extend the rising main’s service life. Remediation works consisted of replacing the worst affected pipes with fibreglass pipes, relining others with acid resistant fibre reinforced resin sleeves and grouting pipe joints. The remediated pipeline was expected to have a service life out to 2046.

In 2012/13 -2016/17 five failures occurred in the main. Two from pipe failures in the section immediately downstream of Corder Park, one adjacent the Marybank injector station in an air valve takeoff point, one North of Marybank at Clifton Terrace from a person access port in the main and one from a displaced rubber ring joint in a pipe close to Founders Park on Atawhai Drive.

Additional budget of $100,000 was approved by Council for 2014/15 to carry out a non-destructive inspection of the full length of the rising main, focussing on identifying hydrogen sulphide gas pockets. Proprietary "smart ball" technology using a spherical sensor encased in a sponge exterior was used in 2015/16 to identify any areas where gas pockets may have become established, allowing sulphuric acid to develop. The investigation confirmed that no permanent gas pockets were present in the rising main.

The two failures in the proximity of the Marybank pump station were found to be related to services penetrations of the pipe and an access port leading to the view that an ongoing risk of wastewater discharge exists from other similar features. A further programme of inspections of all other services connections is proposed. Remedial works may be required as a result of the investigations.

Figure 4-9: Rising main length versus Diameter – June 2017



Swallows

To minimise pumping costs, a system of gravity pressure sewers (swallows) are used to convey effluent from the higher Central City areas, under the Maitai River to the Neale Park Pump Station. There are a total of 5.6km of these types of mains.

Manholes/LHCE

Manholes in Nelson are typically 1050mm in diameter with 450mm lids/openings to provide access for inspection and maintenance staff. Older manholes are constructed of bricks. Most manholes installed since the 1950s are constructed of pre-cast concrete. LHCE are used where access points are required at less than usual spacing such as on hillsides and where multiple changes in direction are needed over a short distance. LHCE are typically constructed from small diameter pipes and do not allow person access to the reticulation.

Where lines are constructed on hillsides such that changes in direction/grade occur closer than usual, the use of buried bends and smaller precast plastic manholes will be encouraged to reduce costs and the risk of blockage and infiltration.

Trunk Mains

Trunk mains are defined as all sewers greater than 150mm in diameter. They generally carry high flows and are the lines that discharge into the pump stations.

There is approximately 34km of trunk mains in Nelson. The trunk mains are being assessed for capacity as part of the network model project.

Pump Stations

The Nelson City Council is responsible for 25 wastewater pump stations, ranging in size from the smallest serving the Tahuna skating rink to the main pumping stations for central Nelson at Neale Park and Corder Park. All pump stations have telemetry and flow monitoring installed.

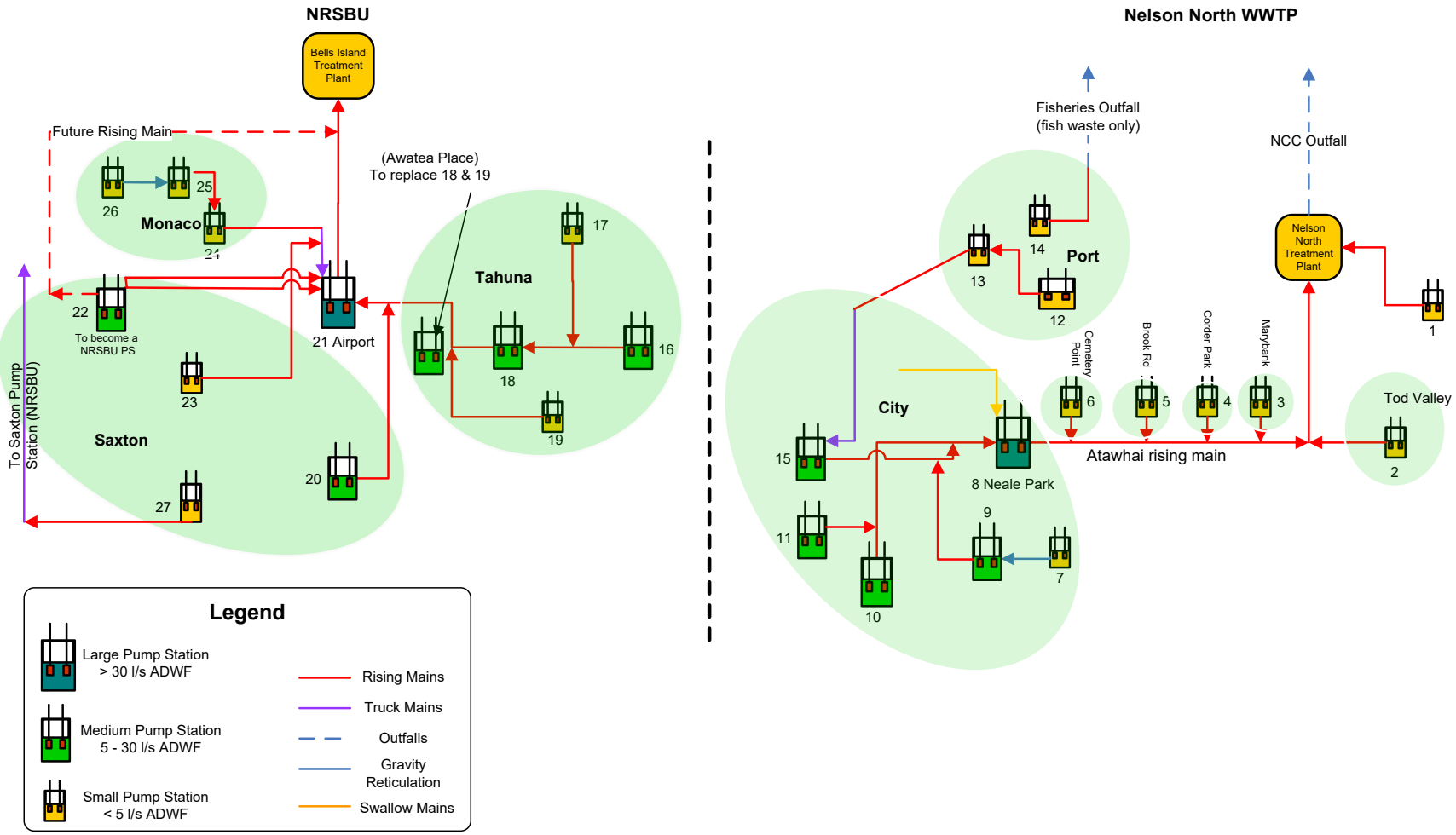
There is a need to complete an updated pump station inventory of all 25 pump stations, to ensure the records held internally are complete and readily available. This work will then support the review of the storage capacity in the reticulation and pump stations to ensure the necessary capacity is available in the event of emergencies. Storage will be aided by the development of a strategy for the utilisation of emergency generators and proposed detention tanks.

Table 4-5: Asset Lives Pump Stations

Component	Structure	Steelwork	Pump	Electrical	Valves	Telemetry	Flow Meters	Biofilters
Life	50	30	30	15	30	10	10	20

All pump stations have Supervisory control and data acquisition and flow monitoring installed. The general layout of the pumping system is detailed in Figure 4-9.

Figure 4-10: Schematic of Nelson City Council Wastewater System



Neale Park and Corder Park Pumping Station Upgrades

Wastewater from the central city is reticulated to Neale Park pump station and then pumped 8.5km to Nelson Waste Water Treatment Plant. The route of the rising main (pressurised pipe) follows Atawhai Drive and then the state highway. Along the route to the treatment plant smaller catchments connect to the rising main with injector pump stations.

Due to the distance of Neale Park Pump Station from the treatment plant the pumps pump at elevated pressures to get the flows to the treatment plant. This means that as the city grows and flows increase, the rising main will be put under greater stress from high pressure flows. In order to reduce the pressure profile of the flow in the rising main, upgrading the existing pump station at Corder Park has been identified as the most desirable option. This would mean Neale Park pump station would pump to Corder Park and then Corder Park pump station would pump to the treatment plant. Upgrading Corder Park means that while the flows in the rising main can increase, which will manage the increasing flows as the city grows, the pressure in the rising main can stay at a lower level to maximise the working life of the rising main.

Construction of the upgrade of Corder Park pump station has been completed as a first priority. Some additional remediation of the rising main has been carried out in conjunction with the pump station construction to address areas where failures have occurred since the original remedial works were carried out in 1997. Table 6.6 outlines the Capital Expenditure for this project.

Council has undertaken a comprehensive upgrade of most of the injector pump stations in recent years, to standardize electronic controls and install variable speed drive units. These units electronically control the speed of the pumps to match the pumping rate with the flow of wastewater into the pumpstation. This extends the life of the pumps and reduces electricity costs. Additionally the majority of pump stations have had at least one of the pumps replaced with a modern unit. Some further works will be required when the Corder Park and Neale Park pump station upgrade works are completed.

As a result of damage to the pumps at Neale park during the December 2011 extreme rain event, where very high volumes of wastewater lead to one of the pumps burning out, a new large storm pump has been installed. The two pumps now at Neale Park are able to cope with current flows but lack the necessary pumping security of backup pumps. Additionally the building housing the pumps and electronic drive equipment is considered to be earthquake prone and must be strengthened or demolished at some point in the future. The importance of the pump station to the city suggests that either a new pump station is constructed or the necessary upgrading and expansion of the existing facility should happen in the next 5 plus years.

The proposed redevelopment of the Neale Park Pump Station will allow for the construction of new larger wastewater collection wells (wet wells), with some ability to pre-screen wastewater and upgrade odour control. Odours from the wet wells and open grit channels are a feature of the existing station, particularly in the summer months. In addition, the existing pump station building has been identified as an earthquake risk and must be upgraded of demolished in the medium term. Currently, seismic upgrading efforts have been directed to the drinking water assets. A review of the remaining wastewater assets will follow that work.

Awatea Place – Pumping Station, Rising Main and Trunk Main upgrades

In the Stoke/Tahuna area the twin pump stations in Parkers Road are programmed to be replaced with a single new pump station in Awatea Place. The current pump stations are close to the end of their service life and being situated very close to

residential buildings have their own odour control issues. The new pump station will connect to the Nelson Regional Sewerage Business Unit pump station at Nelson Airport via a new rising main. Upgrades to the trunk mains will be required to link the existing pipework with the new pump station. Installing a single larger pump station in Awatea Place will significantly reduce operating and maintenance costs, allow for the installation of modern odour control equipment and provide a level of storage in event of emergency - Parkers No. 1 and No. 2 pump stations will stay within the reticulation network as extra emergency storage.

Pump Station Systems and Power Failures

All pump stations are monitored by a Supervisory control and data acquisition/telemetry system. In the event of a system or power failure, the system notifies On-Call operators to take the necessary action.

The options available to cope with the consequences of a power failure event are standby power and emergency storage. Council owns four mobile generators, one with 30kVA, one with 35kVA and two with 50kVA capacity. 300kVA generators are kept at Neale Park pump station and Nelson Wastewater Treatment Plan, and at the water treatment plant at the Tantragee Saddle.

To increase power failure back up an additional generator has been acquired. A review of the strategy for the requirement for standby generators is now required to ensure levels of service requirements are achievable.

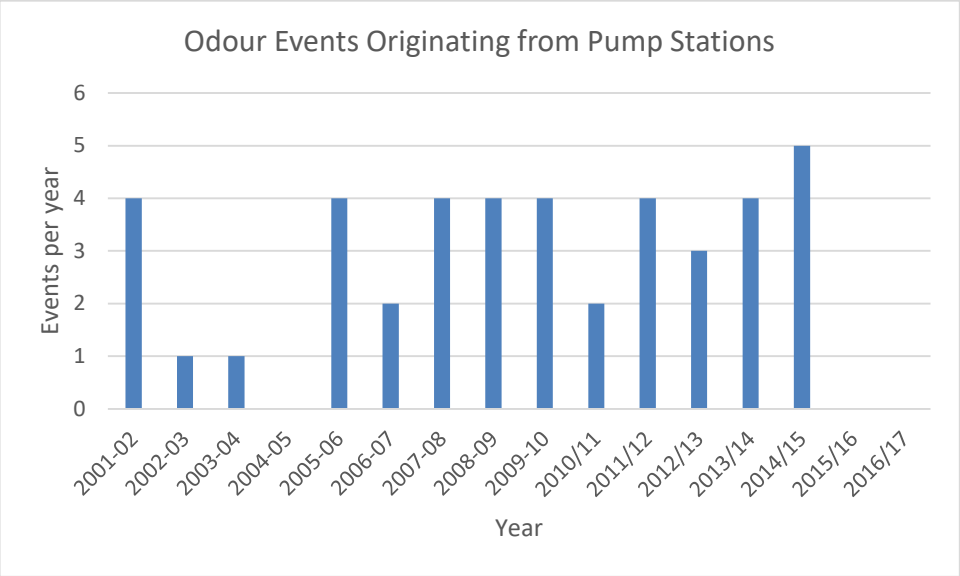
Pump Station and Network Storage

The issues of significance for pump stations is the need to provide 4 hours average dry weather flow storage where possible, under the conditions of the resource consent for accidental discharges, and to formalise the use of generators to provide coverage in an emergency situation. All new pump stations are designed with this level of storage, and additional storage will be considered for existing pump stations where this is practical. Significant storage is also available within the reticulation network as well (from pipes and manholes only flowing part full most of the time) and work is ongoing to quantify this. Main pump stations at Neale Park and Vanguard Street have an emergency generator installed onsite as part of the design. A fleet of trailer mounted emergency generators is maintained to enable other pump stations to be operated in the event of either localised or wide area power failure.

Minimise odour events associated with pump stations

Odours can originate from the wastewater reticulation network via pump stations and manholes. Historically pump stations have been the major cause of reticulation based odours. Biofilters comprising bark or activated carbon have been fitted to some pump stations to minimise odour events, and if complaints occur at the remaining individual pump stations odour measures will be programmed. The programmed upgrade of Corder Park and Neale Park Pump Stations will include review of odour event data and consider options as appropriate.

Figure 4-11: Odour Events Originating from Pump Stations



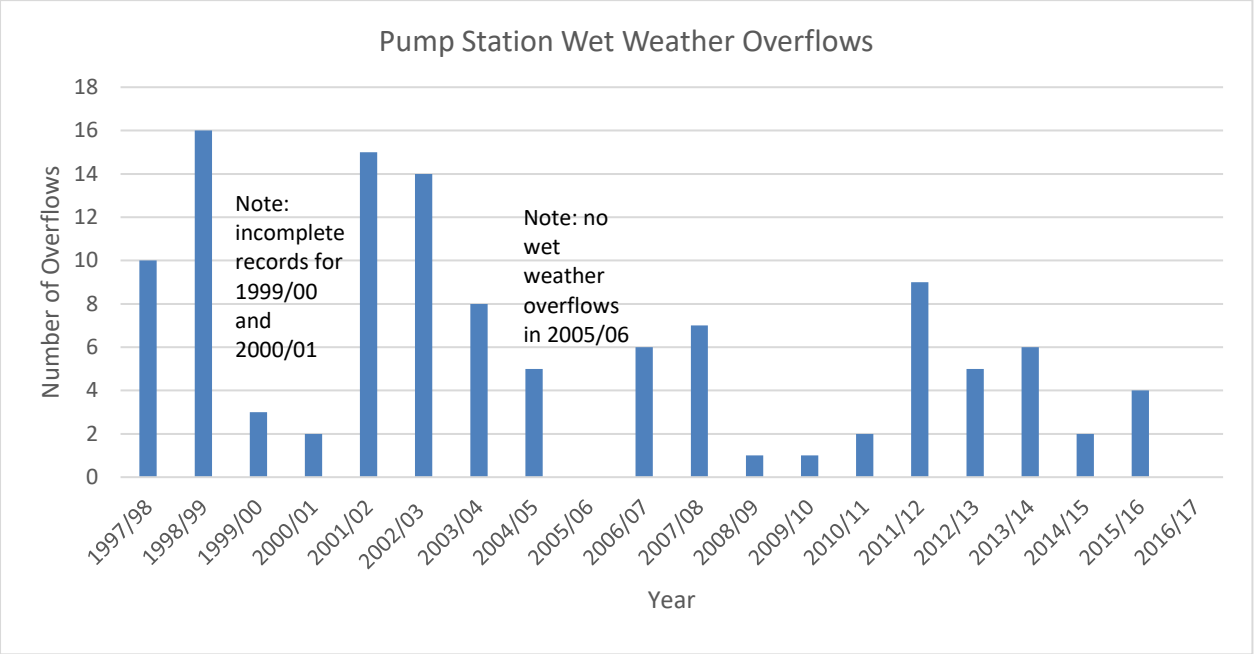
Minimise Overflow Events from Pump Stations

Nelson City Council is nearing the completion of a programme to upgrade the majority of Nelson City Council Pump Stations. The upgraded pumps and controls in the network are designed for PWWF plus 10% with a design life of 25-50 years depending on the pump station. The wastewater computer model is currently being developed to allow investigation of the network performance including different pumping scenarios (especially in linked pump stations) and maximum flow rates from pump stations. Nelson City Council have also completed a four year programme of installing flow meters at all pump stations.

The upgrading of the Corder Park and Neale Park Pump Stations is programmed for 2014-18. This is expected to significantly reduce overflows at the Neale Park Pump Station by lowering the pressure in the rising main between Neale Park and Corder Park, thereby allowing for the pumping of increased volumes of peak wet weather flows

Generally overflows from pump stations discharge to stormwater systems for which resource consents are required. The potential for significant overflow volumes at the Neale Park Pump Station has been recognised in the past and addressed by the installation of an underground storage tank giving 4 hours of average dry weather flow storage, which is the nationally accepted standard.

Figure 4-12: Pump Station Wet Weather Overflows



Reliability

Reduction in Pump Station Facility Failures that Result in Overflows

Historically approximately 15 overflow events per year occur due to pump stations inability to cope with flows (during peak wet weather periods). Comparatively, only 4 or 5 overflow events per annum can be attributed to "system failures".

All pump stations are monitored by a Supervisory control and data acquisition/telemetry system. In the event of a system or power failure the system notifies on-call operators to take the necessary action.

There is a need to complete an updated pump station inventory of all pump stations, so that records held internally are readily available.

A review of pump station capacity, the development of a strategy for emergency power generators and construction of network storage where practicable are proposed as a means of meeting this performance measure.

Connections

Where a sewer pipe passes through private property and serves more than one house, Council maintains the pipe to within 15 metres of the boundary of the last property served. The landowner is responsible for maintaining the sewer lateral which is the pipe from the Council main to the dwelling.

Unintended discharges

During rain events stormwater enters the wastewater network through faults in pipes and as a result of cross connections between private stormwater pipes and the sewer network. When the volume of wastewater within the reticulation exceeds the design capacity, discharges can occur from the wastewater pump stations and some manholes throughout the network.

On 1 April 2012, Resource Consent (RM105388A) was granted for accidental discharges. The consent duration is 20 years. The consent considers the impact the wastewater has on the receiving environments where the pump stations are located.

A feature of the consent is the requirement that Council reduces overflows from pump stations over the next twenty years and establish a compliance and liaison monitoring group with community representatives to provide a means of disseminating information. Representatives from the following organisations, identified in the resource consent, are invited to annual meetings: Nelson City Council, Department of Conservation, Tiakina Te Taiao Ltd, Ngati Toa, Ngati Kuia, Friends of Nelson Haven and Tasman Bay Inc, New Zealand Fish and Game Council, and Nelson Public Health Services. The group has met twice to review overflow information and Council response

Inflow and Infiltration

Inflow and infiltration into piped services can originate from a variety of sources. Above ground, inflows during rain events can happen when storm water flows through manhole lids, low gully traps, emergency overflow points in pump stations, crossed connections between private stormwater pipes and sewer pipes and deliberate redirection of stormwater into sewer mains.

Below ground, infiltration occurs when ground water enters sewer pipes through cracks in the pipes, failed joints, broken pipes, poor lateral connections and a similar range of issues associated with manholes and pump stations.

High ground water levels arise from existing natural seepages, rain saturation, tidal and river effects and on site stormwater soakage. As sea levels rise and an increasing interest in low impact urban design develops it is anticipated that inflow and infiltration will need an expanded effort to minimise adverse effects arising from it. Addressing the issues of inflow and infiltration requires the efforts of both council and the community.

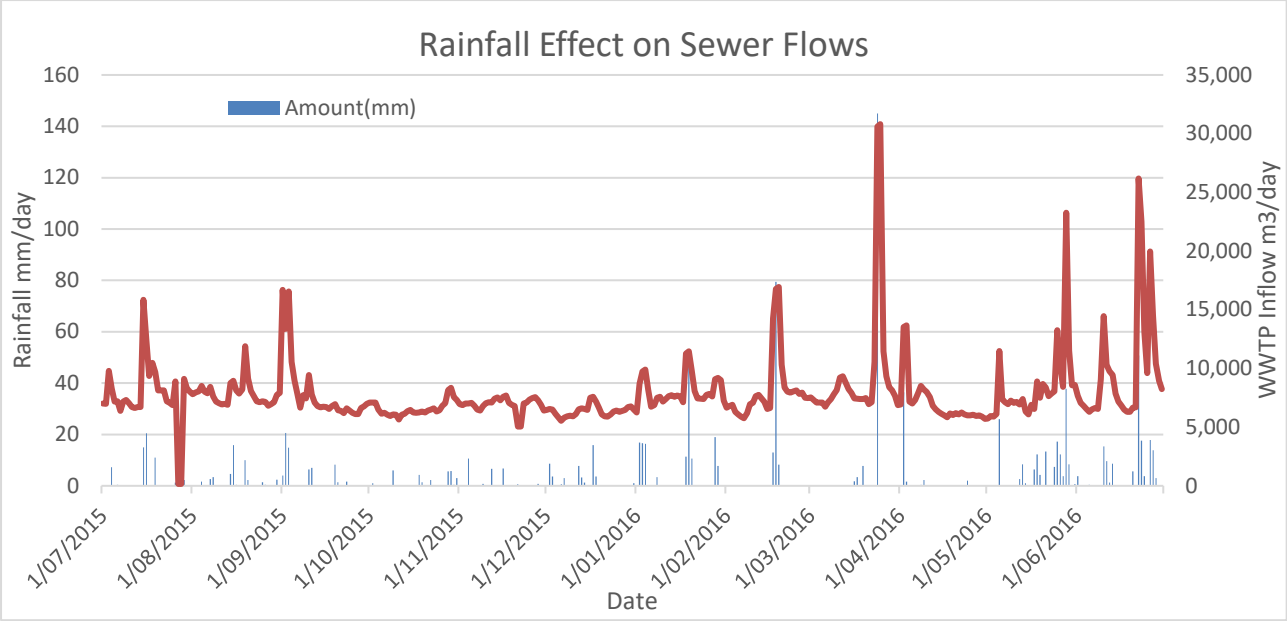
Monitoring of flows during rain events has shown that infiltration of ground water can lead to peak flows in excess of 6 times average dry weather flow. As a result overflows due to wet weather occur within the system. Also additional volumes during wet weather lead to an increase in pumping and treatment costs.

A target peaking factor of 7 times average dry weather flow has been determined for the reticulation design in Nelson south region[1] but may be decreased for future development as infiltration is further brought under control.

Figure 4-12 details the impact of rainfall on wastewater flows recorded at the waste water treatment plant during the period July 2015 – June 2016.

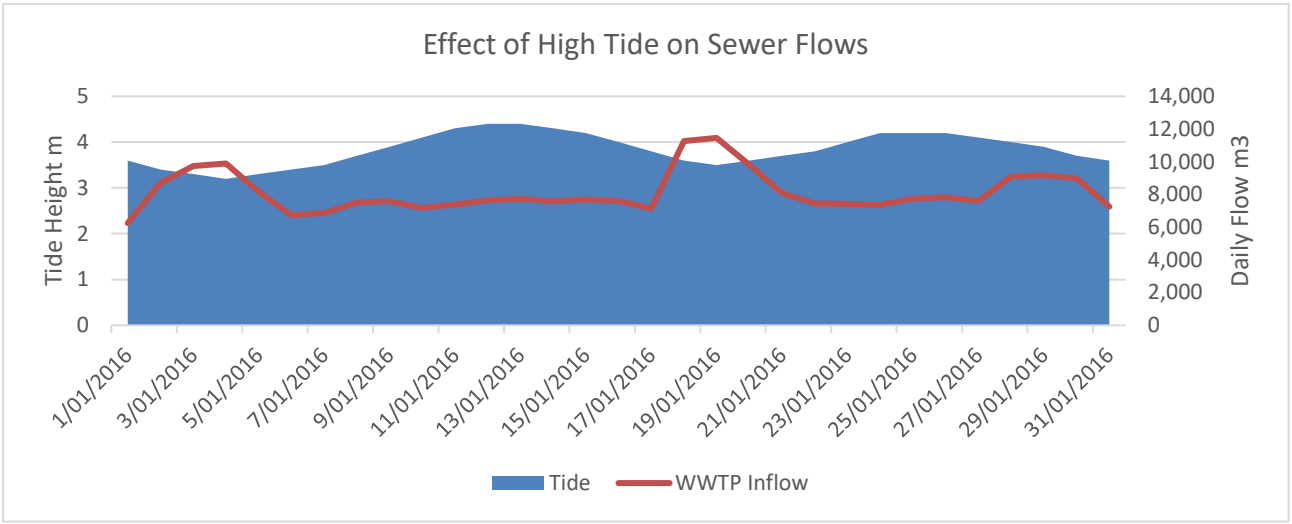
[1] Nelson Regional Sewerage Business Unit – Regional Pipeline Strategic Issues and Options Study

Figure 4-13: Rainfall Effects on Sewer Flows



Tidal influences on wastewater flows to the Nelson Waste Water Treatment Plant have also been recorded and may account for the recorded increase in flows. Figure 4-13 below details the high tide levels and the changing flows to the treatment plant during January 2016.

Figure 4-14: Effect of High Tides on Sewer Flows



The ingress of stormwater into the sewer system through direct inflow and infiltration requires proactive intervention to control. It is a serious issue for network utility operators and it is extremely hard to control. There are significant sustainability and operational impacts, consent compliance issues and major negative effects on Nelson City Council customers.

Reducing the Amount of Inflow and Infiltration

Controlling inflow and infiltration is a long term commitment and reductions in wet weather flows are likely to be gradual. There is a need to control inflow and infiltration as ingress of stormwater can quickly exceed system capacity and the "do nothing" option is not appropriate given the resulting system overflows and costs of treating this volume of wastewater.

Inflow and infiltration reduction receives financial commitment in:

- Installation of new stormwater reticulation;
- Stormwater upgrades within existing reticulation;
- Sewer renewal programmes (dependant on age profile);
- Specific inflow and infiltration reduction programs;
- Reduction in overflow events from pump stations by renewal programme, level monitoring/alarms, and additional storage capacity and emergency generators.

For its part council seeks to lessen the impact of inflow and infiltration primarily by the following:

- Upgrading the older section of the network in those areas most at risk of infiltration in particular and requiring private land owners to replace older failed laterals when council mains are replaced or testing identifies a specific problem;
- Smoke testing sections of the city sewer network in an effort to identify crossed connections and deliberate stormwater discharge into the sewer. This is an initiative that is carried out annually, targeting areas of high inflow and infiltration. Previously the full city has been smoke tested twice;
- Ensuring the sewer network is maintained.

The status of Nelson City Council inflow and infiltration strategies are as detailed in Table 4-6 below.

A developing area of stormwater control that impacts on the wastewater network is the application of low impact urban design (LIUD) techniques for stormwater disposal. Increasingly LIUD focuses on the disposal of stormwater to on-site soakage rather than by reticulated stormwater network to streams and rivers.

While disposal to soakage is not a new concept the effect of increased volumes of water to areas where the wastewater reticulation is installed can be to increase the levels of inflow and infiltration in older pipes. Additionally where soakage is poor property owners often resort to disposal of stormwater to gully traps in an attempt to reduce the effect on their property of too much water.

Requirements included in Council's Land Development Manual focus on options for low impact urban design in new subdivisions and for the control and processing of stormwater run-off from roads. A functioning reticulated stormwater network is seen as critical to ensuring inflow and infiltration is controlled on private property as well as public streets.

Table 4-6: Inflow and infiltration Reduction Strategies

Reduction Strategies	Strategy Status
Inflow/Infiltration Programme	Staged Investigations, implementing staged work plan with supporting budget
Water Loss Reduction Programme	Staged Investigations, implementing staged work plan with supporting budget
Stormwater Upgrades	Staged Investigations, implementing staged work plan with supporting budget
Management of LIUD	A focus on low impact urban design in new subdivisions and for the control and processing of stormwater run-off from roads.
Sewer Renewals (on Target)	Staged Investigations, implementing staged work plan with supporting budget

To enable improvements in the reduction of inflow and infiltration to be achieved an ongoing review of the inflow and infiltration reduction strategy has been undertaken. It is proposed to continue the more strategic approach with a focus on identifying areas with high levels of water ingress and network overflows and establishing a future programme to address them. Ongoing education of the public to stop the discharge of stormwater to the sewer reticulation from downpipes and sumps is also required. These will be further developed over the next three years.

Response to Wet Weather Overflows

The above sections describe the programme to investigate sources of inflow and infiltration and address the sources. As this programme is expected to take 5-10 years before significant positive results can be identified it is proposed to carry out the following projects to alleviate the impacts of wet weather overflows from the network:

- Gracefield to Quarantine Road catchment beheading. This project will redirect a significant portion of the upper Wakatu/Enner Glynn catchment away from Gracefield Street and redirect it to Quarantine Road.
- Wastewater detention tanks or trunk main upgrades. To minimise the volume of wastewater discharged to the wider environment during wet weather events a series of detention tanks or trunk main upgrades is proposed. Detention tanks can be located in appropriate locations to capture excess flow for the duration of a storm event and return it to the network when inflow levels reduce. In some locations it may be more appropriate to upgrade reticulation and provide future growth capacity as inflow and infiltration reduction programmes produce results.

4.1.2. Asset Capacity/Performance

Treatment Plant Capacity

Estimated design flow parameters[2] for various time-related flow periods for the upgraded waste water treatment plant are set out in Table 4-8 below.

[2] Nelson City Council Waste Water Treatment Plant Upgrade – Final Report Date October 2006

Table 4-7: Design Flow Parameters

EOY	Population	Municipal Flow (cubic metres/ day	Industrial Flow (cubic metres/day)	ADWF (cubic metres/day)	PDWF (cubic meters/ hour)	PWWD (cubic metres/ day)	IF (litres/ second)
2005	26,600	7,283	2,342	9,625	992	39,283	606
2020	28,187	7,717	2,508	10,225	1,052	41,671	644
2050	33,749	9,239	2,821	12,060	1,252	49,592	760

Table 4-8: Actual Flow Parameters

Actual Flow Parameter (2 year rainfall return period)	2015/16	Consent Capacity (discharge)
Instantaneous in-flow rate (maximum)	600 (approx) l/sec	
Peak one-day pond inflow	21,500 cubic metres/day	38,000m³/d
Peak 5-day average pond inflow		28,000m³/d
Peak 28-day average pond inflow	10.855 cubic metres/day	21,000m³/d
Dry season 28-day average pond inflow		7-8,000m³/d
Daily average	7,731 cubic metres	
Annual	2,830,911 cubic metres	

Assumptions made for the above design flow parameters are:

- Limited further industrial growth (500m³/day allowance)
- Wet weather and seasonal infiltration effects are likely to remain the same in terms of volume, and could even reduce through future reticulation upgrades
- A population increase from 2003 of approximately 10,000 persons (2,500m³/d allowance) to year 2049.

Performance of Reticulation

In 2004, Council formulated a long term strategy for the development of hydraulic network models for the entire Nelson wastewater network. This project is intended to establish the interaction and capacity of those systems and to allow investigation of potential changes to the network with the aim of improving efficiency of the system and to reduce the risk of overflows. The Nelson south and central city catchments have been modelled using Infoworks CS software. The remainder of the city can be added to the model in future years as development shows this to be desirable or demand for better information develops.

Pump Station Storage Capacity

Figure 4-14 below details the extent of storage capacity of the individual pump stations during dry weather flows.

As 4 hours (240mins) storage is the nationally accepted standard, Figure 4-14 is capped at that amount and some pump stations have storage that exceeds this amount – see table 4-10 for actual amounts.

Figure 4-15: Pump Station Storage Capacity

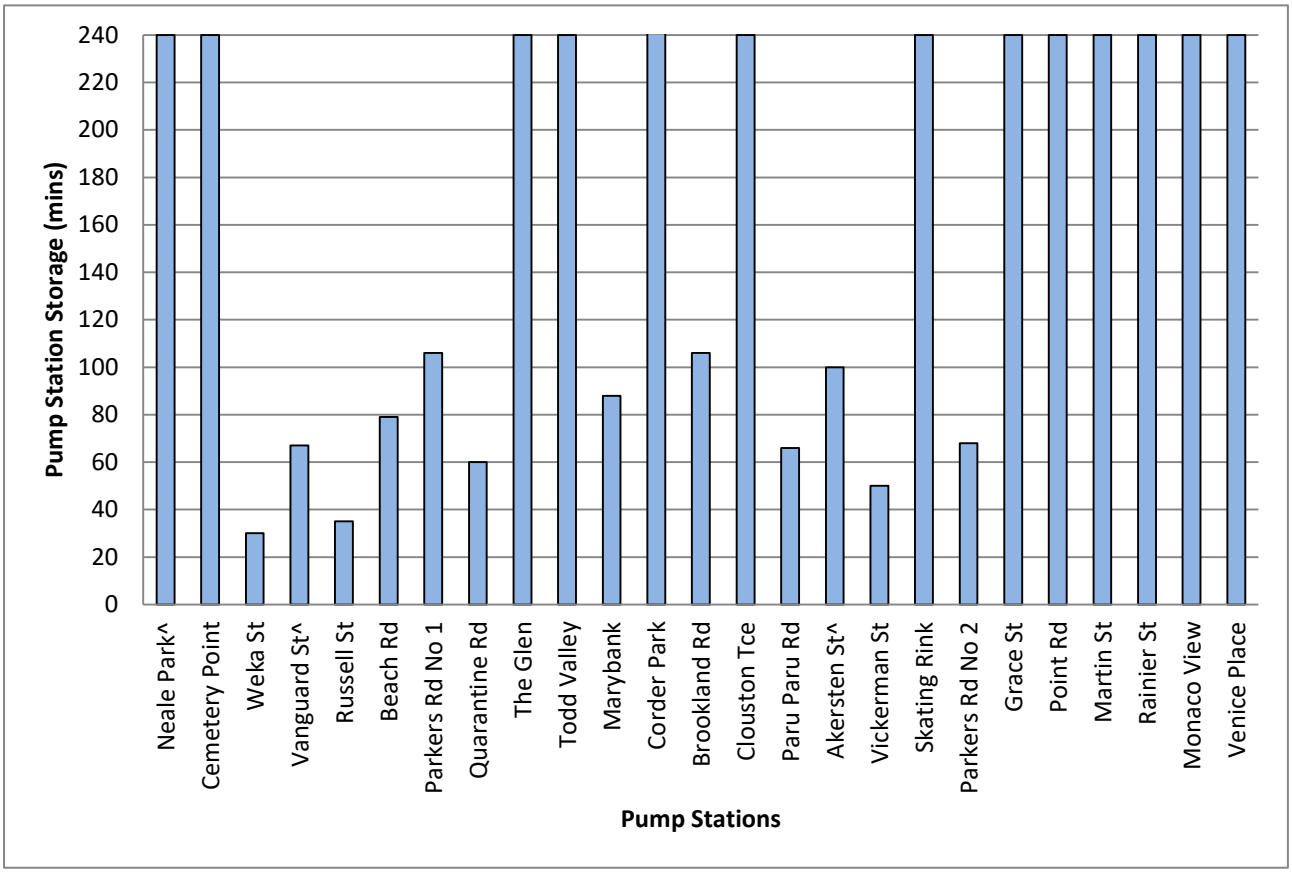


Table 4-9: Pump Station Details

	Name	Size	average dry weather flow	Pump Capacity	Number of Pumps	Estimated Storage Hrs:Min	
			L/sec				
8	Neale Park^	Large	90	414 - 531	2	4:19	Duty/Assist (upgrading soon)
6	Cemetery Point	Medium	1.5	19 - 38	2	4:00	Duty/Assist
9	Weka St	Medium	14.3	95 - 185	2	0:30	Duty/Assist
10	Vanguard St^	Medium	34.7	135 - 204	2	1:07	Duty/Assist
15	Russell St	Medium	10.7	78 - 103	2	0:35	Duty/Assist
16	Beach Road	Medium	8.9	71 - 104	2	1:19	Duty/Assist
18	Parkers Road No 1**	Medium	7.1 + 8.9	37 - 105	2	1:46	Duty/Assist
20	Quarantine Road	Medium	8.6	42 - 143	3	1:00	Duty/Assist
1	The Glen	Small	0.9	5.6 – 5.8	2	9:02	Duty/Assist
2	Todd Valley	Small	3.9	38 - 65	2	12:50	Duty/Assist
3	Marybank	Small	4.7	38 - 95	2	1:28	Duty/Assist

	Name	Size	average dry weather flow	Pump Capacity	Number of Pumps	Estimated Storage Hrs:Min	
			L/sec				
4	Corder Park	Large	16~	292 - 703	4	5:09	Upgraded
5	Brookland Road	Small	6.4	46 - 117	2	1:46	Duty/Assist
7	Clouston Terrace	Small	4	33	2	6:41	Duty/Assist
11	Paru Paru Road	Small	7.4	57 - 143	2	1:06	Duty/Assist
12	Akersten Street#	Small	tba	tba	2	1:40	Duty/Assist
13	Vickerman Street#	Small	tba	tba	2	0:50	Duty/Assist
17	Skating Rink#	Small	0.4	4 - 15	1	13:49	Duty/Assist
19	Parkers Road No 2**	Small	17.3	42 - 143	3	1:08	Duty/Assist
23	Grace Street+	Small	1	7 - 8	2	15:13	Duty/Assist
24	Point Road+	Medium	1	25 - 30	2	9:04	Duty/Assist
25	Martin Street#+	Small	tba	tba	2	4:00	
26	Rainier Street#+	Small	tba	tba	2	4:00	
27	Monaco View	Small	tba	tba	2	95:40	
31	Venice Place	Small	1	8.9	2	4:00	
**Station being replaced by Awatea Place ^Pump station has standy generation #Lift stations ~Needs to include other incoming i.e. Neale Park, Cemetery Point and Brookland Road + Monaco area							

Notes:

- Limited desktop evaluation (excluding laterals) calculating estimated time between high level alarm to actual overflow, based on average dry weather flow
- L/sec ranges are due to the number of stations and pumps operation at the time
- Average dry weather flow does not include other pump station catchments
- Desired Nelson City Council storage is 4 hours at average dry weather flow
- Large Pump Station >30Lts/sec, Medium 5 – 30 Small < 5
- All pump stations (except Pt Road and Rainier) are fitted with variable speed drive pumps

Pump Station Performance

At present approximately 5 overflow events per year occur due to pump stations inability to cope with flows (during peak wet weather periods). Furthermore, only 8 overflow events have been attributed to "system failures" with none occurring over the last two years. The upgrading of the pump stations will significantly reduce the occurrence of system failure related overflows.

There is a need to review the storage capacity of all reticulation and pump stations to allow the necessary capacity in event of emergencies and the development of a strategy for the utilisation of emergency generators.

Table 4-10: Pump Station Performance

	Name	Storage (m3)	Electrical	Pumping
8	Neale Park	1399	2	4
6	Cemetery Point	10	2	2
9	Weka St	20	2	2
10	Vanguard St	7	2	2
15	Russell St	46	2	1
16	Beach Road	15	2	1
18	Parkers Road No 1**	3	2	4
20	Quarantine Road	23	2	2
1	The Glen	21	2	2
2	Todd Valley	13	2	2
3	Marybank	23	2	3
4	Corder Park	130	1	1
5	Brookland Road	30	2	3
7	Clouston Terrace	10	2	2
11	Paru Paru Road	17	2	1
12	Akersten St	13	2	1
13	Vickerman St	tba	2	2
17	Skating Rink	14	2	3
19	Parkers Road No 2**	6	2	3
23	Grace St	8	2	2
24	Point Road	9	2	2
25	Martin St	12	1	1
26	Rainier St	12	1	1
27	Monaco View	137	1	3
31	Venice Place	2.8	2	2

Performance rating as per the NZ infrastructure Asset Grading Guidelines 1999
1 = Very Good 2 = Good 3 = Moderate 4 = Poor 5 = Very Poor

**station being replaced by Awatea Place

	Limited desktop evaluation (excluding laterals) calculating estimated time between high level alarm to actual overflow, based on average dry weather flow

4.1.3. Asset condition

Condition Assessment

Historically asset monitoring to determine condition has been subjective, based on local knowledge and experience. Nelson City Council now has procedures to assess and report on asset condition via closed circuit television and failure mode analysis.

The cost of undertaking condition assessment can be relatively expensive and is unlikely to provide a degradation curve that can be statistically supported. The need for inspection for assets with long economic lives will in the future be based on consequence of failure (criticality), remaining life and asset performance (failure modes).

A re-evaluation of the strategy for condition profiling is required to ensure that condition profiling is conducted using a risk based methodology that is at an appropriate industry standard and will comply with Audit requirements.

Current Position on Condition Assessment

Presently the simple approach to condition assessment is being used.

Whenever the maintenance contractor is working on pipe repairs a condition report is made and entered into the Asset Management System. It is anticipated that this database will be used to plot developing problem areas on a city wide basis and allow relationships between pipe types, construction techniques, age and geology to be developed.

Pipe samples will also be recovered, where unexpected failures occur, so that sophisticated condition assessment can be implemented and the data recorded on the Asset Management System.

The Asset Management System will be used as part of an Optimised Decision Making process. The level of sophistication will increase as the condition data base is developed.

100mm Diameter Lines

These lines are the smallest diameter sewer lines used and account for 14% of the reticulation network. They are common on hillsides where lines traverse private properties that do not have direct frontage to a sewer main in the road. Council no longer permits the installation of new 100mm public sewers, but will allow infill subdivisions to connect to existing 100mm lines provided they are proven to be in sound condition, and only if the total number of households served does not exceed 5.

The older lines are often poorly installed, without proper bedding, without sufficient access points and are typically failing at joints. This makes them prone to allowing infiltration and root ingress causing blockages and overflows.

150mm Diameter Reticulation Mains

The original network was constructed using glazed earthenware pipes in the early 1900s. These pipes are either butt or rubber ring jointed and are known to be failing at joints. They are also susceptible to cracks due to the increased loads imposed by modern vehicles.

Most pipes installed since the 1970s are of plastic (PVC or HDPE) construction. These pipes have a nominal life between 75 and 90 years.

The majority of Nelson City Council sewer mains are between the range of 0 – 70% of their standard lives and 8% is considered to be in the intervention zone.

Table 4-12 details the experienced Nelson City Council Operations and Maintenance investigator estimate of the condition of the reticulation using staff knowledge of the network along with blockages and failure rates.

To support longer term benchmarking it would be appropriate to review asset condition against a nationally recognised grading system, such as the International Infrastructure Management Manual Grading system, utilising a 1-5 grading hierarchy.

This is proposed to be undertaken over the next three years.

Table 4-11: Condition of Mains Estimates

%	Very Good	Good	Moderate	Poor	Very Poor	Total
100mm diameter lines	10%	20%	20%	30%	20%	19.9km
Reticulation	10%	20%	20%	20%	30%	325.2km
Trunk Mains	10%	20%	20%	20%	30%	36.3km
Rising Mains	10%	80%	10%	0%	0%	25.9km
Swallow Mains	10%	80%	10%	0%	0%	5.6km
Manholes	15%	35%	30%	10%	10%	6780
Condition rating as per the NZ infrastructure Asset Grading Guidelines 1999 1 = Very Good 2 = Good 3 = Moderate 4 = Poor 5 = Very Poor						

Pump Station Condition

The condition of the pump stations are as detailed in Table 4-12 below. The good condition of the stations is due to the extensive pump station programme that started in 2003.

Table 4-12: Pump Station Condition

	Name	Electrical		Pumping		Structural	
		Year Upgraded	Condition	Year Upgraded	Condition	Year Upgraded	Condition
1	The Glen	2004	1	2004	1	2004	1
2	Todd Valley	2003	1	2006	1	1985	2
3	Marybank	2003	1	1969/2007	4/2	1969	2
4	Corder Park	2016	1	2016	1	2016	1
5	Brookland Road	2003	1	1969/2007	4/2	1969	2
6	Cemetery Point	2003	1	2006	1	1979	2
7	Clouston Terrace	2005	1	2006	1	1985	2
8	Neale Park	2001	3	1969	4	1989	2
9	Weka St	2002	1	2004	1	1984	2
10	Vanguard St	2007	1	2006	1	1986	2
11	Paru Paru Road	2004	1	2006	1	1995	2
12	Akersten St	2004	1	2006	1	1986	2
13	Vickerman St	2004	1	2006/2009	1/1	1970	2

	Name	Electrical		Pumping		Structural	
		Year Upgraded	Condition	Year Upgraded	Condition	Year Upgraded	Condition
15	Russell St	2008	1	2000	1	1980	2
16	Beach Road	2004	1	2014	1	1950	2
17	Skating Rink	2004	1	2014	1	1960	2
18	Parkers Road No 1**	2004	1	1951/2008	3/1	1951	2
19	Parkers Road No 2**	2004	1	1982	4	1982	2
20	Quarantine Road	2005	1	1981/2006	3/1	1981	2
23	Grace St	2004	1	2004	1/2	1976	2
24	Point Road	2004	1	2004	1	1976	2
25	Martin St	1976	3	2010/2010	3/1	1976	2
26	Rainier St	1976	3	2010	1	1976	2
27	Monaco View	2001	1	2001/2004	2/3	2001	2
31	Venice Place	2009	1	2009	1	2009	1

Condition rating as per the NZ infrastructure Asset Grading Guidelines 1999
1 = Very Good 2 = Good 3 = Moderate 4 = Poor 5 = Very Poor
**Station being replaced by Awatea Place

Confidence Rating in Attributes, Condition and Performance

The Council has generally a high confidence in the processes for the attributes data, condition and performance of assets within the wastewater activity as indicated in Figure 8-2 below. Where the confidence rating is required to be increased additional resources will be required to resolve this issue. Examples of this are:

- The ongoing updating of the asset register of the pipe assets when repairs are carried out and the attributes are compared with the asset register attributes
- The ongoing modelling of the reticulation where increased areas within the city are modelled with the associated increase in the accuracy of the performance of the network

Figure 4-16: Confidence Rating in Attributes, Condition and Performance

Attribute	All Data Estimated	Significant Data Estimated	50% Estimated	Minor Inaccuracies	Accurate	Comment
Attributes						
Reticulation						
Size						The data was captured using photogrammetry in 1994 and progressively delivered over the following three years. Nelson City Council staff carried out accuracy checks on the co-ordinate data supplied, searched all the engineering plans and field books for information on pipe alignment, material and age and entered this information into the Geographical Information System
Depth						
Material						
Install Date						
Location						
Pipe Length						

Attribute	All Data Estimated	Significant Data Estimated	50% Estimated	Minor Inaccuracies	Accurate	Comment
Attributes						
Wastewater Treatment Plant – all components						Facility upgraded in early 2008 with a high level of knowledge on all aspects of the facility
Pump Stations– all components						High level of knowledge known on the majority of pump stations due to the upgrading programme that is nearing completion
Condition						
Reticulation						Limited inspections to date
Trunk Mains						
Rising Mains						
Swallow Mains						
Manholes						Limited inspections to date
Pump Stations– all components						High level of knowledge known on the majority of pump stations due to the upgrading programme that is nearing completion
Electronics– all components						
Waste water treatment plant						Upgraded in 2008
Outfall						
Performance						
Reticulation						Limited inspections to date
Trunk Mains						
Rising Mains						
Swallow Mains						
Manholes						Limited inspections to date
Pump Stations– all components						High level of knowledge known on the majority of pump stations due to the upgrading programme that is nearing completion and associated testing programme that was associated with this programme
Electronics						
Waste water treatment plant – all components						Upgraded in 2008 due to high level of testing that has occurred over the last 12 years
Outfall						

4.1.4. Asset valuations

The replacement costs of the wastewater assets are $239.2m at June 2016 as detailed in Table 4-13 below. The majority of the replacement costs are the reticulation mains.

Valuation Method

Valuations are completed on a bi-annual cycle. Every second year a full revaluation is completed of all assets held by NCC, which is completed by reviewing all assets and

valuing them based on recent costs for similar work within Nelson City Council. This work is peer reviewed by OPUS International Consultants Ltd. For the intervening years an Indexed revaluation is completed based on the previous years full revaluation and a factor of recognised price increase advised by OPUS after allowing for known asset additions and disposals. In addition major assets, (dams, Pump stations etc.) are revalued by OPUS on a replacement value basis. The Depreciated Replacement Value is used to calculate the straight line depreciation over the remaining useful life.

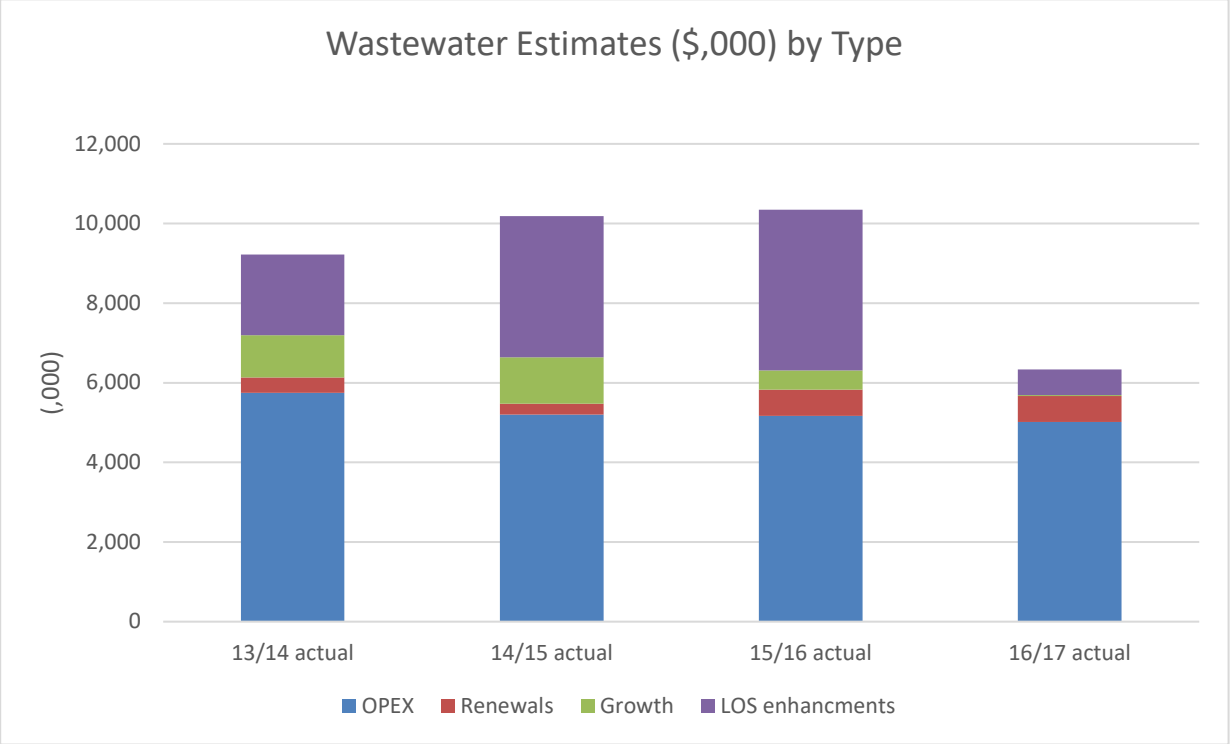
Table 4-13: Wastewater Asset Valuation

Asset Category	June 2016			
	Quantity	RV	DRV	Depr
	km/units/Ha	($)	($)	($)
Reticulation Mains	325.2	134,429,658	76,483,913	1,636,453
Trunk Mains	36.3	17,753,716	8,473,597	237,698
Swallow Mains	5.6	3,441,706	377,996	60,592
Rising Mains	25.9	20,716,287	7,984,344	336,025
Access points	924	844,874	632,376	10,571
Manholes	6,780	33,954,240	19,505,602	419,989
Tanks	11	88,047	38,151	1,101
Valves	152	368,995	116,567	12,202
Neale Park Retention Tank	1	587,052	444,006	7,338
Pump Stations	25	7,222,161	2,337,285	251,228
Wakapuaka Treatment Plant	1	19,830,800	14,539,900	407,400
Total		**239,237,537**	**130,933,735**	**3,380,597**

The 2017 indexed depreciated replacement valuation of the wastewater supply assets is $146,199,000.

4.1.5. Historical data

Figure 4-17: Expenditure on Wastewater Network



4.2. Operations and maintenance plan

Operations and Maintenance strategies set out how the wastewater activity will be operated and maintained on a day-to-day basis to consistently achieve the optimum use of assets and meet levels of service. Operations and Maintenance activities fall into the following categories, each having distinct objectives and triggering mechanisms:

Operations - Activities designed to ensure efficient utilisation of the assets, and therefore that the assets achieve their service potential and the network is capable of meeting required levels of service. Operational strategies cover activities such as energy usage, control of mechanical and electrical plant, inspections and service management.

Maintenance - Maintenance strategies are designed to enable existing assets to operate to their service potential over their useful life. This is necessary to meet levels of service, achieve target standards and prevent premature asset failure or deterioration. There are two types of maintenance:

- Programmed - A base level of maintenance carried out to a predetermined schedule. Its objective is to maintain the service potential of the asset system. And maintenance actioned as a result of condition or performance evaluations of components of the wastewater system. Its objective is to avoid primary system failure
- Reactive Maintenance - Maintenance carried out in response to reported problems or system defects. Its objective is to maintain day-to-day levels of service.

Additional planned maintenance work is carried out on the reticulation to address faults identified by the inflow and infiltration strategy.

4.2.1. Operations and maintenance plan

Maintenance Planning

Currently the asset maintenance is a mix of programmed and reactive. Further work moving towards advanced asset management planning techniques for critical components is considered appropriate to apply programmed maintenance programmes to the widest area of components required to ensure the safe and efficient operation of the network. This approach would allow for maximising the useful life of an asset while minimising the consequences of unforeseen failures.

Method of Delivery

The operation and maintenance of the Nelson City Council wastewater activity is carried out using a combination of Nelson City Council staff and external contractors consisting of:

- Network Services internal utilities business unit for design and Supervision (Nelson City Council).
- NELMAC Limited for all reticulation operations and maintenance (CCTO).
- External contractors for specialist activities such as closed circuit television and major overhauls of mechanical equipment.

Minimise Sewer Blockages

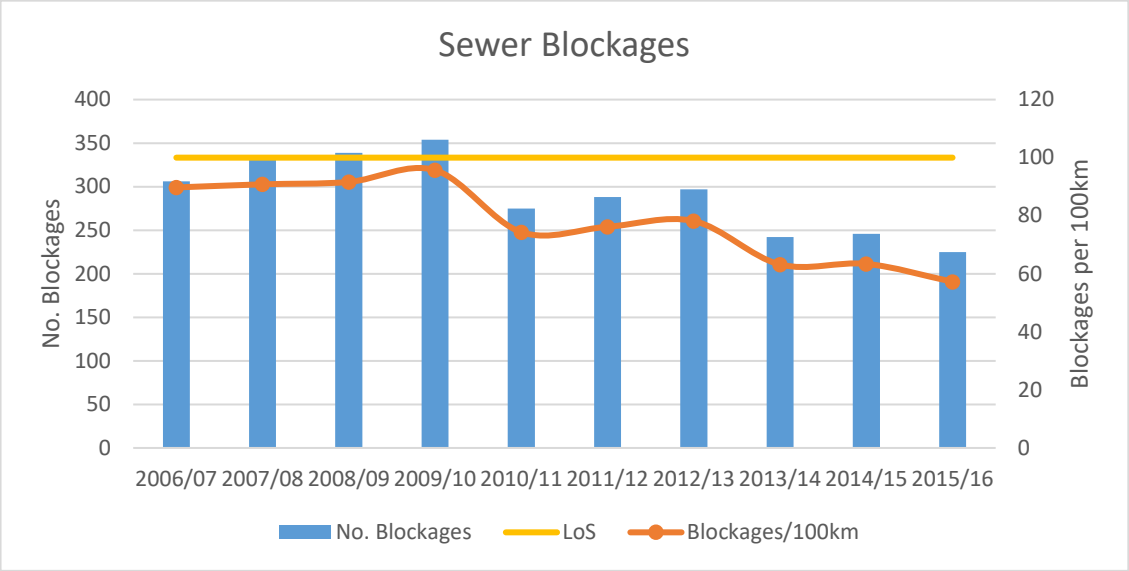
Blockages in the sewer reticulation can lead to overflows and odour complaints with associated health issues.

To address this a 24-hour callout system provides a prompt response to any sewer blockage. If the blockage is within the private section of the system and the landowner still wants the repair carried out then the Council's Maintenance Contractor will carry out the work and invoice the landowner directly.

Pipes with continual blockages are inspected via closed circuit television and either cleaned or replaced. Regular flushing occurs at 17 points around the city. Closed circuit television survey work is also carried out at regular intervals to identify areas prone to root intrusion.

Figure 4-15 indicates the historical trend of sewer blockages over a ten year period. The 10 year trend indicates that the performance measure has been achieved for the majority of time.

Figure 4-18: Sewer Blockages



4.2.2. Operations and Maintenance Strategies

Day to day operation and maintenance of the network is carried out by contractors with specific requirements set out in the Maintenance of Utility Services contract.

Level of Service Implications

For the wastewater network to deliver the levels of service it must be intact and functioning. Reactive maintenance must be carried out promptly. Programmed maintenance must be carried out to ensure that downtime is minimised by carrying out maintenance before it becomes reactive.

Demand Implications

With increasing demand there will be an increase in total variable costs particularly as more wastewater is transported and pumped.

Risk Implications

Pump stations and reticulation mains, must all be maintained, kept secure and protected from natural hazards so that they can continue to function through an emergency albeit at a reduced level of service.

Lifecycle Implications

Operations and maintenance is the longest period of the asset lifecycle and ongoing maintenance is necessary to ensure that the design life of the asset is achieved.

The following table sets out the operations and maintenance strategies:

Table 4-14: Operations and Maintenance Strategies

Strategy	Objective/ Description
Maintenance	
Preventative Maintenance	Routine Maintenance will be carried out in terms of defined routine maintenance programmes with predetermined triggers for these activities to be carried out

Strategy	Objective/ Description
Reactive Maintenance	Remedial maintenance will be undertaken as quickly as practically possible to restore an asset to a satisfactory condition after a failure or other another unsatisfactory condition has been detected
Repairs	The detection and repair of faults causing failure will be undertaken as quickly as practically possible. The fault will be isolated and components repaired or replaced as appropriate and then if warranted the item will be tested to ensure that it meets the relevant standard
Redesign and Modification	Redesign may be necessary if an asset or system does not meet its operational objective. Similarly, modifications may be necessary to improve the operating characteristics. Redesign and modifications will be undertaken in a methodical manner to ensure alternative options are considered and optimum decisions made
Operations	
Operations	Operational activities will be undertaken via NELMAC unless specialised advice is required. Staff will be responsible for the determination and optimisation of planned and unplanned works, work methods and maintenance scheduling to achieve the target service standards
Physical Works Monitoring	Audits of work will be carried out to verify compliance with standards
Operation of Utilities	Utilities such as treatment plants and pumping stations will be operated in terms of defined parameters and standards
Incident management	Council will effectively respond to and manage incidents to ensure system availability and service continuity, and mitigate adverse effects Maintenance staff and contractors are expected to effectively manage minor incidents. Nelson City Council Infrastructural Asset management staff will become involved in serious incidents
System control and monitoring	Council will utilise Supervisory control and data acquisition systems to monitor operation of the wastewater facilities The Supervisory control and data acquisition system provides surveillance of the operation of pumping stations in the wastewater system and provides alarms when equipment fails or when operating parameters are exceeded. The Supervisory control and data acquisition system also records operating data from the treatment plants and pumping stations

4.2.3. Summary of future costs

Table 4-15: Wastewater 10 Year Operations and Maintenance Projections ($000)

Account	2018/19 LTP Final Uninflated	2019/20 LTP Final Uninflated	2020/21 LTP Final Uninflated	2021/22 LTP Final Uninflated	2022/23 LTP Final Uninflated	2023/24 LTP Final Uninflated	2024/25 LTP Final Uninflated	2025/26 LTP Final Uninflated	2026/27 LTP Final Uninflated	2027/28 LTP Final Uninflated
6405 Wastewater										
Expenses	7,338.2	7,810.9	7,997.0	7,415.6	7,013.8	7,068.7	6,980.2	7,241.1	7,307.3	7,475.4
Base Expenditure	4,648.3	4,781.4	4,937.4	5,251.7	5,459.8	5,473.8	5,499.8	5,713.3	5,753.3	5,801.4
Unprogrammed Expenses	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0
Programmed Expenses	1,069.9	1,239.8	1,254.8	806.9	502.0	522.5	465.2	488.9	502.0	562.0

4.3. Renewal/Replacement plan

Capital Renewal./Replacement

Renewal is major work that does not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing component to its original capacity. This includes:

- Works that do not increase the capacity of the asset but restores them to their original size, condition capacity, etc.
- The replacement component of augmentation works which increase the capacity of the asset, i.e. that portion of the work which restores the assets to their original size, condition, capacity etc;
- Reconstruction or rehabilitation works involving improvements and realignment.
- Renewal and/or renovation of existing assets, restoring the assets to a new or fresh condition consistent with the original asset.

Work over and above restoring an asset to original capacity is creation/acquisition/ augmentation expenditure. However if the additional cost is within 10% of the renewal cost then the total cost will be treated as renewal expenditure.

4.3.1. Renewal identification and strategies

Assets can fail from various modes other than the normally recognised physical, failure or breakage.

Condition assessment is a typical failure mode assessment activity.

To evaluate cost and obsolescence as failure modes it is necessary to capture the asset's operating and maintenance cost information, and to compare this with the lifecycle cost expectations.

As condition assessment and maintenance histories are built up, these will be used in determining renewal priorities.

Level of Service Implications

It is necessary to renew pipes and equipment before they impact on levels of service.

Demand Implications

Renewals will be sized to allow for future demand. Where the increase is greater than 10% then the difference will be funded from creation/acquisition/ augmentation expenditure.

Risk Implications

There is a risk to life, property and business' financial income by not undertaking renewals of pipes, intakes and detention dams.

Lifecycle Implications

Pipes and equipment must be renewed before maintenance costs become excessive. Decisions made at the time of renewal have impact on the whole lifecycle costs of the asset.

For the purpose of developing asset renewal programmes, the wastewater assets have been separated into "discrete" and "non-discrete" assets.

- "Discrete" assets are assets such as pumping stations, which are separately identifiable, generally above ground and which can readily be inspected

- "Non-discrete" assets are assets such as buried pipelines which are part of an extensive network, are generally below ground and which cannot readily be inspected (other than by techniques such as excavation and Closed circuit television)

This renewal strategy deals with the reticulation portion of the network –intakes, pipes, valves and associated chambers and outfalls. Pumpstations, telemetry, flow meters and river works are considered separately.

Table 4-16: Renewal Strategies

Strategy	Objective/ Description
Identification of Renewal Needs	To avoid a concentration of asset renewals in a short window of time, when they all reach the end of their life, renewals are set by: Potential development in the city Other Council projects e.g. the condition of wastewater pipelines will be inspected prior to major road works to identify the risk of the road being damaged by pipeline failure or the need for pipeline replacement in the short/medium term. Pipelines in poor condition will be programmed for replacement prior to or in conjunction with the road works. Issues identified with asset by location and or materials Through condition reports, maintenance records (asset failure and expenditure history), wastewater infiltration studies, request for service (RFS) records, and observations of public, staff and contractors. 1) Critical assets just before they fail. 2) Others after three unexpected overflows (same locality) or multiple blockages in five years (same pipe/fitting material or location). 3) When the level of service is no longer met owing to diminished capacity or excessive damage. 4) Alignment with other utility renewals or upgrades where excavation to renew the wastewater asset would be undesirable within the next ten years.
Project options	Decision Criteria are weighed. Then Business Options which consider benefits (aligned with the Decision Criteria), dis-benefits, cost, timescale and risks are compared to determine whether to proceed with a renewal or which renewal option to take. See Appendix N for decision criteria.
Design	Construct renewal works each year, are generally designed in advance, to maintain level of service. Renewal works are designed and undertaken in accordance with Nelson City Council Land Development Manual that stress the use of long life materials Investment is made in new technologies to rehabilitate existing reticulation where appropriate, rather than excavate and replace.
Deferred Renewals	The quantity and impact of deferred renewals (if any) is tracked The Council recognises that although the deferral of some items in the network will not impede the operation of many assets in the short term, repeated deferral will create a future Council liability. As Council currently funds asset renewals from depreciation deferred renewals are not necessary for complying with capital expenditure debt caps and are not viable in the medium to long term.

Nelson City Council renewal strategy is in a stage of transition from renewal, based on condition and age, to the strategy based on a combination of the following:

- Performance
- Asset criticality (using the business and extended asset risk schedules)
- Capacity
- Condition (age data used to estimate condition when condition data not held)

The transition to the above strategy will require supporting data and analysis of the following:

- Field maintenance condition feedback
- Asset failure records
- Pipe sampling programmes
- Specific inspections and condition rating of assets

Performance and condition of the assets are assessed with respect to the following criteria:

- Inflow and infiltration potential.
- Leakage from pipes, manholes and fittings where the network is adjacent to waterways, marine environment or areas of high groundwater.
- Areas with elevated levels of blockages.
- Areas with elevated maintenance costs.
- Parts of the network prone to overflows.
- Parts of the network with objectionable odour emissions

Reticulation renewal strategy

Council renews components of the wastewater network as they reach the end of their service life. The rate of asset renewal is intended to maintain the overall condition of the asset system at a standard which reflects its age profile, and ensures that the Community's investment in the City's wastewater infrastructure is maintained.

The gravity pipe network is made up of a variety of materials with different service lives. Where pipes remain in good condition it is anticipated that lives of 80-100 years can be achieved. Current renewal strategies focus on renewing pipelines that show high infiltration rates and/or a history of multiple repairs. A constant renewal programme is undertaken to even out the rate of renewal and avoid the need for very high expenditure in the years when the pipes reach the end of their service lives.

Rising Mains and Swallows (gravity pressure main) renewals strategy

The main feature of these pipes is that they are constantly full of wastewater under pressure. Swallows are gravity pressure mains where the pipes are generally full, but at a lower pressure. It is difficult to inspect these mains and assess the condition as they are in constant use, which makes renewal programming challenging. Historically this has meant that monitoring has not been possible on a regular basis and failures are likely to be the first indication of problems. This is common throughout New Zealand and has been demonstrated by the recent failures of the Atawhai rising main.

Some investigations of the swallows have been undertaken with closed circuit television, and a condition assessment and renewal strategy is required. The first area investigated will be the central city to align with intensification proposals and the inflow and infiltration strategy.

The rising mains will be more difficult to inspect and investigation for renewals will focus on pipeline materials, such as concrete, that are likely to be at greater risk of chemical attack. Each assessment will require careful planning as it is likely a section of the pipeline will have to be taken out of operation for short periods of time. This brings with it a risk of overflows that can be addressed in part with suction trucks.

Atawhai Rising Main

To address the risk to the city of ongoing pipe failures the following broad strategy has been developed.

The renewal of the rising main is currently being looked at in five stages:

Stage 1 – construction of the new pump station and section of rising main upgrade at Corder Park, constructed in 2014/15 and 2015/16. This reduces the pressure in the line between Neale Park and Corder Park.

Stage 2 – construction of the new pump station at Neale Park in 2017/18 and 2018/19. This allows installation of additional pumps which will ensure a smoother pressure profile that better matches flows.

Stage 3 -duplication or re-lining of the rising main from Neale Park to Brooklands Road 2027/28 and 2028/29. This work secures the rising main either through Founders Park or relocates it around the Founders Park- Miyazu Park area.

Stage 4 -duplication or relining of the rising main from Brooklands Road to Corder Park 2029/30 and 2030/31.

Stage 5 -duplication or re-lining of the rising main from Corder Park to Boulderbank Drive 2031/32 and 2032/33.

4.3.2. Summary of future costs

Table 4-17: Wastewater 10 Year Renewal Projections ($000)

Account	2018/19 LTP Final Uninflated	2019/20 LTP Final Uninflated	2020/21 LTP Final Uninflated	2021/22 LTP Final Uninflated	2022/23 LTP Final Uninflated	2023/24 LTP Final Uninflated	2024/25 LTP Final Uninflated	2025/26 LTP Final Uninflated	2026/27 LTP Final Uninflated	2027/28 LTP Final Uninflated
6405 Wastewater										
Capital Expenditure										
Renewals	1,785.2	1,327.2	1,345.3	1,439.3	1,589.3	1,489.3	1,607.0	1,779.8	1,601.8	3,526.8

Deferred Renewals

This plan indicates no deferred renewals

4.4. Creation/Acquisition/Augmentation plan

Capital Creation/Upgrading

Creation/Acquisition/Augmentation works create a new asset that previously did not exist, or upgrade or improve an existing asset. They may result from growth, social or environmental needs, levels of service. This includes:

- Expenditure which purchases or creates a new asset (not a replacement) or in any way improves an asset beyond its original design capacity.
- Upgrading works which increase the capacity of the asset eg for future growth demand.
- Construction works designed to produce an improvement in the standard and operation of the asset beyond its present capacity.

Asset development and asset renewal can occur simultaneously. The purpose of asset renewal is to prevent a decline in the service potential of the assets whereas asset development is concerned with the service improvements, measured by asset performance.

4.4.1. Selection criteria

Level of Service Implication on Capital

The capital works for wastewater network construction are to address problems with appropriate wastewater disposal options in the city to the levels of service required.

Demand Implications on Capital

The capital works proposed will address the need for more detention and mains to meet growth requirements. Failure to meet growth requirements will then impact on Levels of Service.

Risk Implications on Capital

The capital works proposed address the need for decreasing the risk to the city from inadequate response to wet weather overflows, inadequate capacity for growth and failure of the ongoing functioning of wastewater treatment plant.

Lifecycle Implications on Capital

Decisions made to construct a capital project will have implications for the life of the asset, as will subsequent design decisions. Optimised decision making will therefore be used to identify and prioritise all potential solutions for wastewater projects over $0.5million in value.

Selection Strategy

Table 4-18: Project Selection Criteria

Criteria	Objective/ Description
Identification of upgrade needs	Asset upgrade needs are identified from analysis of: Demand forecasts System performance monitoring (pressure, flow, leakage rates, etc.) Network modelling

Criteria	Objective/ Description
	Risk assessments (Risk Management Plan) Nelson Resource Management Plan Customer service requests A provisional forward capital works development programme is maintained and updated at least annually
Upgrade Project Categorisation	Upgrade Projects will be separated into projects to close service gaps and projects required to accommodate growth Upgrade projects to close service gaps are generally funded entirely by Nelson City Council. Upgrade projects to accommodate growth may be partly or wholly funded through Development Contributions
Prioritisation of projects	Upgrade projects are justified and prioritised using a risk based process. Decisions on upgrade works consider the short and long-term effects on the operating and structural integrity of the wastewater system In determining the requirement for capital or asset upgrade works the short and long-term effects on the operating and structural integrity of the system are considered, together with any forecast increase in loading upon the system Decisions on priorities for new works and renewal of assets for the wastewater network are based on the following: • Known problem areas with blockages and or overflows • New growth areas • Criticality of proposed works • Multiple network project (e.g. incorporating road work, sewer, water assets)
Project Approval	A long-term programme is prepared from projects meeting the assessment criteria, and all projects are approved through the Long Term Plan process The actual timing of asset works will reflect the community's ability to meet the cost, as determined through the Annual Plan process Scheduled projects meeting assessment criteria not funded are listed on the forward works programme for the following year

4.4.2. Capital investment strategies

The table below sets out the strategies used for developing capital works programmes for the wastewater systems. These strategies are intended to progressively close gaps between target service standards (taking account of demographic and economic growth projections) and the current service capability of the asset system.

Table 4-19: Creation/Acquisition/Augmentation Strategies

Strategy	Objective/ Description
Project design	All asset upgrade works will be designed and constructed in accordance with Nelson City Council Engineering Standards/Land Development Manual that stress the use of long life materials, and system design loading. In determining capital or asset upgrade work requirements the short and long term effects on the operating and structural integrity of the system are considered, together with the demands of any forecast increase in loading upon the system

Strategy	Objective/ Description
	The system will be designed to minimise supply disruptions as far as practically possible by building in an appropriate level of redundancy The standardisation of designs and specifications will be considered in the interest of facilitating replacement and operational simplicity All feasible options, including non-asset demand management options and the use of second-hand plant, are considered. Low impact urban design is used where appropriate. Various components of the wastewater goal are considered when developing the final detailed design: • Economics of various options • Efficiency of meeting the network need • Cultural values relating to wastewater disposal to freshwater and marine environments • Ecological values of freshwater and marine eco-systems
Future Development	Identifies sufficient, feasible development capacity in short, medium and long term and the location, timing and sequencing if infrastructure to support it.
Gifted Assets	The risk, cost and benefits of accepting any new privately funded assets constructed in association with property development will be considered on a case by case basis in approval decisions Such assets will be accepted into public ownership when satisfactorily completed in accordance with approvals given. Council will not contribute to the cost of such work unless there are exceptional service standard or equity issues

4.4.3. Summary of future costs

Table 4-20: Wastewater 10 Year Creation/Acquisition/Augmentation Projections ($000)

Account	2018/19 LTP Final Uninflated	2019/20 LTP Final Uninflated	2020/21 LTP Final Uninflated	2021/22 LTP Final Uninflated	2022/23 LTP Final Uninflated	2023/24 LTP Final Uninflated	2024/25 LTP Final Uninflated	2025/26 LTP Final Uninflated	2026/27 LTP Final Uninflated	2027/28 LTP Final Uninflated
6405 Wastewater										
Capital Expenditure	7,098.7	6,069.0	7,980.1	9,012.2	7,111.8	8,340.7	8,181.2	6,949.6	6,730.5	12,310.5
Capital Growth	912.0	1,144.2	1,347.5	2,542.1	882.7	1,942.1	2,016.1	1,327.0	1,327.0	1,557.0
640576102884. Gracefield Beheading	80.0	162.2	540.5	1,540.5	0.0	0.0	0.0	0.0	0.0	0.0
640576102891. Network Capacity Confirmation for Growth Areas	0.0	0.0	0.0	0.0	54.1	54.1	108.1	500.0	500.0	0.0
640576103162. Hill Street sewer upgrad	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640576103163. Saxton Road sewer upgrade	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	750.0
640576152876. Ngawhatu Valley TM - Stage 2	0.0	0.0	0.0	194.6	21.6	1,081.0	1,081.0	0.0	0.0	0.0
64057691. Vested Assets	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0
640576913161. Elm st sewer upgrades	0.0	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640576913162. Hill St sewer upgrade	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Increased LOS	2,616.3	2,270.6	3,942.1	3,591.5	3,050.5	3,420.0	2,951.1	2,063.1	2,200.0	3,700.0
640577203147. Quarantine Road Sewer Pump Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	1,500.0
640579102890. Natural Hazards Risk Remediation	0.0	0.0	54.1	54.1	108.1	208.1	208.1	0.0	0.0	100.0
640579103148. Wastewater Network Upgrades	0.0	0.0	0.0	0.0	0.0	50.0	50.0	500.0	500.0	500.0
640579201187. Neale Park PS	2,116.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640579201716. Awatea Place Pump station	300.0	2,000.0	3,500.0	1,000.0	0.0	0.0	0.0	0.0	0.0	0.0
640579201914. Pump Station Storage	129.8	54.1	175.7	1,000.0	1,000.0	1,000.0	1,000.0	0.0	0.0	0.0
640579202885. Atawhai Pump Stations (Brooklands & Marybank)	0.0	86.5	82.4	82.4	432.4	432.4	216.2	0.0	0.0	0.0
640579301191. Capital: NN Waste water plt Up	0.0	30.0	30.0	20.0	10.0	250.0	0.0	0.0	100.0	100.0
640579503230. System Performance Improvements	100.0	100.0	100.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0
64057997. LoS: investigation, options, testing, engagement	-30.2	0.0	0.0	-64.9	0.0	-20.5	-23.2	-36.9	0.0	0.0

4.5. Disposal plan

The disposal plan recognises that there can be activities and costs associated with the decommissioning and disposal of assets which are no longer required as part of the wastewater system. In some situations there can be revenue resulting from asset disposal.

Mechanical equipment that has been replaced will be reused for parts or sold as scrap metal unless it is considered to have genuine resale value. In this case, the piece of surplus equipment will be sold with income directed to the Nelson City Council account.

Table 4-21: Disposal Strategies

Strategy	Objective/ Description
Asset Disposal	Assess each proposal to dispose of surplus or redundant assets on an individual basis, subject to the requirements of the relevant legislation Asset disposal will comply with the requirements of the Local Government Act 2002 and in particular the requirement for Councils to retain a capability to provide wastewater services Redundant pipes are backfilled or removed where their alignment clashes with replacement pipelines or where their existence is considered dangerous. This is to ensure collapse or build-up of gases does not occur Possible use of abandoned pipes for telecommunication ducts is reviewed on a case by case basis. Currently Chorus and Network Tasman lease access to abandoned gas mains and abandoned water and wastewater pipes. Health and Safety issues associated with accessing asbestos cement pipes is likely to lead to a re-evaluation of this use.
Residual Value	The residual value (if any) of assets, which are planned to be disposed of, will be identified and provided for in financial projections Abandoned wastewater pipelines have possible future value for other purposes (such as ducting for cabling). As the extent of this value (if any) is uncertain it is not recognised in the asset valuation. Health and Safety issues associated with accessing buried asbestos pipes will potentially reduce the usage of these for other utility ducting.

Assets, which are disposed of, have generally reached the end of their useful lives and have minimal or no residual value. When a wastewater asset is abandoned or replaced the Geographic Information System and fixed asset register are updated. A system of job number creation and asset identification is used to document this process.

Asset Disposal Plan

If pipes are left in the ground and cannot be reused for other services ducting, they will generally be sealed at the connections and backfilled with cement grout, apart from those located within the estuary.

Mechanical equipment that has been replaced will be reused for parts or sold as scrap metal unless it is considered to have genuine resale value. In this case, the piece of surplus equipment will be sold with income directed to the Nelson City Council wastewater account.

5. Risk management plan

This section describes the risk management procedures used in the wastewater activity.

Applying risk management procedures enables decisions to be made about the best use of limited resources to achieve as much as possible of the Council's objectives from the maintenance and development of the wastewater assets.

Threats and opportunities are assessed against wastewater objectives and levels of service.

As set out above risk management is not simply about uncertain events with a downside (such as financial loss or legal proceedings). The process can also be used to identify and decide on the merits of uncertain opportunities for the Council to do things more innovatively, sustainably and effectively.

5.1. Critical assets

5.1.1. How critical assets are identified and managed

For practical purposes it is helpful to separately identify critical assets to the delivery of the wastewater activity.

The asset manager applies professional judgement based on experience, considering risk of failure and lifelines evaluation to identify critical assets. Generally critical assets are considered to be those assets for which the consequence of failure is unacceptable given the difficulty of repair and/or the strategic role they play, and would result in a major disruption or failure in meeting one or more levels of service.

A more robust framework for identification of critical assets is noted in the improvement programme.

Assets that are considered critical within the Nelson City Council wastewater system are:

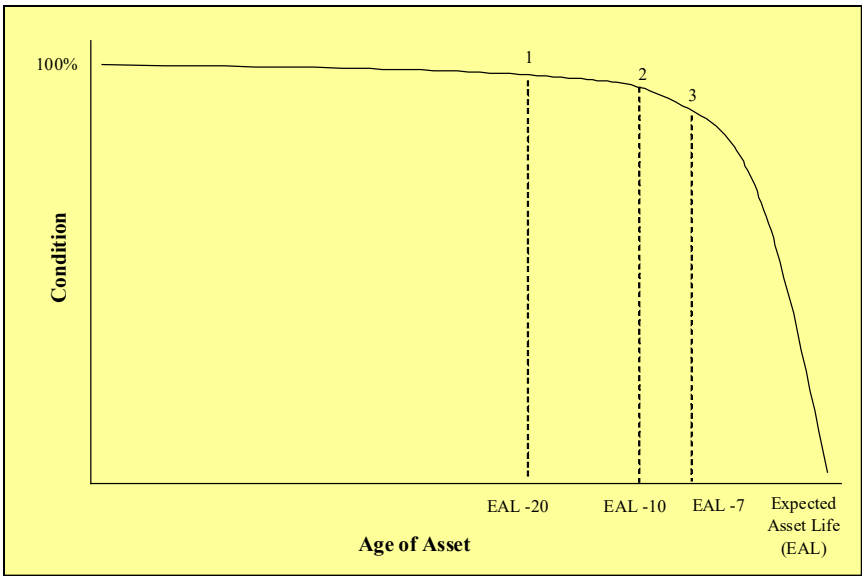
- All pump stations
- All rising mains
- All trunk mains
- The waste water treatment plant

By contrast non-critical assets are relatively quickly and easily repaired or replaced and their failure do not disrupt a significant number of customers.

Monitoring and intervention strategies are therefore quite different for both categories of asset. Critical assets attract a greater level of monitoring and ongoing condition assessment, with physical investigations taking place at a much earlier stage. Conversely non-critical assets can be expected to undergo a higher level of repair before complete replacement is considered.

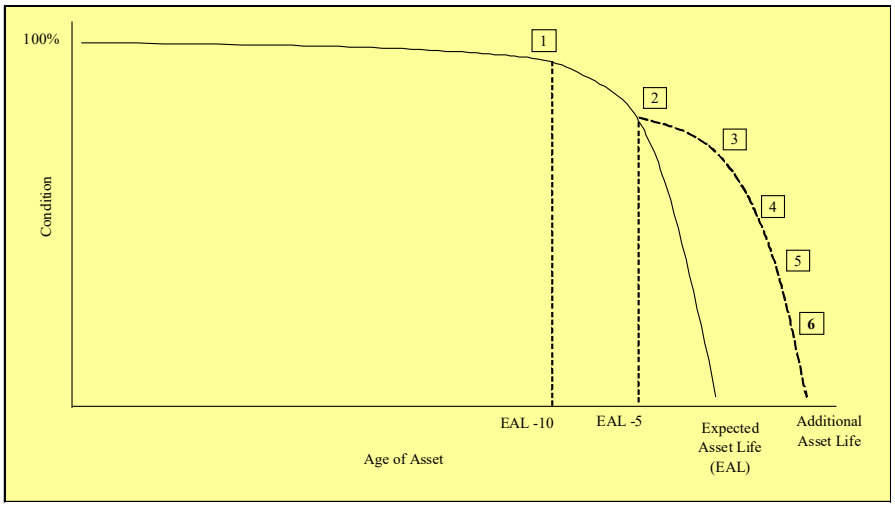
The following shows the nature and timing of interventions for both critical and non-critical assets.

Figure 5-1: Interventions for Critical Assets



Intervention: 1 Desktop review of asset and performance supported by Closed circuit television inspection, 2 Physical inspection of asset and performance review. 3 Replacement initiated.

Figure 5-2: Interventions for Non-Critical Assets



Intervention: 1 Desktop review of asset and performance, 2 Physical inspection of asset with Closed circuit television review and decision made on extending expected asset life, 3 Repair, 4 Repair, 5 Repair, 6 Replace asset.

The effect of criticality on an asset is highlighted in the following areas:

- Operation and maintenance planning
- Proactive or scheduled maintenance
- Priorities for collecting and determining the required level of reliability of data for asset management systems

- Priorities for undertaking condition assessments
- Adjusting economic lives with respect to renewal profiles
- Prioritising/Deferring renewals
- Prioritising expenditure
- Prioritising levels of service reviews

A methodology for determining asset criticality to a component level, along with options, will be determined to integrate criticality into the ongoing operation, maintenance, renewals and capital programme for the wastewater activity.

5.2. Risk assessment

5.2.1. Approach for assessing risks

The Council's risk management policy provides for assessing risk by:

- Clearly identifying the objectives for which achievement may be uncertain
- Identifying events which could make the achievement of one or more objectives uncertain
- For each event, using best available information (including considering the quality of that information and the controls already in place to manage the risk) to estimate the scale of consequence for an objective if the event happened and estimating a corresponding likelihood. Consequences and likelihoods are estimated using the Council's agreed risk criteria. See Appendix E.
- Selecting the likelihood consequence combination from the council's criteria giving the largest risk for the event.

As this Asset management plan is developed it will progressively apply the criteria required by the Council's updated risk management policy (formally adopted in August 2017) to managing risks. These criteria follow principle (g) of the international standard codifying good risk management practice (ISO 31000:2009) and tailor this generic process to the Council's specific circumstances. It is the organisation's intention to progressively align the risk management practices used in asset management with Council's Policy and Criteria and to apply generally accepted good practice.

Alignment with the new framework is in progress. The identified and assessed risks are not all derived by this process. Some are historical and may be based on a different framework and may have been ranked using criteria other than those adopted by the Council in August 2017. It is our intention to review and update the risks set out in the risk register Appendix E so that the information is all on a consistent basis.

5.2.2. Top risks and how these will be managed

The level of risk established from the assessment process (formally called residual risk) is compared with the Council's residual risk tolerance as set out in Table 3 of the Council's risk criteria.

The table sets out priorities for action and at what level of Council decisions should be taken to either accept (tolerate) the risk or take further actions to manage the risk to achieve a more acceptable risk level.

In many cases risks have already been acted on by officers in the course of the normal work of managing the wastewater activity and no further action is required.

In other cases specific decisions may be required to either accept the current level of risk or place actions in this plan to reduce the level of risk.

The following table provides an indication of areas of high residual risk and some information about how these could be further treated (i.e. further controls implemented or choices made to reduce risk levels). The complete Risk Resister can be found in Appendix K.

Table 5-1: High Risks in Network (See Appendix E for the full risk table)

WASTEWATER RISK REGISTER	**Objectives** **Treatment and disposal of wastewater in a safe and economic manner** **Environmental Protection for the built and natural environment from wastewater discharges** **Reliability – an operational wastewater network** **Contractor response – provide a prompt, reliable and timely response to service requests and system failures**	**Assessed by Phil Ruffell**

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
	TREATMENT							
Failure to achieve consent conditions: Odour	Ponds	Failure to comply with resource consents.Customer complaints.	Recent upgrading work has introduced pre-treatment processes to minimise loading fluctuations.Currently the pond is required to be operated and maintained in a manner that employs best practicable options that includes:- Pond loadings are adjusted for different seasons and conditions- Loading profile of the ponds are known and operated to these limits- A regular pond monitoring and sampling programme is in place-Sporadic odour problems continue feature in the operation of the Nelson North Waste Water Treatment Plant. Current investigations have centred on the build up of sludge in the pond. Budgets have been identified for further investigation and some remedial de-sludging.	Major (4)	Possible (3)	High (12)		Ensure clear delineation between waste water treatment plant, pump station, reticulation in systems and reports. Monitor treatment plant odour producing areas regularly.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
	RISING MAINS							
Deterioration and acid attack	Atawai - concrete	Deterioration and failure of asset resulting in loss of service, health and safety issues and wastewater discharges to the environment having an impact on environmental and cultural issues. No waste water from Nelson City can be pumped to waste water treatment plant.	The construction of the Corder Park pump station will reduce the pressure profile in the bulk of the rising main and is expected to reduce the risk of failure. The installation of air valves at high points in the main will remove the accumulated hydrogen sulphide gas and lessen the risk of ongoing acid attack.Contingency Plan in EPM	Major (4)	Possible (3)	High (12)		A re-evaluation of the strategy for condition profiling (including Closed circuit television) is requiredInitiate investigation and regulatory processes for construction of duplicate main
Deterioration	Other	Other mains failure points - discharges to the environment having an negative impact on environmental and cultural issues	Prevention through inspection and remedial strategy.	Major (4)	Possible (3)	High (12)		A re-evaluation of the strategy for condition profiling (including Closed circuit television) is required
Movement failure caused by, Earthquake, landslide or settlement/ liquefaction.	Atawhai		Civil Defence Emergency Management Procedures Manual.	Major (4)	Possible (3)	High (12)		Emergency Procedures Manual. Temporary bunding if necessary. Immediate repair if possible.
	PUMP STATIONS							
Power failure/System failure	Neale Park	Overflows - discharges to the environment having an negative impact on environmental and cultural issues	Stand-by generators and additional storage capacity [reduces probability of failure]Redevelopment of the pump station is programmed.	Major (4)	Possible (3)	High (12)		Formalise strategy for failure of pump stations that include contingency planning, lifelines and emergency management
Equipment/ component Failure	Neale Park	Wastewater discharges to the environment having an negative impact on environmental, cultural and health issues.Customer complaints.No wastewater from Nelson City can be pumped to waste water treatment plant.	Processes within pump station that has contingencies for failure (duplication of pumps) or alarm systems (Supervisory control and data acquisition) installed.Redevelopment of the pump station is programmed.	Major (4)	Possible (3)	High (12)		Formalise strategy for failure of pump stations that include contingency planning, lifelines and emergency management

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Insufficient Wet Weather Storage Capacity	Neale Park	Insufficient storage or capacity resulting in wastewater discharges to the environment having an impact on environmental and cultural issues	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions.Wet weather overflows due to volumes greater than the design limit require storage or resource consent for discharge to the environment.	Major (4)	Possible (3)	High (12)		Investigate storage capacity of network, document, & develop mitigation strategy
Power failure/System failure	Other	Overflows - discharges to the environment having an negative impact on environmental and cultural issues	Stand-by generators and additional storage capacity.	Major (4)	Possible (3)	High (12)		Formalise strategy for failure of pump stations that include contingency planning, lifelines and emergency management
Insufficient Wet Weather Storage Capacity	Other	Insufficient storage or capacity resulting in wastewater discharges to the environment having an impact on environmental and cultural issues	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions.et weather overflows due to volumes greater than the design limit require storage or resource consent for discharge to the environment.	Major (4)	Possible (3)	High (12)		Investigate storage capacity of network, document, & develop mitigation strategy

Potential Risks

Risks can be seen to arise from many areas of the Nelson City Council, both in the physical aspect for assets and business risks.

Climate Change

Climate change is expected to bring with it more extreme weather in the form of higher intensity and longer duration rain events (with associated flood damage and inflow and infiltration issues) and drought periods. The issue will be monitored and future asset management plans will be adjusted to address impacts as they become better understood.

Natural Hazards

Recent work by Council has focussed on natural hazards that might impact on the city, in particular:

- Direct damage from Earthquake shaking
- Damage from liquefaction in susceptible areas
- Damage from Tsunami
- Damage from Flooding and major storm events
- Impact of potential climate change and sea level rise

Security of the network in light of the recent Canterbury Earthquakes and Nelson storm events, including wider network hazards - Earthquake fault line, liquefaction and climate change will influence network upgrades into the future.

In February 2018 the remnants of two tropical cyclones hit the Nelson Tasman region. Both caused extensive damage.

Coastal damage on 1 February 2018 was caused by a combination of ex- tropical cyclone Fehi's gale force northerly winds creating large waves (and possibly swells coming from where it travelled in an area west of the North Island), low barometric pressure and onshore wind creating storm surge, along with a predicted large high tide. The storm surge added an extra 60cm to the expected tide level.

Within the city seawater damaged buildings on Rocks Road and backflowed through sumps in low lying areas. Significant surface flooding occurred particularly at The Glen and the Monaco peninsula where power supply was also damaged leading to overflows from the wastewater pump stations. Surface flooding delayed access to these areas and the subsequent installation of emergency generators. Some remedial works have been undertaken to electrical controls at the pump stations and future planning for more permanent emergency generators at these locations is underway.

Ex-tropical cyclone Gita mostly affected the Motueka/Takaka Hill area on 20 February 2018. Damage was caused by a narrow band of intense rain, as well as a low level wind convergence between westerlies and easterlies. Debris flows on steeper catchments, resulting from the intense rain caused extensive slope failures that affected road closures, most notably on the Motueka side of Takaka Hill. Lower down, blockages caused by the larger and heavier debris deposits from the debris flows created debris floods in the Motueka Valley.

Future work will focus on near fault proximity of the network, possible impacts of liquefaction on existing and future infrastructure, impacts of flooding and the long term planning required as a result of climate change.

The Christchurch Earthquakes of 2010 /2011 led to significant damage to that city's infrastructure including pump stations, treatment plants and pipe network from direct shaking and liquefaction. Recognising this, and the results of other natural hazard investigation post the Nelson storm events of December 2011 and April 2013, Nelson City Council is reassessing the risk to the network from earthquakes (including liquefaction, tsunami and direct shaking), flooding, storms and sea level rise.

In particular a series of reports have been compiled, as part of the city's wider hazard planning, as follows:

- TSUNAMI MODELLING AND EVACUATION ZONE MODELLING FOR TASMAN AND GOLDEN BAY- GNS FEBRUARY 2012
- REVIEW OF TSUNAMI HAZARD IN NEW ZEALAND (2013 UPDATE)- GNS AUGUST 2013
- ASSESSMENT OF THE LOCATION AND PALEOEARTHQUAKE HISTORY OF THE WAIMEA-FLAXMORE FAULT SYSTEM IN THE NELSON-RICHMOND AREA WITH RECOMMENDATIONS TO MITIGATE THE HAZARD ARISING FROM FAULT RUPTURE OF THE GROUND SURFACE- M. R. JOHNSTON A. NICOL GEOLOGICAL CONSULTANT GNS SCIENCE 395 TRAFALGAR STREET PO BOX 30368 NELSON LOWER HUTT GNS SCIENCE CONSULTANCY REPORT 2013/186 AUGUST 2013
- TAHUNANUI AREA LIQUEFACTION ASSESSMENT- TONKIN AND TAYLOR LTD NOVEMBER 2013
- MAITAI RIVER FLOOD HAZARD MAPPING MODELLING REPORT TONKIN AND TAYLOR LTD AUGUST 2013

A further report is required to update the 2009 report by the National Institute of Water and Atmospheric studies (NIWA), looking at the latest state of knowledge of the impact of climate change on sea level rise.

The wastewater network activity is likely to be impacted by sea level rise more than other utilities because the reticulation is essentially gravity based, with pipes of varying depth, age and integrity. Inflow and infiltration rates would be expected to rise, with base ground water levels likely to become elevated and high tides enhancing this effect. Pump stations and treatment plants are mostly positioned on lower level ground with potential for direct tidal impact, particularly in the Port Nelson and Tahunanui areas.

Liquefaction was seen in Christchurch to be an extreme risk to the network through floating manholes and sand and silt infiltration into pipelines and manholes.

Risk summary

The extreme and high risks are associated with the following:

- Waste water treatment plant processes
- Rising mains failures (Atawhai and others)
- Overflows from trunk mains caused by infiltration and blockages
- Trunk mains failure due to influence of hazardous trade wastes
- Neale Park pump station failure due to system failures

The Asset Risk Register needs be further developed to a component level i.e. pumps, electrical, controls etc to be confident that the risk has been appropriately evaluated. This is seen as necessary as different assets lend themselves to different treatment options. These treatment options may include:

- Duplication
- Increased maintenance
- Early replacement
- High level of procedures, decision making process, contingency plans and operation and maintenance manuals
- Quicker response times and/or increased storage
- Accepting risk i.e. do nothing, monitor

These treatment options may increase operating and depreciation costs but offsets the high level of risks associated with failure of the Nelson City Council assets.

If the improvements or actions indicated in the action plans are implemented then the level of risk is considered to be at an acceptable level for the ongoing operation of the Nelson City Council wastewater asset.

5.3. Infrastructure resilience approach

- ***Development of resilient infrastructure to address climate change predictions and to handle extreme weather events.***

  As a result of geographical constraints the bulk of wastewater pump stations in the network are concentrated at the bottom of the catchments close to the coast. These are vulnerable to both flooding and sea level rise. Current advice from both the Ministry for the Environment and the National Institute for Water and Atmospheric studies is that climate change will lead to a greater number of extreme weather events into the future with the prospect of more flooding, particularly in these lower areas of the city. All new pump stations are designed to withstand expected sea level rise predictions for the service life of the pump station.

  For temporary power outages Council has five pump stations with permanent emergency generators direct wired and six mobile generators that can be rotated between pump stations. Arrangements have also been made with contractors to access two additional mobile generators if necessary. See Appendix E for details.

- ***Natural Hazard Security of the network in light of the recent Canterbury and Kaikoura Earthquakes and various storm events.***

  Further work is proposed in this asset management plan to build on the hazard vulnerability studies carried out by Treasury in 2016/17 in response to the recent Canterbury and Kaikoura Earthquakes and multiple flood events across the country. Natural hazard resilience will include wider network hazards such as earthquake fault line rupture and liquefaction. Much of this work is expected to focus on the Nelson treatment plant, pump stations and the piped network across the city. The work will link with similar projects in the stormwater and water supply activities.

Insurance

Nelson City Council has insurance cover for the Wastewater, Water & Stormwater services, staff and property as detailed in Table 5-2 below. The insurance cover is updated on a regular basis following valuations to ensure the insurance cover is appropriate for its purpose.

Table 5-2: Wastewater Insurance Provisions

Components / Items	JLT TOS collective				Aon Si collective
	Public Liability	Professional Indemnity	Buildings and Contents	General Insurance	
Reticulation					✓
Pump Stations					
- Electrical				✓	
- Mechanical				✓	
- Structural				✓	
Staff	✓	✓			
Council Vehicles				✓	
Private property damage related to stormwater damage	✓				
✓ Indicates coverage by that particular insurance type					

Aon South Island (SI) collective

Nelson City Council is a member of an Aon South Island collective of councils from 1 July 2017 after withdrawing from the Local Authority Protection Programme Disaster Fund.

In the event of a natural disaster, the insurance cover will generally cover 40% of the reinstatement cost of infrastructure assets that have been damaged and declared for cover by the Aon SI collective.

The Aon SI collective is a shared program limit, Council has a sub-limit of $160 million plus AICOW – Additional Increased Cost of Working – this allows for additional costs to be paid over and above normal operating costs during a loss. The $160m was deemed to be the mean 1 in 750 ARI (annual return interval) loss estimate.

Emergency Management

Civil Defence and Emergency Response Plans

The following documents are available for guidance in the Civil Defence and Emergency Management:

- Civil Defence Emergency Management Plan
- Nelson City Council Emergency Procedures Manual - exercises are carried out on a six monthly basis to ensure all staff are familiar with the procedures.

Section 64 of the Civil Defence Emergency Management Act 2002 requires Local Authorities to:

64 Duties of local authorities
(1) A local authority must plan and provide for civil defence emergency management within its district.
(2) A local authority must ensure that it is able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency"

Local Civil Defence Emergency Management Arrangements

Nelson-Tasman Civil Defence Emergency Management Group is a joint committee of both Nelson City Council and Tasman District Council.

The Nelson Tasman Civil Defence Emergency Management Group Plan provides for an 'all hazards' approach to emergency management planning and activity within the Civil Defence Emergency Management Group area for Nelson City and Tasman District. The Civil Defence Emergency Management Group Plan states the civil defence emergency management structure and systems necessary to manage those hazards, including the arrangements for declaring a state of emergency in the Group's area. The Group Plan is the primary instrument whereby the community identifies and assesses its hazards and risks, and decides on the acceptable level of risk to be managed and how it is to be managed.

Lifelines Responsibility

Section 60 of the Civil Defence Emergency Management Act 2002 requires Local Authorities to:

60 Duties of lifeline utilities
Every lifeline utility must—
(a) ensure that it is able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency

Nelson City Council participated in the Nelson-Tasman Engineering Lifelines project as a life line utility.

The following table indicates the status of the wastewater schemes in the areas of Risk Reduction, Readiness, Response and Recovery.

Table 5-3: Risk Reduction, Readiness, Response and Recovery Status

Activities Required	Description	Stormwater Status
Risk Reduction	Identifying hazards, describing risks, and taking actions to reduce the probability or consequences of potential events.	Asset Management Plan Risk Register
Readiness	Planning and preparation required to equip agencies and communities to respond and recover.	Emergency procedures manual and exercises.
Response	Addressing immediate problems after an emergency.	Mutual Aid Plan.
Recovery	Addressing the long-term rehabilitation of the community.	Nelson-Tasman Civil Defence Emergency Management Group.

Nelson City Council Mutual Aid Plan

The Nelson City Council is a signatory to the Wastewater Mutual Aid Plan administered by the Water Services Group of the New Zealand Water and Waste Association.

Electricity Supply

The electricity lines suppliers are Network Tasman Ltd and Nelson Electricity Ltd.

Energy supply is currently via a contract with Trustpower.

Interconnectivity Effects

Interconnectivity or interdependence between different utilities during and after a disaster is of utmost importance. In the event of failure, access is necessary to visit a site and provide power for recovery or removal of debris. To enable effective and efficient recovery of lifelines from an event which disrupts their service, dependencies on other lifelines must be understood and where necessary, mitigated against.

Figures 5-3 and 5-4 summarise interdependencies between lifelines sectors during business-as-usual and major disaster events where disruption is expected to roads and electricity networks. The ratings presented in this section are illustrative only – obviously the extent of dependence in a response and recovery situation will depend on the specific scenario. The total dependency scores clearly illustrate the importance of electricity, roads, fuel and telecommunications to the other sectors, with air transport, VHF and broadcasting becoming more important in a major disaster event.

Figure 5-3: Interdependency Matrix – Business As Usual

The degree to which the utilities listed to the right are dependent on the utilities listed below	Roads	Rail	Sea Transport	Air Transport	Water Supply	Wastewater	Stormwater	Electricity	Gas	Fuel Supply	Broadcasting	VHF Radio	Telecomms	Total Dependency
Electricity	1	2	3	3	3	3	2		2	2	3	3	3	30
Roads		3	3	3	2	2	2	2	2	3	2	2	2	28
Fuel	2	3	3	3	2	2	2	2	2		2	2	2	27
Tele-comms	2	2	2	2	2	2	2	2	2	2	2	3		25
Water Supply	1	1	1	2		3	1	1	1	1	1	1	2	16
VHF Radio	2	2	2	2	1	1	1	1	1	1	1		1	16
Stormwater	2	1	1	2	1	1		1	1	1	1	1	1	14
Wastewater	1	1	1	2	1		1	1	1	1	1	1	1	13
Rail	1		1	1	1	1	1	1	1	1	1	1	1	12
Sea Transport	1	1		1	1	1	1	1	1	1	1	1	1	12
Air Transport	1	1	1		1	1	1	1	1	1	1	1	1	12
Gas	1	1	1	1	1	1	1	1		1	1	1	1	12
Broadcasting	1	1	1	1	1	1	1	1	1	1		1	1	12

Figure 5-4: Interdependency Matrix – During / Post Disaster Event

The degree to which the utilities listed to the right are dependent on the utilities listed below	Roads	Rail	Sea Transport	Air Transport	Water Supply	Wastewater	Stormwater	Electricity	Gas	Fuel Supply	Broadcasting	VHF Radio	Telecomms	Total Dependency
Fuel	3	3	3	3	3	3	3	3	3		3	3	3	36
Roads		3	3	3	3	3	3	3	3	3	2	2	3	34
Tele-comms	3	2	2	2	3	3	3	3	3	2	2	3		31
Electricity	1	2	3	3	3	3	2		2	2	3	3	3	30
VHF Radio	2	2	3	3	2	2	2	2	2	2	2		2	26
Broadcasting	2	2	2	2	2	2	2	2	2	2		2	2	24
Air Transport	2	1	1		2	2	2	2	2	2	2	2	2	22
Water Supply	1	1	1	2		3	1	1	1	1	1	1	2	16
Stormwater	2	1	1	2	1	1		1	1	1	1	1	1	14
Wastewater	1	1	1	2	1		1	1	1	1	1	1	1	13
Rail	1		1	1	1	1	1	1	1	1	1	1	1	12
Sea Transport	1	1		1	1	1	1	1	1	1	1	1	1	12
Gas	1	1	1	1	1	1	1	1		1	1	1	1	12

3: Required for Service to Function, 2: Important but can partially function and/or has full backup, 1: Minimal requirement for service to function.

Succession Planning

Succession planning within any business is considered necessary to reduce the risk associated with staff leaving the organisation. Succession planning allows institutional knowledge to be passed on, and assists in ensuring continuity of organisational culture.

Currently succession planning is largely by way of multiple staff members involved in administering the activity and detailing strategies for the future in asset management plans. In order to ensure greater effectiveness there is a need to improve planning and recording of strategies over the next three years.

Climate Change Effects

There has been considerable work undertaken at a national level on the possible effects of climate change and sea level rise.

The New Zealand Government has published projections of climate change to 2080. The general trend for Nelson is of winters being wetter and the other seasons being drier. More frequent heavy rainfall events have been predicted. By the 2090s the typical temperature rise is expected to be +2 degrees Celsius and extreme rain events should increase by about 16%

The key climate influences on the wastewater activity is more intense rainfall, higher sea level and tides, and storm surges. More water inflow and infiltration into the wastewater system increases the risk of wet weather overflow events.

Sea Level Rise:

According to the Ministry for the Environment, the average relative sea level rise for the 100 years leading up to 2015 was around 1.8mm a year. For future sea level rise, the Ministry recommends the adoption of four New Zealand wide sea level projection scenarios for use in hazard, vulnerability/risk assessments and adaptation planning, and provides transitional minimum values for sea level rise for four broad categories of development to be used in planning:

- Avoid hazard risk for coastal subdivision, greenfield developments and major new infrastructure by using sea level rise over more than 100 years and the RCP H+ scenario (which translates to 1.5m sea level by 2130);
- Adapt to hazards by conducting risk assessment using a range of scenarios and using the pathways approach for changes in land use and redevelopment;
- 1.0m for existing coastal development and asset planning; and
- 0.65m for non-habitable short-lived assets with functional need to be at the coast and either low-consequences or readily adaptable (including services).

Nelson City Council will follow this approach to factor future sea level rise into its technical assessments of climate change related hazards and to formulate minimum ground and floor level requirements for low lying sites in the proposed Whakamahere Whakatū Nelson Plan and Land Development Manual. The predictions for sea level rise, flooding, and storm surges will be monitored on an ongoing basis to ensure that Council's future planning documents reflect the most up to date predictions.

Rainfall:

The High Intensity Rail Fall Analysis for Nelson Urban Area carried out by NIWA in 2008 indicated the following; *The present Nelson City design storm intensity chart is somewhat conservative: the 50 year return period totals on this chart are close to 100 year return period HIRDS estimates. However, a degree of conservatism in the estimates is probably desirable, especially since intensities increase moving to higher elevations inland from the coast.*

The Nelson City Council Land Development Manual incorporates changes noted in the NIWA report.

6. Financial summary

This Section sets out financial statements, funding strategy, depreciation forecast and charges for the Wastewater Services in Nelson City.

The Local Government Act 2002 (Part 6 Subpart 3) requires local authorities to manage their finances "prudently and in a manner that promotes the current and future interests of the community. This implies compliance with applicable Financial Reporting Standards, which include Public Benefit Entity International Public Sector accounting Standards (PBE IPSAS).

6.1. Financial statements and projections

Definition of Expenditure Categories

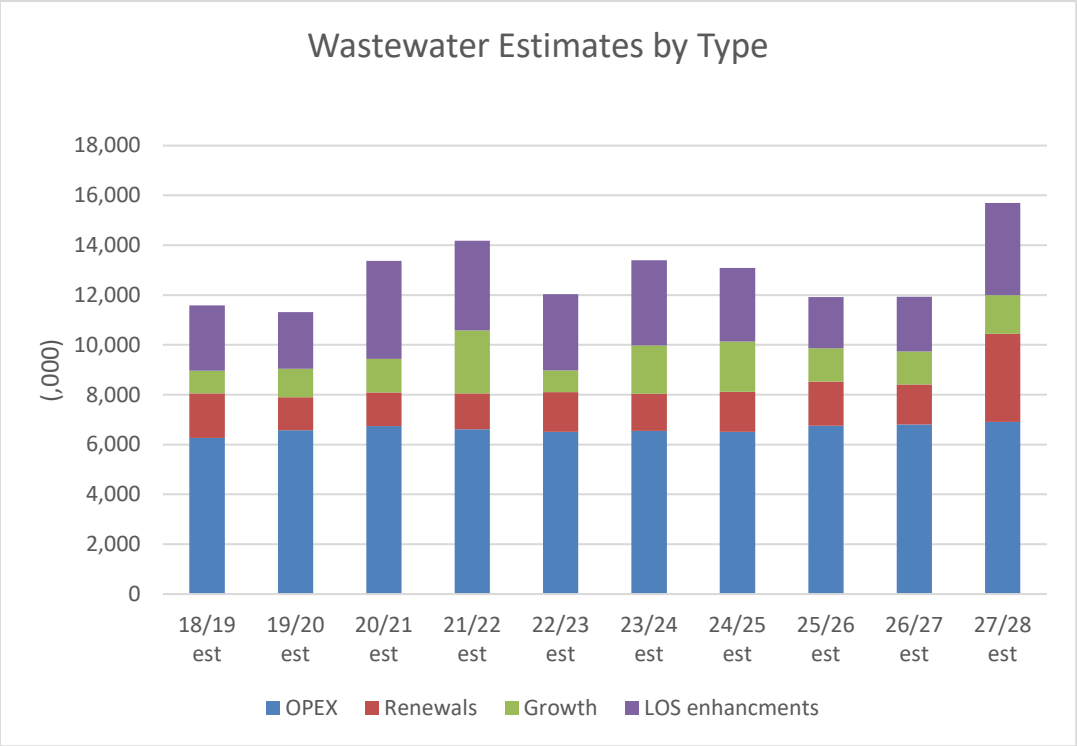
All expenditure on infrastructure assets falls into one of three categories:

- Operations and Maintenance Expenditure
- Capital Expenditure –Renewal/Replacement
- Capital Expenditure –Creation/Acquisition/Augmentation for both level of service compliance and growth

Table 6-1: Wastewater Expenditure Year 1-10 of the 2018/28 Long Term Plan ($000)

Group Account	2018/19 LTP Final Uninflated	2019/20 LTP Final Uninflated	2020/21 LTP Final Uninflated	2021/22 LTP Final Uninflated	2022/23 LTP Final Uninflated	2023/24 LTP Final Uninflated	2024/25 LTP Final Uninflated	2025/26 LTP Final Uninflated	2026/27 LTP Final Uninflated	2027/28 LTP Final Uninflated
6405 Wastewater	**14,436.9**	**13,879.9**	**15,977.1**	**16,427.8**	**14,125.6**	**15,409.4**	**15,161.4**	**14,190.7**	**14,037.8**	**19,785.9**
Expenses	**7,338.2**	**7,810.9**	**7,997.0**	**7,415.6**	**7,013.8**	**7,068.7**	**6,980.2**	**7,241.1**	**7,307.3**	**7,475.4**
Base Expenditure	4,648.3	4,781.4	4,937.4	5,251.7	5,459.8	5,473.8	5,499.8	5,713.3	5,753.3	5,801.4
Unprogrammed Expenses	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0	550.0
Programmed Expenses	1,069.9	1,239.8	1,254.8	806.9	502.0	522.5	465.2	488.9	502.0	562.0
Capital Expenditure	**7,098.7**	**6,069.0**	**7,980.1**	**9,012.2**	**7,111.8**	**8,340.7**	**8,181.2**	**6,949.6**	**6,730.5**	**12,310.5**
Renewals	1,785.2	1,327.2	1,345.3	1,439.3	1,589.3	1,489.3	1,607.0	1,779.8	1,601.8	3,526.8
Capital Growth	912.0	1,144.2	1,347.5	2,542.1	882.7	1,942.1	2,016.1	1,327.0	1,327.0	1,557.0
640576102884. Gracefield Beheading	80.0	162.2	540.5	1,540.5	0.0	0.0	0.0	0.0	0.0	0.0
640576102891. Network Capacity Confirmation for Growth Areas	0.0	0.0	0.0	0.0	54.1	54.1	108.1	500.0	500.0	0.0
640576103162. Hill Street sewer upgrad	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640576103163. Saxton Road sewer upgrade	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	750.0
640576152876. Ngawhatu Valley TM - Stage 2	0.0	0.0	0.0	194.6	21.6	1,081.0	1,081.0	0.0	0.0	0.0
64057691. Vested Assets	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0	807.0
640576913161. Elm st sewer upgrades	0.0	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640576913162. Hill St sewer upgrade	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Increased LOS	2,616.3	2,270.6	3,942.1	3,591.5	3,050.5	3,420.0	2,951.1	2,063.1	2,200.0	3,700.0
640577203147. Quarantine Road Sewer Pump Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	1,500.0
640579102890. Natural Hazards Risk Remediation	0.0	0.0	54.1	54.1	108.1	208.1	208.1	0.0	0.0	100.0
640579103148. Wastewater Network Upgrades	0.0	0.0	0.0	0.0	0.0	50.0	50.0	500.0	500.0	500.0
640579201187. Neale Park PS	2,116.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
640579201716. Awatea Place Pump station	300.0	2,000.0	3,500.0	1,000.0	0.0	0.0	0.0	0.0	0.0	0.0
640579201914. Pump Station Storage	129.8	54.1	175.7	1,000.0	1,000.0	1,000.0	1,000.0	0.0	0.0	0.0
640579202885. Atawhai Pump Stations (Brooklands & Marybank)	0.0	86.5	82.4	82.4	432.4	432.4	216.2	0.0	0.0	0.0
640579301191. Capital: NN Waste water plt Up	0.0	30.0	30.0	20.0	10.0	250.0	0.0	0.0	100.0	100.0
640579503230. System Performance Improvements	100.0	100.0	100.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0	1,500.0

Table 6-2: Wastewater Budgets - Ten Years



Nelson Regional Sewerage Business Unit

Nelson City Council as a contributor to the Nelson Regional Sewerage Business Unit for the Nelson South area has a quota based agreement detailing Nelson City Council existing and future requirements. The following sets out the projected Nelson Regional Sewerage Business Unit expenses for Nelson City Council.

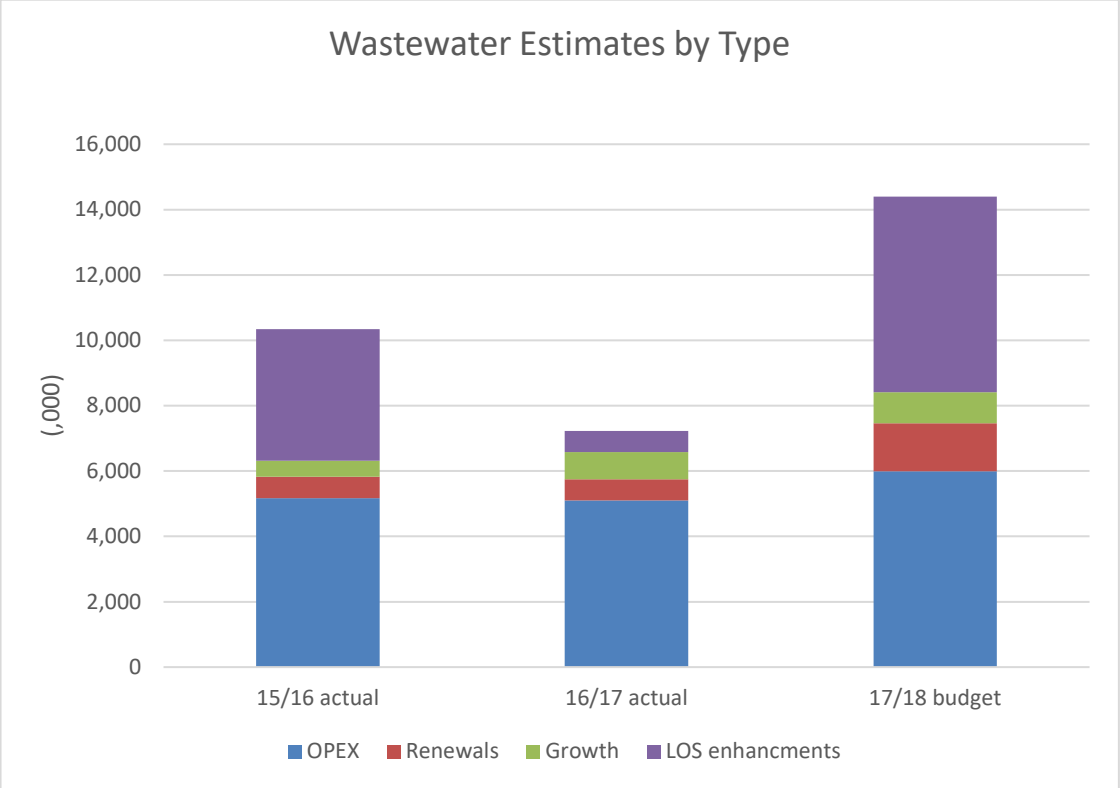
Table 6-3: Projected Nelson Regional Sewerage Business Unit Expenses for Nelson City Council

Year	Fixed ($,000s)	Operations and Maintenance ($,000s)
16/17	$1,614	$1,226
17/18	$1,764	$1,267
18/19	$1,892	$1,243
19/20	$1,985	$1,238
20/21	$2,040	$1,216
21/22	$2,023	$1,249
22/23	$2,006	$1,217
23/24	$1,991	$1,214

Note: Fixed and Operations and Maintenance costs are based on current contracted loads and Operations and Maintenance loads but are adjusted for projected capital spending (and associated Operations and Maintenance costs) by Nelson Regional Sewerage Business Unit.

6.1.1. Trends from the previous 2 – 3 years

Table 6-4: Wastewater Expenditure-Three years



6.2. Funding strategy

In determining how activities will be funded local authorities are required to take the following into consideration:

- The contribution to the achievement of Community Outcomes (strategic alignment)
- Beneficiaries of each activity (beneficiary/user pays principles)
- The period over which benefits from the activity will occur (intergenerational equity issues)
- The extent to which identifiable individuals contribute to the need to incur expenditure (exacerbator and user pays principles)
- The costs and benefits of funding the activity compared to other activities (cost/benefit, prioritisation principles)
- The impact of funding the activity on the wellbeing of the community (ability to pay principles)

REVENUE AND FINANCING POLICY - WASTEWATER

Distribution of Benefits

Community Benefits:

- Contributes to community health
- Provides recreational and environmental benefits associated with both inland and marine waters (for which there are increasing public expectations)
- Land is protected from the effects of sewage seepage
- Sewage treatment and disposal assists the local economy
- Meets the community's increasing environmental standards

Individual Benefits:

- Benefits are received by those connected to the sewage collection system

The Costs and Benefits of Funding the Activity Distinctly from Other Activities:

The benefit of funding domestic wastewater access to the wider population as well as those connected to the system and therefore a lump sum general rate is considered the most equitable form of funding this activity. Council uses Trade Waste Bylaws and volume based charges to ensure industrial and commercial businesses pay for their share of waste treatment and disposal costs.

Residential Wastewater Charge:

A separate targeted rate is set under section 16 of the Local Government (Rating) Act 2002 to recover the costs required for Council's wastewater and sewage disposal system. This charge is levied on all units to which the Council's wastewater and sewage disposal service is provided. Wastewater charges for previous three years are:

- 2017/18 - $407.97 per unit
- 2016/17 – $369.54
- 2015/16 - $410.00 per unit (including GST)

A unit is defined as a rating unit

Creation/Acquisition/Augmentation

Nelson City Council will review funding requirements and strategies to achieve equitable funding of upgrade works through development contributions.

6.3. Valuation forecasts

Table 6-5: 2016 Wastewater Asset Valuation

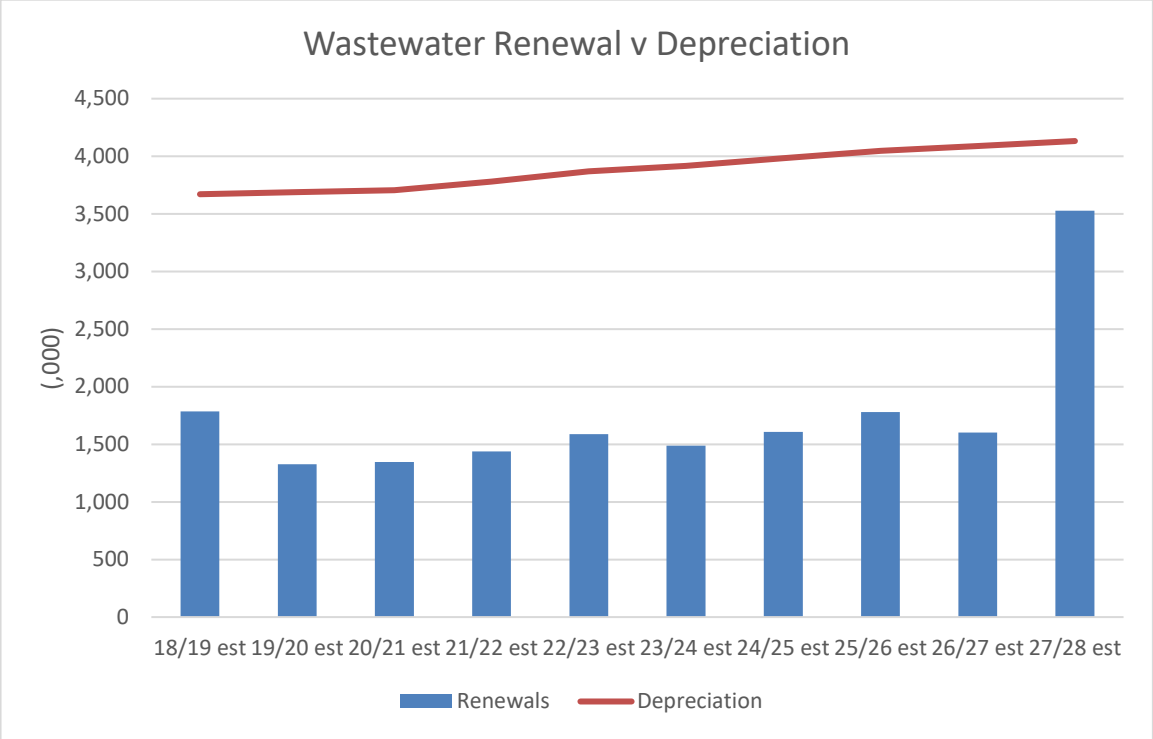
Asset Category	June 2016				
	Quantity		RV	DRV	Depr
	km	unit	($)	($)	($)
Reticulation Mains	**325.2**		**134,429,658**	**76,483,913**	**1,636,453**
Trunk Mains	**36.3**		**17,753,716**	**8,473,597**	**237,698**
Swallow Mains	**5.6**		**3,441,706**	**377,996**	**60,592**
Rising Mains	**25.9**		**20,716,287**	**7,984,344**	**336,025**
Access points		**924**	**844,874**	**632,376**	**10,571**
Manholes		**6,780**	**33,954,240**	**19,505,602**	**419,989**
Tanks		**11**	**88,047**	**38,151**	**1,101**
Valves		**152**	**368,995**	**116,567**	**12,202**
Neale Park Retention Tank		**1**	**587,052**	**444,006**	**7,338**
Pump Stations		**25**	**7,222,161**	**2,337,285**	**251,228**
Wakapuaka Treatment Plant		**1**	**19,830,800**	**14,539,900**	**407,400**
Total			**239,237,537**	**130,933,735**	**3,380,597**

The 2017 indexed depreciated replacement valuation of the wastewater supply assets is $146,199,000.

Table 6-6: 2014 Wastewater Asset Valuation

Asset Category 2014	Quantity	Unit	Replacement Value $
Reticulation Mains	315.1	km	128,289,048
Trunk Mains	33.4	km	16,317,016
Swallow Mains	5.6	km	3,381,052
Rising Mains	28.4	km	20,876,370
Access points	901	No	822,823
Manholes	6,635	No	29,173,299
Tanks	11	No	86,321
Valves	147	No	366,877
Neale Park Retention Tank	1	No	575,541
Pump Stations	25	No	6,998,524
Nelson Waste Water Treatment Plant	1	No	19,064,400
Total			**225,951,271**

Forecasts of depreciation



6.4. Key assumptions made in financial forecasts

Council is required to identify the significant forecasting assumptions it has made in preparing its ten year Long Term Plan. Assumptions are necessary to allow Council to plan for expenditure and costs over the next ten years. They are the best reasonable assessment made on the basis of currently available information.

The Nelson Long Term Plan details possible and actual significant forecasting assumptions and uncertainties relating to Nelson City Council activities.

As well as the general assumptions that apply as the basis for forecasting budgets across Council's work, some specific assumptions apply to Council's wastewater activities:

Assumptions

Typical useful lives from the NZ Infrastructure Asset Valuation and Depreciation Guidelines – Version 1.0 have been used as a guide in determining base lives. However the manual generally provides average expected life detail for asset components and Nelson City Council experience from the renewals of its assets has been used to vary these base lives where appropriate. The Lifecycle section of this plan provides detail of asset lives.

Sewer pipe lives vary based on:

- The pipe use (rising main, reticulation etc)
- Pipe material and soil conditions.

The Atawhai rising main was installed in 1969 within expected base life of 45 years. As a result of pipeline failures initiated by acid attack it was assessed by Duffill, Watts and Tse in 1994 and remedial work was completed in 1996 to give it a then remaining life of 45 years. Based on this work, the main has been given a base life of 72 years.

Where an asset has exceeded its nominated base life, and is shown to be in good condition, a residual life of 5 years is assumed.

Pump stations have been valued individually based on the size of the pumps and associated infrastructure. However standard component lives have been used for all pump stations. Lives have been extended from the previous valuation for steelwork, pumps and valves based on a new assessment of life expectancy from the assets in conjunction with experience from the Nelson Regional Sewerage Business Unit pump stations.

- Renewals will continue at a rate that is sustainable based on considering both resource and financial aspects
- It is assumed that Nelson's climate will remain substantially unchanged for the next decade, with enough rain to meet our water needs. Factors such as climate change and population growth will receive increased analysis as the Infrastructure Strategy is reviewed in future years
- Wastewater activities of Council will be funded from wastewater charges and, consistent with Council's financial policies, most of the capital expenditure will be borrowed. Development and Financial Contributions over the next 10 years will fund the increased provision of wastewater treatment due to population growth

- The most efficient, safe and cost-effective means of disposing wastewater is a Council-provided piped system for the Nelson urban area, with treatment facilities to the north and west of the city.

6.5. Forecast reliability and confidence

The table below details the possible and actual significant forecasting assumptions and uncertainties relating to the Nelson City Council wastewater system.

Table 6-7: Significant Forecasting Assumptions and Uncertainties

No.	Assumption	Degree of Risk or Uncertainty	Likely Impact if the Assumption is (or is Not) Realised or is Not Acceptable
1	Interest rates for new loans raised or existing debt refinanced during the years are forecasted in the range of 5%.	Low	Level of debt is moderate. Interest costs are not expected to vary significantly.
2	Growth is based on figures provided by statistics New Zealand and Nelson City Council growth projections.	Low	Any significant increase in the growth may require upgrading of reticulation to occur at an earlier stage than presently proposed.
3	The actual remaining lives of assets will not deviate significantly from those contained in the asset valuation.	Medium	Changes in estimated asset lives could lead to significant changes in asset renewal projections, depreciation and renewal budgets.
4	The replacement values are a realistic cost and have taken into consideration engineering fees, resource consents etc.	Low	Replacement values have gone through a review process.
5	Upgrade/capital estimates are as follows: Concept +/- 30% Initial & Planning +/-10 to +/- 25% Delivery/Construction +/- 5% Projects of unusual complexity or presenting landowner / regulatory issues that cannot be quantified and such that estimating with accuracy is difficult, may lie outside these figures.	Medium	Costs of upgrades are estimated only without detailed project planning.
6	Maintenance cost of service for Reticulation and Treatment will be within -5% and +10% of budget.	Low	Historically maintenance costs % variations for reticulation have been low.
7	Depreciation based on estimated useful lives not on condition of pipework.	Medium	If proposed condition assessments indicate that Councils mains have decreased useful lives, depreciation presently taken will be less than that required for replacement.

7. Asset management practices

The goal of infrastructure asset management is to:

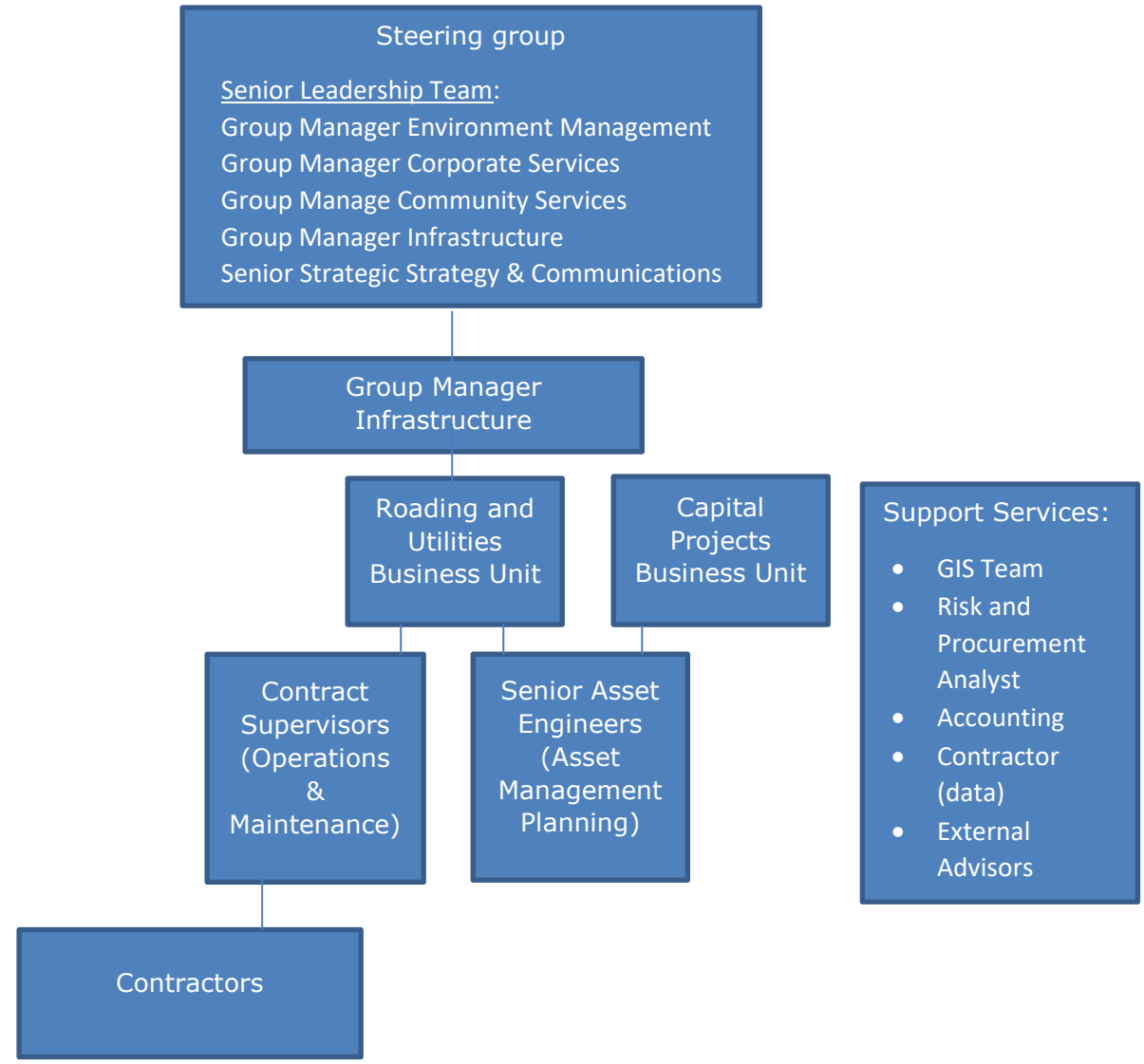
"Deliver the required level of service to existing and future customers in a sustainable and cost effective manner."

A formal approach to the management of assets is essential in order to provide services in the most cost-effective manner, and to demonstrate this to customers and other stakeholders. The benefits of improved asset management are:

- Improved governance and accountability
- Enhanced service management and customer satisfaction
- Improved risk management
- Improved financial efficiency
- More sustainable decisions

The key elements of Asset Management are as shown below:

7.1. AM leadership and structure



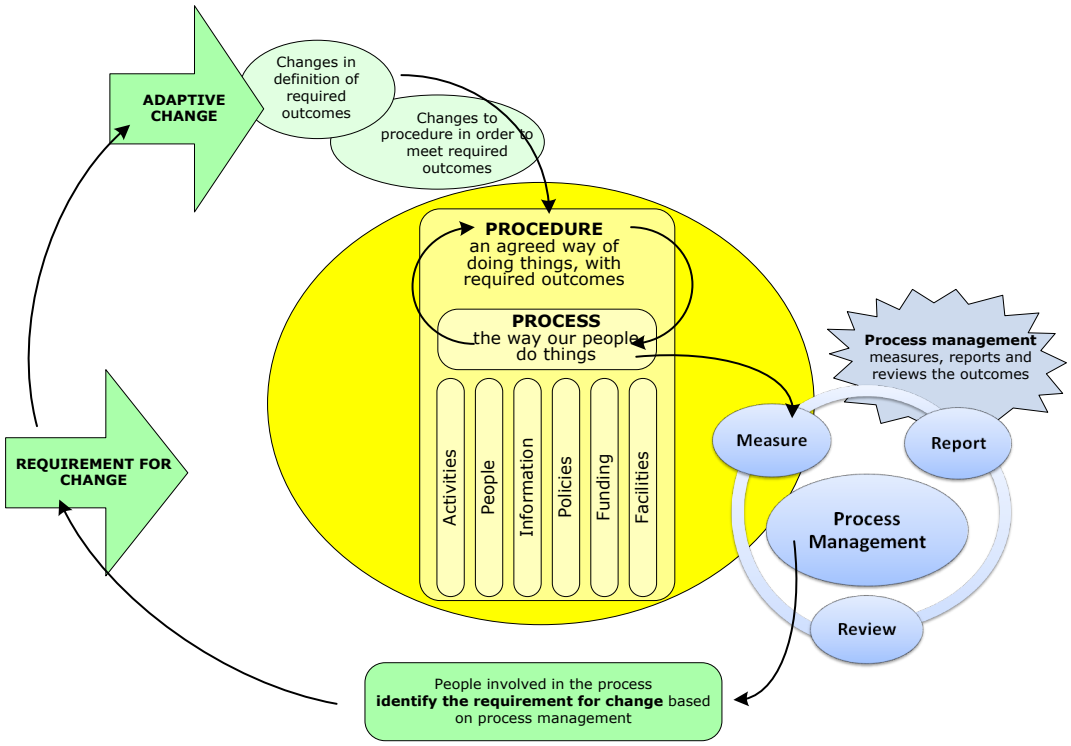
7.2. Management systems

A management system is defined as the set of procedures an organisation needs to follow in order to meet its objectives.

Quality Management

The quality management system is process management based on a quality cycle. It is aligned with ISO 9000, and benchmarked against this standard each year. The focus of the Quality Management programme is to improve the effectiveness and efficiency with which Nelson City Council deliver services to the community; ensuring processes deliver their required outcomes, which are aligned with community outcomes and organisational goals. Required outcomes are typically defined in terms of the core key performance areas - customer satisfaction, legislative compliance, and management of resources (budget and staff time), and employee engagement.

Quality Management Lifecycle:



1: Define the Process: Document the Procedure

NCC's Quality Management system (QMS) is a process-based approach. A process is a set of interrelated or interacting activities which transforms inputs into outcomes. Required outcomes are achieved more efficiently when activities and related resources are managed as a process.

A procedure is an agreed way to carry out a process. A procedure includes and defines:

Required outcomes from the procedure (most important)

- Definition of the required outcome forms the "quality" standard for the process
  - Agreement of the required outcomes tells us what would success look like (our KPIs)
- We need to ensure that required outcomes are recorded so that they can be measured later - not just what needs to be achieved, but when, and how many, and what exceptions

People involved in the procedure (equally important)

- Definition of all of the people involved in all aspects of the process, including the customer, those "doing stuff", those "accountable for stuff" and any suppliers directly involved in the process
- Are the people involved the most effective, most efficient way to do this?

Activities comprising the procedure

- Defining all the activities required and undertaken to achieve the required outcomes
- Are all the activities undertaken necessary, are they in the right order, are the right people doing them, is this the most effective, most efficient way to do this?

Enablers that support the procedure

- The enablers of the process include things like information (and information systems), policies (and culture), funding and facilities. These should be documented as part of the process

Documenting the procedure (activities involved, who does what when, what funding and resources are required) provides a *written procedure* to support the process.

Processes work together to form end-to-end procedures:

Managing interrelated processes improves the organisation's effectiveness and efficiency in achieving its objectives. This means consideration of how processes interrelate to form end-to-end procedures with overall outcomes. The

1: Define the Process: Document the Procedure
outputs from one procedure often form the trigger for the next procedure. End-to-end procedures have their own required outcomes.

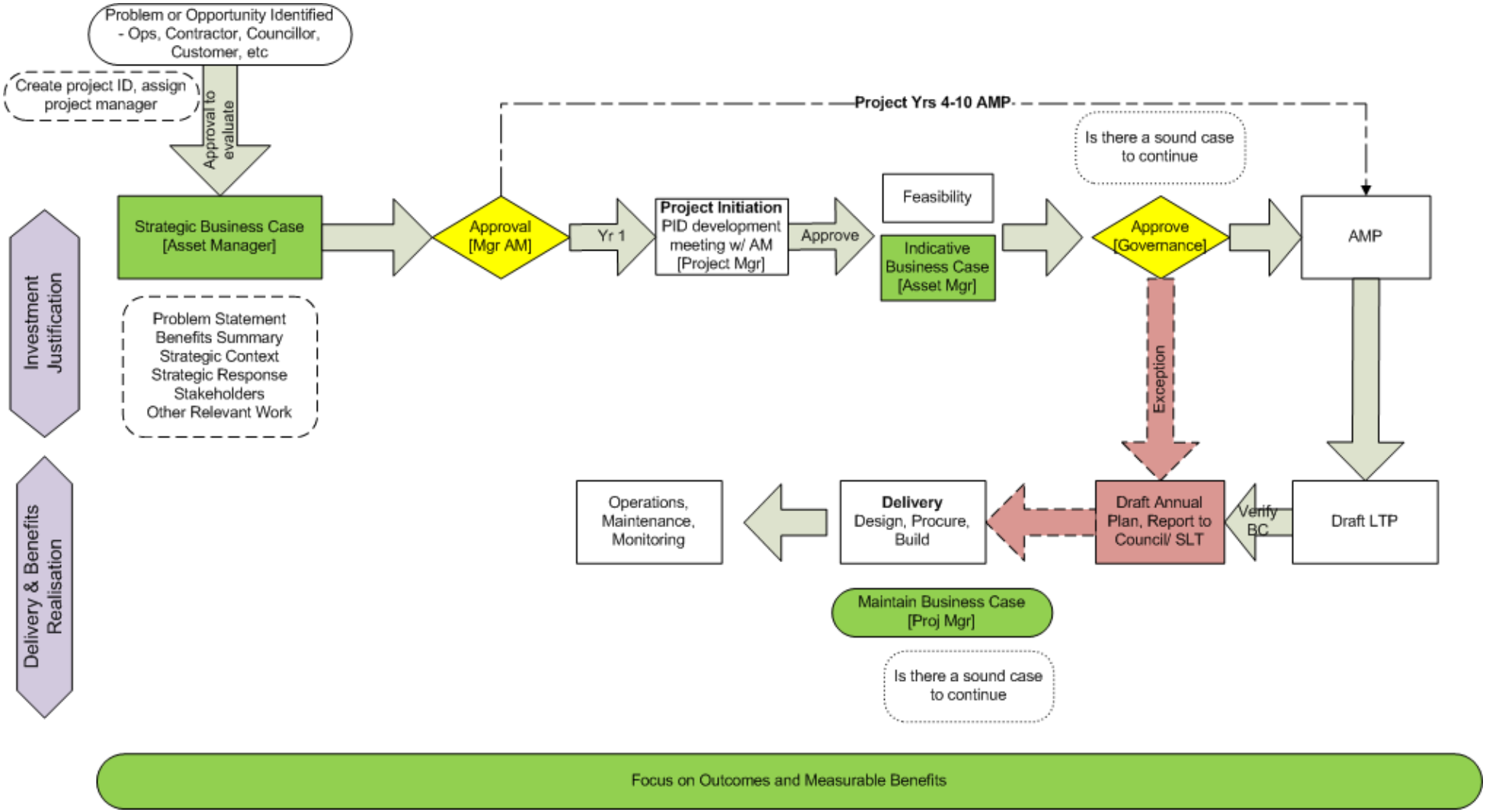
2: Manage the procedure: Measure, Report and Review
Measuring whether the procedure is being followed and whether outcomes are being met This enables us to apply a factual approach to decision making and to the need for change. • Measure how the process is going – is the procedure being followed – are interim goals being met? Measure the outputs of the process – were these met and did these meet the required outcomes? **Reporting tells us whether procedures are being followed and outcomes being met** • We need to not just know whether outcomes are being met, but to "know that we know" • Reporting gives us options for remediation or consequences of non-conformity **The procedures and the outcomes are subject to review by those responsible and accountable for the process** • Why did we really do this? What did we think we would gain? Did we get that result? • Are we doing the right things? Are we doing them the right way, and are we doing this consistently? Are we getting them done well? Are we getting the benefits? • Review provides a tool for continual improvement of the process by re-examination and change to the required outcome, or by change in the process to achieve the required outcome

3: Improve the procedure: Requirement for Change, then Adaptive Change
Procedure are subject to adaptive improvement to the process and the required outcomes. People involved with processes identify and initiate change: • Are the required outcomes still required? Is there a requirement for change? • Are the activities and people defined in this process the best way to achieve these outcomes? • Are things being done in the right order, and by the right people, in the right places? Is the process being followed? Does everyone do it the way that we've agreed? • Is there anything listed that isn't contributing? Is there something that would contribute more?

Project management

NCC processes for project management require that time, cost, and quality/scope objectives are agreed before project delivery begins. Project management is focussed on ensuring that the desired benefits, as per the agreed business case, are delivered. Project management processes are based on the principles of the PRINCE2™ method. Fiscal approvals, and change approvals are in line with Council delegations and Officer delegated authority.

Business case process



7.3. Information systems and tools

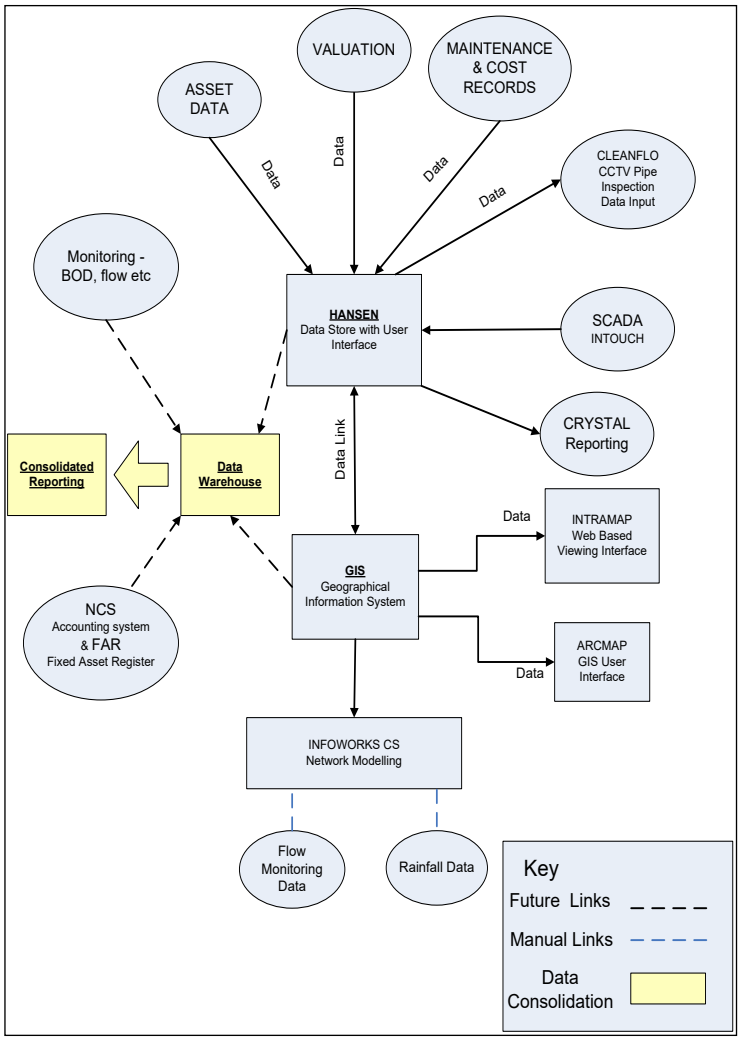
Asset Management Information Systems provide an understanding of assets to optimise lifecycle costs, identify required work, record completed work and cost of work. It benefits general management, long-term planning and data analysis.

All asset information is stored in the Asset Register linked with GIS

An overview of the asset information system in its existing state and future state is depicted in Figure 7-1 below. The warehousing of specific data and further development of reporting will assist in management of the assets.

The Council has a number of information systems (Infor, MagiQ, InTouch, Network Model, and closed circuit television) that are integrated to varying degrees. The integration of these systems is considered to assist in the optimisation of operations, renewals and the ongoing development of the wastewater activity.

Figure 7-1: Asset Information Systems



Asset Improvement Register (ongoing AM practice)

The Asset Improvement Register is used to capture, store, and share discussions, thoughts and concerns with regard to asset performance and improvement

Integrated Accounting, Financial, Electronic Purchase Order, and Service Request Systems

Accounting is currently carried out to Generally Accepted Accounting Principles to comply with the Local Government Act 2002 and Public Benefit Entity International Public Sector Accounting Standards (PBE IPSAS). The Nelson City Council uses integrated computer software supplied by MagiQ. The General Ledger is linked to packages that run Debtors, Creditors, Banking, Rates, Fixed Assets, Invoicing, Water Billing, Job Costing, and Payroll. Internal monthly financial reports are generated by Council significant activity and sub-activity categories although real time data is available at any time. External financial reports by significant activity are published in the annual report.

Service requests record customer questions, enquiries, and complaints.

Electronic Document and Records Management System (EDRMS)

Nelson City Council uses Objective as its electronic document and records management system.

Geographical Information System

Geographical information system was implemented in 1994 with data captured using photogrammetry (1994) and progressively delivered over the following years. Nelson City Council staff carried out accuracy checks on the geographical co-ordinate data supplied, searched all the engineering plans and field books for information on pipe alignment, material and age and entered this information into the Geographical information system.

Accuracy Limitations

The data captured by photogrammetry was required to be accurate to within a tolerance of +/- 0.3m. In inaccessible areas, it was not considered economic to search for buried fittings. Instead, the best estimated position was entered and the accuracy limitation flagged. Similarly, only limited fieldwork has been done to confirm the pipe material and sizes. The accuracy of this information is verified through time by asset data collection procedures.

Maintenance of GIS data

Procedures are in place to update new data into the Geographical information system on a monthly basis via Nelson City Council engineering staff.

Council's Engineering Standards require that any work on a Council sewer must be proposed to Council by means of an engineering plan for approval and an "As-built" record submitted at the completion of works.

Data on assets associated with renewal and upgrade capital are now updated into the asset register by Nelson City Council Engineering and Finance staff. This ensures a high level of reliability.

Closed Circuit Television

Currently, Closed Circuit Television condition inspections are carried out by an external contractor only as required.

The Infor system is used to assist in the selection of pipes to be checked. The Closed Circuit Television inspection records are inputted into the Infor system via Cleanflow.

Asset management Recording System – Infor

The use of the Infor system has enabled the following:

- Customer enquiries being logged directly and sent immediately to the contractor for action.
- Contractor directly enters resolution confirmation at completion of job.
- Tracking of expenditure on assets to allow assets that have a disproportionately high maintenance cost to be identified - upgrade or renewal can then be prioritised.

Nelson City Council principal contractor Nelmac has a live interface with Infor. Any work associated with unscheduled maintenance is entered into Infor work order by the contractor. Completed work orders forms the basis of the contractors' payment.

There are known issues with the existing implementation of Infor surrounding the work order processes including a lack of reporting to trend results and alert for operational issues. With confirming the required reporting outputs for all levels of management the work order processes and data captured by the contractor and/or Nelson City Council staff can be refined to ensure the needs of all parties are met.

ProMapp

ProMap is Nelson City Council's procedures library

Supervisory Control and Data Acquisition System (SCADA)

The Supervisory Control and Data Acquisition system provides surveillance of the operation of pumping stations in the stormwater system and provides alarms when equipment fails or when operating parameters are exceeded. The Supervisory Control and Data Acquisition system also records operating data from the pumping stations.

All of the Nelson City Council's strategic utility components are monitored remotely, at Civic House or by duty staff using laptop computers at home, utilising a telecommunication system.

This system has given Council the ability to ascertain faults and instigate repairs without affecting the service to the consumer and has significantly increased efficiency and reliability of the utility schemes. This function has become critical to the operation of the network and has been supported by Council's in house Information Management team up to now. There is a need to upgrade this package and at the same time consider how the technical requirements can be accommodated with the essentially office based computer network used by the majority of Council staff.

Council has a "Kingfisher" and "Intouch" system at the base station (rationalisation of system occurred in 2005). The system is used to monitor and control critical aspects of all Nelson City Council treatment plants and pump stations, 67 sites are presently monitored that include:

- Waste Water Treatment Plants
- Stormwater Pump Stations
- Wastewater Pump Stations
- Water Treatment Plants
- Water Pump Stations and Reservoirs

Appendix G details the over view of the Supervisory Control and Data Acquisition system. The system is used for:

- Monitoring the operation of sites
- Reporting, trending and analysing historical data
- Alarm monitoring (operators are informed of alarms via text messages to mobile phones)
- Some control functions

Monitoring of water, wastewater and stormwater systems by the Councils Supervisory Control and Data Acquisition system has grown to the point that without the current Supervisory Control and Data Acquisition system, maintaining the existing Levels of Service would be difficult. Supervisory Control and Data Acquisition has given the ability for Council to ascertain faults and instigate repairs without affecting the service to the consumer and has significantly increased efficiency and reliability of the utility schemes. The Supervisory Control and Data Acquisition system is a critical system in Council's operation.

Review and Upgrade

In 2016/17 an extensive upgrade of this package was completed.

Future Strategy for Councils Supervisory Control and Data Acquisition

Council's strategy for the ongoing use of Supervisory Control and Data Acquisition is:

- Maintain Supervisory Control and Data Acquisition system at a high level to ensure system reliability and ongoing reporting ability.
- Increase availability of information to the in-house Business Units in a format that will enable increased efficiencies in operation and management.
- Develop the reporting functions of the system.
- Develop further use of the system to control plant and equipment.

Modelling

Currently modelling covers the Stoke/Tahuna catchment and the central Nelson City catchment for the pumping and reticulation components of the wastewater system.

Pumping: The EPANET model is used in the majority of cases to calculate different pumping scenarios (especially in linked pump stations) and maximum flow rates from pump stations.

Reticulation: The modelling software package used is InfoWorks v.8 with external consultants used to carry out the modelling requirements.

To assist the modelling data requirements the Council uses portable flow meters and permanent flow meters that are installed at pump stations. Rain gauges are installed at most pump stations and other key sites within the city and linked to the Supervisory control and data acquisition system.

Nelson City Council will develop more detailed models in areas with high infiltration levels to accurately identify the location and quantity of infiltration within a catchment.

7.4. Service delivery models

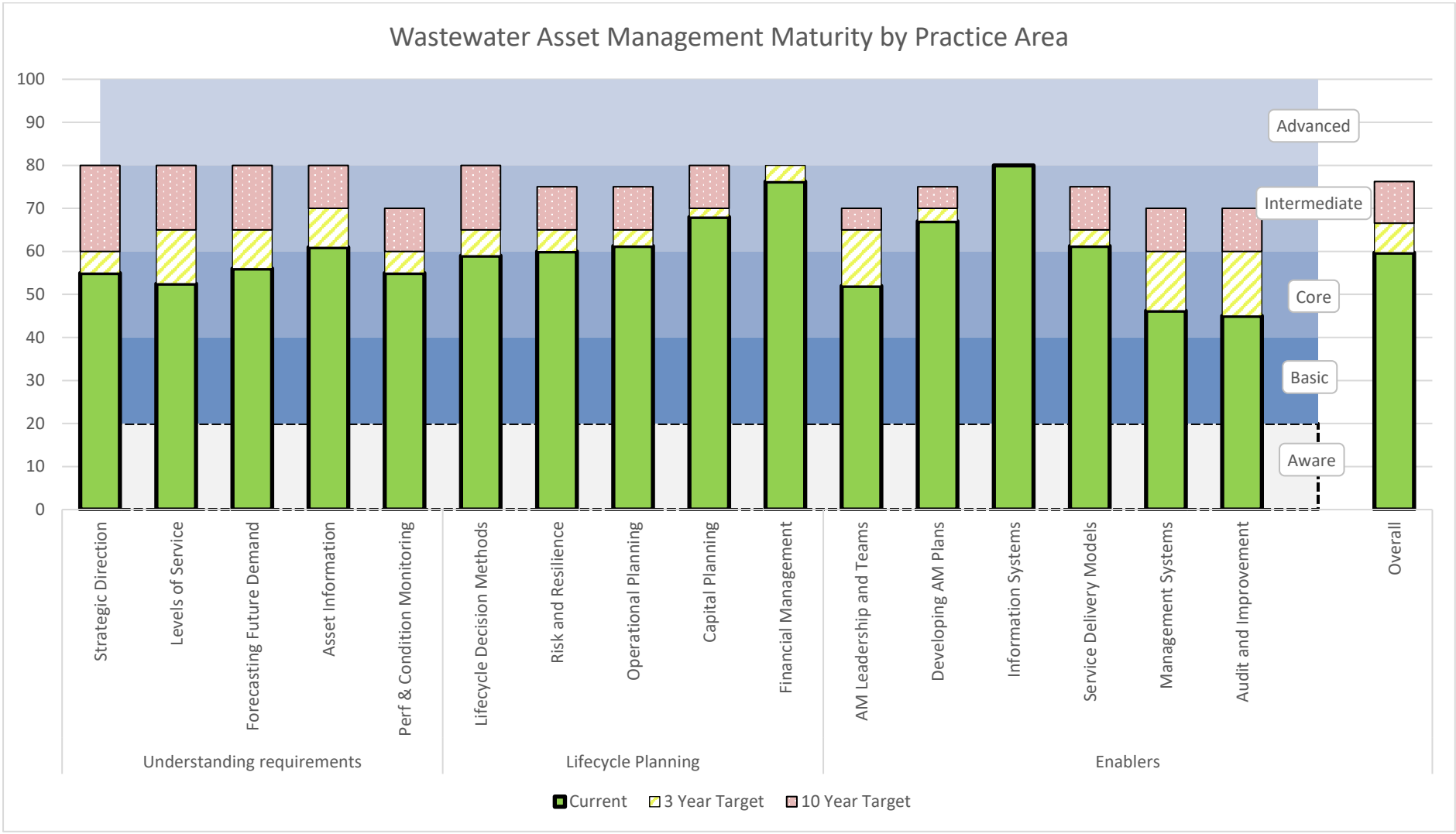
Maintenance contracts have been reviewed and grouped to provide a good balance between price and quality, and use either prequalification or price/quality supplier selection methods. The methods used to procure capital projects will differ depending on the size of the project, but will be either lowest price or price/quality.

Council maintains an in-house professional services capability balanced with external consultants as required to achieve best value for money. Additional professional services are sometimes required.

8. Plan Improvement and Monitoring

8.1. Status of AM practices

Figure 8-1: Current and desired state of AM processes, data and systems



8.2. Improvement programme

An important component of this asset management plan is the recognition that it is a "live" document in need of monitoring, change and improvement over time. The wastewater Asset Management Plan will be reviewed annually and updated every three years in conjunction with the Long Term Council Community Plan process.

The Asset Management Plan will be developed throughout its life cycle as further information about the wastewater system assets are collected in terms of condition, performance and service delivery. Nelson City Council is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the Nelson City Council wastewater assets and the achievement of the appropriate level of asset management.

Improvement Plan

The improvement plan required is summarised in Table 8-1 below.

Table 8-1: Plan Improvement

Improvement Programme
Improve accuracy of data through review and modification of collection, storage, and auditing
More detailed strategy for maintenance and workaround of critical assets in the event of emergency
Expand focus on inter-relationship of network components and development of improved strategies for renewals and replacement based on criticality and actual condition
Expand sustainable practice throughout the wastewater activity
Ongoing refinement of lifecycle decision making and financial forecasts
Investigate a process to distinguish private overflows from public. It is believed that a large proportion of the overflows are on private property.
Better reporting options need to be investigated regarding number of dry weather sewerage overflows
Reporting need improving regarding median response times to network issues. For 2015/16 median response times were based on 88% of the total requests and median resolution times were based on 99% of the total requests
Complete the investigation of the storage capacity of pump stations and reticulation and develop a strategy to respond to emergencies requiring back up electricity generation.
Review asset lives using NAMs– NZ Infrastructure Asset Valuation and Depreciation Guidelines
Improve accuracy of condition assessments
Systematic processes will be introduced for the collection and upgrading of essential data based on asset criticality including: Asset attribute information Asset performance data Asset condition data
More robust framework for identification of critical assets
A methodology for determining asset criticality to a component level, along with options, to be determined to integrate criticality into the ongoing operation, maintenance, renewals and capital programme

Improvement Programme
Ensure appropriate funding mechanisms are in place such as Development Contributions Valuation forecasts
Levels of service and cost linkage to be better defined
Better use of future demand modelling
Create matrix of lifecycle decision frameworks/strategic objectives/levels of service
Set time frames for risk mitigation measures
Extend natural hazard assessment throughout the network
Review operational contracts to ensure optimisation and development of programmes and processes
Update emergency management response plan
Improve monitoring of operational KPI's
Improve resourcing to ensure better scope and cost estimates for inclusion in capital projects budget forecasting
Get wider range of tendered rates for asset valuations
Create wider range of reference material for supporting assumptions and forecasting methodology
More trend analysis to optimise decision making
Improve use of AMP content to be more user friendly and appropriate
Training for Information Systems re: analysis and reporting
Better documentation of gap analysis identification of improvement tasks, prioritisation with allocation of resources/timeframes/deliverables, project scope/brief development for major improvement tasks, regular monitoring of progress against the asset management improvement programme and reporting to management

8.3. Monitoring and review procedures

Nelson City Council Wastewater Asset Management Plan is a regularly revised and evolving document and will be reviewed annually and updated at least every three years to coincide with the Annual and Long Term Plans and to incorporate improved decision making techniques, updated asset information, and Nelson City Council policy changes that may impact on the levels of service.

The Asset Management Plan will be improved throughout its life cycle as further information about the wastewater system assets are collected in terms of condition, performance and service delivery. Nelson City Council is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the Nelson City Council assets.

Nelson City Council will report variations in the adopted annual plan budgets against the original asset management plan forecasts and explain the level of service implications of budget variations.

Internal Review

Internal reviews will be undertaken every three years to assess the effectiveness of the plan in achieving its objectives. The internal audit will also assess the adequacy of the asset management processes, systems and data.

Statutory Audit

The LGA requires that an independent, annual, audit of the operations of the Nelson City Council be carried out.

8.4. Performance measures

Benchmarking

Benchmarking (trending) of the activity through Audit NZ, Local Government NZ and Water NZ benchmarking initiatives is carried out at the request of these organisations to give increased understanding of:

- The efficiency and efficiency variations of individual activities
- Effects of any programmes instigated by the Asset Management Plan
- Operating costs over range of individual activities

Examples of types of benchmarking that are to be considered include tracking progress, responsiveness to service calls, operation costs i.e. $/m/year and energy costs. As data is obtained and implications understood the benchmarking can be used for additional or revised levels of service and can be incorporated into a graphical display.

In 2014 Nelson City Council participated in a Local Government New Zealand benchmarking exercise for water based utilities.

The effectiveness of the Asset Management plan will be monitored by the following procedures:

- Financial expenditure projections prior to year end
- Resource consent monitoring as required by consents
- Operations and Maintenance reports on a monthly basis
- The ongoing updating of the asset register of the pipe assets when repairs are carried out and the attributes are compared with the asset register attributes
- The development of modelling for the reticulation on a catchment by catchment basis

The continued monitoring of these procedures and ongoing analysis of results will result in:

- Optimisation of expenditure through the asset lifecycle
- Service levels actively monitored and reported on
- Management of risk and control of failures

9. Appendices

APPENDIX A: GLOSSARY OF TERMS

Term	Definition
Activity	The work undertaken on an asset or group of assets to achieve a desired outcome
Advanced Asset Management	Asset management which employs predictive modelling, risk management and optimised renewal decision making techniques to establish asset lifecycle treatment options and related long term cashflow predictions. (See Basic Asset Management)
Annual Plan	The Annual Plan provides a statement of the direction of Council and ensures consistency and co-ordination in both making policies and decisions concerning the use of Council resources. It is a reference document for monitoring and measuring performance for the community as well as the Council itself
Annual Report	The audited report published annually (by 30 November) which provides information on how the Local Authority has performed with respect to its policies, objectives, activities, targets, budgets and funding proposals
Asset	A physical facility of value which enables services to be provided and has an economic life greater than 12 months
Asset Management	The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner
Asset Management Plan	A plan developed for the management of one or more infrastructure assets that combines multi-disciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost effective manner to provide a specified level of service. A significant component of the plan is a long term cashflow projection for the activities
Asset Management Strategy	A strategy for asset management covering, the development and implementation of plans and programmes for asset creation, operation, maintenance, renewal, disposal and performance monitoring to ensure that the desired levels of service and other operational objectives are achieved at optimum cost
Asset Management System	A system (usually computerised) for collecting analysing and reporting data on the utilisation, performance, lifecycle management and funding of existing assets
Asset Management Team	The team appointed by an organisation to review and monitor the corporate asset management improvement programme and ensure the development of integrated asset management systems and plans consistent with organisational goals and objectives
Asset Register	A record of asset information considered worthy of separate identification including inventory, historical, financial, condition, construction, technical and financial information about each
Asset	A physical component of a facility which has value, enables services to be provided and has an economic life of greater than 12 months

Term	Definition
Benefit Cost Ratio (B/C)	The sum of the present values of all benefits (including residual value, if any) over a specified period, or the life cycle of the asset or facility, divided by the sum of the present value of all costs
Business Plan	A plan produced by an organisation (or business units within it) which translate the objectives contained in an Annual Plan into detailed work plans for a particular, or range of, business activities. Activities may include marketing, development, operations, management, personnel, technology and financial planning
Cash Flow	The stream of costs and/or benefits over time resulting from a project investment or ownership of an asset
Components	Specific parts of an asset having independent physical or functional identity and having specific attributes such as different life expectancy, maintenance regimes, risk or criticality
Condition Monitoring	Continuous or periodic inspection, assessment, measurement and interpretation of resulting data, to indicate the condition of a specific component so as to determine the need for some preventive or remedial action
Consequence	The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event
Critical Assets	An asset where failure would have significant consequences, either in the ability of the system to provide service to customers or the effect on the environment
Current Replacement Cost	The cost of replacing the service potential of an existing asset, by reference to some measure of capacity, with an appropriate modern equivalent asset
Deferred Maintenance	The shortfall in rehabilitation work required to maintain the service potential of an asset
Demand Management	The active intervention in the market to influence demand for services and assets with forecast consequences, usually to avoid or defer CAPEX expenditure. Demand management is based on the notion that as needs are satisfied expectations rise automatically and almost every action taken to satisfy demand will stimulate further demand
Depreciated Replacement Cost (DRC)	The replacement cost of an existing asset after deducting an allowance for wear or consumption to reflect the remaining economic life of the existing asset
Depreciation	The wearing out, consumption or other loss of value of an asset whether arising from use, passing of time or obsolescence through technological and market changes. It is accounted for by the allocation of the historical cost (or revalued amount) of the asset less its residual value over its useful life
Economic life	The period from the acquisition of the asset to the time when the asset, while physically able to provide a service, ceases to be the lowest cost alternative to satisfy a particular level of service. The economic life is at the maximum when equal to the physical life however obsolescence will often ensure that the economic life is less than the physical life

Term	Definition
Facility	A complex comprising many assets (e.g. a water treatment plant, recreation complex, etc.) which represents a single management unit for financial, operational, maintenance or other purposes
Frequency	A measure of the rate of occurrence of an event expressed as the number of occurrences of an event in a given time
Geographic Information System	Software which provides a means of spatially viewing, searching, manipulating, and analysing an electronic data-base
GUI	Graphical User Interface is a particular case of user interface for interacting with a computer which employs graphical images in addition to text to represent the information and actions available to the user
IMS	Hansen IMS software - Asset Management software product purchased as result of an investigation and needs analysis project
InTouch	The brand of Graphical User Interface (GUI)
Infrastructure Assets	Stationary systems forming a network and serving whole communities, where the system as a whole is intended to be maintained indefinitely at a particular level of service potential by the continuing replacement and refurbishment of its components. The network may include normally recognised 'ordinary' assets as components
Level of service	The defined service quality for a particular activity (i.e. wastewater) or service area (i.e. sewage disposal) against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost
Life	A measure of the anticipated life of an asset or component; such as time, number of cycles, distance intervals etc
Life Cycle Cost	The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs
Maintenance Plan	Collated information, policies and procedures for the optimum maintenance of an asset, or group of assets
Maintenance Standards	The standards set for the maintenance service, usually contained in preventive maintenance schedules, operation and maintenance manuals, codes of practice, estimating criteria, statutory regulations and mandatory requirements, in accordance with maintenance quality objectives
Maintenance	All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal
Multi-Criteria Analysis (MCA)	Analysis technique that takes a range of criteria into account which are both qualitative and quantitative and reflect the social, cultural, economic, and environmental characteristic of the project outcomes
NZPIM	New Zealand Pipe Inspection Manual - National manual for inspecting and scoring wastewater pipes. Published by New Zealand Water and Waste Association - Second Edition March 1999
NZWWA	New Zealand Water and Wastes Association - National industry association formed for the advancement and application of fundamental and practical knowledge to natural water resources, water use and wastes

Term	Definition
Operations & Maintenance Expenditure (Operations and Maintenance)	The cost of operating and maintaining assets. Operations and Maintenance expenditure does not alter the value of an asset and is not included in the asset valuation
Objective	An objective is a general statement of intention relating to a specific output or activity. They are generally longer term aims and are not necessarily outcomes that managers can control
Optimised Depreciated Replacement Cost (ODRC)	The ORC after deducting an allowance for usage to reflect the remaining life of the asset
Operation	The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials. Operation costs are part of the life cycle costs of an asset
Optimised Renewal Decision Making (ORDM)	An optimisation process for considering and prioritising all options to rectify performance failures of assets. The process encompasses NPV analysis and risk assessment
Optimised Replacement Cost (ORC)	The minimum cost of replacing an existing asset by another asset offering the same utility most efficiently. The optimisation process adjusts the value for technical and functional obsolescence, surplus assets or over-design
Outcome	The end result for the community which Council hopes to achieve
Output	Services, actives or goods produced by Council which contribute to achieving an outcome
Performance Measure	A qualitative or quantitative measure of a service or activity used to compare actual performance against a standard or other target. Performance indicators commonly relate to statutory limits, safety, responsiveness, cost, comfort, asset performance, reliability, efficiency, environmental protection and customer satisfaction
Performance Monitoring	Continuous or periodic quantitative and qualitative assessments of the actual performance compared with specific objectives, targets or standards
Rehabilitation	Works to rebuild or replace parts or components of an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification. Generally involves repairing the asset using available techniques and standards to deliver its original level of service (i.e. heavy patching of roads, slip-lining of sewer mains, etc.) without resorting to significant upgrading or replacement
Renewal	Works to upgrade, refurbish, rehabilitate or replace existing facilities with facilities of equivalent capacity or performance capability
Renewal Accounting	A method of infrastructure asset accounting which recognises that infrastructure assets are maintained at an agreed service level through regular planned maintenance, rehabilitation and renewal programmes contained in an asset management plan. The system as a whole is maintained in perpetuity and therefore does not need to be

Term	Definition
	depreciated. The relevant rehabilitation and renewal costs are treated as operational rather than capital expenditure and any loss in service potential is recognised as deferred maintenance
Repair	Action to restore an item to its previous condition after failure or damage
Replacement	The complete replacement of an asset that has reached the end of its life, so as to provide a similar, or agreed alternative, level of service
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and the likelihood of a particular risk
Risk Assessment	The overall process of risk analysis and risk evaluation
Risk Management	Risk Management is the systematic application of management policies, procedures and practices to the tasks of identifying, analysing, evaluating and monitoring those risks that could prevent a Local Authority from achieving its strategic or operational objectives or Plans or from complying with its legal obligations
Routine Maintenance	Day to day operational activities to keep the asset operating (replacement of light bulbs, cleaning of drains, repairing leaks, etc.) and which form part of the annual operating budget, including preventative maintenance
Service Potential	The total future service capacity of an asset. It is normally determined by reference to the operating capacity and economic life of an asset
Strategic Plan	Strategic planning involves making decisions about the long term goals and strategies of an organisation. Strategic plans have a strong external focus, cover major portions of the organisation and identify major targets, actions and resource allocations relating to the long term survival, value and growth of the organisation
TKN	Total Kjehldahl Nitrogen. TKN is the combination of organically bound Nitrogen and Ammonia. The combination of the organic nitrogen and the inorganic nitrogen (NH4 Ammonia, NO3 Nitrate, NO2 Nitrite) make up the total nitrogen
Unplanned Maintenance	Corrective work required in the short term to restore an asset to working condition so it can continue to deliver the required service or to maintain its level of security and integrity
Upgrading	The replacement of an asset or addition/ replacement of an asset component which materially improves the original service potential of the asset
Valuation	Estimated asset value which may depend on the purpose for which the valuation is required, i.e. replacement value for determining maintenance levels or market value for life cycle costing

A1 Acronyms

Term	Definition
AC	Asbestos cement pipe
ADWF	Average dry weather flow
ATAD	Autothermal thermophilic aerobic digestion plant
AV	Average flow
BNR	Biological nutrient removal
BOD	Biochemical oxygen demand
BTWWTP	Bells island wastewater treatment plant
CCTV	Close circuit television
CDEM	Civil Defence Emergency Management
COD	Chemical oxygen demand
DAF	Dissolved air floatation
FAR	Fixed asset register
FOP	Facultative oxidation ponds
GAAP	Generally Accepted Accounting Principles
KPI	Key Performance Indicators
LA	Local Authority
LAPP	Local Authority Protection Programme Disaster Fund
LHCE	Lamp Hole Cleaning Eye
LOS	Levels of Service
LTCCP	Long Term Community Plan
NAMS	National Asset Management Steering Group
NCS	Napier Computer System
NPV	Net present value
NRSA	Nelson Regional Sewerage authority
NRSBU	Nelson Regional Sewerage Business Unit (replaced NRSA in July 2000)
NTL	Network Tasman Limited
NUGS	The Nelson Urban Growth Strategy
P/S	Pump station
PACC	Renewal strategy based on Performance, Asset criticality, Capacity and Condition
QA/QC	Quality Assurance and Quality Control
RCRRJ	Reinforced concrete rubber ring joint pipe
RMA	Resource management act
SCADA	Supervisory control and data acquisition
SS	Suspended solids

Term	Definition
STP	Sewerage treatment plant
TA	Territorial Authority
TKN	Total kjeldahl nitrogen
TP	Total potassium
TSS	Total suspended solids
uPVC	Unplasticised Polyvinyl Chloride pipe
WWTP	Wastewater treatment plant

APPENDIX B: BIBLIOGRAPHY

Title	Date	Author
Nelson City Council Wastewater Asset Management Plan	2005	Nelson City Council
The Development of Business Process Mapping for Asset Management Systems	June 2000	Opus International Consultants Limited
New Zealand Infrastructure Assets Grading Guidelines	1999	New Zealand Water and Waste Association
Member Authority Risk Profile for Infrastructure Assets for Nelson City Council	April 2008	Risk Management Partners
Nelson City Council Long Term Council Community Plan 2006-16	2006	
Nelson City Council Trade Waste Bylaw	2007	Nelson City Council
Nelson City Council Communities for Climate Change Protection Programme – Hearing Report	August 2008	Nelson City Council
Nelson waste Water Treatment Plant - Odour Management Plan	April 2007	OPUS
High intensity Rainfall Analysis for Nelson Urban Area	2008	NIWA

APPENDIX C: ASSET DATA AND OVERVIEW

Appendix Table C-1: Geographical Information System List of Code Definitions used by Nelson City Council

Value	Description
2000	2000: Meter type
3000	3000: Meter type
ACBK	Black Asbestos Cement
ACMT	Asbestos Cement
ALUM	Aluminium
ARMC	ArmourCoil
BLBT	Blue Brute Pipe
BLKA	Black Asbestos Cement
BRCK	Brick
CIDT	Ductile Cast Iron
CIPT	PitCast Iron
CISP	Spun Cast Iron
CNIL	Concrete (InsituFORM lined)
CONC	Concrete
COPR	Copper
DRNC	Drainage Coil
EWRE	Earthenware
FGLS	Fiberglass
FLDT	Field Tiles
GALV	Galvanised
HDPE	High-density polyethylene pipe
HELA	Helcoil Aluminium
HELS	Helcoil Steel
MDPE	Medium Density Pe
NAPP	Not Applicable
OTHR	Other
PE1H	Pe 100 Material
POLE	Pole Construction
PRFC	Perforated Concrete
PVC	uPVC
STCL	Steel Concrete Lined
STNY	Nylon Coated Steel: Used in pump stations
STPL	Steel Pitch Lined
UNKW	Unknown

Appendix Table C-2: Length of Mains (m) by Material and Decade of Installation

Decade Installed	Asbestos Cement	Concrete	Earthenware	High Density PE	PVC	Other	Grand Total
1900 - 1909			16			25	41
1910 - 1919	209		7,725			298	8,232
1920 - 1929			2,676				2,676
1930 - 1939		815	6,443			522	7,781
1940 - 1949		769	6,626			8	7,402
1950 - 1959	696	7,496	14,936		244	370	23,741
1960 - 1969	4,123	42,020	8,318		39	94	54,594
1970 - 1979	33,626	18,275	2,978		620	351	55,850
1980 - 1989	32,287	9,293	1,506	104	8,573	234	51,996
1990 - 1999	10,391	3,195	298	5,804	41,536	216	61,441
2000 - 2009		1,386		7,937	59,174	752	69,249
2010 - 2012		115		255	33,778	399	34,547
Total	81,333	83,363	51,521	14,100	143,964	3,269	377,550

APPENDIX D: GAP ANALYSIS AND APPROPRIATE PRACTICE

Appendix Table D-1: Maturity Assessment

Wastewater					Maturity Levels												w	
Reference	Question	IIMM Descriptors			Aware	Basic	Core	Intermediate	Advanced									
		Process Development and Documentation			Ad hoc processes, minimal documentation.	Process and documentation in development	Main process components developed and documented	Process complete, optimisation developing	Optimised process in place, documentation complete.									
		Coverage (assets, people, frequency)			Rarely	Occasionally	Often	Usually	Always									
		Section	Questions	Why	0-20	25-40	45-60	65-80	85-100	Element %	Element Score (out of 100)	Current Score	Appropriate Target (3 yrs)	Target (10 years)	Reason for scores	Improvement Tasks to close gap
Understanding and Defining Requirements																
IIMM 2.1	1	**Establishing Strategic Direction**	To what extent has your organisation's AM Policy and AM Strategy been articulated, approved, communicated and acted on? How consistent is this policy and strategy with current government policies?	The AM Policy supports an organisation's strategic objectives. It articulates the principles, requirements and responsibilities for asset management (AM). It articulates the objectives, practices and action plans for AM improvement, audit and review processes. The AM Policy and Strategy may be incorporated into the AM Plan.	Corporate awareness of the benefits of AM.	Corporate expectation expressed in relation to development of AM Plans and AM objectives.	AM Policy and AM Objectives developed, aligned to corporate goals and strategic context.	AM System scope is defined and documented. Strategic context (internal, external, customer environment) analysed and implications for the AM System documented in the Strategic AM Plan.	AM Policy and Strategy fully integrated into the organisation's business processes and subject to defined audit, review and updating procedures.			55	60	80		
		Strategic context (internal / external) analysed and AM implications understood.								25%	50					
		AM Policy sets out AM expectations, objectives and accountabilities								25%	50					
		The organisation's AM System / Framework is defined								25%	60					
		Strategic, tactical and operational goals are aligned across the organisation								25%	60					
IIMM 2.2	2	**Defining and Measuring Levels of Service**	How does your organisation determine what is the appropriate level of service for its customers and then ensure that asset performance is appropriate to those service levels?	Levels of service are the cornerstone of asset management and provide the platform for all lifecycle decision making. Levels of service are the outputs a customer receives from the organisation, and are supported by performance measures. One of the first steps in developing asset management plans or processes is to find out what levels of service customers are prepared to pay for, then understand asset performance and capability to deliver those requirements.	Level of service requirements generally understood but not documented or quantified.	Asset contribution to organisation's objectives and some basic levels of service have been defined. Customer Groups defined and requirements informally understood.	Levels of service and performance measures in place covering a range of service attributes. Annual reporting against performance targets. Customer Group needs analysed.	Level of service and cost relationship understood. Customers are consulted on significant service levels and options.	Customer communications plan in place. Levels of service are integral to decision making and business planning.			52.5	65	80		
		Customer engagement to understand level of service requirements.								25%	35				Done through LTP & Annual Plan. Don't facilitate wide customer group discussions	
		Levels of service and performance measures defined								25%	70					
		Measurement and reporting occurs, including analysis of trends.								25%	70					
		Level of service and cost relationship analysed.								25%	35				Not done for changes to L.O.S.	L.O.S. and cost linkage
IIMM 2.3	3	**Forecasting Future Demand**	How robust is the approach your organisation uses to forecast demand for its services and the possible impact on its asset portfolios?	This AM activity involves estimating demand for the service over the life of the AM plan or the life of the asset. Demand is a measure of how much customers consume the services provided by the assets. The ability to predict demand enables an organisation to plan ahead and meet that demand, or manage risks of not meeting demand.	Future demand requirements generally understood but not documented or quantified. Demand forecasts based on mathematical analysis of past trends and primary demand factors.	Demand forecasts based on experienced staff predictions, with consideration of known past demand trends and likely future growth patterns.	Demand Forecasts based on robust projection of a primary demand factor (eg: population growth) and extrapolation of historic trends. Risk associated with demand change broadly understood and documented. Demand management considered as an alternative to major	A range of demand scenarios is developed (eg: high/medium/low). Demand management is considered in all strategy and project decisions.	Risk assessment of different demand scenarios with mitigation actions identified.			56	65	80		
		Historical demand / consumption of services recorded and trends analysed history recorded								20%	75					
		Demand factors identified and analysed								20%	75					
		Demand forecast models developed								20%	50					Better use of model
		Demand management strategies identified and impacts on future demand quantified								20%	50					Better use of model
		Risk associated with demand uncertainty understood, scenarios are developed and managed								20%	30					Better use of model
IIMM 2.4	4	**Collecting Asset Information (Asset Knowledge)**	What sort of asset-related information does the organisation collect, and how does it ensure the information has the requisite quality (accuracy, consistency, reliability)?	Asset data is the foundation for enabling most AM functions. Planning for asset renewal and maintenance activities cannot proceed until organisations know exactly what assets they own or operate and where they are located	Asset information in combination of sources and formats. Awareness of need for asset register.	Basic physical information recorded in a spreadsheet or similar (e.g. location, size, type), but may be based on broad assumptions or not complete.	Sufficient information to complete asset valuation (basis attributes, replacement cost and asset age/ life) and support prioritisation of programmes (criticality). Asset hierarchy, identification and attribute systems documented. Metadata held as appropriate.	A reliable register of physical, financial and risk attributes recorded in an information system with data analysis and reporting functionality. Systematic and documented data collection process in place.	Information on work history type and cost, condition, performance, etc. recorded at asset component level. Systematic and fully optimised data collection programme with supporting metadata.			61	70	80		
		Asset hierarchy defined and data requirements for each level of the hierarchy specified.								20%	55					
		Basic physical information captured against assets (age, material, type, etc)								20%	55					
		Spatial / location information recorded or links to GIS from asset register (if separate)								20%	65					
		Asset age / life / replacement cost recorded at asset level (information for valuation / renewals)								20%	65					
		Asset criticality data recorded at asset level								20%	65					

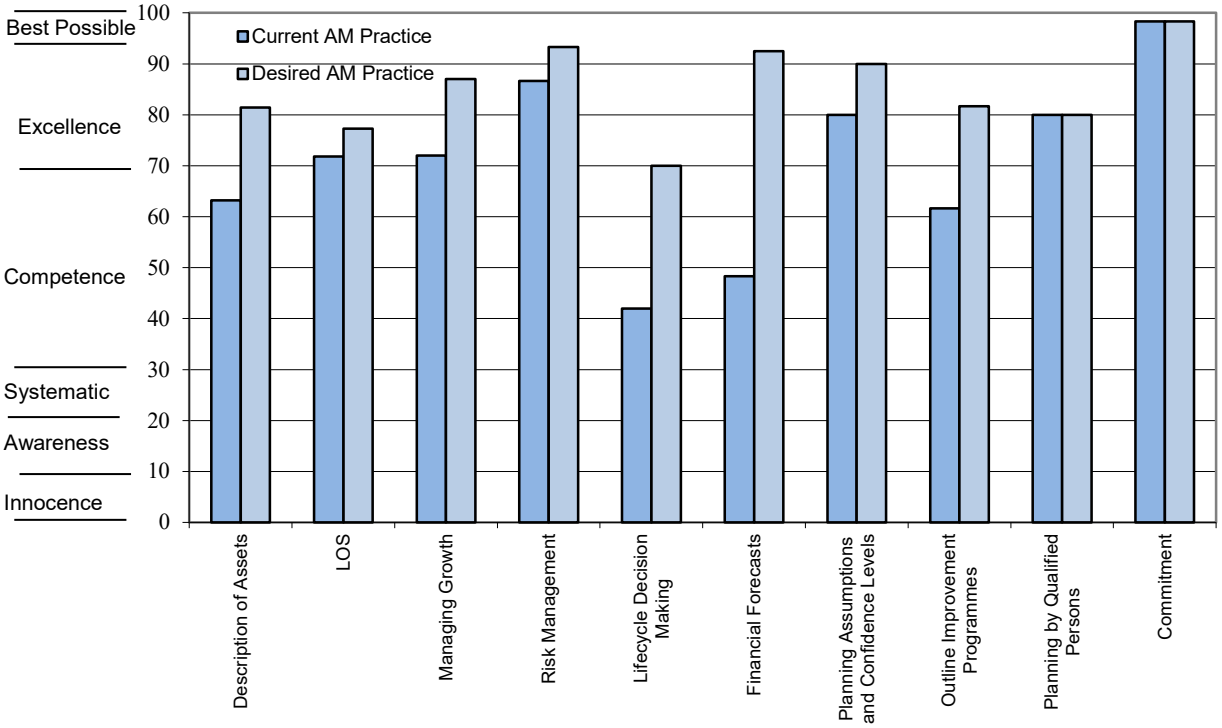
Wastewater					Maturity Levels											w	
Reference	Question	IIMM Descriptors			Aware	Basic	Core	Intermediate	Advanced								
		Process Development and Documentation			Ad hoc processes, minimal documentation.	Process and documentation in development	Main process components developed and documented	Process complete, optimisation developing	Optimised process in place, documentation complete.								
		Coverage (assets, people, frequency)			Rarely	Occasionally	Often	Usually	Always								
		Section	Questions	Why	0-20	25-40	45-60	65-80	85-100	Element %	Element Score (out of 100)	Current Score	Appropriate Target (3 yrs)	Target (10 years)	Reason for scores	Improvement Tasks to close gap
Understanding and Defining Requirements																
IIMM 2.5	5	**Monitoring Asset Performance and Condition**	How does the organisation measure and manage the condition of its assets?	Timely and complete condition information supports risk management, lifecycle decision-making and financial / performance reporting.	Condition and performance understood but not quantified or documented.	Adequate data and information to confirm current performance against AM objectives.	Condition and performance information is suitable to be used to plan maintenance and renewals to meet over the short term.	Future condition and performance information is modelled to assess whether AM objectives can be met in the long term. Contextual information, such as demand, is used to estimate likely performance.	The type, quality and amount of data are optimised to the decisions being made. The underlying data collection programme is adapted to reflect the assets' lifecycle stage.			55	60	70		
		Condition and performance monitoring programmes established								25%	55					
		Condition data captured in asset register								25%	45				Not checked, no trend data analysis	
		Performance data captured in asset register (eg: service outages)								25%	55					Accessability and use. How much of the network can we isolate.
		Works costs recorded at asset level								25%	65					
Lifecycle Decision Making																
IIMM 3.1	6	**Lifecycle Decision Methods**	How does your organisation go about making decisions on the replacement or refurbishment of existing assets or investment in new ones?	Decision techniques provide the best value for money form an organisation's expenditure programmes. These techniques reveal strategic choices, and balance the trade off between levels of service, cost and risk. ODM is a formal process to identify and prioritise all potential asset and non-asset solutions with consideration of financial viability, social and environmental responsibility and cultural outcomes.	AM decisions based largely on staff judgement.	Corporate priorities incorporated into decision making.	Formal decision making techniques (MCA / BCA), are applied to major projects and programmes, where criteria are based on the organisations' AM objectives.	Formal decision making and prioritisation techniques are applied to all operational and capital asset programmes within each main budget category. Critical assumptions and estimates are tested for sensitivity to results.	AM objectives/targets are set based on formal decision making techniques, supported by the estimated costs and benefits of achieving targets. The framework enables projects and programmes to be optimised across all activity areas. Formal risk-based sensitivity analysis is carried out.			59	65	80		
		Good information available to support AM decisions.								20%	50					Imporove condition data
		Options developed and analysed (including 'do nothing')								20%	65					
		Agreed frameworks / techniques applied to support decision making								20%	65					Record process better
		Decision frameworks are aligned to straregic objectives / levels of service								20%	65					Matrix - see business case renewals
		Sensitivity analysis / scenario testing used to assess robustness of result								20%	50					
IIMM 3.2	7	**Managing Risk and Resilience**	How does your organisation manage the interplay between business risks and asset-related risks?	Risk management helps identify higher risks, and identify actions to mitigate those risks. This process reduces the organisation's exposure to asset related risk, especially around critical assets, and drives renewal and rehabilitation programmes and decision making.	Risk management is identified as a future improvement. Risk framework developed.	Critical services and assets understood and considered by staff involved in maintenance / renewal decisions.	Critical assets and high risks identified. Documented risk management strategies for critical assets and high risks.	Resilience level assessed and improvements identified. Systematic risk analysis to assist key decision-making. Risk register regularly monitored and reported. Risk managed and prioritised consistently across the organisation.	Resilience strategy and programme in place including defined levels of service for resilience. Formal risk management policy in place. Risk is quantified and risk mitigation options evaluated. Risk is integrated into all aspects of decision making.			60	65	75		
		Risk policy / framework in place								20%	80					
		Risks are identified and recorded in risk register.								20%	80					
		Risk actions are identified, monitored and reported.								20%	30					Set time frames for mitigation measures
		Strategy for management of critical assets in place								20%	50					
		Assessments of network resilience to major hazards								20%	60					Extend natural hazard assessment
IIMM 3.3	8	**Operational Planning**	How does your organisation manage the cost effective performance of its key business assets over time (e.g. in terms of utilisation, availability, fitness for purpose)?	Effective operational strategies can mitigate risk, defer the need for asset renewals and minimise service downtime following asset failures. Planning for business continuity and full utilisation of assets are key factors in good asset management processes.	Operational processes based on historical practices.	Operating Procedures are available for critical Operational Processes. Operations Organisational structure in place and roles assigned	Operating Procedures are available for all Operational Processes. Operational Support Requirements are in place.	Risk and Opportunity Planning completed. Operational objectives and intervention levels defined and implemented. Alignment with Organisational Objectives can be demonstrated.	Continual Improvement can be demonstrated for all operational processes. Comparison with ISO 55001 requirements complete.			65	65	75		
		Operational programmes and processes are developed and optimised								25%	65					Check what contract says
		Operational objectives and intervention criteria are defined								25%	65					
		Emergency response arrangements are in place and tested								25%	65					Updating emergency management
		Operational performance is monitored and improvements identified								25%	65					Improve monitoring of KPI

Wastewater					Maturity Levels											w	
Reference	Question	IIMM Descriptors			Aware	Basic	Core	Intermediate	Advanced								
		Process Development and Documentation			Ad hoc processes, minimal documentation.	Process and documentation in development	Main process components developed and documented	Process complete, optimisation developing	Optimised process in place, documentation complete.								
		Coverage (assets, people, frequency)			Rarely	Occasionally	Often	Usually	Always								
		Section	Questions	Why	0-20	25-40	45-60	65-80	85-100	Element %	Element Score (out of 100)	Current Score	Appropriate Target (3 yrs)	Target (10 years)	Reason for scores	Improvement Tasks to close gap
Understanding and Defining Requirements																
IIMM 3.4	9	**Capital Investment Planning**	What processes and practices does the organisation have in place to plan and prioritise capital expenditure?	Capital investment include the upgrade, creation or purchase of new assets, typically to address growth or changes in levels of service requirements, or for the periodic renewal of existing assets, to maintain service levels. Agencies need to plan for the long term asset requirements relative to future levels of service. The decision on whether to create a new asset is typically the time when there is the most opportunity to impact on the potential cost and level of service. Cabinet expects all capital-intensive agencies to disclose 10 year capital intentions and make appropriate use of the better business cases methodology for programmes and individual investment proposals.	Capital investment projects are identified during annual budget process.	There is a schedule of proposed capital projects and associated costs for the next 3-5 years, based on staff judgement of future requirements.	Projects have been collated from a wide range of sources and collated into a project register. Capital projects for the next three years are fully scoped and estimated. A prioritisation framework is in place to rank the importance of capital projects.	Formal options analysis and business case development has been completed for major projects in the 3-5 year period. Major capital projects for the next 10-20 are conceptually identified and broad cost estimates are available.	Long-term capital investment programmes are developed using advanced decision techniques such as predictive renewal modelling.			70.5	70	80		
		Capital projects are identified and recorded in a register								20%	80					
		Capital projects are scoped and costs estimated for inclusion in budget forecasts								30%	65					Time constraints
		Capital projects are prioritised within and between activities and work areas								25%	65					
		Renewal forecasts are modelled based on age, condition, performance								25%	75					
IIMM 3.5	10	**Financial Management**	How does your organisation plan for the funding of its future capital expenditure and asset-related costs?	Poor financial management can lead to higher long run life cycle costs, inequitable fees and charges, and financial "shocks". Good collaboration between financial and asset managers is important, especially in relation to long term financial forecasts and asset revaluations. Asset valuation is required by International Accounting Standards, and can be used in lifecycle decision making. Robust financial budgets are a key output of any asset management planning process.	Financial planning is largely an annual budget process, but there is intention to develop longer term forecasts.	Assets re-valued in compliance with financial reporting and accounting standards. 10 year financial forecasts are based on extrapolation of past trends and broad assumptions about the future. Expenditure categories compliant with FRS.	Asset revaluations have a 'B' grade data confidence 10 year+ financial forecasts based on current comprehensive AMPs with detailed supporting assumptions / reliability factors.	Asset revaluations have a 'B' grade data confidence 10 year+ financial forecasts based on current comprehensive AMPs with detailed supporting assumptions / reliability factors.	Asset revaluations have an 'A' grade data confidence. 10 year + financial forecasts based on comprehensive, advanced AM plans with detailed underlying assumptions and high confidence in accuracy. Advanced financial modelling provides sensitivity analysis, demonstrable whole of life costing and cost analysis for level of service options.			72.5	80	80		
		Budget categorisation supports analysis of asset-specific financial requirements								25%	75					
		Long term financial forecasts are developed								25%	65					
		Assets are revalued in accordance with financial reporting standards								25%	80					Wider range of tendered rates
		Supporting assumptions and forecasting methodologies are documented and auditable.								25%	70					Wider range of reference material
Asset Management Enablers																
IIMM 4.1	11	**Asset Management Leadership and Teams**	What is the level of organisational commitment to asset management? How is this reflected in existing organisation structure, responsibilities and resourcing of AM competencies?	Effective asset management requires a committed and co-ordinated effort across all sections of an organisation.	Leadership is supportive of AM.	AM functions are carried out by small groups. Roles reflect AM requirements.	Position descriptions incorporate AM roles. AM coordination processes established. Ownership and support of AM by leadership. Awareness of AM across most of the organisation.	Organisational structures support AM. Roles reflect AM resourcing requirements and reflected in position descriptions for key roles. Consistent approach to AM across the organisation. Internal communication plan established.	Roles reflect AM requirements and defined in all relevant position descriptions. Formal documented assessment of AM capability and capacity requirements to achieve AM objectives. Demonstrable alignment between AM objectives, AM systems and individual responsibilities			52	65	70		
		Leadership supports and actively advocates investment in AM.								20%	60					Current workshop
		AM roles and role interfaces are defined.								20%	55					Improve job description and organisational structure
		Resources (internal and external) to support an effective 'AM System' are in place.								20%	55					Need extra contractor resources or capital projects engineer
		All staff understand AM and their role / contribution to the AM System.								20%	45					
		AM capability requirements are reviewed and provided								20%	45					

Wastewater					Maturity Levels								w				
Reference	Question	IIMM Descriptors			Aware	Basic	Core	Intermediate	Advanced								
		Process Development and Documentation			Ad hoc processes, minimal documentation.	Process and documentation in development	Main process components developed and documented	Process complete, optimisation developing	Optimised process in place, documentation complete.								
		Coverage (assets, people, frequency)			Rarely	Occasionally	Often	Usually	Always								
		Section	Questions	Why	0-20	25-40	45-60	65-80	85-100	Element %	Element Score (out of 100)	Current Score	Appropriate Target (3 yrs)	Target (10 years)	Reason for scores	Improvement Tasks to close gap
Understanding and Defining Requirements																
IIMM 4.2	12	**Developing AM Plans**	How does your organisation develop, communicate, resource and action its asset management plans?	An asset management plan is a written representation of intended capital and operational programmes for it's new and existing infrastructure, based on the organisations understanding of demand, customer requirements and it's own network of assets.	Stated intention to develop AM Plans	AM Plans contains basic information on assets, service levels, planned works and financial forecasts (5-10 years) and future improvements.	AM objectives are defined with consideration of strategic context. Approach to risk and critical assets described, top-down condition and performance assessment, future demand forecasts, description of supporting AM processes, 10 year financial forecasts, 3 year AM improvement plan.	Analysis of asset condition and performance trends (past/future), customer engagement in setting levels of service, ODM/risk techniques applied to major programmes. Strategic context analysed with risks, issues and responses described.	Evidence of programmes driven by comprehensive decision making techniques, risk management programmes and level of service/cost trade-off analysis. Improvement programmes largely complete with focus on ongoing maintenance of current practice.			67	70	75		
		AMP development includes relevant staff and stakeholders								20%	60					More trend analysis to optimise decision making
		AMP content in line with IIMM								20%	65					
		AMP document is of good quality, readable for target audience								20%	65					Improve use of AMP content to be more user friendly and appropriate
		AMPs are integration with other business processes / plans								20%	55					Content of AMP relevant and easy to use
		AMPs are communicated to / approved by Council / Executive/ key stakeholders								20%	90					
IIMM 4.3	15	**Establishing and Maintaining Management Systems**	How does your organisation ensure that it's asset management processes and practices are appropriate and effective?	When AM processes are part of a Quality Management system the organisation is able to operate consistent and reliable processes,, provide evidence that what was planned was delivered, and ensure that knowledge is shared. In short, that processes are appropriate and consistently applied and understood.	Awareness of need to formalize systems and processes.	Simple process documentation in place for service-critical AM activities.	Basic Quality Management System in place that covers all organisational activities. Critical AM processes are documented, monitored and subject to review. AM System meets the requirements of ISO 55001.	Process documentation implemented in accordance with the AM System to appropriate level of detail. Internal management systems are aligned.	ISO certification to multiple standards for large asset intensive organisations, including ISO 55001. Strong integration of all management systems within the organisation.			46.25	60	70		
		Management systems are in place to support AM.								25%	60					
		AM processes are documented within a management system framework								25%	45				Business cases/PIDs/Data Analysis/Computer models	
		Processes are subject to review, audit and continual improvement								25%	45					
		AM System is aligned / certified to ISO 55001								25%	35					
IIMM 4.4	13	**Establishing and Maintaining Information Systems**	How does your organisation meet the information needs of those responsible for various aspects of asset management?	AM systems have become an essential tool for the management of assets in order to effectively deal with the extent of analysis required.	Intention to develop an electronic asset register / AMIS.	Asset register can record core asset attributes – size, material, etc. Asset information reports can be manually generated for AM Plan input.	Asset register enables hierarchical reporting (at component to facility level). Customer request tracking and planned maintenance functionality enabled. System enables manual reports to be generated for valuation, renewal forecasting.	**Spatial relationship capability.** More automated analysis reporting on a wider range of information.	Financial, asset and customer service systems are integrated and all advanced AM functions are enabled. Asset optimisation analysis can be completed			72	80	80		
		IS records asset data within a hierarchy								20%	80					
		IS enables tracking of service requests and scheduling of planned maintenance								20%	80					
		IS suports AM analysis (performance evaluation, valuation / renewal forecasting)								20%	70				Not sure of capabilities	Need training
		IS reporting supports management and AMP requirements								20%	65				Not sure of capabilities	Need training
		Information systems share / exchange data								20%	65					
IIMM 4.5	14	**Service Delivery Models**	How does your organisation procure asset-related services like maintenance and consumables for different classes of assets? How does the organisation exercise control over any outsourced asset management services?	The effectiveness of asset management planning is proven in the efficient and effective delivery of services at an operational level.	AM roles generally understood.	Service delivery roles clearly allocated (internal and external), generally following historic approaches.	Core functions defined. Procurement strategy/policy in place. Internal service level agreements in place with the primary internal service providers and contract for the primary external service providers.	Risks, benefits and costs of various outsourcing options considered and determined. Competitive tendering practices applied with integrity and accountability.	All potential service delivery mechanisms reviewed and formal analysis carried out to identify best delivery mechanism.			61.25	65	75		
		Service delivery roles / functions defined (O&M, capital project delivery, etc)								25%	65					Documenting
		Functions allocated to roles / teams / contracts								25%	60					Documenting
		Service delivery options are evaluated and a strategy for outsourcing is in place								25%	60				Nelmac contract	Documenting
		Contracts / SLAs are in place for outsourced / in house service delivery								25%	60					Documenting

Wastewater					Maturity Levels												w	
Reference	Question	IIMM Descriptors			Aware	Basic	Core	Intermediate	Advanced									
		Process Development and Documentation			Ad hoc processes, minimal documentation.	Process and documentation in development	Main process components developed and documented	Process complete, optimisation developing	Optimised process in place, documentation complete.									
		Coverage (assets, people, frequency)			Rarely	Occasionally	Often	Usually	Always									
		Section	Questions	Why	0-20	25-40	45-60	65-80	85-100	Element %	Element Score (out of 100)	Current Score	Appropriate Target (3 yrs)	Target (10 years)		Reason for scores	Improvement Tasks to close gap	
Understanding and Defining Requirements																		
IIMM 4.6	16	**Audit and Improvement**	How does your organisation ensure that it continues to develop its asset management capability towards an appropriate level of maturity?	Well performing agencies give careful consideration of the value that can be obtained from improving AM information, processes, systems and capability. The focus is on ensuring AM practices are "appropriate" to the business objectives and government requirements.	Recognition of AM improvements.	Improvement actions identified and allocated to appropriate staff.	Current and future AM performance assessed and gaps used to drive the improvement actions. Improvement plans identify objectives, timeframes, deliverables, resource requirements and responsibilities	Formal monitoring and reporting on the improvement programme to Executive Team. Project briefs developed for all key improvement actions.	Improvement plans specify key performance indicators (KPIs) for monitoring AM improvement and these are routinely reported. Improvement plans specify key performance indicators (KPIs) for monitoring AM improvement and these are routinely reported.			45	60	70			
		Gap analysis used to identify AM improvement tasks								25%	50						Document it	
		Improvement tasks prioritised and developed into an AM improvement plan with allocated resources / timeframes / deliverables								25%	50						Document it	
		Project scope / brief developed for major improvement tasks.								25%	40						Document it	
		Progress against the AM improvement programme is regularly monitored and reported to management								25%	40						Document it	

Appendix Graph D-1: Nelson City Council Appropriate Asset Management and Performance Analysis



Quality Level	Score	Description
Best Possible	96 - 100	
Excellence	70 to 95	Appropriate Practice
Competence High	69	Very Good
Average	50	Average/Good
Low	30	Low/Average
Systematic Approach	20 – 29	Poor
Aware	10 – 19	Unsatisfactory
Innocence	0 to 9	Unsatisfactory

APPENDIX E: RISK

WASTEWATER RISK REGISTER	**Objectives** **Treatment and disposal of wastewater in a safe and economic manner** **Environmental Protection for the built and natural environment from wastewater discharges** **Reliability – an operational wastewater network** **Contractor response – provide a prompt, reliable and timely response to service requests and system failures**	**Assessed by Phil Ruffell**

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Toxic Discharge to network where it reaches the treatment plant		Failure of biological process resulting in the treatment plant discharges failing to meet consent conditions.	Current trade waste by-laws prohibit certain toxic discharges to the plant. Trade waste sampling and monitoring programme requires enhancement. Emergency Action Plan. Emergency Procedures Manual	Moderate (3)	Rare (1)	Low (3)		Appoint additional Trade Waste monitoring resource.
Overloading of plant treatment capacity	Plant plus ponds	Odour beyond plant boundariesDischarge of raw/partially treated wastewater. Failure to comply with resource consent.Customer complaints.	Regular inspections and maintenance programme. Emergency Action Plan. Emergency Procedures Manual. Monitor long term trends for quality and quantity of wastewater treated. Processes within treatment plant have contingencies for failure (duplication of pumps) and alarm systems. Currently the pond is required to be operated and maintained in a manner that employs best practicable options that includes: pond loadings are adjusted for different seasons and conditions; loading profile of the ponds are known and operated to these limits; a regular pond monitoring and sampling programme is in place	Moderate (3)	Rare (1)	Low (3)		Review future demand from growth. Remedial de-sludging.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Pipe failure	Rising Mains (concrete)	Wastewater discharges to the environment- environmental and cultural issues. Pumping to waste water treatment plant suspended. Minor health and safety issues.	Regular inspections carried out under utility provider's maintenance contract. Respond to damage after event. The construction of the Corder Park pump station will reduce the pressure profile in the bulk of the rising main and is expected to reduce the risk of failure. The installation of air valves at high points in the main will remove the accumulated hydrogen sulphide gas and lessen the risk of ongoing acid attack. Contingency Plan in EPManual.	Moderate (3)	#N/A	#VALUE!		A re-evaluation of the strategy for condition profiling (including Closed circuit television) is required. Renew sections on risk based approach/initiate investigation and regulatory processes for construction of duplicate main.
Pipe failure	Rising Mains (other)	Wastewater discharges to the environment - environment and cultural issues. Pumping to other pump stations suspended. Minor health and safety issues.	Regular inspections and maintenance programme. Emergency Action Plan. Emergency Procedures Manual. Respond to damage after event.	Moderate (3)	Rare (1)	Low (3)		Renew sections on risk based approach.
Pipe blockage	Gravity reticulation	Wastewater discharges to the environment - environment and cultural issues. Minor health and safety issues.	Regular inspections and maintenance programme of public drain sections. Emergency Action Plan. Emergency Procedures Manual. Renewal of old pipelines. Clear blockage. Wastewater Bylaw infringement provisions where appropriate.	Moderate (3)	Rare (1)	Low (3)		Ongoing renewal programme. Public education about waste disposal. Appoint additional Trade Waste monitoring resource.
	Gravity reticulation	Flooding of adjoining properties, erosion of banks and foundations of structures. Minor health and safety issues. Contamination from sewerage system may occur. Debris build	Regular inspections and maintenance programme of public drain sections. Emergency Procedures Manual. Civil Defence and emergency management response.	Moderate (3)	Possible (3)	Medium (9)		Regular inspections and maintenance programme of all public drain sections
	TREATMENT							
Climate Change /Sea Level Rise	Plant	More extreme storm events. Risk of inundation of plant by sea or floodwater.	Civil Defence Emergency Management PlanEmergency procedures manual and exercisesWastewater supply Mutual Aid PlanEmergency procedures manual and exercises	Moderate (3)	Possible (3)	Medium (9)		Monitor climate change and sea level rise. Not expected to be an issue until close to 2100.
Tidal wave	Plant		Civil Defence Emergency Management PlanWastewater supply Mutual Aid Plan	Extreme (5)	Rare (1)	Medium (5)		Rare event. Treatment dependent upon size of event and range from re-establishing biota in oxidation pond to repair and re-establish pond.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Movement failure caused by, Earthquake, landslide or settlement/ liquefaction.	Plant		Civil Defence Emergency Management PlanEmergency procedures manual and exercisesWastewater supply Mutual Aid Plan	Major (4)	Unlikely (2)	Medium (8)		Rare event. Treatment dependent upon size of event and range from repair and re-establish pond through to rebuild site.
Failure to achieve consent conditions: Odour	Ponds	Failure to comply with resource consents.Customer complaints.	Recent upgrading work has introduced pre-treatment processes to minimise loading fluctuations.Currently the pond is required to be operated and maintained in a manner that employs best practicable options that includes:- Pond loadings are adjusted for different seasons and conditions- Loading profile of the ponds are known and operated to these limits- A regular pond monitoring and sampling programme is in place-Sporadic odour problems continue feature in the operation of the Nelson North Waste Water Treatment Plant. Current investigations have centred on the build up of sludge in the pond. Budgets have been identified for further investigation and some remedial de-sludging.	Major (4)	Possible (3)	High (12)		Ensure clear delineation between waste water treatment plant, pump station, reticulation in systems and reports. Monitor treatment plant odour producing areas regularly.
Sludge build up reduces capacity and effectiveness of the ponds.	Ponds	Failure to comply with resource consents.Customer complaints.	Ponds de-sludged in 2014. Sludge build-up will be monitored and ponds de-sludged when reqd. Future budget is included in 30 year tables.	Major (4)	Unlikely (2)	Medium (8)		Monitor sludge build-up in ponds and clarifier.
Harm to operators from exposure to sewage	All	Operator becomes ill from exposure to sewage.	Health and Safety training. Preventative innoculation of staff.	#N/A	#N/A	#VALUE!		Health and Safety training.
	RISING MAINS							
Deterioration and acid attack	Atawai - concrete	Deterioration and failure of asset resulting in loss of service, health and safety issues and wastewater discharges to the environment having an impact on environmental and cultural issues. No waste water from Nelson City can be pumped to waste water treatment plant.	The construction of the Corder Park pump station will reduce the pressure profile in the bulk of the rising main and is expected to reduce the risk of failure. The installation of air valves at high points in the main will remove the accumulated hydrogen sulphide gas and lessen the risk of ongoing acid attack.Contingency Plan in EPM	Major (4)	Possible (3)	High (12)		A re-evaluation of the strategy for condition profiling (including Closed circuit television) is requiredInitiate investigation and regulatory processes for construction of duplicate main

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Deterioration	Other	Other mains failure points - discharges to the environment having an negative impact on environmental and cultural issues	Prevention through inspection and remedial strategy.	Major (4)	Possible (3)	High (12)		A re-evaluation of the strategy for condition profiling (including Closed circuit television) is required
Discharge of hazardous substances to the sewer	Atawhai	Significant health and safety risks to operations and contracting personnel. Deterioration and failure of sewer asset resulting in loss of service. Possibility of impairing the treatment process and limiting the reuse of sludge and effluent.	Trade Waste consents and Trade Waste Bylaw.Regular inspection of pump stations.	Major (4)	Unlikely (2)	Medium (8)		Begin regular Trade Waste monitoring
Inaccurate and/or Unknown Location of pressure line	Atawhai		Existing As-Built Plan of reticulation.	Major (4)	Unlikely (2)	Medium (8)		Upgrade As-Built as opportunities allow.
Movement failure caused by, Earthquake, landslide or settlement/ liquefaction.	Atawhai		Civil Defence Emergency Management Procedures Manual.	Major (4)	Possible (3)	High (12)		Emergency Procedures Manual. Temporary bunding if necessary. Immediate repair if possible.
	RETICULATION							
Sewerage blockages	Gravity - trunk mains	Overflow- discharges to the environment having an negative impact on environmental and cultural issues	Renewal of old pipelines. Clear blockage.	Moderate (3)	Possible (3)	Medium (9)		Ongoing renewal programme.
Non-compliant Trade waste / Hazardous Waste discharge to network	Gravity - trunk mains	Mains failure- discharges to the environment having an negative impact on environmental and cultural issues	Prevention through future enhanced monitoring.	Moderate (3)	Possible (3)	Medium (9)		Appoint additional Trade Waste monitoring staff
Stormwater Infiltration	Gravity - trunk mains	Overflows - discharges to the environment having an negative impact on environmental and cultural issues	Renewal of old pipelines and investigation of private sewers.	Moderate (3)	Possible (3)	Medium (9)		A re-evaluation of the strategy for condition profiling (including Closed circuit television) is required
Pipe collapse	Gravity - trunk mains		Strategic approach to renewal regualr inspection.	Moderate (3)	Unlikely (2)	Medium (6)		Develop Closed circuit television monitoring strategy

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Inaccurate and/or Unknown Location of sewer line	Gravity - trunk mains		Use existing As-Built Plan of reticulation.	Moderate (3)	Possible (3)	Medium (9)		Upgrade As-Built as opportunities allow.
Odours from Reticulation	Gravity - trunk mains		Trunk mains vented.	Moderate (3)	Possible (3)	Medium (9)		Investigate odour control or masking if necessary.
Mains up to 175mm dia. Failure caused by Earthquake, landslide or settlement/ liquefaction.	Gravity - trunk mains		Localised facilities to be isolated and repaired as a priority work. Extensive failures discharge to environment and public health warnings put in place by Civil Defence Emergency Management Plan.	Moderate (3)	Unlikely (2)	Medium (6)		Investigate storage options and 'pump around' options.
Mains > 175mm Failure caused by, Earthquake, landslide or settlement/ liquefaction.	Gravity - trunk mains		Localised facilities to be isolated and repaired as a priority work. Extensive failures discharge to environment and public health warnings put in place by Civil Defence Emergency Management Plan.	Major (4)	Unlikely (2)	Medium (8)		Investigate storage options and 'pump around' options.
Discharge of deleterious substances to the sewer	Sewer mains	Silt and gravel in the sewer system can obstruct and block sewer pipelines as well as cause excessive wear to pump stations. Fat and grease can deposit on the inside of the pipeline causing obstruction and blockages.	Trade Waste consents and Trade Waste Bylaw.Regular inspection of pump stations.	Moderate (3)	Possible (3)	Medium (9)		Appoint additional Trade Waste monitoring staff
Discharge of high flows and/or loads to the sewer	Sewer mains	High peak flows to the sewer increase the likelihood of overflows at manholes and pump stations. Discharge of high loads to the sewer can affect the operation of the treatment plant.	Regular monitoring of pump station flows.	Moderate (3)	Possible (3)	Medium (9)		Calibrate pump station flow meters & regular monitoring to detect possible inaccuracies
Discharge of hazardous substances to the sewer	Sewer mains	Significant health and safety risks to operations and contracting personnel. Deterioration and failure of sewer asset resulting in loss of service. Possibility of impairing the treatment process and limiting the reuse of sludge and effluent.	Trade Waste consents and Trade Waste Bylaw.Regular inspection of pump stations.	Moderate (3)	Possible (3)	Medium (9)		Appoint additional Trade Waste monitoring staff

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
	PUMP STATIONS							
Power failure/System failure	Neale Park	Overflows - discharges to the environment having an negative impact on environmental and cultural issues	Stand-by generators and additional storage capacity [reduces probability of failure]Redevelopment of the pump station is programmed.	Major (4)	Possible (3)	High (12)		Formalise strategy for failure of pump stations that include contingency planning, lifelines and emergency management
Equipment/ component Failure	Neale Park	Wastewater discharges to the environment having an negative impact on environmental, cultural and health issues.Customer complaints.No wastewater from Nelson City can be pumped to waste water treatment plant.	Processes within pump station that has contingencies for failure (duplication of pumps) or alarm systems (Supervisory control and data acquisition) installed.Redevelopment of the pump station is programmed.	Major (4)	Possible (3)	High (12)		Formalise strategy for failure of pump stations that include contingency planning, lifelines and emergency management
Insufficient Wet Weather Storage Capacity	Neale Park	Insufficient storage or capacity resulting in wastewater discharges to the environment having an impact on environmental and cultural issues	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions.Wet weather overflows due to volumes greater than the design limit require storage or resource consent for discharge to the environment.	Major (4)	Possible (3)	High (12)		Investigate storage capacity of network, document, & develop mitigation strategy
Odours from pump Stations	Neale Park		Ventilation and biofilters. Distance from public areas.	Moderate (3)	Possible (3)	Medium (9)		Identify pump station in need of odour mitigation and develop strategy to include possible use of biofilters
Corrosion and sulphur attack	Neale Park		Regular inspection and monitoring of effluent.	Moderate (3)	Unlikely (2)	Medium (6)		Detail proposed new pump station construction to minimise impact.
Vandalism	Neale Park		Construct compounds of vandal resistant materials. Install security fences.	Moderate (3)	Unlikely (2)	Medium (6)		Upgrade security lighting and cameras.
Movement failure caused by earthquake,	Neale Park		Civil Defence Emergency Procedures Manual.	Major (4)	Unlikely (2)	Medium (8)		Ensure new construction is detailed to resist impacts of earthquakes/liquifaction and flooding.
Tidal wave inundation	Neale Park		Civil Defence Emergency Management Plan.Emergency Procedures Manual.	Major (4)	Rare (1)	Medium (4)		Rare event. Ensure new construction is detailed to resist impacts of tidal inundation/tsunami as far as practicable.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Discharge of deleterious substances to the sewer	Neale Park - Sewer Mains	Silt and gravel in the sewer system can obstruct and block sewer pipelines as well as cause excessive wear to pump stations. Fat and grease can deposit on the inside of the pipeline causing obstruction and blockages.	Trade Waste consents and Trade Waste Bylaw.Regular inspection of pump stations.	Moderate (3)	Possible (3)	Medium (9)		Appoint additional Trade Waste monitoring staff
Discharge of hazardous substances to the sewer	Neale Park - Sewer Mains	Significant health and safety risks to operations and contracting personnel. Deterioration and failure of sewer asset resulting in loss of service. Possibility of impairing the treatment process and limiting the reuse of sludge and effluent.	Trade Waste consents and Trade Waste Bylaw.Regular inspection of pump stations.	Moderate (3)	Possible (3)	Medium (9)		Appoint additional Trade Waste monitoring staff
Storm surge inundation	Monaco	Inoperative pumps. Loss of service.	Raised electrics. Civil Defence Emergency Management Plan. Emergency Procedures Manual	Moderate (3)	Unlikely (2)	Medium (6)		
Storm surge inundation	The Glen	Inoperative pumps. Loss of service.	Civil Defence Emergency Management Plan. Emergency Procedures Manual	Moderate (3)	Rare (1)	Low (3)		Raise electrics
Power failure/System failure	Other	Overflows - discharges to the environment having an negative impact on environmental and cultural issues	Stand-by generators and additional storage capacity.	Major (4)	Possible (3)	High (12)		Formalise strategy for failure of pump stations that include contingency planning, lifelines and emergency management
Insufficient Wet Weather Storage Capacity	Other	Insufficient storage or capacity resulting in wastewater discharges to the environment having an impact on environmental and cultural issues	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions.et weather overflows due to volumes greater than the design limit require storage or resource consent for discharge to the environment.	Major (4)	Possible (3)	High (12)		Investigate storage capacity of network, document, & develop mitigation strategy
Insufficient Dry Weather Storage Capacity	Other	Insufficient storage or capacity resulting in wastewater discharges to the environment having an impact on environmental and cultural issues	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions.Back up emergency generationIncrease system storage capacity for 4 hrs average dry weather flow	Major (4)	Unlikely (2)	Medium (8)		Investigate storage capacity of network, document, & develop mitigation strategy

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Odours from pump Stations	Other		Ventilation and biofilters. Distance from public areas.	Moderate (3)	Possible (3)	Medium (9)		Identify pump station in need of odour mitigation and develop strategy to include possible use of biofilters
Corrosion and sulphur attack	Other		Regular inspection and monitoring of effluent.	Moderate (3)	Unlikely (2)	Medium (6)		Regular washing of wet well. Monitor and reline well if necessary.
Vandalism	Other		Construction compounds or of vandal resistant materials.	Moderate (3)	Unlikely (2)	Medium (6)		Review all pump stations for vandalism risk.
Movement failure caused by earthquake,	Other		Civil Defence Emergency Procedures Manual.	Major (4)	Unlikely (2)	Medium (8)		Investigate temporary 'pump around' options. Repair if possible.
Tidal wave inundation	Other		Civil Defence Emergency Management Plan.Emergency Procedures Manual.	Major (4)	Rare (1)	Medium (4)		Rare event. Investigate temporary 'pump around' options. Repair if possible. Emergency Procedures
Discharge of deleterious substances to the sewer	Other - Sewer Mains	Silt and gravel in the sewer system can obstruct and block sewer pipelines as well as cause excessive wear to pump stations.Fat and grease can deposit on the inside of the pipeline causing obstruction and blockages.	Trade Waste consents and Trade Waste Bylaw.Regular inspection of pump stations.	Moderate (3)	Possible (3)	Medium (9)		Appoint additional Trade Waste monitoring staff
Discharge of hazardous substances to the sewer	Other - Sewer Mains	Significant health and safety risks to operations and contracting personnel. Deterioration and failure of sewer asset resulting in loss of service. Possibility of impairing the treatment process and limiting the reuse of sludge and effluent.	Trade Waste consents and Trade Waste Bylaw.Regular inspection of pump stations.	Moderate (3)	Possible (3)	Medium (9)		Appoint additional Trade Waste monitoring staff

Appendix Table E-1: Consequence Rating (Impact)

Rating	Safety	Health	Asset Performance/ Service Delivery	Environmental/ Historical/cultural	Financial	Political / Community/ Reputational	Relationship with Iwi	Legal compliance	Information/ decision support
Exterme (5)	Multiple fatalities of workers or public (MF)	Significant loss of life expectancy for multiple persons or incapacity for more than 1000 person days	Service not provided for more than 5000 person days	Permanent environmental damage on a nationally significant scale and/or permanent loss of nationally significant building, artwork, or other valued entity	Overspend, loss (i.e. spend without result) or income loss of > $5m OR >100% of business unit budget	Major loss of public confidence in Council (>2000 opponents via social media or other mediums) Negative international mainstream media coverage; shareholder or key stakeholder outage; or loss of a key customer	Major breakdown of relationship affecting multiple areas. Refusal to resolve without one or more major concessions from council	Litigation/ prosecution or civil action successful resulting in major (>50% of maximum available) fine/costs awarded and/or imprisonment of council officer.	Multiple errors in information and analysis and presentation misleading (intentionallly or not) or not understandable by non- specialists
Major (4)	Single fatality of workers or public (SF)	Single loss of life expectancy or incapacity for between 100 and 1000 person days	Service not provided for less than 5000 person days but more than 500 person days	Major environmental damage with long-term recovery requiring significant investment and/or loss or permanent damage to a registered historical, cultural or archaeological site or object	Overspend, loss (i.e. spend without result) or income loss of > $1m and <$5m OR between 70% and 100% of business unit budget	Significant negative public reaction likely (200-2000 opponents via social media or other mediums) Negative national mainstream media coverage; significant negative perception by shareholder or key stakeholder; or a customer disruption	Significant breakdown of relationship largely in in one area. Some concessions from council sought before substantive issue considered by iwi grouping affected	Litigation/ prosecution or civil action successful resulting in minor fine(<50% of max available)/ costs awarded.	One major error in information, analysis incomplete and presentation ambiguous
Moderate (3)	Notifiable injury of workers or public.	Incapacity for between 20 and 100 person days	Service not provided for less than 500 person days but more than 50 person days	Measurable environmental harm on a nationally significant scale. Some costs in terms of money and/or loss of public access or conservation value of the site and/or restorable damage to historical, cultural or archaeological site or object	Overspend, loss (i.e. spend without result) or income loss of > $0.5m and <$1m OR between 30% and 70% of business unit budget	Some negative public reaction likely (30-200 opponents via social media or other mediums) Repeated complaints; Regulatory notification; or negative stakeholder, local media attention	Major relationship damaged in a single area but amenable to negotiation	Documented Breach of legislation, no legal action or prosecution or civil action not successful.	Information correct but presentation/ analysis insufficient to support decision on the day
Minor (2)	Serious injury on one person requiring medical treatment (MA)	Incapacity for between 1 and 20 person days	Service not provided for less than 50 person days but more than 5 person days	Medium term environmental impact at a local level and/or development compromising the integrity of a registered historical, cultural or archaeological site	Overspend, loss (i.e. spend without result) or income loss of > $100k and <$500k OR between 10% and 30% of business unit budget	Minor public reaction likely (<30 active opponents via social media or other mediums) Workforce attention; limited external attention;	Relationship damage resolvable through normal communication/ consultation mechanisms	Formal warning of breach from legislative authority.	Information correct, analysis complete but presented in a way which could be misinterpreted
Insignificant (1)	Minor injury requiring only first aid or less (FA)	Incapacity for less than 1 person day	Service not provided for between 1 & 5 person days	Short term and temporary impact requiring no remedial action and/or restorable loss damage to historical/ cultural record	Overspend, loss (i.e. spend without result) or income loss of > $10k and <$100k OR between 5% and 10% of business unit budget	Very limited negative reaction (1 or 2 active opponents via social media or other mediums) Internal attention only from staff directly working on the matter.	Iwi/ tribe/ hapu public dissatisfaction resolvable through routine communication	Breach of minor legislation/ no legal action	Small errors in information or presentation - no effect on decision

Appendix Table E-2: Risk Matrix – Consequences x Likelihood

CONSEQUENCES					LIKELIHOOD of the given consequence occurring			
Insignificant(1)	Minor (2)	Moderate (3)	Major (4)	Extreme (5)	Descriptor	Qualitative guidance statement	Indicative Probability range %	Indicative frequency range (years)
Medium (5)	Medium (10)	High (15)	Very High (20)	Very High (25)	Almost certain (5)	The consequence can be expected in most circumstances OR *A very low level of confidence/information*	>90%	>1 occurrence per year
Medium (4)	Medium (8)	High (12)	High (16)	Very High (20)	Likely (4)	The consequence will quite commonly occur OR *A low level of confidence/information*	20% - 90%	Once per 1-5 years
Low (3)	Medium (6)	Medium (9)	High (12)	High (15)	Possible (3)	The consequence may occur occasionally *A moderate level of confidence/information*	10% - 20%	Once per 5-10 years
Very Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)	Unlikely (2)	The consequence may occur only infrequently *A high level of confidence/information*	2% - 10%	Once per 10 - 50 years
Very Low (1)	Very Low (2)	Low (3)	Medium (4)	Medium (5)	Rare (1)	The consequence may occur only in exceptional circumstances *A very high level of confidence/information*	<2%	Less than once per 50 years

Appendix Table E-3: Residual Risk Tolerance

Risk Level	Description and Action	Authority for continued tolerance	Timing for implementing action	Obligation to promptly advise including advising treatments
Very High	Not normally tolerable, immediate intervention to reduce risk	Full Council on advice from CE	Immediate if possible but no more than one month	Full Council using best practicable means
High	Not normally tolerable, initiate action as soon as practicable to reduce risk below High	SLT or Group Manager (Council at CE discretion)	As soon as practicable but no more than 2 months	SLT or accountable Group Manager (Council at CE discretion)
Medium	Normally tolerable, frequently review to look for opportunities to further reduce risk where practicable	Business Unit Manager	At least within one quarter	Accountable Group Manager
Low	Acceptable risk, routine review for low cost actions to reduce risk further	No specific authority required	Routine review period (e.g. 3- 6 monthly)	None
Very Low	Acceptable risk, no specific actions to reduce further	No specific authority required	Only if incidental to another action	None

From Nelmac November 2017.

No	Generator/Location	Contact	Transport Required	Generator Connection	Comments	Pump Station
1	NCC 300kVA - NWWTP	Duty Operator 0272 268 662	NA	Permanently wired	Manual start when required on mains power failure	NWWTP
2	NCC 200kVA - Oxford St	Duty Operator 0272 268 662	NA	Permanently wired	Automatic start on mains power failure	Vanguard Street.
3	NCC 50kVA - Vickerman Street Pump Station	Duty Operator 0272 268 662	NA	Permanently wired	Automatic start on mains power failure	Vickerman Street.
4	NCC 350kVA - Neale Pk pump station	Duty Operator 0272 268 662	NA	Permanently wired	Automatic start on mains power failure	Neale Park - also wired to run one pump at the Wood SW station
5	NCC 300kVA - Corder Pk Pump Station	Duty Operator 0272 268 662	NA	Permanently wired	Automatic start on mains power failure	Corder Park.
6	NCC Lister 35kVA - Nelmac Depot, 2 Bullen St.	Duty Operator 0272 268 662	GW 1620kg *	32 AMP PDL	Runs one pump	**Weka St,** Akersten St, Clouston Br, Cemetary Pt.
7	NCC Powerlink 137kVA - Trafalgar Pk Storage	Duty Operator 0272 268 662	GW 2860kg *	Cables to be connected by electrician - IME	IME 03 548 5804 24hrs	**Russell Street.**
8	NCC Powerlink 80kVA - Trafalgar Pk Storage	Duty Operator 0272 268 663	GW 2240kg *	32 AMP PDL	Will run two pumps at most stations	**Parkers #1**, Parker #2, Beach Rd, Skating Rink.
9	NCC Green Baifa 50kVA - Trafalgar Pk Storage	Duty Operator 0272 268 662	GW 1860kg *	32 AMP PDL	Runs one pump	**Paru Paru Road.**
10	NCC White Baifa 50kVA - Trafalgar Pk Storage	Duty Operator 0272 268 662	GW 1880kg *	32 AMP PDL	Runs one pump	**Quarantine Rd,** Monaco, Monaco View, Venice Place (sucker truck option for Monaco)
11	NCC Chinese 30kVA - Trafalgar Pk Storage	Duty Operator 0272 268 662	GW 1220kg *	32 AMP PDL	Runs one pump	Brooklands Rd, Marybank, Todds Valley, The Glen.

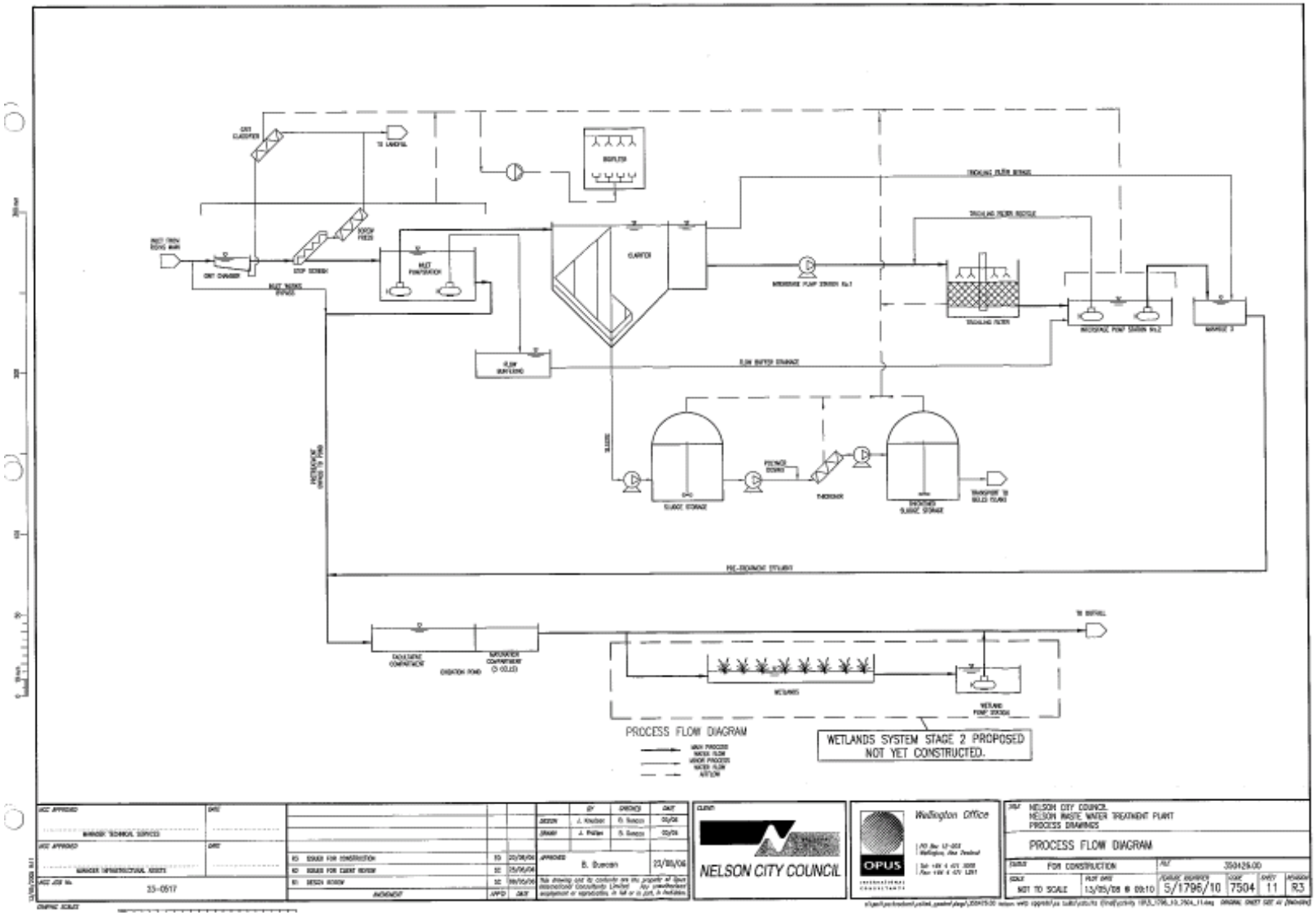
12	FH Flaxmore Quarry - check generator availability	Troy Adamson 0273 181 373 03 547 9789 24hrs	Lift n Shift Hiab 03 547 0670 24hrs	Cables to be sourced and connected by electrician - IME	IME 03 548 5804 24hrs	Stations as required
13	Hirepool Nayland Rd - check generator availability	Hirepool 03 546 9259	Check GWs *	Cables to be sourced and connected by electrician - IME	IME 03 548 5804 24hrs	Stations as required

NOTES: * vehicles towing generators must have a braked tow rating greater than the GW which is stamped on the plate fixed to one of the trailer mudguards.

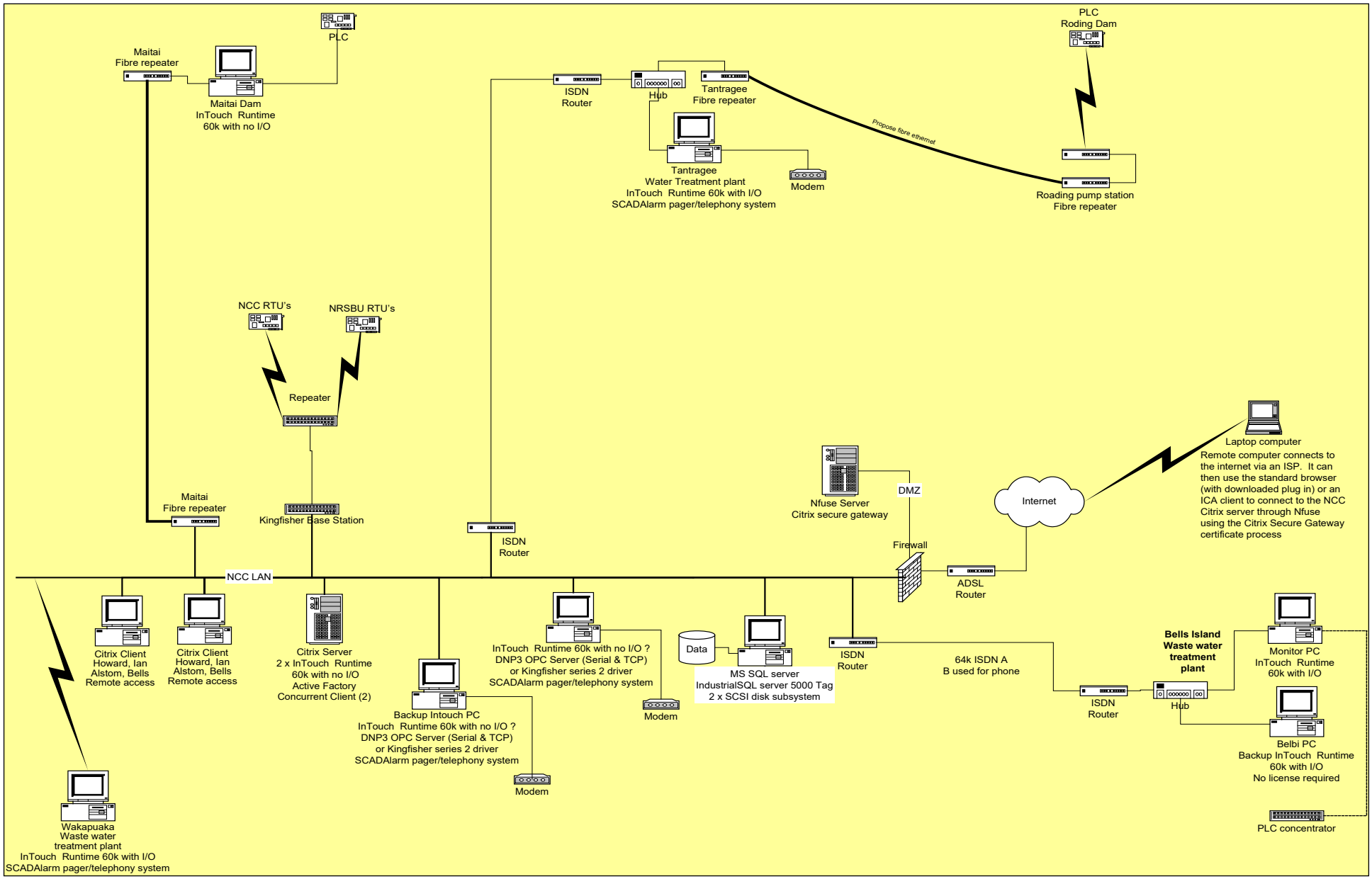
Pump Stations in **BOLD** indicates priority of pump down sequence but will depend on extent of power outage and other events occuring at the time e.g. storm.

APPENDIX G: SCHEMATICS

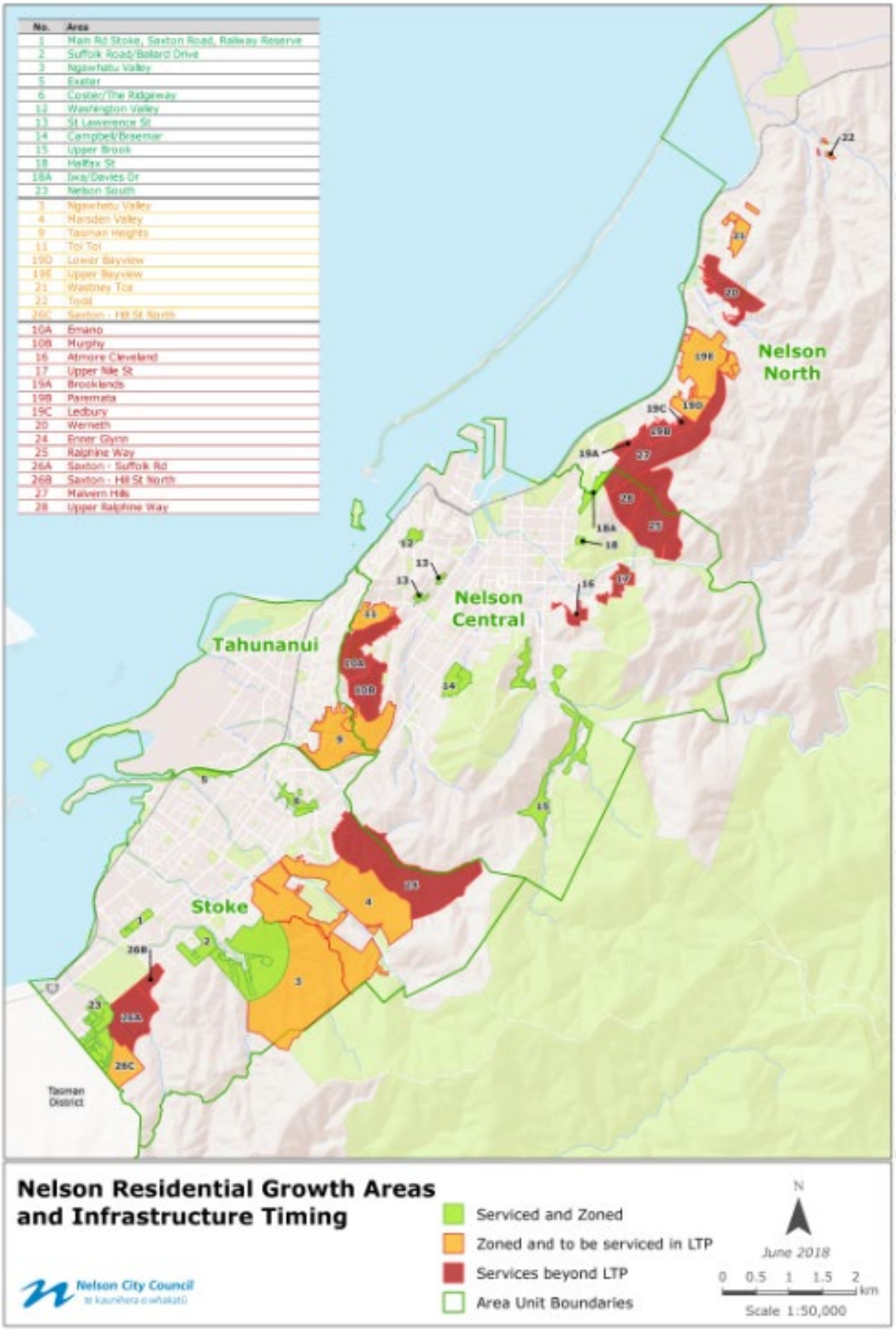
Appendix Figure G-1: Nelson Waste Water Treatment Plant Schematic



Appendix Figure G-2: Supervisory control and data acquisition Schematic



APPENDIX I: INFRASTRUCTURE PLANNING PROCESS FOR GROWTH PROJECTS



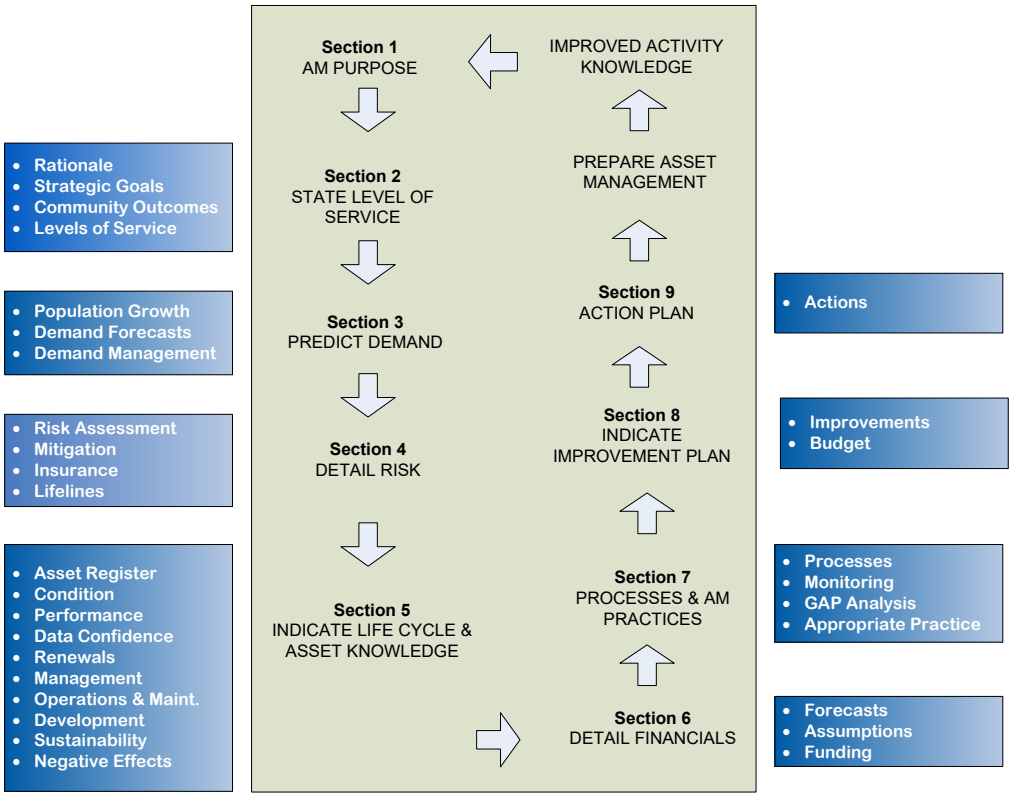
APPENDIX J: PREVIOUS ASSET MANAGEMENT PLANS

The first asset management plan was completed in June 1999 and further plans were prepared in 2003 and 2005 to meet minimum requirements. Asset management changes since 1999 include:

- Significant Asset Management awareness at Council representative level
- Increased understanding and implementation of risk management principles in decisions
- Asset register implemented into Hansen
- Customer complaints and maintenance activities logged to Hansen
- Awareness of reticulation & pump stations issues via network modelling
- Awareness of pipe condition and performance
- Increased monitoring and data collection of pump stations performance and capacity through Supervisory control and data acquisition system
- Increased use of advanced asset management practices for strategic planning
- Expanded demand management strategies
- The Asset Management Plan Format

A mixture of the top down and bottom up approaches has been taken to develop this Asset Management Plan by using existing data followed by data improvement. The structure of this plan mirrors the logical process followed for asset management planning as shown in Figure J-1 below:

Appendix Figure J-1: Asset Management Process



APPENDIX K: 30 YEAR INFRASTRUCTURE STRATEGY

The requirement for an infrastructure strategy arose from advice provided by Better Local Government programme advisory groups. The strategy is intended to improve local authorities' delivery of core infrastructure and management of physical assets. It should identify strategic issues facing the council and the future implications and is intended to add transparency for residents and ratepayers about these issues and their consequences.

The strategy is included in the LGA 2002 Amendment Act (2014).

This Asset Management Plan contains the information that would form the basis of the Wastewater utility section of an integrated strategy, in particular the following are addressed in the sub sections of the plan either directly or as areas that will require future work:

a) What level of infrastructure investment, if any, is necessary to provide for growth in the community. See section 3.2 -Demand Forecast and section 6.6- Capital Programme;

b) Managing the timing of investment for growth, to avoid constraints on growth from limited infrastructure capacity while minimising the costs to the community of underutilised infrastructure capacity. See section 3.2 -Demand Forecast and section 6.6- Capital Programme;

c) What level of investment is needed to maintain, renew and replace existing assets.See section 6.5-Renewal Strategy;

d) Balancing service level expectations with affordability in the context of demographic changes such as depopulation and aging. See section 2- Levels of Service;

e) What level of investment, if any, is needed to improve the level of service provided by those assets. See section 2- Levels of Service;

f) Planning for maintenance, growth and possible increases or decreases in levels of service provided. See section 2- Levels of Service, section 3- Future Demand, section 5.7 - Operations and Maintenance Plan;

g) Managing or improving public health and environmental outcomes, or mitigating adverse effects on them. See section 2 -Levels of Service;

h) Managing the risks to and resilience of, infrastructure assets from natural disasters. See section 4- Emergency and Risk Management;

i) Managing the financial provision for risks to infrastructure assets from natural disasters. See section 4- Emergency and Risk Management;

j) Indicative estimates of the projected operating expenditure and capital requirements for each year. See section 5.7- Operations and Maintenance Plan, sections 5.8 and 6.5- Renewal Strategy, sections 5.9 and 6.6 -Capital Programme;

k) Assumptions about service levels and asset lives on which the projections are based.

See section 2- Levels of Service and section 6.2- Asset Valuation and Depreciation;

l) Assumptions involving significant uncertainty- the nature of that uncertainty and its potential impacts. See section 4- Emergency and Risk Management.

APPENDIX L: NELSON WASTEWATER TREATMENT PLANT ASSET MANAGEMENT PLAN

Asset Management of the Treatment Plant is not well documented. At this point in time there are renewal details but no single document that covers all aspects of asset management. Further work is required to develop a full Asset Management Plan

NWWTP 2016 Annual Audit

Asset Schedule:

The plant asset schedule spreadsheet forms the basis of the long term renewal strategy currently under development.

Renewal Schedule:

The renewal requirements for the NWWTP have been revised by the contractor and a minor amendment to the budget for the treatment plant will be required in 2017/18. This will be addressed through an Annual Plan.

Appendix Table L-1:

NWWTP - Renewals Schedule

Sum of TOTAL ($)		Renewal Year														
Type	Sub-Type	2015	2017	2018	2020	2021	2022	2023	2025	2026	2030	2033	2036	2038	2039	2040
EQUIPMENT	CHEMICAL MIXING / DOSING		$4,860		$36,000		$30,000		$4,280		$550	$68,105				
	INSTRUMENTS, ELECTRICAL & CONTROL								$2,340							
	LIGHT MECHANICAL EQUIPMENT								$7,000		$42,800	$166,260			$135,000	$30,000
	PUMPS, MOTORS		$15,000		$2,126		$113,000	$2,000	$41,338	$4,500	$18,004	$166,910				
	STRUCTURES											$383,660				
	(blank)				$0	$0	$0	$0	$0		$0	$0				
EQUIPMENT Total			$19,860		$38,126	$0	$143,000	$2,000	$54,958	$4,500	$61,354	$784,935			$135,000	$30,000
INSTRUMENTATION	INSTRUMENTS, ELECTRICAL & CONTROL	$819				$3,905	$5,535	$68,167	$17,854	$250						
INSTRUMENTATION Total		$819				$3,905	$5,535	$68,167	$17,854	$250						
MISCELLANEOUS PROCESS ITEM	INSTRUMENTS, ELECTRICAL & CONTROL							$689,635	$23,538							
	LIGHT MECHANICAL EQUIPMENT											$21,356	$7,000			
	PUMPS, MOTORS											$750				
	STRUCTURES			$7,000				$67,000				$115,952		$37,770		
	(blank)															
MISCELLANEOUS PROCESS ITEMS Total				$7,000				$756,635	$23,538			$138,058	$7,000	$37,770		
VALVES	LIGHT MECHANICAL EQUIPMENT												$50			
	VALVES						$713	$5,945				$85,886	$6,904			
	(blank)											$0				
VALVES Total							$713	$5,945				$85,886	$6,954			
WETLANDS	LIGHT MECHANICAL EQUIPMENT												$2,500			
	STRUCTURES								$20,000				$69,500			$7,300
	VALVES								$15,400				$4,000			
	PLANTING															
WETLANDS Total									$35,400				$76,000			$7,300
Grand Total		$819	$19,860	$7,000	$38,126	$3,905	$149,248	$832,747	$96,350	$40,150	$61,354	$1,008,879	$89,954	$37,770	$135,000	$37,300

Note: Structures includes for Earthen Embankments

APPENDIX M: INFLOW AND INFILTRATION STRATEGY

Appendix Table M-1:

Stormwater Entry Reduction Strategy		
	Activity	**Action / Status**
Prep Tasks	Print area plan and identify reticulation contributing to each Pump Station	Complete
	Mark up plans and create the contributing areas as an overlay in GIS	Complete
	Show all earthenware pipes in the reticulation plans	Complete
	Show all areas identified as having known overflow issues	Currently on hard copy map. Include as a GIS overlay
Phase 1	Evaluate Performance	This exercise identified some improvements needed in the recording of flow data at pump stations.
		Flow Meter Improvements:
	Run analysis of Pump Stations. Determine which react most to rainfall.	Action: Replace flow meter at Corder Park PS - Unlikely - PS currently being upgraded
		Action: - Replace flow meter at Parkers 1 - Install in ground with void creator. New Awatea PS unlikely to be operational until 2021
		Action: - Replace flow meter at Parkers 2 - Install in ground with void creator. New Awatea PS unlikely to be operational until 2021
		Action: - Re-set flow meter at Weka PS - Flow meter works fine, but has reached it's data

Stormwater Entry Reduction Strategy		
		limit in Intouch. Needs re-setting
		Rain Gauges:
		Action: - Confirm that all raingauge tags in Intouch are actually on site
		Action: - Ensure Rain Gauges at the following PS are working correctly.
		Action: - Add Rain Gauges to regular maintenance schedule.
Phase 2	Identify Key Performance Indictors	
	Assess whether response to rainfall is immediate and falls of quickly (inflow) OR if response is more prolonged (infiltration)	
Phase 3	Prioritise Areas for Investigation	Identify key manholes to lift during wet weather
		Visit all key manholes during wet weather to narrow down problem areas
		If there is reasonable flow, keep tracing back until flow is negligable. This will help narrow down area to investigate
		Colour code plans showing severity of I/I based on visual inspections

Stormwater Entry Reduction Strategy		
Phase 4	Source Detetion Activities	Catchments to focus on for 2015/16 and 2016/17:
	Areas generating high flows to be subject to a programme of MH locates, visual inspections, smoke testing, dye testing and cctv as required.	Halifax Trafalgar 1 Trafalgar 2
		Marybank (MH locates only)
	Failures located to be identified, costed and incorporated into list for prioritisation for repair	
Phase 5	Prioritise repairs within available budget	
	Prioritise defects list within available budgets	
Phase 6	Undertake repairs	
Phase 7	Assess Rehabilitation Effectiveness	Re-run analysis of pump stations to determine the repair effectiveness and highlight if further issues still exist
Phase 8	Ongoing: Run analysis of pump stations reaction to rainfall on a 6 monthly basis. Repeat steps above as necessary	

Appendix Table M-2:

SubCatchment Name	Shape_Length	EWRE Pipe length	EWRE % of Length	Wastewater Non Commercial	Wastewater Commercial	GIS Residential Population (2.5)	Modelled Residential Population	No. Manholes	Pump Station	Modelled ADWF (l/s)	Modelled PWWF (l/s)	Inflow Priority - PS (SWI1)	Infiltration Priority - PS (GWI1)	Infiltration Priority - PS (GWI2)	Catchment Priority	Catchment Priority Reasoning	No. Ozone SR	No. Infor WO		ACTION - Year 1
BEACH RD 1	4,559	744	16%	215	22	537.5	523	95	Beach Road	8.90	53	3.95	40.5	347	Medium		10	5		Key MH lift & visual check
BEACH RD 2	4,159	1,544	37%	194	17	485	465	112	Beach Road						High	% ewre, No. WO	26	13		Key MH lift & visual check
BEACH RD 3	2,422	161	7%	130	13	325	412	55	Beach Road						low		10	9		Key MH lift & visual check
BROOKLAND ROAD	6,150		0%	382	0	955		239	Brooklands		0	12.15	10.5	183	Medium	Check for cross connections	15	11		Key MH lift & visual check
CEMETARY POINT	2,311		0%	98	0	245		94	Cemetery Point		0	4.41	26.8	185	low		3	2		Key MH lift & visual check
CORDER PARK	11,990	76	1%	552	5	1380		293	Corder Park		0	5.65	19.9	182	low		13	10		Key MH lift & visual check
GRACE	2,922		0%	79	0	197.5	135	42	Grace St		0									Key MH lift & visual check
HALIFAX	4,965	1,299	26%	29	114	72.5	38	75	Paru Paru Rd	7.40	44	7.9	32.6	311	High	Intensification, % ewre	5	2		Key MH lift & visual check, CCTV & MH Locate - full catchment
WASHINGTON	12,920	2,174	17%	488	9	1220	1399	210	Paru Paru Rd						Medium	No. WO	30	21		Key MH lift & visual check
WAKEQUAY	6,274	1,084	17%	364	24	910	874	190	Russel St	10.70	64	9.51	28.6	395	Medium	No. WO	31	20		Key MH lift & visual check
HAVEN	2,881	457	16%	75	13	187.5	220	64	Russel St						low		6	1		Key MH lift & visual check
PORT	8,864	362	4%	0	98	0	0	92	Russel St						Medium	Tidal influence?	6	4		Key MH lift & visual check
RUSSELL	2,953	534	18%	166	3	415	356	63	Russel St						low		14	5		Key MH lift & visual check
MARYBANK	7,256	51	1%	322	0	805		164	Marybank		0	8.58	30.6	257	High	Unusually high I/I for steep hillside catchment	4	3		Key MH lift & visual check, MH Locate - full catchment
MONACO VIEW	3,741		0%	164	0	410		57	Monaco View		0				low		1	1		Key MH lift & visual check
PARKERS RD 1	13,376	521	4%	355	39	887.5	1300	194	Parkers Rd 1	7.10	43	3.27	33	875	Medium		19	7		Key MH lift & visual check
PARKERS RD 2	35,460	1,523	4%	1250	81	3125	3739	718	Parkers Rd 2	17.30	104	5.39	21.3	171	high	For partial area, No WO, growth	76	40		Key MH lift & visual check, CCTV & MH Locate - Partial area
POINT	667		0%	104	0	260	248	37	Point Rd		0						3	2		Key MH lift & visual check
QUARANTINE RD 1	1,928		0%	0	27	0	14	18	Quarantine Rd	15.50	93	4.04	34.2	389	Medium		2	1		Key MH lift & visual check
QUARANTINE RD 2	1,931		0%	49	45	122.5	134	63	Quarantine Rd						Medium		1	1		Key MH lift & visual check
QUARANTINE RD 3	11,977	548	5%	358	41	895	1034	151	Quarantine Rd						Medium		18	4		Key MH lift & visual check
QUARANTINE RD 4	5,860	140	2%	69	66	172.5	172	70	Quarantine Rd						Medium		1	1		Key MH lift & visual check
SAXTON	21,872		0%	674	71	1685	1407	365	NRSBU - Saxton	5.30	32	4.9	37.3	713	Medium		12	6		Key MH lift & visual check
SONGER 1	11,656	966	8%	383	14	957.5	1418	166	NRSBU - Songer	18.60	112	4.59	23.7	360	low		16	9		Key MH lift & visual check
SONGER 2	17,154	794	5%	757	54	1892.5	2108	297	NRSBU - Songer						low		22	11		Key MH lift & visual check
SONGER 3	35,875	1,476	4%	1540	42	3850	4368	585	NRSBU - Songer						low		36	17		Key MH lift & visual check
EX QUARANTINE RD 3	14,165	1,153	8%	665	7	1662.5	1931	307	NRSBU - Songer						low		28	17		Key MH lift & visual check
THE GLEN	1,417		0%	59	0	147.5		21	The Glen		0	6.7	0	5562	low		1	1		Key MH lift & visual check
TODD VALLEY	4,105		0%	69	0	172.5		65	Todd Valley		0	5.56	29	104	Medium					Key MH lift & visual check
STVINCENT	7,582	1,841	24%	197	96	492.5	474	115	Vanguard St	14.40	86	8.49	34.3	262	low		4	1		Key MH lift & visual check

SubCatchment Name	Shape_Length	EWRE Pipe length	EWRE % of Length	Wastewater Non Commercial	Wastewater Commercial	GIS Residential Population (2.5)	Modelled Residential Population	No. Manholes	Pump Station	Modelled ADWF (l/s)	Modelled PWWF (l/s)	Inflow Priority - PS (SWI1)	Infiltration Priority - PS (GWI1)	Infiltration Priority - PS (GWI2)	Catchment Priority	Catchment Priority Reasoning	No. Ozone SR	No. Infor WO		ACTION - Year 1
TRAFALGAR 1	8,073	1,027	13%	14	307	35	43	140	Vanguard St						Medium	Intensification	11	3		Key MH lift & visual check, CCTV & MH Locate - full catchment
TRAFALGAR 2	5,329	1,350	25%	91	208	227.5	256	120	Vanguard St						high	% ewre, intensification	10	5		Key MH lift & visual check, CCTV & MH Locate - full catchment
VANGUARDSTH	3,955	730	18%	86	82	215	306	66	Vanguard St						low		10	6		Key MH lift & visual check
HARLEY	937	549	59%	21	40	52.5	63	25	Vanguard St(?)						High	% ewre	4	3		Key MH lift & visual check
ATHEDRAL	333	139	42%	25	2	62.5	0		Vanguard St						low					Key MH lift & visual check
STJOHN	2,222	1,037	47%	154	16	385	410	38	Swallow 4	1.50	19				Medium	% ewre	1	0		Key MH lift & visual check
VANGUARDSTH1	12,495	4,495	36%	712	4	1780	2292	280	Swallow 1	2.70	35				Medium	% ewre, No. WO	71	30		Key MH lift & visual check
VANGUARDSTH2	23,297	7,424	32%	1015	37	2537.5	3583	551	Swallow 2	5.00	50				Medium	% ewre, No. WO	65	40		Key MH lift & visual check
RUTHERFORD	8,086	4,219	52%	444	43	1110	1353	177	Swallow 3	3.80	34				High	% ewre, No. WO	36	20		Key MH lift & visual check
TASMAN	13,890	3,178	23%	827	15	2067.5	2546	312	Swallow 5	13.10	43				Medium	No. WO	40	20		Key MH lift & visual check
CLOUSTON	1,754	499	28%	132	0	330	337	46	Clouston			4.52	6	1656	low		3	1		Key MH lift & visual check
WEKA EAST	6,937	702	10%	288	3	720	852	105	Weka St					3818	Medium		9	4		Key MH lift & visual check
WEKA NORTH	867	30	3%	12	0	30	43	18	Weka St	14.40	86	5.42	35.2		Medium					Key MH lift & visual check
WEKA SOUTH	12,335	2,323	19%	684	25	1710	2208	235	Weka St						Medium		5	1		Key MH lift & visual check
WEKA WEST	2,592	282	11%	39	11	97.5	243	35	Weka St						Medium		1	1		Key MH lift & visual check

APPENDIX N:

Appendix Table N-1: Renewal Assessment criteria

Indicator or Attribute	Definition	Weight
Public wastewater asset	Does the section meet the criteria for a public wastewater asset	Y/N
Public Health hazard	Would failure of the asset present a public health hazard	Y/N
Damage to property or roads	Is there evidence that more than minor damage to property or roads would be directly attributable to the failure of the wastewater asset	Y(1-5) /N(0)
Overall system capacity	Can the asset cope with demand and meet the levels of service	Y(1-5) /N(0)
Number of properties covered	Does the asset (location and or material) serve multiple properties (See public wastewater asset)	1-4 (1) 5-9(2) 10-19(3) 20-49(4) 50+(5)
Multiple system failures: Location	Has the asset failed more than once in the past 5 years?	Y 2-3(2) 4-6(5) 7+(8) N(0)
Multiple system failures: Material	Has the asset failed more than once in the past 5 years?	Y 2-3(2) 4-6(5) 7+(8) N(0)
Other NCC works in same general location	Is there an opportunity to combine works	Y(2)/N(0)
Condition Assessment	Results of condition assessment (Scale 1-5, Best-Worst)	1-2(0) 3(2) 4(4) 5(5)
Ground Water Infiltration	Recurring or multiple infiltration points without failure in past 5 years	Y 2-3(2) 4-6(5) 7+(8) N(0)
Accidental Discharge from the Network	Recurring or multiple overflow points in past 5 years	Y 2-3(2) 4-6(5) 7+(8) N(0)
Asset Criticality	Is it a critical asset	Y (10) N (0)

Asset Category	June 2012				June 2010			
	km/ units	RV ($000)	DRV ($000)	Depr ($000)	km/ units	RV ($000)	DRV ($000)	Depr ($000)
Reticulation Mains	310	110,274	66,129	1,342	303	86,860	53,380	1,056
Trunk Mains	34	14,225	6,715	192	34	13,282	6,572	179
Swallow Mains	6	3,385	392	64	5	3,016	381	58
Rising Mains	28	20,892	9,094	345	28	19,727	9,146	328
Access points	870	781	610	10	850	752	604	9
Manholes	6,547	26,869	16,233	333	6,441	22,544	13,907	280
Tanks	11	86	42	1	11	81	41	1
Valves	139	183	68	6	141	177	74	6
Neale Park Retention Tank	1	576	464	7	1	543	458	7
Pump Stations	25	6,785	2,509	205	26	6,657	2,642	203
Wakapuaka Treatment Plant	1	18,398	14,692	354	1	17,503	14,656	338
Total		**202,453**	**116,949**	**2,859**		**171,142**	**101,860**	**2,464**