DRAFT 2021 – 2031 Wastewater Activity Management Plan

2021 – 2031
Mahere Waipara

Nelson City Council
te kaunihera o whakatū

Quality Assurance Statement

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1		Draft for Council Infrastructure Committee	Various	A Louverdis	SLT
2		Draft approved by Infrastructure Committee to inform LTP 2021-31	Various	Councillors	Councillors
3 Final		Approved by Council	Various	Councillors	Council

Cover Photo

Nelson Wastewater Treatment Plant

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i The purpose of the plan

The Wastewater Activity Management Plan (Plan) outlines the current and future operational and capital requirements needed to operate, maintain, renew and upgrade assets to achieve the overall objective and activity specific goal defined below.

The overall objective of Activity Management planning is to:

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

The key elements of infrastructure activity management are:

- Taking a whole of lifecycle approach.
- Developing cost-effective management strategies for the long-term.
- Providing a defined level of service and monitoring performance.
- Understanding and meeting the impact of growth through demand management and infrastructure investment.
- Managing risks associated with asset failures and climate change.
- Sustainable practices, including use of energy and physical resources.
- Recognising and providing for the maintenance and enhancement of freshwater.
- Continuous improvement in activity management practices.

A formal approach to the management of infrastructure assets is essential in order to demonstrate how levels of service will be achieved in the most cost effective manner for the benefit of customers, investors and other stakeholders.

This Plan focuses on ensuring the wastewater assets supporting the activity are operated and maintained to provide the desired level of service, meet statutory requirements 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.

This Plan will provide the substantiation for budget forecasts put forward in the Long Term Plan (2021-2031) for the Wastewater Activity.

ii Asset description

Nelson City Council (NCC) 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 timeline of the wastewater treatment and disposal for the Nelson 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.

The extent of the NCC wastewater system is shown in Figures ES-1 and ES-2.

The wastewater assets are detailed in the Background Data section - 4.1 of this Plan. The inventory of public wastewater assets owned by NCC and managed by the Infrastructure Group - Utilities as at June 2020 is shown in Table ES-1.

Table ES-1: Summary of Wastewater Activity Assets

Asset Category	Quantity June 2020		Replacement Value
	km	units	$M
Reticulation Pipes (gravity – up to 150mm diameter)	337		184.78
Trunk Mains (gravity – 200mm diameter and above)	36.2		23.06
Swallow Mains (pressure gravity – 200 – 525mm diameter)	5.5		4.40
Rising Mains (pressure – 100mm to 900mm diameter)	25.1		27.72
Access points		986	1.07
Manholes		6985	62.87
Tanks (flushing and storage)		7	0.04
Valves		293	0.77
Neale Park Detention Tank		1	0.70
Pump Stations		25	9.69
Neale Park Pump Station		1	7.74
Corder Park Pump Station		1	7.02
Nelson Wastewater Treatment Plant		1	21.53
		Total	**351.39**

Figure ES-1: Nelson City Wastewater Network Bells Island Wastewater Treatment Plant

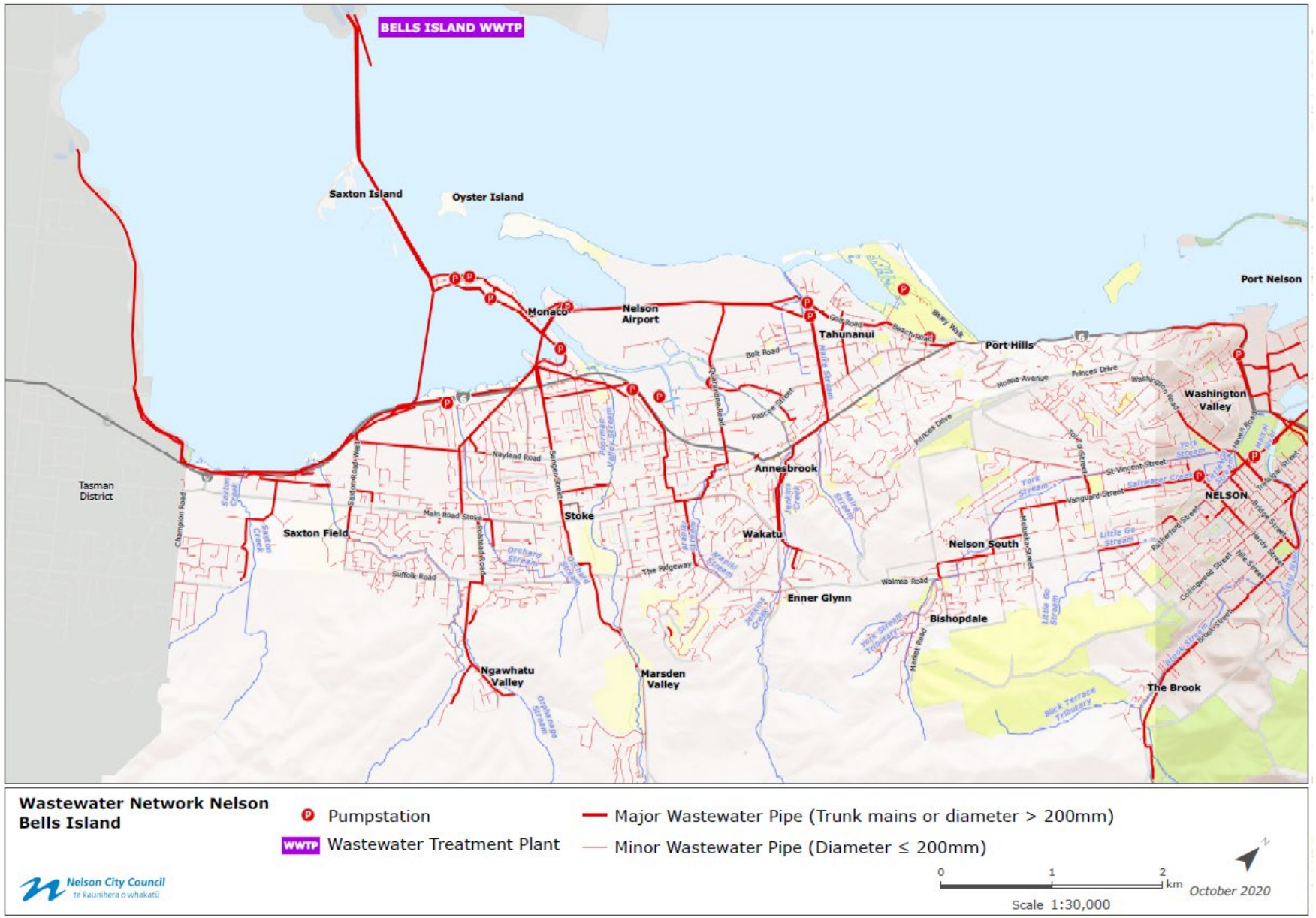
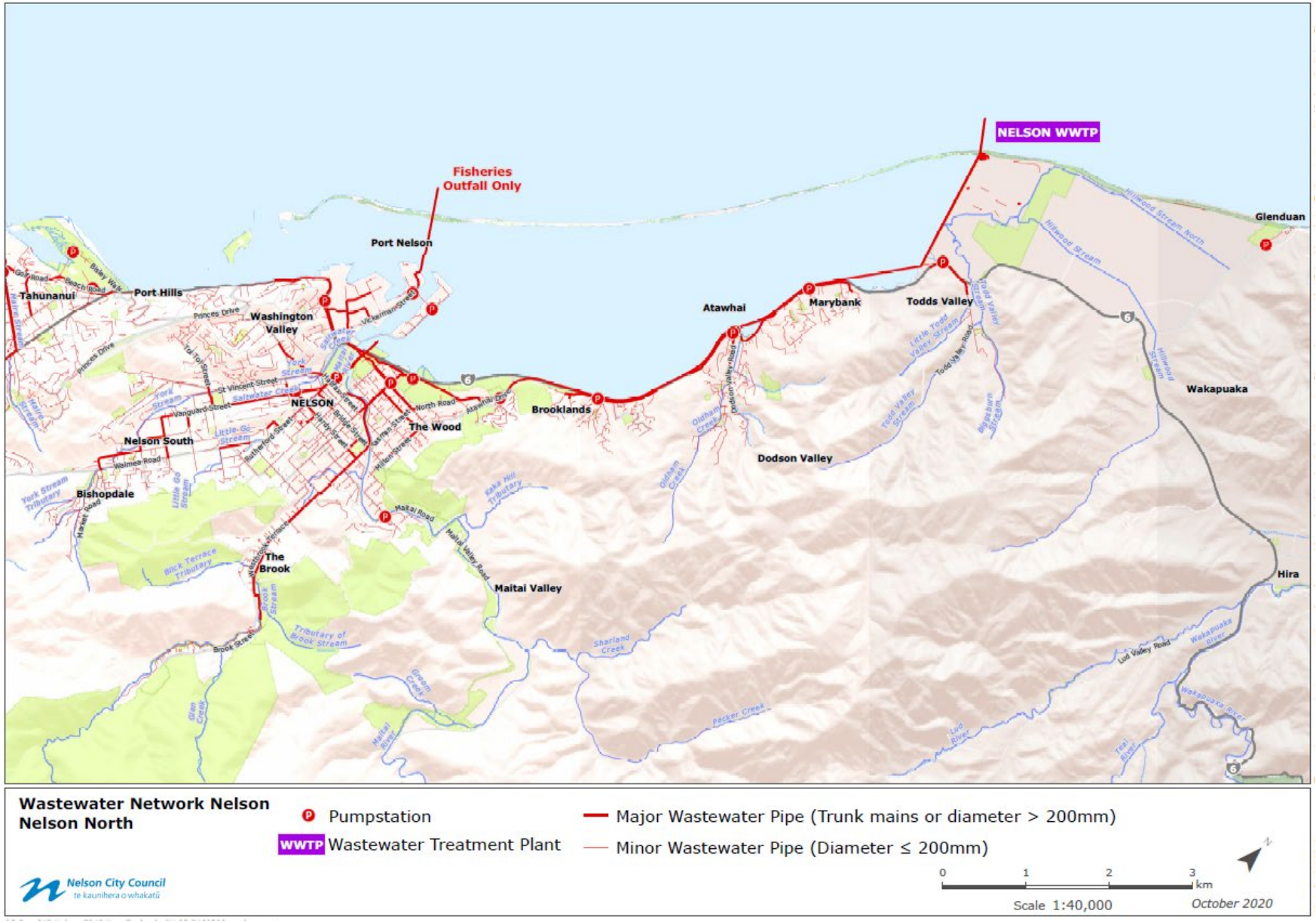


Figure ES-2: Nelson City Wastewater Network Nelson Wastewater Treatment Plant



iii Climate change

Climate Change as an Over-arching Issue:

Climate change is a significant and urgent international, national, and local issue. At a local level, NCC has a key role to work with the community towards mitigating the driving factors of climate change and creating a resilient and low emissions future and implementing adaptive measures to manage and minimise risk. Climate change has been identified as an over-arching issue as it potentially has a bearing on all of the identified issues for wastewater activity over the decades to come.

Climate change effects on the Wastewater Activity

The key climate change effects that will impact on Nelson City Council wastewater assets are sea level rise, and more intense storm rainfall associated with a warmer climate and the higher moisture retention capacity of the atmosphere.

The impacts of climate change are likely to result in the following:

- **Sea level rise**

  Sea level rise is the biggest climate challenge for Nelson as a large proportion of our urban infrastructure is coastal or low lying. Over the long term, these areas will become more vulnerable to coastal inundation (flooding) as tides and storm surges extend further inland over time. Additionally some areas are likely to become more prone to liquefaction in an earthquake due to elevated groundwater levels associated with sea level rise.

- **Heavy rainfall and flooding events**

  Higher intensity rainfall events will result in an increase in stormwater entering the wastewater system at any given location. The implication for the community is that without mitigation of these effects, they may experience more regular and extensive wastewater overflow events.

  Flooding has the potential to affect the wastewater network and the Nelson Wastewater Treatment Plant (NWWTP), resulting in wastewater overflows and contaminants discharging into the receiving environment.

  Increased river flood flows are likely to increase the risk to pipe assets that cross watercourses.

- **Droughts and extreme temperatures**

  With a warmer climate, the temperature of the wastewater within our network will increase. This is likely to lead to increased prevalence of odour issues and a greater incidence of corrosion of susceptible assets (particularly those made of concrete).

Climate Change Mitigation

The wastewater activity is part of the wider community commitment to reducing greenhouse gases through implementing Council's Certified Emissions Measurement and Reduction Scheme (CEMARS - Toitū Envirocare) Action Plan – see appendix A. The activity also needs to recognise the leadership role of Council and be able to develop climate change mitigation and adaptation strategies to advise the location, design and operation of our infrastructure.

In August 2020 Council committed to adopting the 5 year emissions reduction budgets to be developed and confirmed by Central Government at a national level in 2021. This commitment is to ensure that by 2025, Council realises measureable positive

change towards achieving carbon zero status. Longer term the Council has also adopted the Government targets for Council's own greenhouse gas (GHG) emissions reductions (i.e., net zero emissions of all GHG other than biogenic methane by 2050, and a 24 to 47 per cent reduction below 2017 biogenic methane emissions by 2050, including 10 per cent reduction below 2017 biogenic methane emissions by 2030). These targets are intended to be achieved through the development and implementation of a Council wide 'Emissions Reduction Action Plan'.

Figure ES-3 identifies the contribution of the wastewater activity to total council activities. This is low but not negligible. Figure ES-4 outlines the portion of the wastewater activities emissions that are directly attributable to its operations (greenhouse gases) and those that are indirect contributions (electricity).

Figure ES-3: Wastewater Carbon Emissions (% of Overall Council)

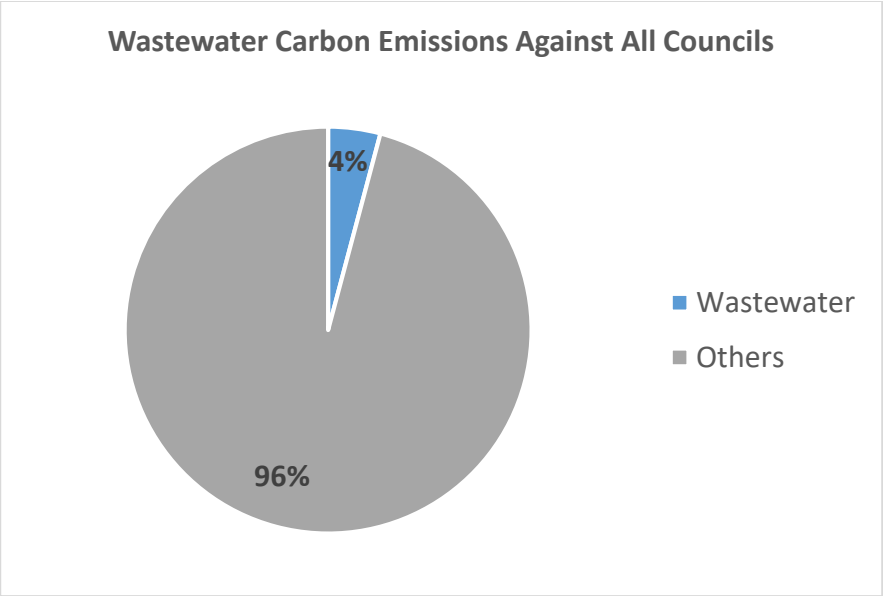
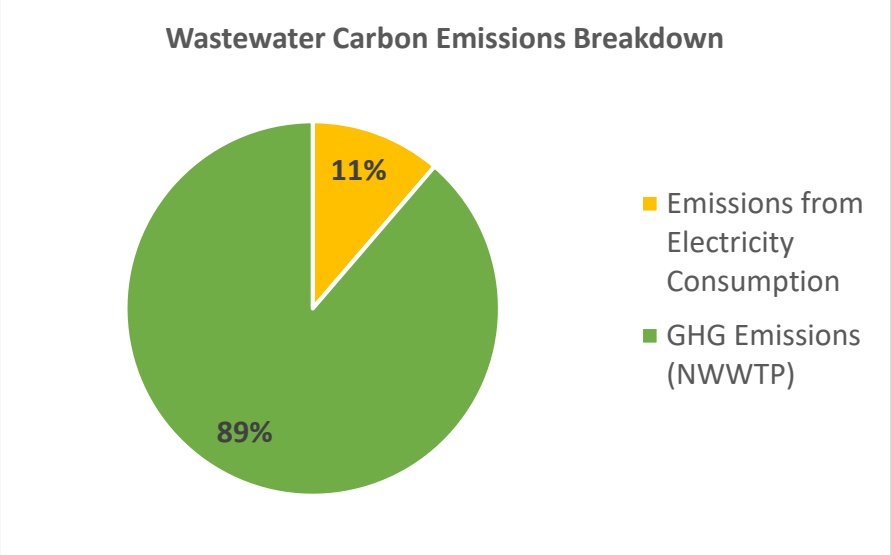


Figure ES-4: Wastewater Carbon Emissions Breakdown



In order to support the Council wide Emissions Reduction Action Plan some knowledge gaps have been identified that will need to be addressed:

- Exact emission reduction budgets to be confirmed by central government in 2021.
- A comprehensive analysis of the sources of production of all greenhouse gases (GHG) by the wastewater activity and details of quantities.
- What options are currently available for reducing and eliminating GHG in line with the Council resolution.
- The effectiveness and affordability of GHG reduction options.

The following projects have been identified to support the Council wide Emission Reduction Action Plan:

- Climate Change Emission Reduction Strategy.
- Climate Change Emission Reduction Strategy Implementation Projects. This is a placeholder for funding and projects are anticipated to be confirmed following completion of the emission reduction strategy.

Areas for further investigation to aid mitigation are:

- Understanding the treatment process emissions at the Nelson Wastewater Treatment Plant (NWWTP) and then developing a plan to mitigate these will be the primary focus for the wastewater activity in terms of mitigation actions.
- Determining the energy efficiency of the NWWTP, the pump stations and operations will also be a strong focus for climate change mitigation.
- The potential for further electricity generation through wider use of photovoltaics.
- Consideration of materials that allow rehabilitation of existing pipes rather than replacement.
- Opportunities for co-construction of assets with other utilities to reduce use of construction plant and bitumen based road surfacing materials.
- Use of more energy efficient technology at the NWWTP and pump stations.
- Use of nett zero carbon emission bulk electricity supplier(s).
- Reduced use of petrol and diesel powered vehicles for operations and maintenance activities.

The outcome of the Emissions Reduction Strategy will feed into the Council's overall Emissions Reduction Action Plan.

Climate change adaptation – responding to the effects of climate change

Climate change adaptation relates to responding to the impacts of climate change. Strategies and standards are in place or in progress to identify optimal solutions for responding to the risks associated with temperature warming and sea level rise.

The following are important considerations with respect to climate change adaptation:

- Strategies are in progress, or shortly will be, that consider operation of the wastewater network under future climate conditions.

- Ensuring renewals are programmed to respond to sea level rise issues and avoid un-necessary expenditure in areas that will not require services in the long term.
- Develop network upgrades in hand with renewals to allow flexibility in establishing new residential areas across the city.
- The Nelson Tasman Land Development Manual 2019 (NTLDM) requires that new assets are designed to meet a specific level of service projected for 2090 and assuming an RCP 8.5 scenario. Generally speaking, all wastewater projects therefore contribute to climate change adaptation to some degree.

The following knowledge gaps have been identified with respect to climate change adaptation:

- A comprehensive analysis of the wastewater network's exposure to impacts of climate change.
- What options are currently available for adapting to the impacts of climate change in the short, medium and long term.
- The effectiveness and affordability of adaptation options.

Budget has been identified for the following strategies and capital response:

- Climate Change Adaptation Strategy.
- Climate Change Vulnerability Assessment.
- Inflow and Infiltration/Overflow Reduction Programme.
- Atawhai Rising Main Renewal.
- Washington Valley/Hastings St Sewer Upgrade.
- Hydraulic Model Upgrade.
- Pump Station Resilience.
- NWWTP Strategic Scoping.
- Natural Hazards Risk Remediation.
- System Performance Improvements.

Climate Change Planning Assumptions

In order to frame the activity response to climate change the following assumptions have been made:

- The contribution of renewable energy sources to the national grid will progressively increase over time (currently targeting 90% renewable energy by 2025). This is expected to contribute to a steady reduction in the carbon footprint of Council assets that draw on mains power.
- Where emissions cannot be reduced, a Council wide offsetting approach will be developed.
- Sea level rise by 2090 will be approximately 0.67m, and by 2130 will be approximately 1.1m-1.5m.
- Temperature warming, which contributes to increased storm rainfall intensity will follow the RCP 8.5 scenario, and sea level rise will follow RCP 8.5 M (mid-range) projections. Projected temperature increase and sea level rise at 2090

are 2.6oC and 0.67m respectively (relative to 1986-2005 baseline). Use of the RCP 8.5 scenario is based on stormwater design standards contained in the LDM 2019. This will be reviewed as climate change monitoring and assessment techniques develop over time.

- Construction materials and techniques will be available that meet net zero GHG emissions by 2050.
- The community will confirm appropriate levels of service and affordability limits that support the Council resolution.
- Council will undertake investigations of the impacts of climate change on the Nelson City geographical area.
- Funding will be available to specifically assess the potential impact of climate change on the wastewater activity.
- Defend, Retreat or Accommodate: For the purpose of planning the next 30 year programme, it is assumed at this stage that asset renewals and upgrades will continue in low-lying areas that are subject to flooding and coastal inundation. Following notification of the Whakamahere Whakatū Nelson Plan it is anticipated that new development in these areas will be designed to be resilient to flooding out to 2130. Wider community engagement is required to inform adaptation responses for existing development in these areas.
- Nelson City Council will seek co-financing where available from Central Government towards implementation of works.

Community Engagement

Climate change is a significant issue facing the community. In order for the Council controlled wastewater activity to respond to future challenges wide community engagement is called for. This is expected to come from a number of Council activities as follows:

- Statutory consultation for the Long Term Plan and Annual Plans.
- Whakamahere Whakatū Nelson Plan consultation on natural hazards overlays (including flood maps) and provisions (Objectives, Policies, Rules and Methods).
- NWWTP Resource consent renewal consultation.
- Notification of other resource consents where required.
- Coastal Hazard Adaptation: Consultation is to be undertaken with the wider community on this significant issue.

iv Key issues for the Wastewater Activity

Key issues for the 2021 – 2031 wastewater activity are summarised as follows:

Issue 1: *The location and disposal route for Nelson's wastewater treatment in the future.*

Issue 2: *Damage to the wastewater network from natural hazards (Asset resilience).*

Issue 3: *Planned levels of service for the wastewater network will not be met unless assets are maintained, renewed and upgraded*.

Issue 4: *Wastewater overflows.*

Issue 5: *Failures of the Atawhai Rising Main are occasionally causing untreated wastewater discharges directly into Nelson Haven.*

Issue 6: *Management of increased wastewater flows associated with urban intensification and growth.*

Issue 1: The location and disposal route for Nelson's wastewater treatment in the future

The current Nelson Wastewater Treatment Plant (NWWTP) – note the NRSBU facility Bell Island WWTP is the subject of its own Activity Management Plan - is in a location that may be prone to impacts from sea level rise and fluvial flooding in the long term. The NWWTP is located in an area that has been naturally reclaimed from the sea by a combination of the formation of the boulder bank and the gradual sedimentation (as is continuing today) of the estuary.

It is expected that the NWWTP will remain in this location for the medium term however work programmed as part of this Plan will be seeking to define the options available into the future and the levels of risk and cost associated with these options as well as better understanding the risks associated with climate change at the current location.

Figures ES-5 and ES-6 outline flooding at the NWWTP site, based on modelling undertaken in 2020, with the respect to extreme rainfall and tide events in 2070. From these figures it is clear that whilst causing elevated water levels in various locations around the site, the site itself is not inundated through these events.

Regardless of the lack of inundation at the site shown by the modelling in 2070 it is considered prudent, due to uncertainties related to climate change predictions, to examine the options available for the future treatment of Nelsons wastewater.

Figure ES-5: River Flow Flooding 2070 RCP 8.5M 1 in 100 year rainfall event

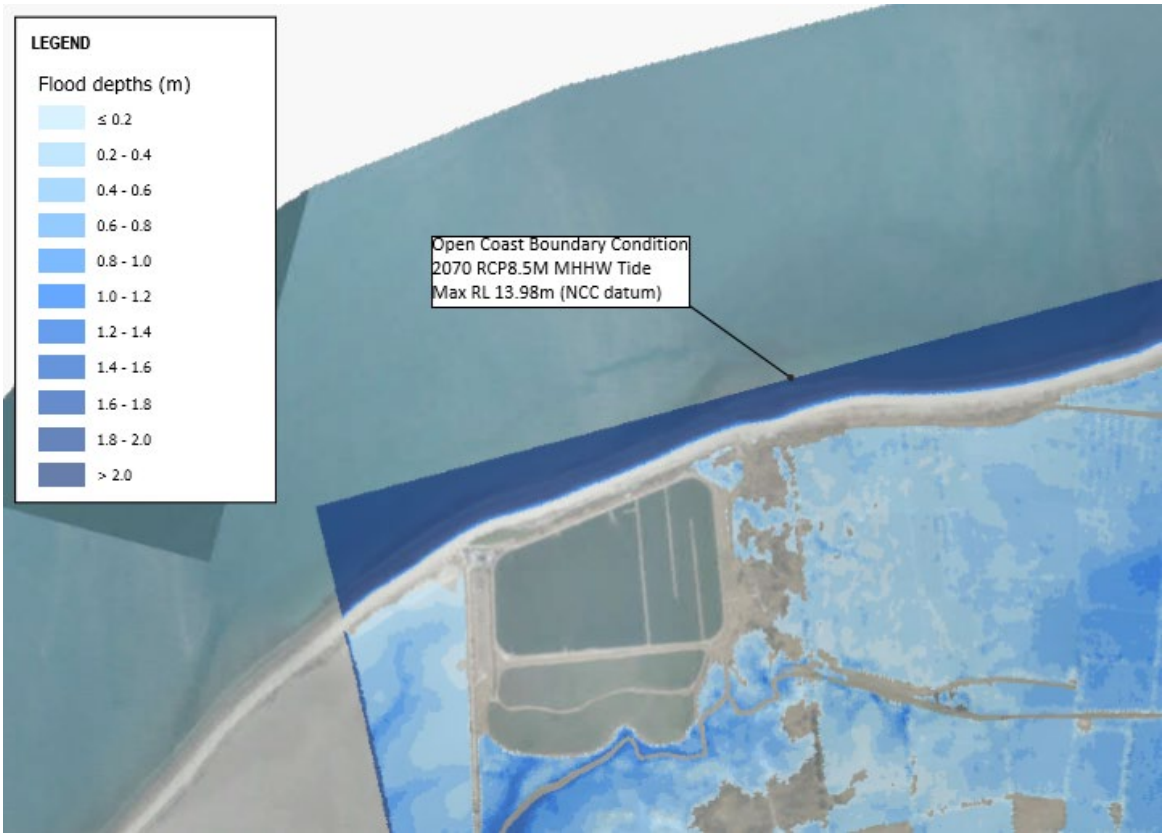
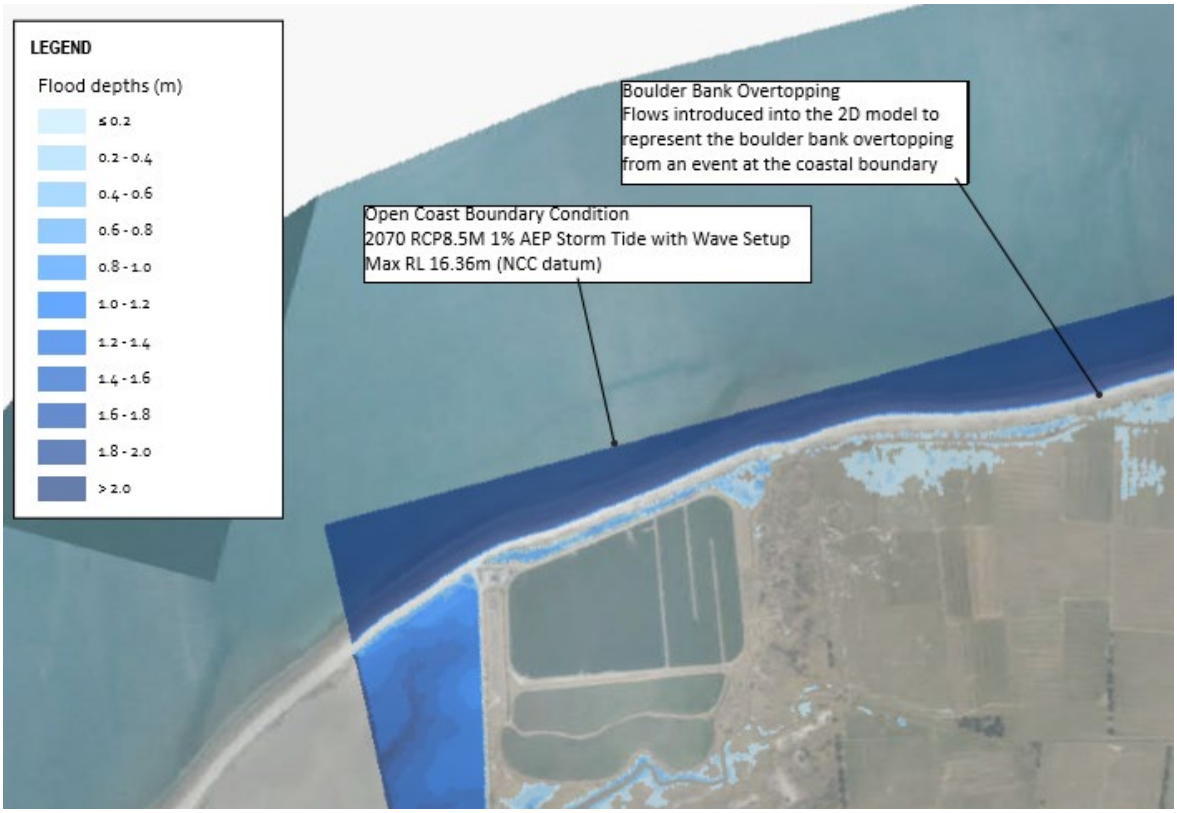


Figure ES-6: Coastal Flooding 2070 RCP 8.5M 1 in 100 year storm tide event



Issue 2: Damage to the wastewater network from natural hazards (Asset resilience)

Natural hazard events over the last decade have highlighted that parts of any utility network can be exposed to natural hazard events and that different natural hazards may impact on different parts of the network.

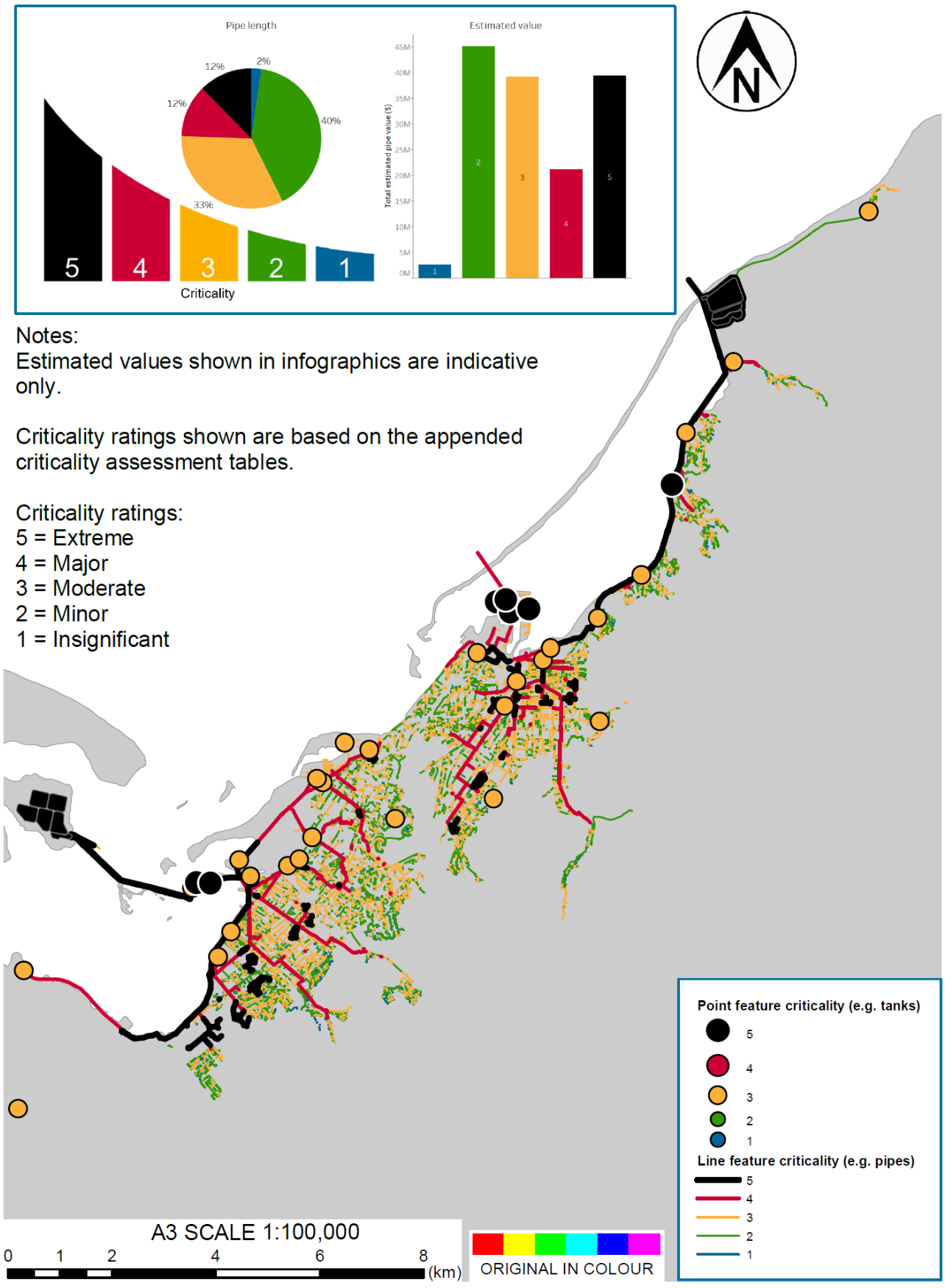
Council has recently undertaken a 3 Waters Natural Hazards study (Study) to establish the critical aspects of the 3 Waters networks and to understand what natural hazards events are likely to impact on these. A key aspect of this work is outlined in figure ES-7 that identifies the criticality of various parts of the network. Unsurprisingly a large portion of the assets identified as most critical are those at the bottom of the catchments (and hence serve a greater number of ratepayers).

The focus of increased resilience will be on assets that have a higher criticality rating. To further refine the prioritisation of assets the Study reviewed available hazard information and compared this against the criticality layer – this effectively defines critical assets that are likely to be susceptible to specific natural hazard events. The natural hazards considered as part of the Study are:

- Earthquake – ground shaking.
- Earthquake – liquefaction.
- Earthquake – fault rupture.
- Storm inundation and coastal erosion.
- Sea level rise.
- Tsunami.
- Wind/treefall.
- Fire hazard.
- Landslide hazard.

This piece of work is ongoing and long term. In time it will develop into a programme under which a variety of specific projects will be undertaken. A capital and operational budget placeholder for this work has been included within this Plan.

Figure ES-7: Criticality of the components of the wastewater network.



Issue 3: Planned levels of service for the wastewater network will not be met unless assets are maintained, renewed and upgraded

Significant sections of the Nelson wastewater network were installed in the city from the 1950's -1970's as part of a surge of new developments. These earlier networks are now approximately 60-70 years old and some pipe materials have already reached the end of their service life.

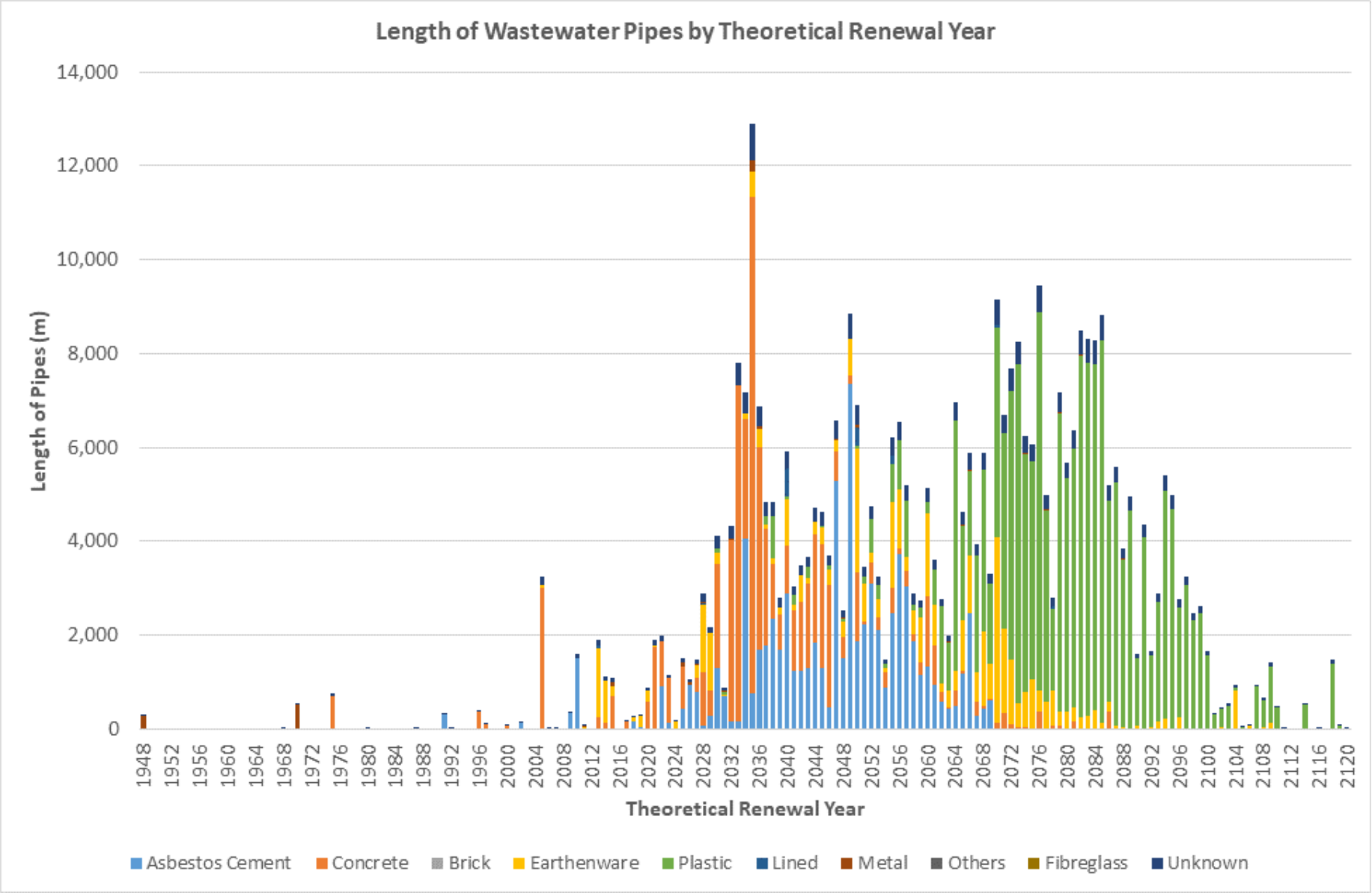
It is clear from the pipe renewals graph (Figure ES-8) that there is a significant lift in the amount of renewals required in the period from the mid 2030's onwards (a renewals "bow wave").

In order to ensure assets are able to be renewed, in terms of affordability, prior to their associated levels of service dropping then it is likely some assets will be renewed early (most likely coinciding with upgrades) and some renewals will be deferred where asset condition merits this approach.

The budget approach taken within this plan will be to ramp up spending (from $1.2 million in 2021/22 to $4 million in 2030/31) on pipe renewals and then maintain a degree of consistency of spend over a period of time (5 or 10 years). This will encourage efficiency and provide a degree of certainty to the market (that will hopefully also encourage efficiencies).

The Atawhai Rising Main (pumped pipe that connects the majority of the city to the NWWTP) has been excluded from Figure ES-8. The reason this has been done is that it is a significant asset that is budgeted for separately in the Plan budget programme; additionally there has been remedial work undertaken on the pipe at critical locations that have extended the base life of this asset. Condition assessment work is ongoing.

Figure ES-8: Theoretical Renewal Year / Material Distribution



Issue 4: Wastewater overflows

Overflows occur in the network when, for a variety of reasons, the network is overwhelmed and excess wastewater volumes are released at "weak" points. Overflows are primarily linked to wet weather events however they are also caused by blockages and breakages within the system. A significant issue that contributes to wet weather overflows occurring is Inflow and Infiltration (I&I). In summary I&I is the entry of water (typically groundwater or stormwater) into the wastewater network, typically, unintentionally. It is an urban issue nationally and around the globe.

Above ground, inflows during rain events can happen when stormwater flows through manhole lids, low gully traps, crossed connections between stormwater pipes and sewer pipes and deliberate redirection of stormwater into sewer mains.

Below ground, infiltration occurs when groundwater 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 groundwater levels arise from existing natural seepages, rain saturation, tidal and river effects and on site stormwater soakage; these exacerbate the below ground issues. As sea levels rise an increased focus on parts of the network that is susceptible to tidal inflows will be required. Addressing the issues of inflow and infiltration requires the efforts of both council and the community.

Central government regulatory and Whakamahere Whakatū Nelson Plan changes are expected to provide some degree of guidance with respect to this issue particularly in regards to the level of overflows that are acceptable.

The Ministry for the Environments *Action for Healthy Waterways* has outlined the intention to consult upon and develop a National Environmental Standard – Wastewater (NES-WW). As wastewater overflows are a national issue it is expected that the NES-WW will provide guidance related to how an approach to managing wastewater overflows should be developed.

The updating and calibration/verification of the two hydraulic models is key to understanding network performance and where constraints exist. Therefore enabling better decision making and investing appropriately to reduce wastewater overflows. This work has commenced.

Misconnections to NCC's reticulation system and broken pipes on private property are challenging to resolve either through education or regulation and will be the subject of ongoing educational efforts.

To have the best chance of completely solving the issue, Council would have to replace most of the wastewater network, including privately owned pipes and pump stations, and ensure stormwater was being disposed of appropriately across the city (which itself is a challenging piece of work particularly where there is no existing stormwater network).

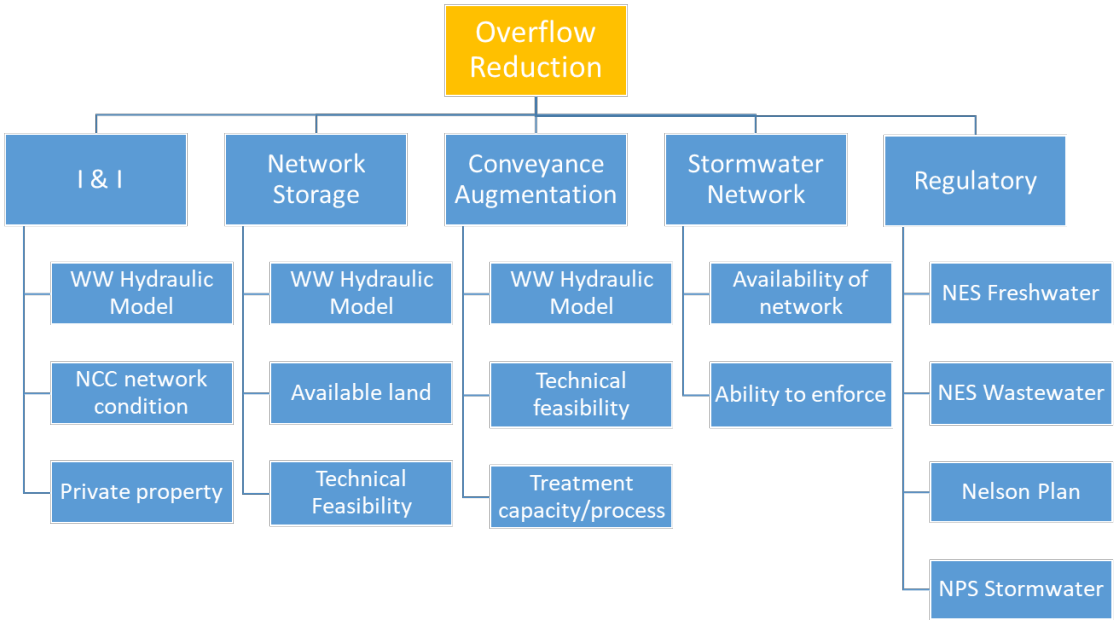
One approach, and likely a part of any solution to limiting wastewater overflows, is to upgrade the system downstream (to carry flow away from areas prone to overflows) and/or provide storage to minimise overflows by:

- Developing a holistic strategy, using the hydraulic model to predict where there is a higher likelihood of overflows.
- Factoring in the entry of some stormwater and groundwater into the wastewater system by increasing network capacity, potentially including the ability to store limited amounts of wastewater.

- Continuing to investigate high E.coli readings in water samples and repair any damage in the public network with urgency (noting that the network is, in the natural order of things, constantly degrading).

Figure ES-9 Outlines the intricacies associated with the overflow reduction programme.

Figure ES-9: Overflow Reduction work streams



The Plan budgets reflect this as an ongoing area of focus and reaffirm Council's commitment to minimise the impact of wastewater overflows on the community. Projects/programmes specifically linked to overflow reduction work include:

- Inflow and Infiltration/Overflow Reduction Programme.
- Washington Valley/Hastings St Sewer Upgrade.
- Hydraulic Model Upgrade.
- Pump Station Resilience.
- System Performance Improvements.
- Wastewater Pipeline Renewal Programme.

Issue 5: Failures of the Atawhai Rising Main are occasionally causing untreated wastewater discharges directly into Nelson Haven

The history of this pipeline is given in section 4.1.2 of this Plan. It is a high value and fragile asset and it requires replacement in the near future. Figure ES-10 identifies the alignment of this key asset.

The pipes that make up the Atawhai Rising Main are mostly concrete. The primary issue associated with this pipe is the degradation of the concrete and reinforcing steel by sulphuric acid. Sulphuric acid is generated by the release of hydrogen sulphide gas at air pockets along the length of the pipe.

Extensive repairs were carried out in the 1990s replacing some of the concrete pipes with fibreglass, however further failures have occasionally caused small volumes of untreated wastewater to directly discharge into the Haven.

These occasional untreated wastewater discharges impact on coastal water quality, cultural values, and public perceptions of the quality of the environment. They also have the potential to affect Council's compliance with future resource consent conditions, as the regulatory environment related to discharges of wastewater to the environment is likely to become more stringent over time in particular in relation to the National Policy Statement – Fresh Water Management.

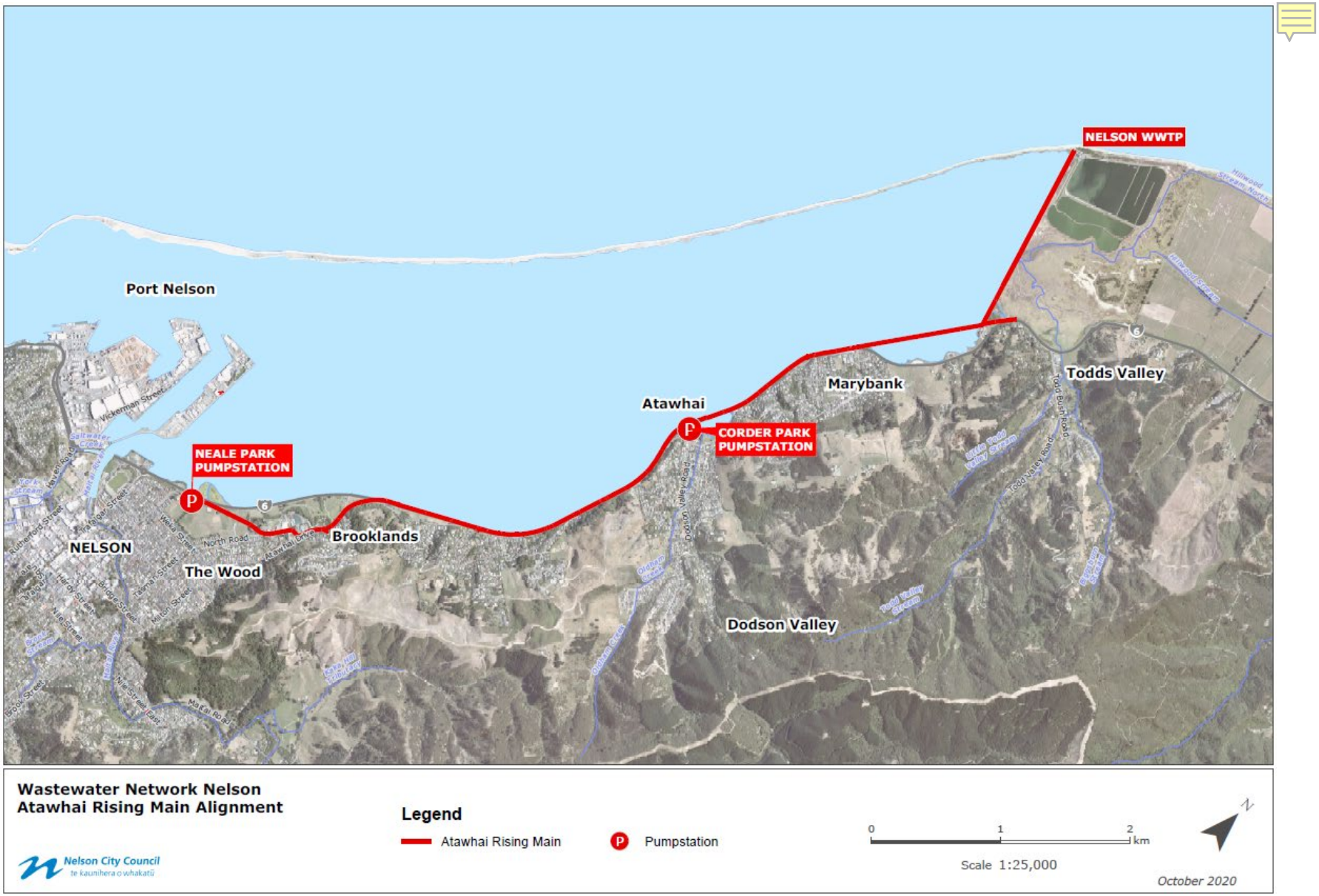
Investigation and condition assessment of the Atawhai Rising Main has been a focus since 2019 and will continue until the pipe is replaced. Given the pipe is pumped and there are a lack of access points to allow entry (whilst still being pumped), finding technology that provides a reliable data outcome relating to the internal condition of the pipe is challenging. Current efforts are focussing on manual inspection of access points, mechanical joints and fittings (these points tend to be more prone to failure), and on identifying the best "smart" option for internal condition assessment.

The upgrades of Neale Park and Corder Park Pump Stations are key elements of reducing the risk of pipeline failure through enhanced management of the pumping pressures.

During the period of the Plan work will commence on identifying the most appropriate way of replacing the pipe. This is likely to focus on the identification of high risk areas, sequencing of replacement and where the new alignment will run.

However, decisions on early renewal (replacement) of the rising main will depend on whether Council is able to gain consent for the NWWTP to continue in its current location. It is not cost-effective to upgrade the existing rising main if the future location of the NWWTP is not going to be in the Nelson North area. At this stage however, it is assumed that the NWWTP will remain in its current location in the short to medium term or within the Nelson North area for the long term.

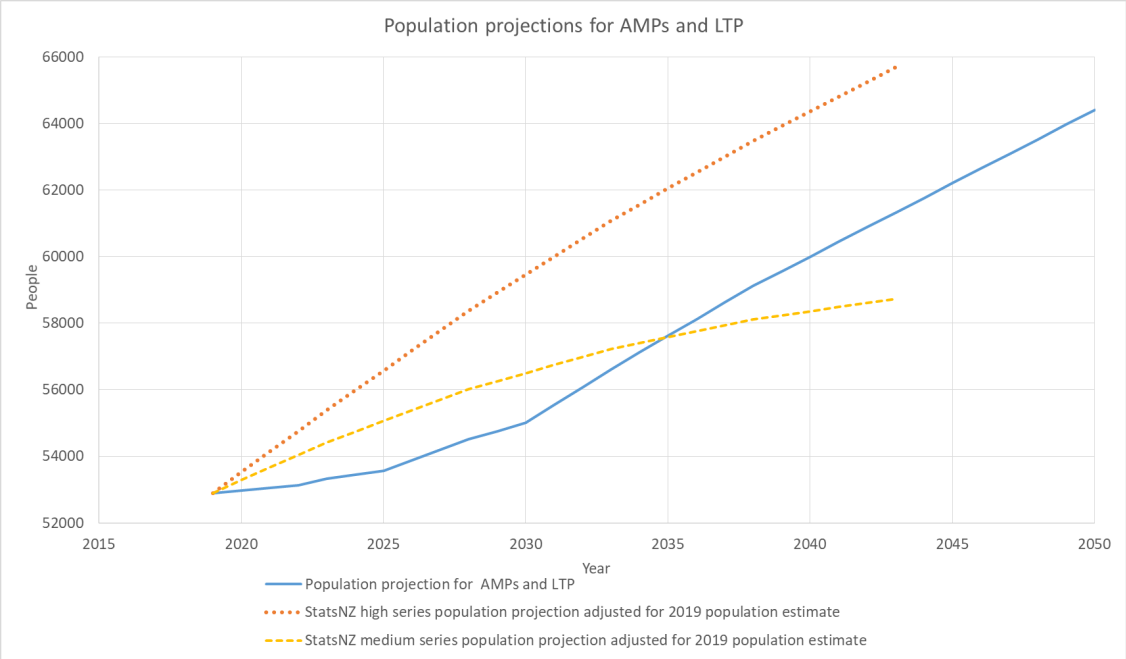
Figure ES-10: Atawhai Rising Main



Issue 6: Management of increased wastewater flows associated with urban intensification and growth

Between 2001 and 2008 the population of Nelson grew by around 330 people per year on average. Since 2008 the rate of population growth has increased to around 700 additional residents or 290 additional households per year. Figure ES-11 is based on statistics New Zealand growth projections for the city out to 2043. An increase in population to 64,400 by 2050 is expected under post-COVID 2020 population projections (as outlined in the publicly available NCC report *Population Growth and Demographics (Long Term Plan and Activity Management Plans 2021)*).

Figure ES-11: Population growth and projections, 2020-50, Nelson



The need to respond to growth/intensification is expected to be a constant into the future and that there will not always be clarity on exactly how this will unfold. As such whilst programmes will be planned/developed to support this there will be a need to be responsive and to ensure costs are apportioned appropriately.

The following documents set out the city's future urban capacity requirements and identify where urban intensity and growth are planned to take place over the next 30 years in Nelson.

- National Policy Statement – Urban Development (2020)
- Future Development Strategy (2019)

National Policy Statement – Urban Development (2020)

The National Policy Statement on Urban Development 2020 (NPS-UD) replaces the National Policy Statement on Urban Development Capacity 2016 (NPS-UDC) and requires local authorities to ensure there is sufficient development capacity to meet demand over the next 30 years with specific zoning and servicing requirements over different time frames:

- in the short term (within 3 years)
- medium term (3-10 years)
- long term (10-30 years)

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 *section 3.5 - Asset programmes to meet demand*.

Future Development Strategy and Intensification Action Plan

The Future Development Strategy (FDS) sets out where it is feasible and likely for future housing to be located within the next 30 years, in Nelson and Tasman, and the likely timing of these developments. Community feedback on the FDS supported growth through intensification of existing urban areas rather than expansion onto rural land, although greenfield development also plays a role. The FDS identifies space for 8,166 extra dwellings in the Nelson Urban Area (which includes Richmond and surrounds), with about 60% of this growth to be achieved by adding new housing into existing urban areas including the City Centre and Stoke.

Council does not have control over the location or level of uptake of intensification or urban expansion opportunities, as this is largely dependent on decisions by individual land owners and/or developers. The intensification objectives of the FDS are supported by an Intensification Action Plan (IAP). The IAP actions that relate to the programming of infrastructure are:

- Bulk programming of infrastructure investment to enable sufficient capacity for intensification development.
- Development of neighbourhood asset upgrade plans
- Refinement of infrastructure investment through the Long Term Plan process for the next thirty years.

The focus areas for the next ten years are the City Centre and Victory. Washington Valley is also programmed for an upgrade and therefore will have infrastructure capacity for greater intensification.

Two greenfield areas within Nelson which have been identified as being suitable for new urban development in the medium term are Mahitahi and Saxton.

Ensuring wastewater capacity is available to facilitate growth and intensification.

The nature of development with its market driven uncertainties relating to location and timing mean that, while some pre planning can be undertaken, there is a need to have some flexibility in relation to where work is undertaken to meet demand requirements.

Reducing inflow and infiltration and freeing up network capacity is supportive of growth and development. There is some opportunity to increase the current pipe diameters when the network is renewed.

The wastewater hydraulic model is the key tool that enables a good understanding of current constraints within the system and future constraints based on what is currently known about growth/intensification areas. This will enable key decision making when considering network renewals, upgrades and storage.

v Levels of service

Levels of service for the wastewater activity are shown in Table ES-2. These reflect the requirements of the Department of Internal Affairs for reporting non-financial measures. No changes are proposed for the period 2021-31.

Table ES-2: Levels of Service table 2021 - 2031

				Performance Target
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2021/22 -2030/31 (Year 1-10)**
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	100% compliance in 2019/20 12 odour complaints in 2018/19 100% compliance in 2017/18 100% compliance in 2016/17	100% compliance
		Number of dry weather overflows from the sewerage system, per 1000 connections*	3 in 2019/20 3 in 2018/19 6 in 2017/18 8 in 2016/17	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	Median response time of 24 minutes in 2019/20 Median response time of 25 minutes in 2018/19 Median response time of 28 minutes in 2017/18 Median response time of 21 minutes in 2016/17	Contractor to attend in median time of 60 minutes or less
		b) resolution time: from the time notification is received to the time service staff confirm resolution of the blockage or other fault*	Median resolution time of 195 minutes in 2019/20 Median resolution time of 194 minutes in 2018/19 Median resolution time of 189 minutes in 2017/18 Median resolution time of 202 minutes in 2016/17	Contractor to resolve issue in a median time of 480 minutes or less

				Performance Target
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2021/22 -2030/31 (Year 1-10)**
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 b) infringement notices c) enforcement orders d) convictions in relation to those resource consents*	100% compliance in 2019/20 100% compliance in 2018/19 100% compliance in 2017/18 100% compliance in 2016/17	100% compliance
		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*	17 complains per 1000 connections in 2019/20 16 complains per 1000 connections in 2018/19 20 complaints per 1000 connections in 2017/18 16 complaints per 1000 connections in 2016/17	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

Central Government Regulation

The event of the campylobacteriosis outbreak in Havelock North in August 2016 concluded with a Government Inquiry. The focus of the Inquiry was twofold: The security of the source, particularly subsurface bores; and the regulatory framework that applies to drinking water suppliers in New Zealand. Numerous administrative and operational recommendations were made in the two final reports. The Stage 2 report also had a section with a recommendation that the Government look at aggregating supplies of water across the country.

In response to the Inquiry Central Government introduced the following legislation**:**

- *On 11 December 2019, the Taumata Arowai – Water Services Regulator Bill was introduced to Parliament. The Bill implements decisions to establish a new regulatory body – Taumata Arowai – which will be responsible for:*
    - *administering and enforcing a new drinking water regulatory system (including the management of risks to sources of drinking water); and*
    - *a small number of complementary functions relating to improving the environmental performance of wastewater and stormwater networks (developing standards and regulations then monitoring and enforcing compliance with them, and providing training).*
- *A separate Water Services Bill was introduced to Parliament on 28 July 2020. The Bill will establish the new drinking water regulatory system and develop provisions relating to source water protection. It also includes some obligations on wastewater and stormwater network operators. The Bill is not expected to complete the parliamentary process until sometime after the October 2020 elections.*

In July 2020, the Government announced a funding package of $761 million to provide immediate post-COVID-19 stimulus to local authorities to maintain and improve three waters infrastructure, and to support reform of local government water services delivery arrangements. Initial funding will be made available immediately to those councils that sign up to the Memorandum of Understanding (MoU) and associated Funding Agreement and Delivery Plan for the first stage of the Three Waters Services Reform Programme by 31 August 2020. NCC has confirmed acceptance of the offer and subject to final approval of the delivery plan will receive $5.7M to address infrastructure issues.

The Government has indicated that its starting intention is public multi-regional models for water service delivery to realise the benefits of scale for communities and reflect neighbouring catchments and communities of interest. There is a preference that entities will be in shared ownership of local authorities. Design of the proposed new arrangements will be informed by discussion with the local government sector.

For the Wastewater Activity, NCC is well placed to respond to potential changes. The Council has been proactive in recognising and investing in reducing wastewater overflows. Furthermore, the NWWTP is currently operating under an active resource consent, and work is currently well underway to renew this consent by December 2024.

vi Future demand

Modelling of the network suggests that there is currently sufficient dry weather capacity, in the city's pipes considered to date, for at least the short-medium term; this is strongly supported by the low level of dry weather overflows that occur in the network. The hydraulic model is currently undergoing a significant upgrade; this will prove a key tool in determining restricted parts of the network and the development of associated solutions.

The demand changes related to legislative, climatic and community expectation changes mean that the future of the processes, and potentially the location of the Nelson Wastewater Treatment Plant will require significant consideration in the coming years and in particular over the period of this Plan.

Table ES-3 summarises key future demand drivers considered within this Plan whilst Figure ES-12 outlines the areas that are expected to grow and/or intensify in the coming three decades.

Table ES-3: Future Demand

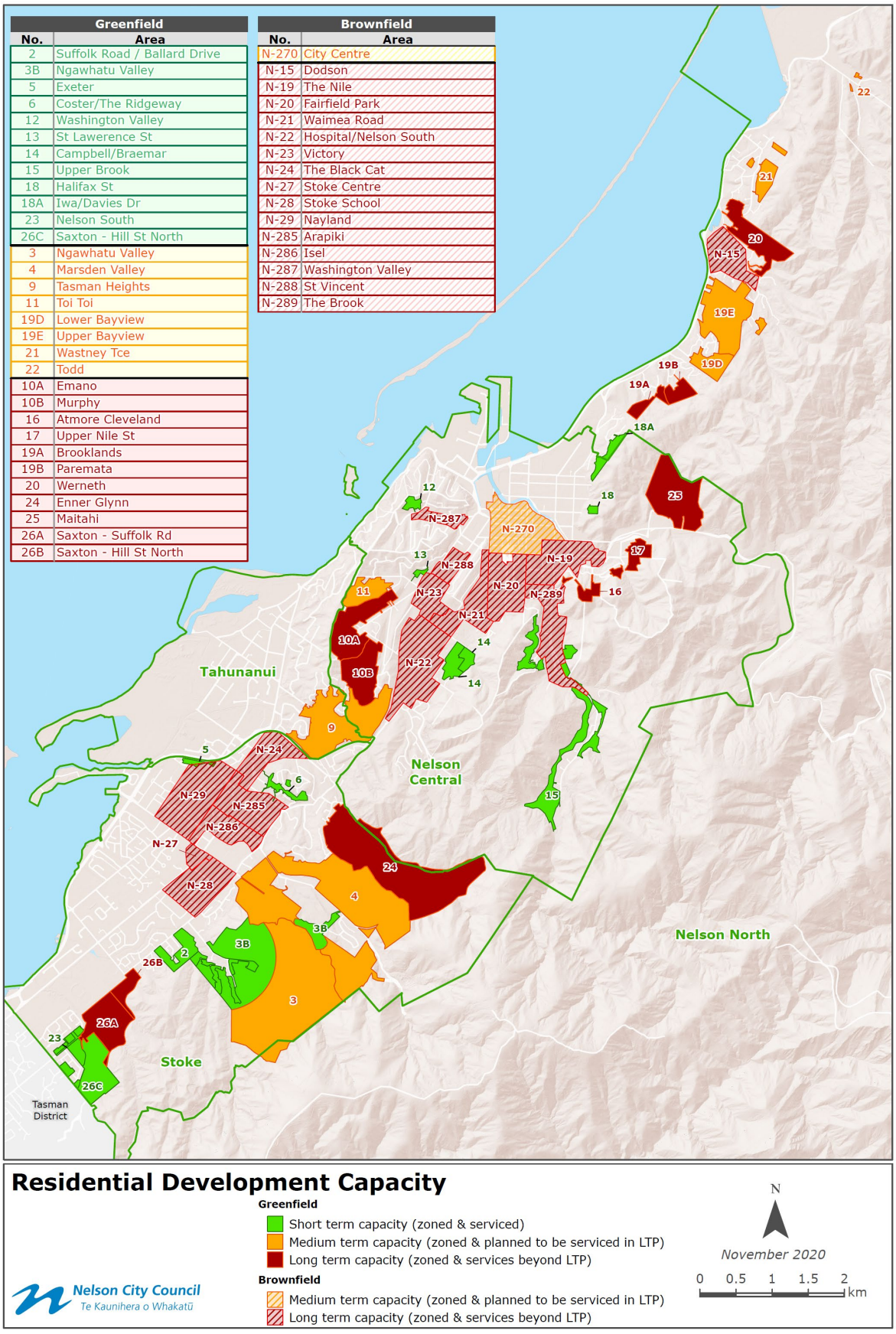
Wastewater Demand Drivers	Changes to Wastewater Activity
Significant population growth and residential expansion into greenfield areas	New development areas on the periphery of the city and increased intensification in some existing developed areas, including the city centre area, leading to increased 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 mean that dwellings with low numbers of occupants can produce more wastewater per capita than dwellings with higher occupancy numbers.
Changes in Customer Expectations	Customer expectations are increasingly tending towards higher levels of service for reliability and response to complaints. These expectations do not always consider the additional costs associated with meeting them.
Community Expectations on Environmental Protection	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.
Climate Change	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: • NPS Freshwater Management • NPS Urban Development	• NPS 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. This will be guided by the National Environmental Standard - Wastewater when released. • NPS Urban Development will ensure each territorial authority makes adequate provision for future population growth in their areas. This will require Council to undertake strategic

Wastewater Demand Drivers	Changes to Wastewater Activity
• Zero Carbon Bill	growth studies and identify the impact on the demand for wastewater services. • Becoming carbon neutral for the wastewater activity will focus on understanding, improving and mitigation of greenhouse gas production at the wastewater treatment plant and ensuring that the various network components that directly or indirectly have a carbon foot print are optimised to minimise their carbon foot print and where possible eliminated.
Organisational Policies Environmental Sustainability Certified Emissions Measurement and Reduction Scheme (CEMARS – Toitū - Envirocare)	This includes an Emissions Inventory Report and Action Plan to Reduce Council Greenhouse Gas Emissions. Will require a focus on understanding, improving and mitigation of greenhouse gas production at the wastewater treatment plant and ensuring that the various network components that directly or indirectly have a carbon foot print are optimised to minimise their carbon foot print and where possible eliminated.

Infrastructure Planning for Growth Projects

Figure ES-12 shows the areas identified for future growth in the FDS. As demand for development becomes clearer they will be prioritised for services upgrades.

Figure ES-12: Nelson Growth Areas and Infrastructure Timing



vii Lifecycle management plan

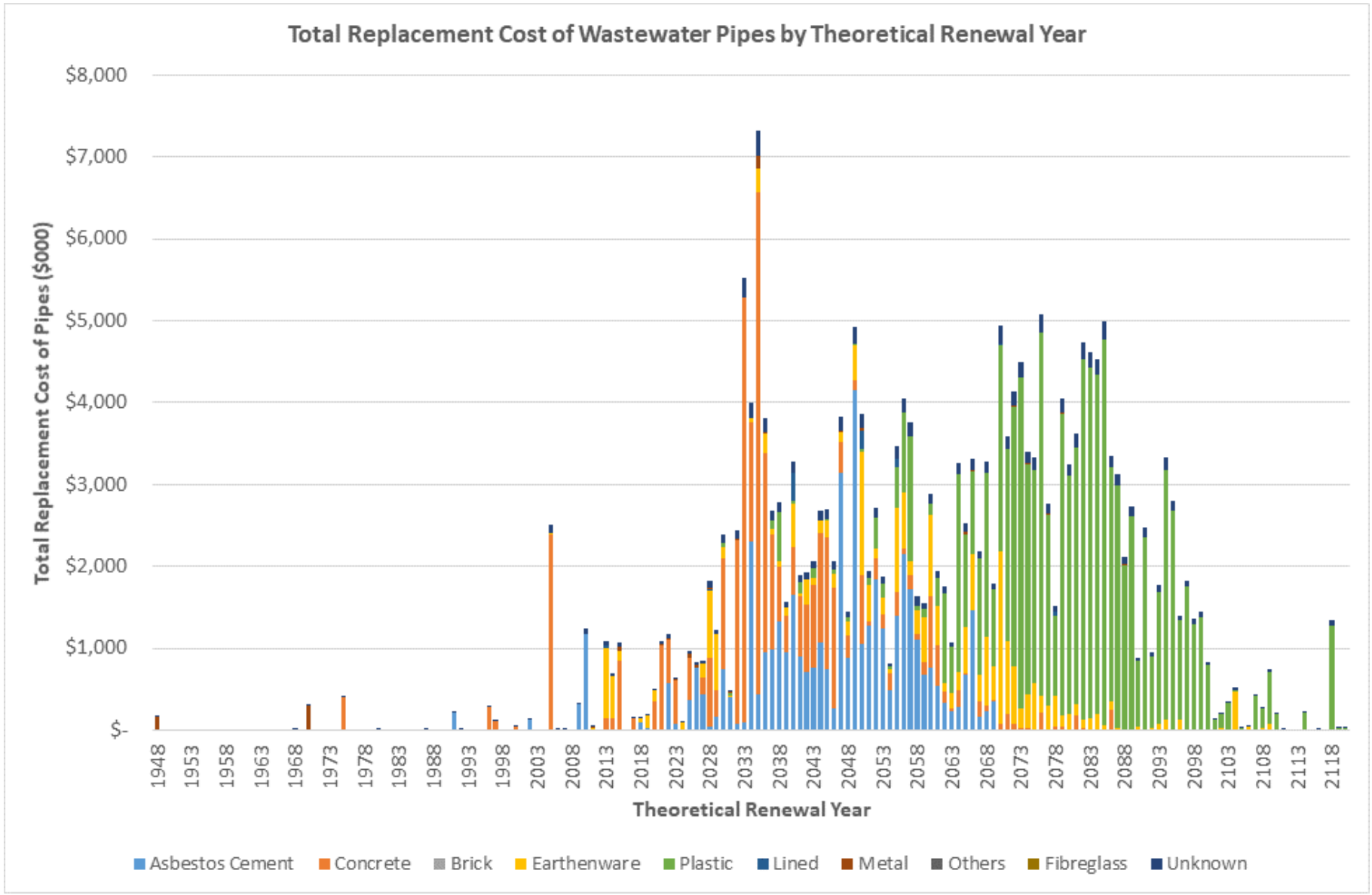
Assets have a lifecycle as they move through from the initial concept to the final disposal. Depending on the type of asset, its lifecycle may vary from 10 years to over 100 years.

As with many other urban areas across the country, much of the 3 waters network in Nelson was developed during a period of intense urbanisation and conversion to public servicing from the 1960s and 70s. The average age of Nelson's wastewater pipe assets is approximately 40 years which sits slightly above the national average at about 37 years.

An important consideration for the coming decades is a "bow wave" of renewals commencing in the period 2030 onwards. Figure ES-13 illustrates this graphically. This is identified as a key issue and is reflected in the Plan programme.

More information on lifecycle management is provided in Chapter 4 of this Plan.

Figure ES-13: Estimated Renewal Cost Year / Material Distribution



viii Risk management plan

NCC 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 Management – Principles and Guidelines.

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

The following consequences are considered:

- Health.
- Safety.
- 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 five specific Community Outcomes that guide the Wastewater Activity risk analysis are also used to inform the Wastewater Activity levels of service:

- 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.

There is potential for future Level of Service changes around the Freshwater NPS / NES, urban growth, and implementation of a risk-based decision making framework in this area.

Table ES-4 sets out the high risks to the wastewater activity.

Table ES-4: Summary of High Risks to the Wastewater Supply Activity

Identification			Analysis: Residual Risk		
Event Description	**Asset Group**	**Consequence**	**Existing Controls**	**Current Risk Level**	**Treatments**
Lack of Staff (NCC) and operator (Nelmac) experience/resilience	All	Inefficiency. Risk of operational failures or errors is increased.	Employ experienced people where possible.	High (12)	Employ appropriately qualified and skilled staff. Pay and conditions should be competitive.
Climate Change /Sea Level Rise	All	Failure of part or component parts of the network.	Nelson Tasman Emergency Management Plan. Emergency procedures manual and exercises. Programmes related to resilience/adaptation underway	High (12)	Continue to develop criticality and natural hazards understanding with a view to progressing to the development of solutions (that will minimise the risk of failure due to a natural hazard event) in order of priority.
Harm to operators from exposure to sewage	All	Operator becomes ill from exposure to sewage.	Health and Safety training. Preventative inoculation of staff. Use of barrier protection where possible.	High (12)	Ongoing health and Safety training. Identify hazardous areas at facilities and employ processes to minimise risk.
Failure to achieve consent conditions.	WWTP	Failure to comply with resource consents. Customer complaints.	Pond management team recently set up to routinely monitor pond performance in order to minimise the risk to the ponds "crashing" and causing odour issues. Pre-treatment processes minimise loading fluctuations. The plant is operated and maintained in a manner that minimises risk of consent breaches within the capabilities of the current processes. Wide ranging sampling and monitoring programme. Buffering provides a factor of safety. Proactive de-sluding programme is being developed.	High (12)	Ensure and maintain adequate sampling and monitoring. React rapidly to potential breaches or indications that breaches are coming. Continue to invest in the pond management team.
Atawhai Rising Main Failure.	Atawhai Rising main	Volume of spills dependent on nature of failure - occurs into or adjacent to a sensitive area (Nelson Haven).	Stock spares available to facilitate rapid repair. Effective systems for reporting and response in place. Staff and contractors aware of the significance of this main. Work underway to assess the internal condition of this rising main and the risk of failure of key external components. "Dry run" exercises on failure response undertaken from time to time.	High (12)	Continue with internal and external condition assessment programme. Ensure critical spares are readily available.
Equipment/ component Failure	All pump stations	Wastewater discharges to the environment having a negative impact on environmental, cultural and health issues. Customer complaints. Wastewater not able to be pumped from the city to NWWTP.	Processes within pump stations have contingencies for failure (duplication of pumps) or alarm systems (Supervisory control and data acquisition) installed. Many PS have additional storage capacity	High (12)	Pump station resilience programme to identify appropriate solutions to decrease risk levels associated with critical equipment failure. Operations team to develop a critical spares list and develop a business case to procure these. Increase "Dry run" exercises on critical pump stations.
Insufficient Storage Capacity	All Pump stations	Insufficient storage or capacity resulting in wastewater discharges to the environment. Environmental and cultural issues and increase in public health risk	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions. A programme of work associated with better understanding key risks (and developing associated solutions) related to pump stations is underway.	High (12)	Investigate storage capacity of network, document, & develop mitigation strategy. Pump station resilience programme to identify appropriate solutions.

ix Financial summary

Detailed financial statements and forecasts are provided in section 6 – Financial Summary. Tables 6-1 and 6-2 include a breakdown of projected expenditure by project.

Tables ES-5 and ES-6 below show total projected operational and capital expenditure for the wastewater activity for 2021 – 2031 by expenditure type.

The period 2021 – 31 in terms of operational expenditure is steady with the exception of the final year showing a significant lift corresponding with the programmed desludging of the oxidation ponds at the Nelson Wastewater Treatment Plant. Though considered operational expenditure, the desludging of the oxidation ponds in 2013/14 was loan funded, and therefore had a similar impact on rates as capital expenditure.

Capital expenditure for the period 2021 – 31 is steadily increasing with the exception of a dip in the 23/24 year that is reflective of a large project, Awatea Pump Station, being completed. The steady increase in capital expenditure is a response to the direction taken to increase renewals spending (smooth out the renewals "bow wave") and to service expected growth areas – these are both key issues identified in this Plan.

Central government has made some finance available to organisations who control and manage 3 Waters networks. This has been used to support a variety of wastewater activity projects (including the NWWTP Resource Consent Project and Awatea Pump Station Project) as well as allowing some initiatives to be bought forward (such as the Emissions Reduction Study and an urban heat mapping study).

Some key operational projects/programmes over the period of the AMP include:

- Climate change – Emissions Reduction.
- Climate Change – Vulnerability Assessment.
- Climate Change – Adaptation Strategy.
- NWWTP Strategic Scoping/Options.
- Atawhai Rising Main Investigation.
- Natural Hazards Risk Assessment.
- Inflow and Infiltration (Overflow Reduction).

Some key capital projects/programmes over the period of the AMP include:

- NWWTP Resource Consent Renewal.
- Atawhai Rising Main - Replacement (Stage 1).
- Pump Station Upgrades.
- Pump Station Resilience.
- System Performance Improvements.
- Climate change – Emissions Reduction Implementation.
- Climate Change – Vulnerability Assessment Implementation.
- Climate Change – Adaptation Strategy Implementation.
- Natural Hazards Risk Remediation.

Table ES-5: Wastewater Operational Expenditure Year 1-10 of the 2021/31 Long Term Plan ($000)

Group Account	2021/22 AMP (2021/31)	2022/23 AMP (2021/31)	2023/24 AMP (2021/31)	2024/25 AMP (2021/31)	2025/26 AMP (2021/31)	2026/27 AMP (2021/31)	2027/28 AMP (2021/31)	2028/29 AMP (2021/31)	2029/30 AMP (2021/31)	2030/31 AMP (2021/31)
6405 Wastewater	**7,043,478**	**7,190,978**	**7,444,078**	**7,455,978**	**7,487,153**	**7,456,653**	**7,476,653**	**7,643,278**	**7,583,278**	**9,626,590**
Base Expenditure	5,681,878	5,966,878	6,119,978	6,071,878	6,238,053	6,180,053	6,130,053	6,211,678	6,261,678	6,304,990
Unprogrammed Expenses	577,500	577,500	577,500	577,500	577,500	577,500	577,500	650,000	650,000	650,000
Programmed Expenses	784,100	646,600	746,600	806,600	671,600	699,100	769,100	781,600	671,600	2,671,600

Table ES-6: Wastewater Capital Expenditure Year 1-10 of the 2021/31 Long Term Plan ($000)

Account	2021/22 AMP (2021/31)	2022/23 AMP (2021/31)	2023/24 AMP (2021/31)	2024/25 AMP (2021/31)	2025/26 AMP (2021/31)	2026/27 AMP (2021/31)	2027/28 AMP (2021/31)	2028/29 AMP (2021/31)	2029/30 AMP (2021/31)	2030/31 AMP (2021/31)
6405 Wastewater	**8,170,063**	**7,288,500**	**5,074,521**	**8,574,500**	**9,519,812**	**12,407,700**	**10,761,700**	**14,250,000**	**16,970,000**	**15,848,500**
Renewals	3,691,500	3,581,000	3,550,000	3,983,500	5,005,000	6,456,000	6,964,000	10,195,000	10,165,000	9,937,500
Capital Growth	175,000	275,000	950,000	3,940,000	3,850,000	4,300,000	2,990,000	3,100,000	5,000,000	4,950,000
Capital Increased LOS	4,303,563	3,432,500	574,521	651,000	664,812	1,651,700	807,700	955,000	1,805,000	961,000

x Monitoring and improvement programme

The 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 NCC policy changes that may impact on the levels of service.

The 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. NCC is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the NCC assets.

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

Table ES-7 outlines the Improvement Programme for the activity.

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 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 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.

WaterNZ annual performance reviews include benchmarking of a range of measures across all territorial and unitary authorities that are operators of 3 Waters networks. Results for the wastewater activity in 2018/19 can be found through the following link https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=4271

The effectiveness of the Plan will be monitored by the following procedures:

- Financial expenditure projections prior to year-end.
- Resource consent monitoring as required by consents.
- The ongoing updating of the asset register of the wastewater assets when repairs are carried out and the attributes are compared with the asset register attributes.

Table ES-7: Improvement Programme

Improvement Programme
Review, clarify and add to the strategic direction of the WW Activity.
Ensure clear links between growth forecasts and budgets exists.
Update and regularly (annually) review the WW Activity Risk Register.
Improve accuracy of asset data through review and modification of collection, storage, and auditing.
Contingency planning for critical asset failure.
Robust and succinct lifecycle decision making; clear links to strategic intent.
Improve accuracy and coverage of condition assessments.
Upgrade of WW Hydraulic Models and increased use of them (and other technological improvements) to inform decision making.
Ensure supporting suppliers (consultants and contractors) are well aligned with the WW Activity requirements.
Ensure an effective Asset Improvement Register is in place and is used to develop project scopes.
Update emergency management response plan.
Improve resourcing to ensure better scope and cost estimates for inclusion in business cases.
Ensure asset valuations reflect market value.
More trend analysis to optimise decision making.
Develop Plan content to be more usable and succinct.
Ongoing professional development for utilities staff to ensure they are up to date with best practice.

1. Introduction

1.1. Background

History of Nelson City Council Wastewater System

Nelson City Council (NCC) 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. The Tahunanui Town Board joined the City in 1950, Stoke was transferred from Waimea County Council in 1958, Atawhai joined in 1968, Wakapuaka and Stoke rural joined in 1989.

The following details the timeline of the wastewater treatment and disposal for the Nelson 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.

1.1.1. Purpose of the plan

The purpose of this Wastewater Activity Management Plan (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 Activity 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.
- Justifying funding requirements.
- Demonstrating regulatory compliance under, Section 94(1) of the Local Government Act 2002 which in summary requires the Long Term Plan to be supported by:
    - Quality information and assumptions underlying forecast information.
    - Ensuring the 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 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 Activity Management planning is to:

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

The key elements of infrastructure activity management are:

- Taking a whole of lifecycle approach.
- Developing cost-effective management strategies for the long-term.
- Providing a defined level of service and monitoring performance.
- Understanding and meeting the impact of growth through demand management and infrastructure investment.
- Managing risks associated with asset failures and climate change.
- Sustainable practices, including use of energy and physical resources.
- Recognising and providing for the maintenance and enhancement of freshwater.
- Continuous improvement in activity management practices.

A formal approach to the management of infrastructure assets is essential in order to demonstrate how levels of service will be achieved in the most cost effective manner for the benefit of customers, investors and other stakeholders.

This Plan focuses on ensuring the wastewater assets supporting the activity are operated and maintained to provide the desired level of service, meet statutory requirements and to meet the current and future community outcomes in a sustainable manner.

This Plan will provide the substantiation for budget forecasts put forward in the Long Term Plan (2021-2031) for the wastewater activity.

1.1.2. Relationship with other planning documents

Infrastructure Strategy

The strategy is expected to look at least thirty years into the future and detail the issues that the local authority can reasonably foresee.

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

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 and work began in 2019/20.

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 Draft Whakamahere Whakatū Nelson Plan (the Draft Nelson Plan) will replace the Nelson Regional Policy Statement, Nelson Resource Management Plan and the Nelson Air Quality Plan, and will include transport and infrastructure, natural hazards, coastal and freshwater provisions. Informal engagement on the Draft Nelson Plan is being carried out in 2020 and a proposed plan is expected to be formally notified in 2021.

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 activity management plans as they develop. The proposed plan will also include Council's response to the requirements of the NZ Coastal Policy Statement (2010) and the National Policy Statement on Urban Development.

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 Freshwater Management (Freshwater NPS 2020) is intended to halt the decline in fresh water quality and lead communities to the point of actively improving it. One of the outcomes of the (Freshwater NPS 2020) is expected to be a Wastewater National Environment Standard

giving increased guidance to wastewater network operators on the management of wastewater discharges/overflows. As with many of council's activities there will be tension between increased cost and the desire for higher quality outcomes.

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.

Standards and Policies: These tools for asset creation and subsequent management are needed to support asset management tactics and delivery of service.

Iwi Management Plans:

These are accessible on: http://www.nelson.govt.nz/council/plans-strategies-policies/strategies-plans-policies-reports-and-studies-a-z/iwi-management-plans/

Ngā Taonga Tuku Iho Ki Whakatū Management Plan (2004):

This is a collective initiative involving five of the six local iwi (Ngati Rarua, Ngati Toa Rangitira, Ngati Te Atiawa, Ngati Koata and Ngati Tama) that gives a big picture approach to the management of nga taonga tuku iho (the treasured resources).

Other Iwi management Plans include:

- Pakohe Management Plan 2015: (Ngati kuia) – Kaupapa (purpose) of the Pakohe Management Plan He Taonga Pakohe tuku iho - Mai ngā tūpuna ki ngā mokopuna (Maintaining our whakapapa and historical connections to Pakohe for today and for future generations and for managing its sustainable use forever).
- Iwi Management Plan 2002: (Ngati Koata) – The primary purpose of this IMP is to provide a means by which Ngati Koata are properly and fully considered in decision-making affecting their interests in Te Tau Ihu.
- Environmental Management Plan 2018: (Ngāti Tama) – The purpose of this plan is to highlight Ngāti Tama aspirations for managing ancestral whenua, awa, wāhi tapu and wāhi taonga in the Ngāti Tama rohe (from Whangamoa in the east to Kahurangi in the west).
- Te Tau Ihu Mahi Tuna (Eel Management Plan) 2000: (All iwi) – To ensure the sustainability of the eel fishery through good management which provides for a customary, recreational and commercial harvest.

Wastewater Bylaw: 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. This document aims to ensure that contamination of the environment is minimised; the wastewater system is protected from damage; assigned discharge volumes and characteristics 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 monitored. The Wastewater Bylaw provides a regulatory framework for Trade Waste discharges.

This document is currently under review and an updated Bylaw is expected to become operative in 2021.

Overflow Reduction (Inflow and Infiltration) Strategy/Exfiltration

Unintended/accidental and wet weather discharges from the network cause wastewater to discharge to land and then to fresh water and the coastal environment.

During rain events stormwater enters the wastewater network primarily through faults in public and private pipes, incorrect use of wastewater fittings (such as gully traps being used for stormwater discharge) and as a result of cross connections between private stormwater pipes and the sewer network. Additionally there are parts of the network that are constrained or will be in the near future (through additional development/intensification). 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.

Managing wastewater overflows and 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. Wastewater 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 2021-31

This activity management plan supports Council in the development of the Long Term Plan 2021-31 by providing the substantiation for budget forecasts put forward in the Draft Long Term Plan for wastewater collection, treatment and disposal.

As the Plan presents the recommendations for the future operations, maintenance and capital works necessary to meet the levels of service for the wastewater activity, the LTP 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.

Future Development Strategy

The National Policy Statement on Urban Development (2020) impacts on the activity management plans and 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

In response to the previous National Policy Statement on Urban Development Capacity (2016) NCC and Tasman District Council (TDC) jointly adopted the Nelson Tasman Future Development Strategy in 2019. The strategy sets out how the combined region intends to plan for its future housing capacity to accommodate projected growth in population and households, as well as the attendant business and other demands this growth will bring. The impact on the wastewater activity of these future growth areas is one of the key focuses for this Plan.

Nelson Tasman Land Development Manual

The Nelson Tasman Land Development Manual 2019 (NTLDM) 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.

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

Certified Emissions Measurement and Reduction Scheme (CEMARS – Toitū Envirocare) Action Plan

Council has undertaken to measure and reduce its carbon emissions. This started with all organisational emissions for 2017/18 being measured, and the development of a draft preliminary action plan for emissions reduction. Council has set a target for emissions reduction in-line with the Climate Change (Zero Carbon Amendment) Act 2002 (net carbon zero by 2050, with the exception of biogenic methane, for which there are a range of targets from 24 to 47% reduction).

1.1.3. Infrastructure assets included in the plan

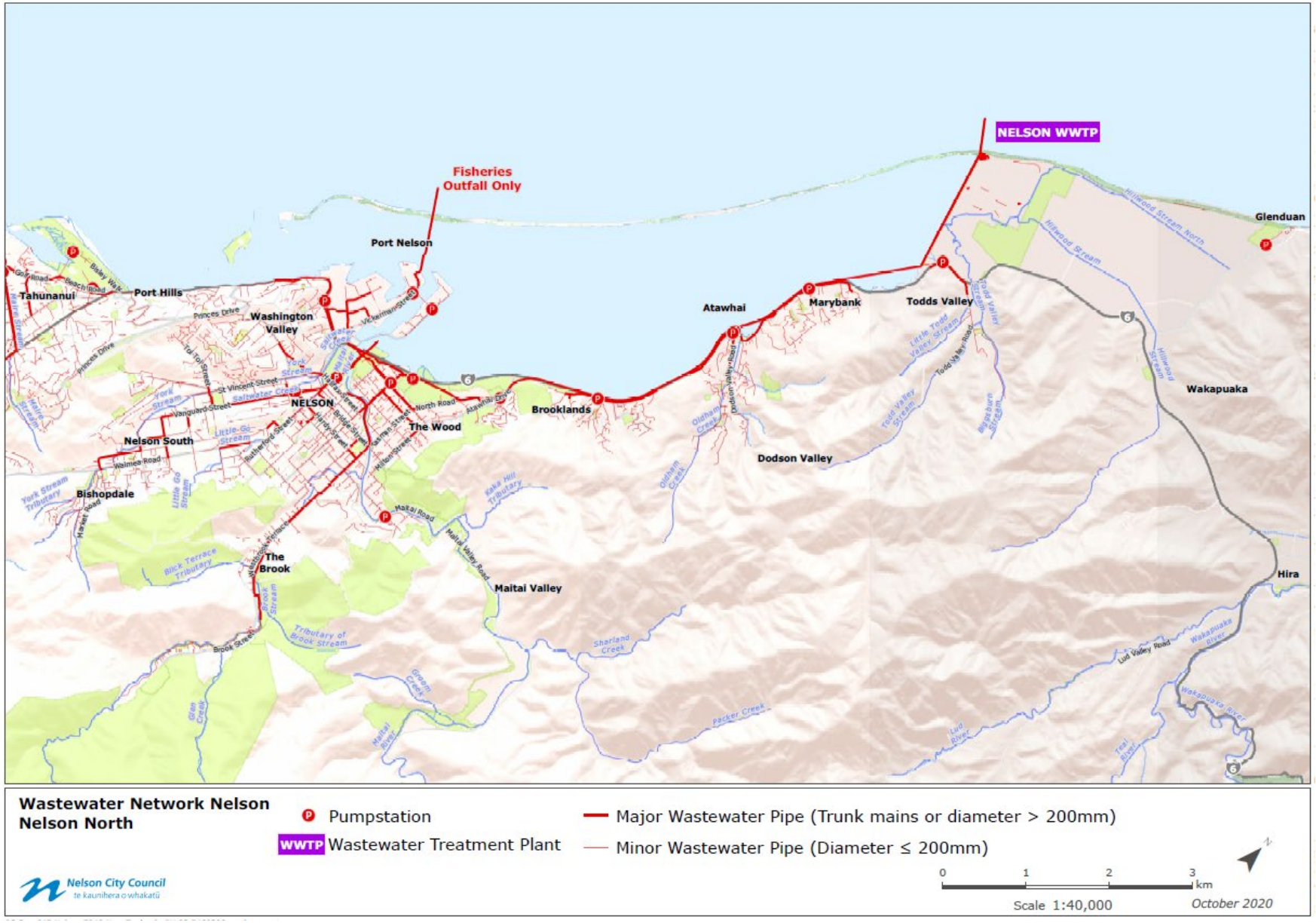
The Nelson City Council provides wastewater services from Glenduan in the north to Stoke in the south with approximately 20,000 connected properties. Sewage from Stoke and Tahunanui is treated at the Nelson Regional Sewerage Business Unit (NRSBU) Treatment Plant on Bell Island (details of NRSBU are shown in the Nelson Regional Sewerage Business Unit Wastewater Activity Management Plan 2021-31). Fish processing water from factories at Port Nelson is screened and discharged beyond the Boulder Bank into Tasman Bay through the Fisheries Outfall. Effluent from the remainder of the city is treated at the Nelson Wastewater Treatment Plant (NWWTP) to the North of the city.

Nelson City Council is a contributor to the NRSBU for the Nelson South area and has a quantity and quality based agreement detailing Nelson City Council existing and future requirements. Sludge from the NWWTP is trucked to Bell Island for further processing.

The extent of the NCC wastewater system is detailed in the Figures 1-1 and 1-2 and discussed in the Background section of 4.

Figure 1-1: Nelson City Wastewater Network Bells Island Wastewater Treatment Plant

Figure 1-2: Nelson City Wastewater Network Nelson Wastewater Treatment Plant



1.1.4. Key partners and stakeholders in the plan

The Plan recognises the following external and internal key partners and stakeholders:

Table 1-1: Key Partners and Stake Holders

Key Partners and Stakeholders	Main Interests
Key Partners	
Tangata Whenua comprising of regional iwi	Environment, cultural heritage
Tasman District Council	Joint Partner in the NRSBU. Part of South Nelson development adjacent Champion Road discharges to the TDC network.
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
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	Public health and safety, service reliability, environment, cost
Staff	Public health and safety, service reliability, environment, cost
Nelson City Council (unitary authority)	Environment
Nelson City Council (unitary authority)	Roading

1.1.5. Organisation structure

Council has an activity based structure with operations & maintenance (O&M) and asset management functions for wastewater assets provided by a separate operations and asset management team with the Utilities Business Unit. The Capital Projects team supports the wastewater activity through delivery of project work by project managers who sit in a separate business unit.

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 Activity Engineers.

1.2. Climate Change

Climate change has been identified as an over-arching issue as it potentially has a bearing on all of the identified issues for wastewater activity over the decades to come.

Climate change and reduction in greenhouse gas emissions

Climate change is a significant and urgent international, national, and local issue. At a local level, NCC has a key role to work with the community towards mitigating the driving factors of climate change and creating a resilient and low emissions future and implementing adaptive measures to manage and minimise risk. The wastewater activity is part of the wider community commitment to reducing greenhouse gases through implementing Council's Certified Emissions Measurement and Reduction Scheme (CEMARS -Toitū Envirocare) Action Plan – see appendix A. The activity also needs to be able to develop climate change mitigation and adaptation strategies to advise the location, design and operation of our future infrastructure.

Budget has been identified for the following strategic responses:

- Climate Change Emission Reduction Strategy 2021/22 onward.
- Climate Change Vulnerability Assessment 2021/22 onward.
- Climate Change Adaptation Strategy 2022/23 onwards.

Central government introduced the Climate Change Response (Zero Carbon) Amendment Act in 2019. This legislation:

- Sets greenhouse gas emission targets at zero by 2050.
- Establishes a system of emissions budgets.
- Requires government to develop and implement policies for climate change adaption and mitigation.
- Establishes a Climate Change Commission.

In 2019 Nelson City Council declared a climate emergency underlining its commitment to a low carbon future.

A focus of the first five years of this plan is to investigate, in depth, the potential impact of climate change on Nelson City and the wastewater activity.

At a local level, the current accepted understanding of the impacts of climate change are as follows:

- Increased air, water and ground temperatures.
- Raised sea levels.
- Higher rainfall intensity and more regular droughts.

1.2.1. Leadership

At an Extraordinary meeting of Council on 16 May 2019 Council considered the issue of climate change and the role Council and the community could play in mitigating and adapting to the challenges it presents. The meeting resolution was in five parts. Parts 1 and 3 are as follows:

1. (Council) Publicly declares that the world is in a state of climate emergency that requires urgent action by all levels of government; that human-induced climate

change represents one of the greatest threats to humanity, civilisation, other species, and the life-supporting capacity of air, water, soil, and ecosystems; and that it is possible to prevent the most harmful outcomes, if societies take sustained emergency action, including local councils.

3. *(Council) Commits to examine how Council's plans, policies and work programmes can address the climate emergency and ensure an emergency strategy is embedded into all future Council strategic plans.*

This Plan identifies the work programmes that will be required for the wastewater activity to support the resolution.

1.2.2. Climate change effects on the Wastewater Activity

The key climate change effects that will impact on NCC Wastewater assets are sea level rise, and more intense storm rainfall associated with a warmer climate and the higher moisture retention capacity of the atmosphere.

The impacts of climate change are likely to result in the following:

- **Sea level rise**

  Sea level rise is the biggest climate challenge for Nelson as a large proportion of our urban infrastructure is coastal or low lying. Over the long term, these areas will become more vulnerable to coastal inundation (flooding) as tides and storm surges extend further inland over time. Additionally some areas are likely to become more prone to liquefaction in an earthquake due to elevated groundwater levels associated with sea level rise.

  For the Nelson community, the main impacts will be the more regular inundation of areas around The Wood, the CBD (including Halifax, St Vincent, Vanguard, Gloucester and Rutherford Streets). Areas on the open coast that are more exposed to coastal swell such as the Glen, Wakefield Quay/ Rocks Road, Tahunanui and Monaco will be subject to increasing coastal inundation and coastal erosion hazard associated with sea level rise.

  For the wastewater activity the impact will be felt particularly on low lying parts of the network that will be more susceptible to groundwater inflows (the groundwater will raise in response to a rise in sea level) and those assets that are located in vulnerable coastal/riverine locations.

- **Heavy rainfall and flooding events**

  Higher intensity rainfall events will result in an increase in stormwater entering the wastewater system at any given location. The implication for the community is that without mitigation of these effects, they may experience more regular and extensive wastewater overflow events.

  Flooding has the potential to affect the wastewater network and the Nelson Wastewater Treatment Plant (NWWTP), resulting in wastewater overflows and contaminants discharging in to the receiving environment.

  Increased river flood flows are likely to increase the risk to pipe assets that cross water courses.

- **Droughts and extreme temperatures**

  With a warmer climate, the temperature of the wastewater within our network will increase. This is likely to lead to increased prevalence of odour issues and a greater incidence of corrosion of susceptible assets (particularly those made of concrete).

1.2.3. Climate Change Mitigation

The wastewater activity is part of the wider community commitment to reducing greenhouse gases through implementing Council's Certified Emissions Measurement and Reduction Scheme (CEMARS – Toitū Envirocare) Action Plan – see appendix A. The activity also needs to recognise the leadership role of Council and be able to develop climate change mitigation and adaptation strategies to advise the location, design and operation of our infrastructure.

In August 2020 Council committed to adopting the 5 year emissions reduction budgets to be developed and confirmed by Central Government at a national level in 2021. This commitment is to ensure that by 2025, Council realises measureable positive change towards achieving carbon zero status. Longer term the Council has also adopted the Government targets for Council's own greenhouse gas (GHG) emissions reductions (i.e., net zero emissions of all GHG other than biogenic methane by 2050, and a 24 to 47 per cent reduction below 2017 biogenic methane emissions by 2050, including 10 per cent reduction below 2017 biogenic methane emissions by 2030). These targets are intended to be achieved through the development and implementation of a Council wide 'Emissions Reduction Action Plan'.

The Emissions Reduction Strategy, included within the Plan, will focus on understanding the source of emissions within the activity and identifying ways in which these emissions can be eliminated or reduced particularly where council has direct control over the operation causing the emissions. The work will consider growth into the future. Figure 1-3 identifies the contribution of the wastewater activity to total council activities. This is low but not negligible. Figure 1-4 outlines the portion of the wastewater activities emissions that are directly attributable to its operations (greenhouse gases) and those that are indirect contributions (electricity).

Figure 1-3: Wastewater Carbon Emissions (% of Overall Council)

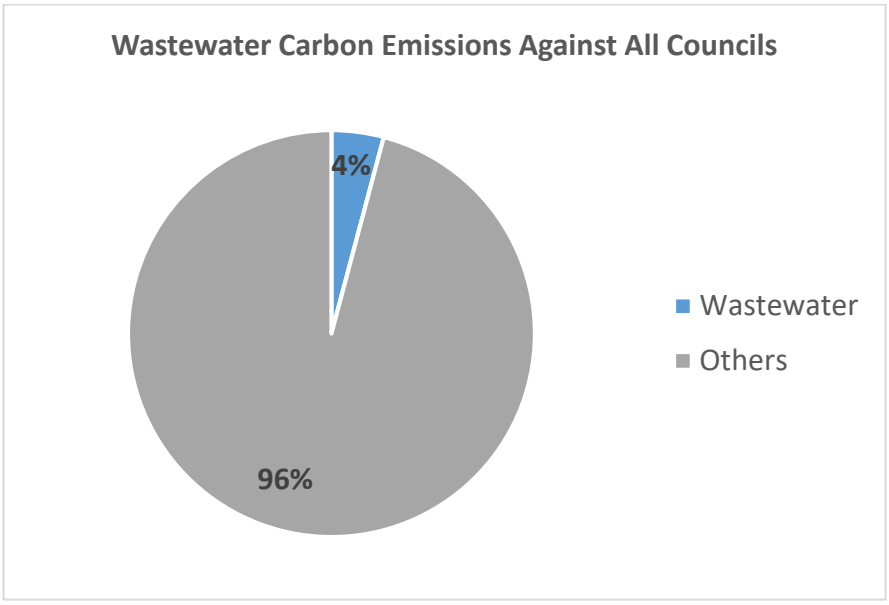
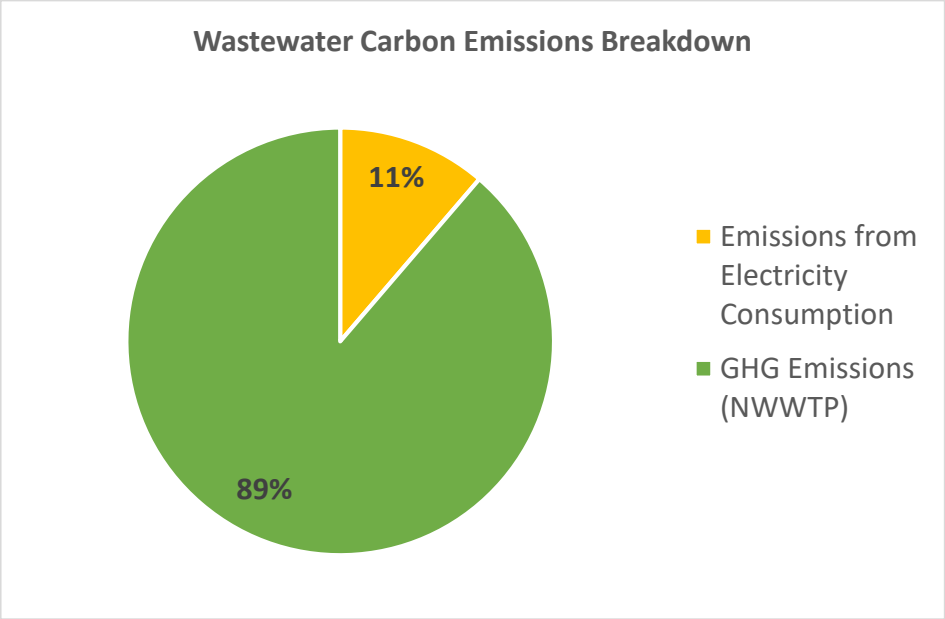


Figure 1-4: Wastewater Carbon Emissions Breakdown



Mitigation Actions:

In order to support the Council wide Emissions Reduction Action Plan some knowledge gaps have been identified that will need to be addressed:

- Exact emission reduction budgets to be confirmed by central government in 2021.
- A comprehensive analysis of the sources of production of all greenhouse gases (GHG) by the wastewater activity and details of quantities.
- What options are currently available for reducing and eliminating GHG in line with the Council resolution.
- The effectiveness and affordability of GHG reduction options.

The following projects have been identified to support the Council wide Emission Reduction Action Plan:

- Climate Change Emission Reduction Strategy.
- Climate Change Emission Reduction Strategy Implementation Projects. This is a placeholder for funding and projects are anticipated to be confirmed following completion of the emission reduction strategy.

Areas for further investigation to aid mitigation are:

- Understanding the treatment process emissions at the NWWTP and then developing a plan to mitigate these will be the primary focus for the wastewater activity in terms of mitigation actions.
- Determining the energy efficiency of the NWWTP, the pump stations and operations will also be a strong focus for climate change mitigation.
- The potential for further electricity generation through wider use of photovoltaics.
- Consideration of materials that allow rehabilitation of existing pipes rather than replacement.

- Opportunities for co-construction of assets with other utilities to reduce use of construction plant and bitumen based road surfacing materials.
- Use of more energy efficient technology at the NWWTP and pump stations.
- Use of nett zero carbon emission bulk electricity supplier(s).
- Reduced use of petrol and diesel powered vehicles for operations and maintenance activities.

The outcome from this emissions reduction strategy will feed into the Councils overall Emissions Reduction Action Plan.

1.2.4. Climate Change Adaptation – responding to the effects of climate change

Climate change adaptation relates to responding to the impacts of climate change. Strategies and standards are in place or in progress to identify optimal solutions for responding to the risks associated with temperature warming and sea level rise.

The following are important considerations with respect to climate change adaptation:

- Strategies are in progress, or shortly will be, that consider operation of the wastewater network under future climate conditions.
- Ensuring renewals are programmed to respond to sea level rise issues and avoid un-necessary expenditure in areas that will not require services in the long term.
- Develop network upgrades in hand with renewals to allow flexibility in establishing new residential areas across the city.
- The Nelson Tasman Land Development Manual 2019 (NTLDM) requires that new assets are designed to meet a specific level of service projected for 2090 and assuming an RCP 8.5 scenario. Generally speaking, all wastewater projects therefore contribute to climate change adaptation to some degree.

The following knowledge gaps have been identified with respect to climate change adaptation:

- A comprehensive analysis of the wastewater network's exposure to impacts of climate change.
- What options are currently available for adapting to the impacts of climate change in the short, medium and long term.
- The effectiveness and affordability of adaptation options.

Budget has been identified for the following strategies and capital response:

- Climate Change Adaptation Strategy.
- Climate Change Vulnerability Assessment.
- Inflow and Infiltration/Overflow Reduction Programme.
- Atawhai Rising Main Renewal.
- Washington Valley/Hastings St Sewer Upgrade.
- Hydraulic Model Upgrade.
- Pump Station Resilience.

- NWWTP Strategic Scoping.
- Natural Hazards Risk Remediation.
- System Performance Improvements.

The Climate Change Vulnerability Assessment will focus on understanding how the impacts of climate change are likely to manifest on the activity. In the short term this is likely to focus on asset security (issues associated with sea level rise and increased rainfall intensity) with the longer term view aiming to understand how the activity will function into the future.

The Climate Change Adaptation Strategy will utilise the findings from the Climate Change Vulnerability Assessment to determine the most effective and efficient way forward in both the short and long term.

1.2.5. Climate Change Planning Assumptions

In order to frame the activity response to climate change the following assumptions have been made:

- The contribution of renewable energy sources to the national grid will progressively increase over time (currently targeting 90% renewable energy by 2025). This is expected to contribute to a steady reduction in the carbon footprint of Council assets that draw on mains power.
- Where emissions cannot be reduced, a Council wide offsetting approach will be developed.
- Sea level rise by 2090 will be approximately 0.67m, and by 2130 will be approximately 1.1m-1.5m.
- Representative Concentration Pathway of 8.5 will be used to guide the climate change response in line with the Nelson Tasman Land Development Manual adopted by Council in 2019. This will be reviewed as climate change monitoring and assessment techniques develop over time.
- Construction materials and techniques will be available that meet net zero GHG emissions by 2050.
- The community will confirm appropriate levels of service and affordability limits that support the Council resolution.
- Council will undertake investigations of the impacts of climate change on the Nelson City geographical area.
- Funding will be available to specifically assess the potential impact of climate change on the wastewater activity.
- Defend, Retreat or Accommodate: For the purpose of planning the next 30 year programme, it is assumed at this stage that asset renewals and upgrades will continue in low-lying areas that are subject to flooding and coastal inundation. Following notification of the Whakamahere Whakatū Nelson Plan it is anticipated that new development in these areas will be designed to be resilient to flooding out to 2130. Wider community engagement is required to inform adaptation responses for existing development in these areas.
- Nelson City Council will seek co-financing where available from Central Government towards implementation of works.

1.2.6. Community Engagement

Climate change is a significant issue facing the community. In order for the Council controlled wastewater activity to respond to future challenges wide community engagement is called for. This is expected to come from a number of Council activities as follows:

- Statutory consultation for the Long Term Plan and Annual Plans.
- Whakamahere Whakatū Nelson Plan consultation on natural hazards overlays (including flood maps) and provisions (Objectives, Policies, Rules and Methods).
- NWWTP Resource consent renewal consultation.

- Notification of other resource consents where required.
- Coastal Hazard Adaptation: Consultation is to be undertaken with the wider community on this significant issue.

1.2.7. Knowledge Gaps

The following knowledge gaps have been identified with respect to climate change:

- NWWTP emissions profile.
- Network wide emissions profile.
- Nelson North Wastewater Hydraulic Model.
- Council wide adaptation strategy identifying long term adaptation responses for each coastal area of the city.
- Data collection equipment and data visibility.
- Asset condition and performance data.

1.3. Goals and Objectives of Asset Ownership

1.3.1. Reasons and Justifications for Asset Ownership

Council is responsible for the provision of reticulation, treatment and disposal of wastewater 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.

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 trade waste network, works to minimise overflows from the wastewater system and treats and disposes of effluent in accordance with best practice and the communities ability to pay.

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.

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

Vision

Nelson is a Smart Little City: *e tāone tōrire a Whakatū*

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 2021-2031 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.

Council Priorities and Focus Areas

Council has the following four priorities and three focus areas for the development of the city for the period covered by this activity management plan. These form the high level strategic direction for the activity and are influenced by the need to recognise the overarching importance of climate change:

The Four Priorities

- **Infrastructure**. The wastewater activity is critical to the residents and business activities in the city. Good operation and maintenance of the network plus timely renewals and upgrades are required to maintain network functionality; appropriate investment is required to ensure this happens. The impact of the covid 19 virus on the local economy is yet to be fully quantified. It is likely that some changes to budgets will need to be considered by Council through the LTP process.
- **Environment.** The wastewater activity safely and efficiently conveys the city's wastewater treatment facilities that provide treatment to levels set through regulatory processes. Inevitably there are occasional failures within the network that allow limited discharges of raw wastewater to the environment; these are not ideal and work is constantly underway to ensure the risk of this occurring is minimal.

  In addition, being mindful that the concept of a fully sealed system is relatively recent, storm and groundwater enters the wastewater network through leaky pipes and cross-connections and during periods of heavy rainfall this can lead to overflows of dilute wastewater from the network. Work in this area is also ongoing.

- **City Centre Development**. The CBD is the heart of the city and ensuring business and residential activites have adequate access to the wastewater network to be successful and grow is very important to council's long term strategy.
- **Lifting Council Performance**. The staff working in the wastewater activity are constantly seeking to leverage technological developments to ensure the wastewater activity is effective as possible.

Council's Focus Areas

- **Creating a sustainable transport culture**. To increase the proportion of journeys made using sustainable transport options (active transport - cycling and walking, electric vehicles, micro-mobility, and public transport). The wastewater activity works with the transport activity to ensure that any network changes/upgrades/renewals are undertaken as efficiently as possible and that where possible active transportation opportunities are taken.
- **Housing – Intensification and affordability**. In order to ensure growth in the city can be sustained into the future council must ensure there is adequate wastewater capacity available to match development timeframes. Areas for likely intensification in the next 10-15 have been identified by Council and will be prioritised for services.
- **Maitai River Precinct.** It's likely that the future Maitai River Precinct will include more open public space and recreation areas, as well as providing improved links to the City Centre, Trafalgar Centre, Rutherford Park, and down to the Haven Precinct. A well-functioning wastewater network with adequate capacity is essential to this vision.

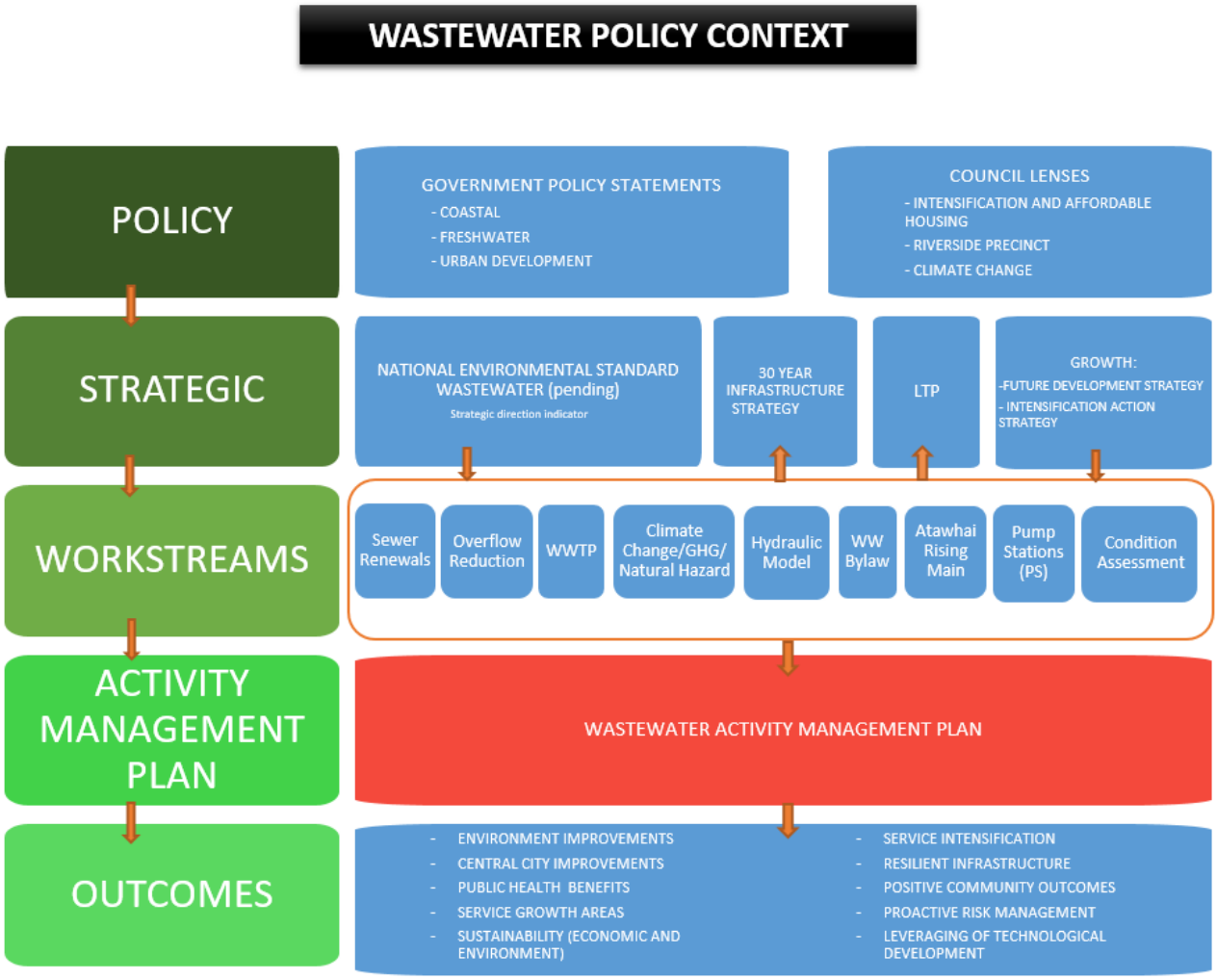
Nelson City Council Arts Strategy

Where opportunities present themselves, consideration will be given to the incorporation of artwork in the wastewater network (e.g. the Tūi murial at Neale Park Pump Station).

1.3.3. Plan framework and key elements

The framework of the Plan follows the generic layout identified in section 4.2 of the International Infrastructure Management Manual 2015. Figure 1-5 outlines the wastewater activity policy context and framework.

Figure 1-5: Wastewater Policy Context



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).

1.4. Asset Management 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

Activity 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. These reflect the requirements of the Department of Internal Affairs for reporting non-financial measures.

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 quarterly via the Infrastructure Quarterly Report and 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.

Service Level Expectations and Affordability

The levels of service set in this asset management plan are subject to change as legislation changes. The community can also request increases above the minimum levels as long as there is a willingness to fund the financial implications.

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.

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 Wastewater 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 Wastewater treatment plant	Sustainability
Overflow Discharge Consent	Every year	Outline discharges and other network metrics over past year	Annual Compliance and Monitoring Liaison Group meeting. Includes representatives from iwi, DOC, environmental/community groups and council representatives.	Sustainability Capacity
Wastewater Bylaw (currently under review)	2014	Legislative requirement criteria of LGA 2002	Public, business and industry submissions requested. Advertising in local papers. Submissions heard and considered	Sustainability Capacity
Ongoing				
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 Wastewater Activity Council is required to obtain consents under the Resource Management Act for the discharge of Wastewater 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 is set out in section 126 of the Local Government Act 2002 as follows:

The purpose of an assessment under section 125 is to assess, from a public health perspective, the adequacy of water and other sanitary services available to communities within a territorial authority's district, in light of—

(a) the health risks to communities arising from any absence of, or deficiency in, water or other sanitary services; and

(b) the quality of services currently available to communities within the district; and

(c) the current and estimated future demands for such services; and

(d) the extent to which drinking water provided by water supply services meets applicable regulatory standards; and

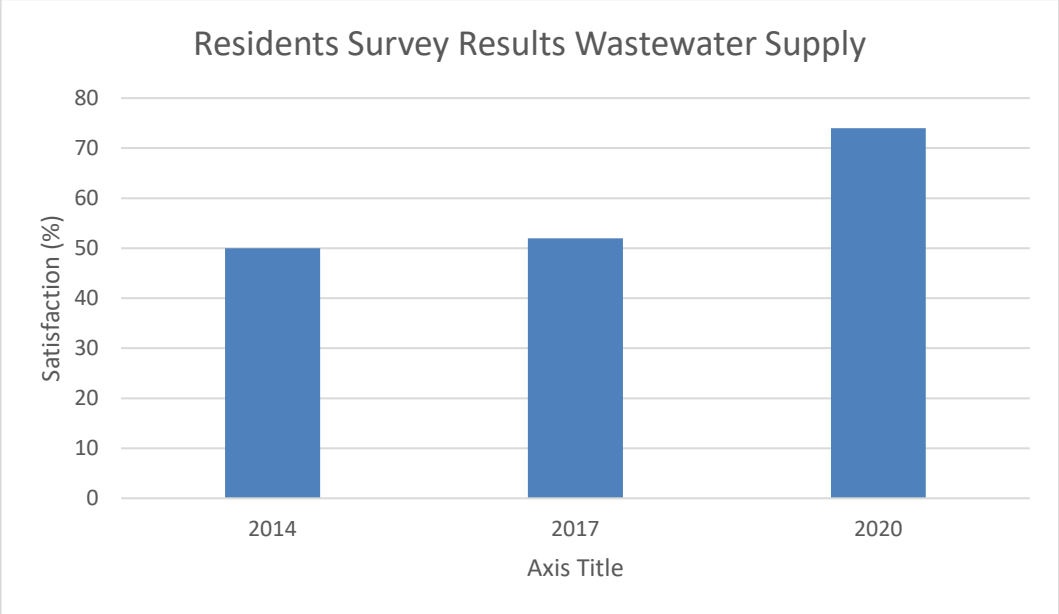
(e) the actual or potential consequences of stormwater and sewage discharges within the district.

The last comprehensive assessment was carried out in 2005 and still remains applicable for this Plan. Any changes in the regulatory environment that are initiated by the new central government water services regulator will be closely monitored and a further sanitary service assessment will be carried out if required.

Residents' Survey

NCC measures a number of its satisfaction and user targets through an annual Residents' Survey. Gathering the views of the broader resident population is important so as to engage with residents who may not normally provide feedback and the method provides for representative data by randomly interviewing Nelson residents in line with population data. Longer twenty-minute surveys are undertaken prior to Long Term Plan years to inform decision making. Results are reported to Council annually and available on the Council's website.

Figure 2-1: Residents Survey Results for Wastewater Supply



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.

2018 & 2019 Residents' Survey

The 2018 & 2019 residents' survey did not seek feedback on the Wastewater activity.

2020 Residents' Survey

74% very satisfied and satisfied with Wastewater. A significant lift from previous years.

Resource Consents

Through the wastewater activity Council is required to obtain consents under the Resource Management Act for the discharge of wastewater and the continued operation and maintenance of structures. These consents set the legal minimum requirements for discharge quality and volumes. Where applications for renewal of these consents are publicly notified the opportunity is given for any person to make a submission on the proposal.

Wastewater Bylaw

Council established the bylaw under the Local Government Act and set out within it the regulatory response for infringements.

The bylaw is advertised using a special consultative process under section 86 of the Local Government Act 2002.

The current bylaw came into effect on 9 October 2014 and is being replaced with a new Wastewater Bylaw in 2020-21.

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. Members of the public can make submissions directly to Council regarding any of the areas covered in the Plan.

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 2021 - 2031. The link between the community outcomes and the wastewater activity is shown in Table 2-2.

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 (see Table 2-3).

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

This Plan will also be reviewed in conjunction with the Stormwater Activity Management Plan. The stormwater system can have a significant impact on the

wastewater system and its ability to comply with the required levels of service, by reducing stormwater inflow and ground water infiltration into the wastewater network. This may include providing property owners with an alternative to discharging stormwater directly to the wastewater network or to the street.

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:

- **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 Purpose of local government

(1) The purpose of local government is-

(a) to enable democratic local decision-making and action by, and on behalf of, communities; and

(b) to promote the social, economic, environmental, and cultural well-being of communities in the present and for the future.

5 Interpretations

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

14 Principles relating to local authorities

(1) 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 well-being 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 (sec261B) 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 the wastewater activity and are incorporated into the levels of service.

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

The *Local Government (Community Well-being) Amendment Act 2019* led to significant changes to sections in Part 2 - Purpose of local government, and role and powers of local authorities. A greater emphasis has been placed on democratic local decision making and the four well-beings (cultural, social, environmental and economic) whilst sections relating to core service provision have less prominence.

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.

The Resource Management Amendment Act 2020 includes new legislation relating to resource consent processes, compliance & monitoring, and a new freshwater planning process for regional planning instruments such as Regional Policy Statements and Regional Plans. In addition there are requirements relating to planning for climate change, including a requirement for Councils to have regard to emissions reduction plans and national adaptation plans under the Climate Change Response Act 2002 (as amended by the Climate Change Response (Zero Carbon) Amendment Act).

In July 2020, the Environment Minister released a review of the RMA prepared by an independent review panel. The report 'New Directions for Resource Management in New Zealand' made a number of recommendations including the replacement of the existing RMA by two separate pieces of legislation:

- Natural and Built Environments Act.
- Strategic Planning Act.

The review panel also concluded that the complexities of the process of managed retreat (for example in coastal areas) require new discrete legislation, suggesting the need for a *Managed Retreat and Climate Change Adaptation Act*. The recommendations of the review will need to considered and acted on by the next government.

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 Coastal 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 Wastewater treatment plant which are objectionable or offensive at any point on or south of SH6
RM 105388 V1 (Discharge Permit) RM 105388A V1 (Coastal Permit)	Accidental discharges from the network. Consent granted 1 April 2012 and varied in 2015.	1 April 2032	From pump station during a wet weather event there shall be no more than 10 overflow events per 12 month period, reducing to 8 overflow events per 12 month period by 31/03/22 and 5 overflow events per 12 month period by 31/03/32. From pump stations 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 135229	To discharge contaminants to air, namely wastewater treatment plant gases associated with the desludging operation of the Nelson Wastewater Treatment Plant	1 January 2022	

RM 135229A	To discharge leachate onto land, namely the buffer storage pond and the contingency storage area, where it may enter water	1 January 2022	
RM 135229B	To remove and damage vegetation, and undertake earthworks to prepare the buffer pond/embankment and contingency storage area, and to gain access to the area for the desludging operation of the Nelson Wastewater Treatment Plant	1 January 2022	
RM 045202-1-4	To allow the fisheries outfall pipeline and diffuser to exclusively occupy the coastal marine area	19 December 2040	
RM 115212 & 115212V1	Anchoring of the Fisheries Outfall Pipeline to the seabed and superseding condition 6 of RM045202	19 December 2040	

The resource consent associated with the NWWTP, for the operation of the plant, the marine outfall and the discharge of treated effluent expires 1 December 2024. As this is a critical lifeline asset, consent renewal work commenced in 2019/20.

The Health Act 1956

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 wastewater and trade waste entering the Council's Sewerage Systems. The current bylaw came into effect in 2014 and is being replaced with a new Wastewater Bylaw in 2021.

National Policy Statement for Freshwater Management 2020

The NPS-FM 2020 replaces the NPS-FM 2014 (amended 2017). This National Policy Statement sets out how Councils will manage water quality and quantity. The Freshwater NPS 2020 is one of several pieces of national direction for managing New Zealand's freshwater. National Environmental Standards for Freshwater and RMA Section 360 regulations for stock exclusion are also being introduced. Guidance to support the implementation of these new rules and regulations will be released as they come into force. New requirements of the NPS-FM relate to:

- Manage freshwater in a way that 'gives effect' to Te Mana o te Wai: This is a concept that refers to the fundamental importance of water and recognizes that protecting the health of freshwater protects the health and well-being of the wider environment.
- Improve degraded water bodies, and maintain or improve all others using bottom lines defined in the NPS.
- An expanded national objectives framework.
- Avoid any further loss or degradation of wetlands and streams, map existing wetlands and encourage their restoration.

- Identify and work towards target outcomes for fish abundance, diversity and fish passage over time.
- Set an aquatic life objective for fish and address in-stream barriers to fish passage over time.
- Monitor and report annually on freshwater (including the data used); publish a synthesis report every five years containing a single ecosystem health score and respond to any deterioration.

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

Action for Healthy Waterways – Proposed Policy Reforms 2019/20

The Action for Healthy Waterways proposals released by the Ministry for the Environment in mid-2019 includes amendments to the Resource Management Act, an update of the above mentioned NPS for Freshwater Management, an updated National Environmental Standard for Sources of Human Drinking Water, and new National Environmental Standards for Freshwater and Wastewater.
Key proposals specific to wastewater include:

- Speed up the implementation of freshwater regulations through amendments to the RMA.
- Set minimum standards for wastewater discharges and overflows and require all operators to follow good practice risk management.
- Set targets/limits on volume/frequency of wet weather overflows.
- A requirement for wastewater network operators to prepare a risk management plan. This would address specific wastewater risks.

New Zealand Coastal Policy Statement 2010

The New Zealand Coastal Policy Statement (NZCPS 2010) guides local authorities in their day to day management of the coastal environment, including managing discharges to water in the coastal environment.

Policy 23 - Discharges of Contaminants - requires local authorities to manage discharges of human sewage in the coastal environment. This includes:

2. In managing discharge of human sewage, do not allow:

a. discharge of human sewage directly to water in the coastal environment without treatment; and

b. the discharge of treated human sewage to water in the coastal environment, unless:

i. there has been adequate consideration of alternative methods, sites and routes for undertaking the discharge; and

ii. informed by an understanding of tangata whenua values and the effects on them.

3. Objectives, policies and rules in plans which provide for the discharge of treated human sewage into waters of the coastal environment must have been subject to early and meaningful consultation with tangata whenua.

National Policy Statement Urban Development

The most recent National Policy Statement on Urban Development 2020 (NPS-UD) replaces the NPS-Urban Development Capacity 2016 and requires local authorities to open up more development capacity, so more homes can be built in response to demand. Capacity is to be provided in accessible places, close to jobs, community services, public transport and other amenity that communities enjoy. NCC has been assessed as a Tier Two Urban Environment in conjunction with the TDC which means that it must 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 zoned and infrastructure ready, while medium-term must either be ready or have funding for adequate infrastructure identified in the Long Term Plan.

Climate Change Response (Zero Carbon) Amendment Act

The Climate Change Response (Zero Carbon) Amendment Act 2019:

- Sets a new domestic greenhouse gas emissions reduction target for New Zealand to reduce net emissions of all greenhouse gases (except biogenic methane) to zero by 2050.
- Establishes a system of emissions budgets to act as stepping stones towards the long-term target.
- Requires the Government to develop and implement policies for climate change adaptation and mitigation.
- Establishes a new, independent Climate Change Commission to provide expert advice and monitoring to help keep successive governments on track to meeting long-term goals.

Council has committed to a implementing a Preliminary Action Plan as part of the Certified Emissions Measurement and Reduction Scheme (CEMARS – Toitū Envirocare). This includes an Emissions Inventory Report and Action Plan to Reduce Council Greenhouse Gas Emissions. The assessment period for achieving reductions in greenhouse gas emissions is over five years from 2018 to 2023. Under this plan all Council activities will need to prepare a carbon reduction plan by June 2023.

In August 2020 Council committed to adopting the 5 year emissions reduction targets to be confirmed by Central Government in 2021. These targets are intended to be achieved through the development and implementation of a Council wide 'Emissions Reduction Action Plan'. Refer to section 1.2 for information on how this relates to the wastewater ctivity.

Outcomes from the Three Waters Review – The Water Services Regulator Bill and The Water Services Bill

The Three Waters Review is looking at how to improve the management of drinking water, stormwater and wastewater (three waters) to address problems identified in the Havelock North Drinking Water Inquiry, and improve overall management of our water resources.

The event of the campylobacteriosis outbreak in Havelock North in August 2016 concluded with a Government Inquiry. The focus of the Inquiry was twofold: The security of the source, particularly subsurface bores; and the regulatory framework that applies to drinking water suppliers in New Zealand. Numerous administrative and operational recommendations were made in the two final reports. The Stage 2 report

also had a section with a recommendation that the Government look at aggregating supplies of water across the country.

In response to the Inquiry Central Government introduced the following legislation**:**

- *On 11 December 2019, the Taumata Arowai – Water Services Regulator Bill was introduced to Parliament. The Bill implements decisions to establish a new regulatory body – Taumata Arowai – which will be responsible for:*
    - *Administering and enforcing a new drinking water regulatory system (including the management of risks to sources of drinking water); and*
    - *A small number of complementary functions relating to improving the environmental performance of wastewater and stormwater networks (developing standards and regulations then monitoring and enforcing compliance with them, and providing training).*

  The Bill passed its third reading on 22 July 2020 and now requires Royal Assent to become an Act. This is expected to be completed shortly.
- *A separate Water Services Bill was introduced to Parliament on 28 July 2020. The Bill will establish the new drinking water regulatory system and develop provisions relating to source water protection. It also includes some obligations on wastewater and stormwater network operators. The Bill is not expected to complete the parliamentary process until sometime after the October 2020 elections.*

In July 2020, the Government announced a funding package of $761 million to provide immediate post-COVID-19 stimulus to local authorities to maintain and improve three waters infrastructure, and to support reform of local government water services delivery arrangements. Initial funding will be made available immediately to those councils that sign up to the Memorandum of Understanding (MoU) and associated Funding Agreement and Delivery Plan for the first stage of the Three Waters Services Reform Programme by 31 August 2020. NCC has confirmed acceptance of the offer and subject to final approval of the delivery plan will receive $5.7M to address infrastructure issues.

The Government has indicated that its starting intention is public multi-regional models for water service delivery to realise the benefits of scale for communities and reflect neighbouring catchments and communities of interest. There is a preference that entities will be in shared ownership of local authorities. Design of the proposed new arrangements will be informed by discussion with the local government sector.

For the Wastewater Activity, NCC is well placed to respond to potential changes. The Council has been proactive in recognising and investing in reducing wastewater overflows. Furthermore, the NWWTP is currently operating under an active resource consent, and work is currently well underway to renew this consent by December 2024.

Civil Defence Emergency Management (CDEM) Act 2002

Sections 64 and 60 of the CDEM Act (Duties of local authorities and Duties of lifeline utilities accordingly) require that a local authority must plan and provide for civil defence emergency management within its district and that a local authority and lifeline utilitiy 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. The Risk section of this Plan provides detail of Nelson City Council's preparation and arrangements for emergency management

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 2-5 identifies the negative effects for the Nelson community that the wastewater activity may have. 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. New consent may lead to enhanced treatment levels.
Biosolids disposed to land	Static	Static	√		Minor	Minor	Minor	Minor	High degree of sustainability
Discharge of odour	Dynamic	Increasing	√		Mod	Minor	Minor	Minor	A pond management team has been established that closely monitors the ponds health. Ongoing vigilance around potential sources of odour.
Outfall									
Curtailing of shellfish gathering in immediate area of outfall mixing zones	Static	Static	√		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 as soon as possible. Odour nits in place at high risk sites.
Overflows	Static	Reducing		√	Mod	Minor	Mod	Mod	Pump station overflows are generally reported and resolved within a short space of time. Ongoing work to increase resilience.
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 awareness of risk levels. Investment in condition assessment and knowledge of asset. Future duplication/renewal of the Atawhai rising main will reduce the risks of overflows

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	
Discharge of odour	Static	Reducing	√		Minor	Nil	Minor	Minor	Reported and resolved as soon as possible. Odour scrubbers are installed at high risk/problem locations.
Network mains									
Overflows	Static	Reducing		√	Mod	Mod	Mod	Mod	Overflow reduction strategy focussing on high risk areas. Use of modern technology to support understanding of network reaction to storm events. Future duplication/renewal 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	City development team on Intensification Action Plan and Future Development Strategy guide prioritisation of spending.

Table 2-6 outlines the current Levels of Service and their associated performance measures. Additionally the table sets out recent performance and outlines the performance targets for the coming LTP period.

Table 2-6: Levels of Service table

				Performance Target
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2021/22 -2030/31 (Year 1-10)**
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 2019/20 12 odour complaints 2018/19 year 100% compliance in 2017/18 100% compliance in 2016/17	100% compliance
		Number of dry weather overflows from the sewerage system, per 1000 connections* 2	3 in 2019/20 3 in 2018/19 6 in 2017/18 8 in 2016/17	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	Median response time of 24 minutes in 2019/20 Median response time of 25 minutes in 2018/19 Median response time of 28 minutes in 2017/18 Median response time of 21 minutes in 2016/17 Median resolution time of 195 minutes in 2019/20 Median resolution time of 194 minutes in 2018/19 Median resolution time of 189 minutes in 2017/18 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 b) infringement notices c) enforcement orders	100% compliance in 2019/20 100% compliance in 2018/19 100% compliance in 2017/18 100% compliance in 2016/17	100% compliance

				Performance Target
Community Outcomes	**Level of service**	**Performance measure**	**Previous and current performance**	**2021/22 -2030/31 (Year 1-10)**
		d) convictions in relation to those resource consents* 1		
		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	17 complains per 1000 connections in 2019/20 16 complains per 1000 connections in 2018/19 20 complaints per 1000 connections in 2017/18 16 complaints per 1000 connections in 2016/17	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

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

Table 2-7: System Failure Response Times

Description	Investigation & Appraisal	Complete Repair
Investigations, inspections and reticulation monitoring	By arrangement	N/A
Minor leaks from fittings and connections	2 hours	1 working day
Flow meters	1 working day	5 working days
Other non-urgent works	N/A	10 working days
Burst pipes/major leakage	30 minutes	8 hours
Pump station failure	30 minutes	8 hours
Major sewage overflow that could endanger life or property or have an adverse effect on the environment	30 minutes	8 hours
Other emergency works	30 minutes	8 hours 90% of times Nil beyond 48 hours
Gravity sewer blockage	2 hours	8 hours

2.5. Desired level of service

There are no changes to the Levels of Service from the previous Plan and therefore the Levels of Service Table (table 2-6) reflects both the current and desired Levels of Service.

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 summarises key future demand drivers within this Plan.

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 intensification in some existing developed areas, including the city centre area, 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 mean that dwellings with low numbers of occupants can produce more wastewater per capita than dwellings with higher occupancy numbers.
Changes in Customer Expectations	Customer expectations are increasingly tending towards higher levels of service for reliability and response to complaints. These expectations do not always consider the additional costs associated with meeting them.
Community Expectation on Environmental Protection	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.
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: • NPS Freshwater Management • NPS Urban Development • Zero Carbon Bill	• NPS 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. This will be guided by the National Environmental Standard - Wastewater when released. • NPS Urban Development 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. • Becoming carbon neutral for the wastewater activity will focus on understanding, improving and mitigation of greenhouse gas production at the wastewater treatment plant and ensuring that the various network components that directly or

Wastewater Demand Drivers	Changes to Wastewater Activity
	indirectly have a carbon foot print are optimised to minimise their carbon foot print and where possible eliminated.
Organisational Policies Environmental Sustainability Certified Emissions Measurement and Reduction Scheme (CEMARS – Toitū Envirocare)	This includes an Emissions Inventory Report and Action Plan to Reduce Council Greenhouse Gas Emissions. Will require a focus on understanding, improving and mitigation of greenhouse gas production at the wastewater treatment plant and ensuring that the various network components that directly or indirectly have a carbon foot print are optimised to minimise their carbon foot print and where possible eliminated.

3.2. Demand forecasts

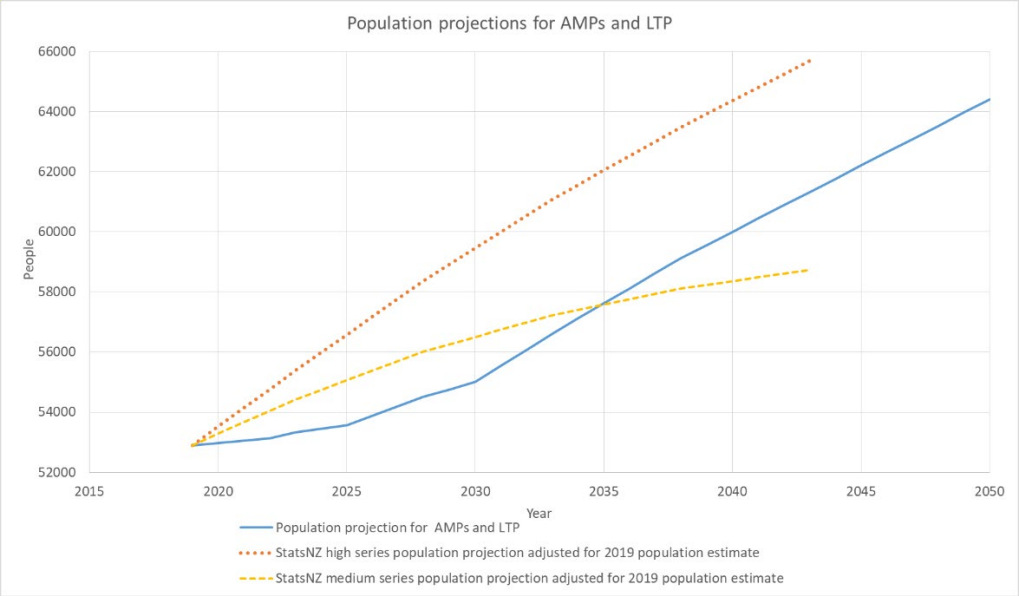
Nelson Population and Household Projections: 2019 - 2050

Traditionally, Statistics New Zealand would provide high, medium and low scenarios for Councils to use. In 2018, the latest census was completed but due to shortcomings in the move to online forms the return rate was lower than previously experienced. As a result, there has been significant delays in Statistics New Zealand providing updated population projections. It has been necessary to utilise alternative methods for determining future population growth in Nelson.

Further complicating projecting the future population of Nelson is the COVID-19 event. The COVID-19 event is expected to have significant immediate and future economic effects particularly as it restricts the movement of people regionally and internationally.

In this context there is a lot of uncertainty involved with projecting future population change. To account for this a custom, or hybrid, population projection for Nelson has been developed looking back at trends over previous recessionary periods to assist in developing rationale for choosing variables to develop the custom population projection.

Figure 3-1: Population projections 2019 - 2050, Nelson



It is clear from Figure 3-1 above that the recommended projection is initially very low compared to the Statistics New Zealand high and medium series scenarios. The projection anticipates very low growth out until around 2025 before the rate of growth returns gradually to somewhere between the high and medium series.

Projected demand under the National Policy Statement on Urban Development

The National Policy Statement on Urban Development 2020 (NPS-UD) requires local authorities to ensure there is sufficient development capacity to meet demand. This includes an additional margin to support more competitive land markets of:

- In the short term (within 3 years) + minimum 20% - zoned and serviced.
- Medium term (3-10 years) + minimum 20% - zoned and planned to be serviced within LTP.
- Long term (10-30 years) + minimum 15% - zoned and planned to be serviced beyond LTP.

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 Section 3.5 Asset programmes to meet demand.

Wastewater Discharge Trends

Trending of historical wastewater flows for the Nelson Wastewater Treatment Plant (NWWTP) and the Stoke/Tahuna (Nelson Regional Sewerage Business Unit – Bell Island WWTP) area are detailed in Figures 3-2 and 3-3. For Bell Island WWTP the trend is clearly a rising one that corresponds with the relatively high levels of development in this catchment. For the NWWTP catchment the trend is more static again reflective of levels of development within the catchment.

Some year to year variability is expected as industrial use fluctuates.

Figure 3-2: Nelson Wastewater Treatment Plant Average Daily Inflows

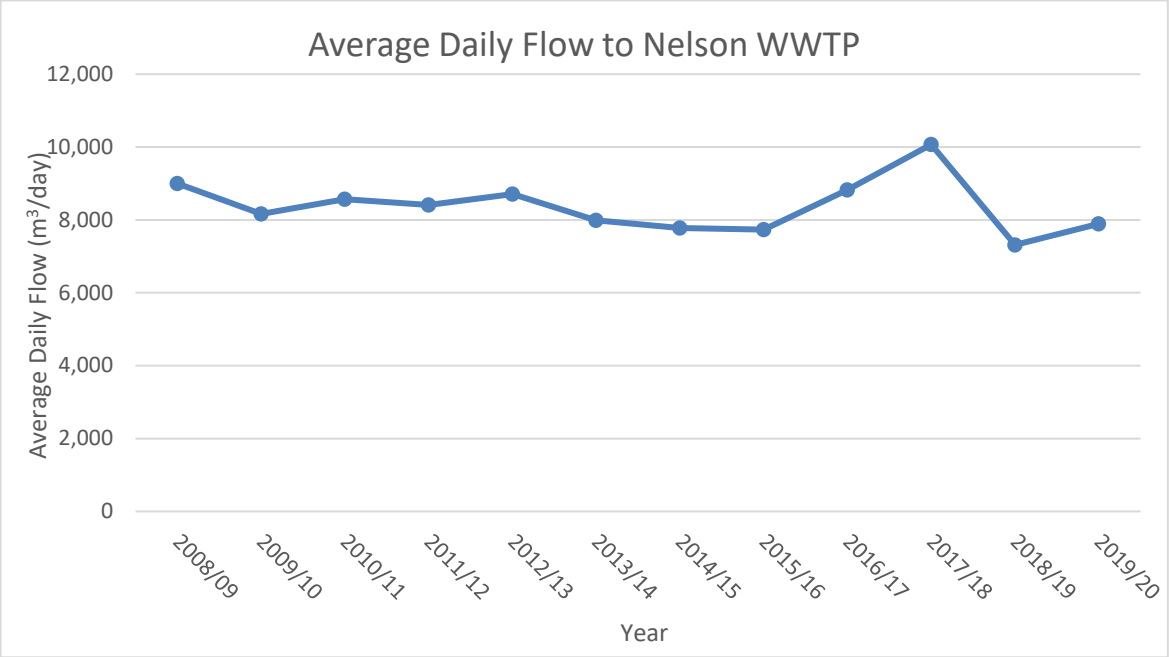
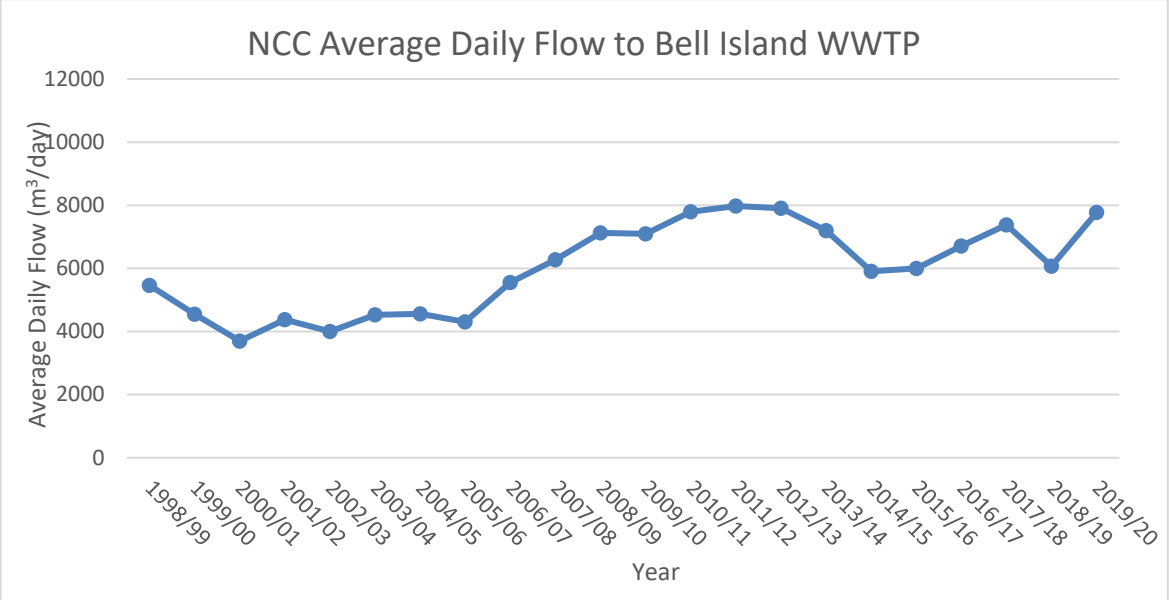


Figure 3-3: Stoke /Tahuna Average Daily flow to Bell Island



3.3. Demand impacts on assets

Modelling of the network suggests that there is currently sufficient dry weather capacity, in the city's pipes, for at least the short-medium term; this is strongly supported by the low level of dry weather overflows that occur in the network. Wet weather capacity is the greatest challenge and is covered in more detail elsewhere in this plan. The hydraulic model is currently undergoing a significant upgrade; this will prove a key tool in determining restrictions within the network and the development of associated solutions.

The demand changes related to legislative, climatic and community expectation changes mean that the future of the processes, and potentially the location of the Nelson

Wastewater Treatment Plant will require significant consideration in the coming years and in particular over the period of this Plan.

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 3-2 below details the demand management strategies that have or will been instigated:

Table 3-2: Demand Management Strategies

Strategy	Objective/ Description
Operations	Reduce direct stormwater entry into the wastewater reticulation system through education, detection and control. Installation of inspection points at private property boundaries to identify inflow and infiltration into the sewer network. 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. 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 focussed on areas with poorer performing assets or areas where there are constraints as identified operationally, anecdotally and through the wastewater hydraulic model. Use of hydraulic modelling to ascertain effects and constraints within the network. Increasing storage capacity at priority pump stations.
Regulation	The use of the Nelson Resource Management Plan to control the areas in which development can occur and the associated density that is permitted. Integrating growth planning with infrastructure provision via the Future Development Strategy and the associated Intensification Action Plan.
Wastewater 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

Strategy	Objective/ Description
	the system capacity is not compromised by high volume or high strength point discharges. Protection of the Council's wastewater network from high levels of inflow and infiltration.
Education	Continuation of the wastewater minimisation programmes aimed at increasing community awareness of the benefits of reducing direct stormwater disposal into the wastewater system. Encourage use of low flow devices where applicable (i.e. showers, toilets, etc.) particularly in council owned facilities. Promotion of the Wastewater Bylaw.

3.5. Asset programmes to meet demand

Future Development Strategy

In response to the National Policy Statement on Urban Development Capacity (2016), NCC and TDC jointly adopted the Nelson Tasman Future Development Strategy in 2019. The strategy sets out how the combined region intends to plan for its future housing capacity to accommodate projected growth in population and households, as well as the attendant business and other demands this growth will bring.

The Future Development Strategy (FDS) sets out where it is feasible and likely for future housing to be located within the next 30 years in Nelson and Tasman, and the likely timing of these developments.

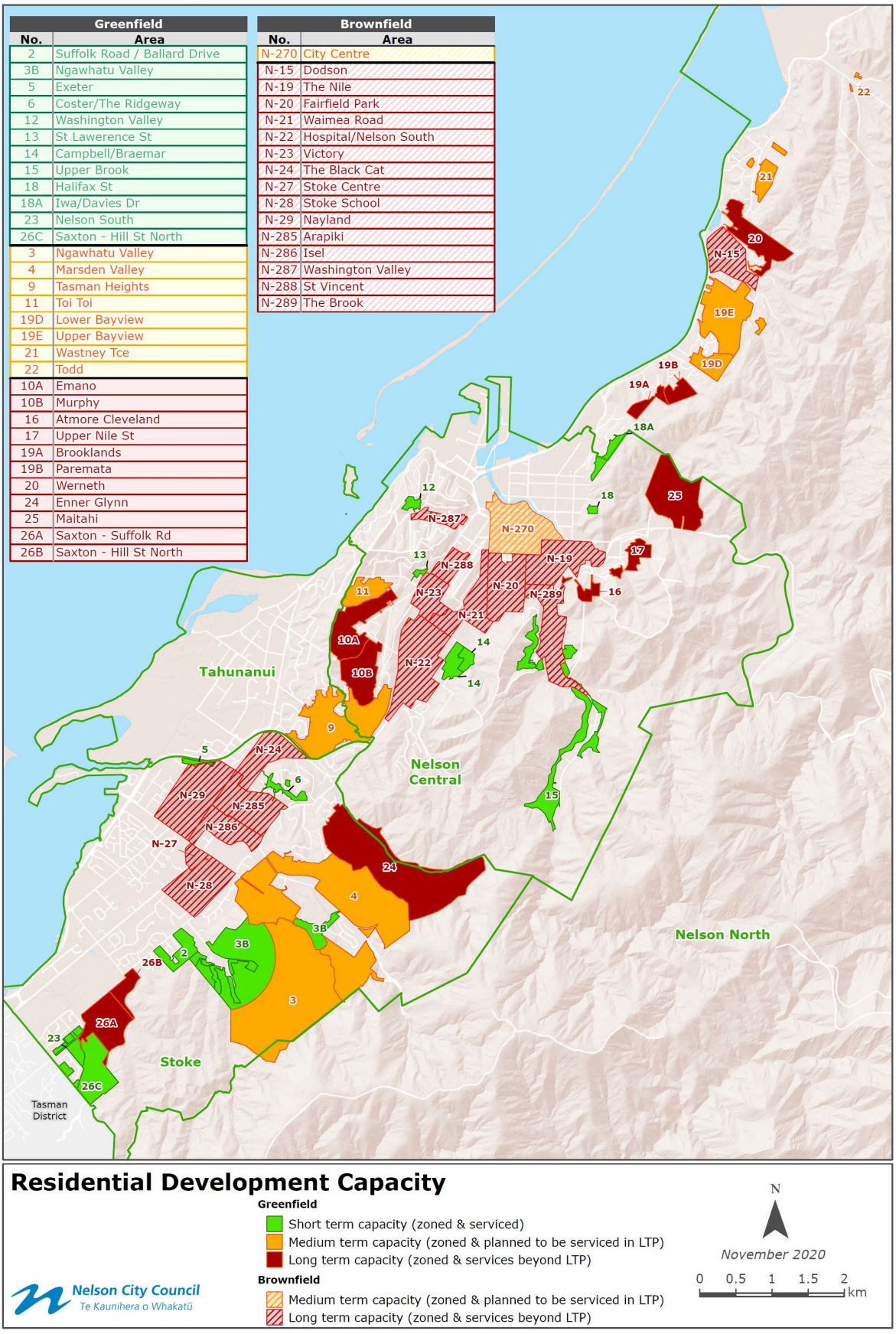
The FDS identifies space for 8,166 extra dwellings in the Nelson Urban Area (which includes Richmond and surrounds), with about 60% of this growth to be achieved by adding new housing into existing urban areas including the City Centre and Stoke. An additional 1300 extra dwellings could be constructed in the Wood, Vanguard, Gloucester Street and Tahunanui in 20–30 years' time, but Council will not be providing for intensification in these areas unless the effects of climate change (particularly sea level rise) can be addressed in these areas. Two greenfield areas within Nelson which have been identified as being suitable for new urban development in the medium term are Mahitahi and Saxton.

Community feedback on the FDS supported growth through intensification of existing urban areas rather than expansion onto rural land.

Figure 3-4 shows the areas that are expected to grow and/or intensify in the coming three decades and are identified for future growth in the FDS. As demand for development becomes clearer they will be prioritised for services.

For planning purposes 3 waters servicing for the City Centre, Victory, and Washington Valley is currently scheduled to progress in decade 1.

Figure 3-4: Nelson Growth Areas and Infrastructure Timing



Intensification Action Plan

Implementation of intensification projects is more complex than traditional expansion, so therefore an Intensification Action Plan has been developed. The Intensification Action Plan states that Council should:

- Lead investment in urban amenity and public transport to encourage growth in specific areas.
- Lag investment in response to growth occurring (e.g. traffic lights to manage increased vehicle numbers, and stormwater and wastewater services to meet demand).

Council does not have full control over the location or level of uptake of intensification or urban expansion opportunities, as this is largely dependent on decisions by individual landowners and/or developers. Two of the methods in the Intensification Action Plan are to:

- Develop comprehensive neighbourhood upgrade plans.
- Integrate urban design principles into infrastructure development and renewal processes at the scoping and design phase.

The availability of wastewater reticulation, and treatment facilities that have capacity to service the proposed intensification will increase developers' certainty that the neighbourhoods they are investing in will be attractive to buyers.

Reticulation Capacity

Modelling of the Nelson City and Nelson South catchments has been occurring since 2004 using a computer network model based on the InfoWorks software. The hydraulic models are used widely to support a variety of programmes and projects.

Maximum flows for design are based on the current development potential of the various catchment zones in accordance with the Nelson Resource Management Plan, supported by field calibration data that accounts for inflow and infiltration.

The wastewater hydraulic models are currently being updated.

Pump Station and Rising Main Capacities

Nelson City Council has an ongoing programme of upgrading and renewing pump stations to meet demand and component renewal requirements. Typically pump stations will have a design life horizon of 25–50 years with various componentry (such as pumps) having shorter design lives.

Future pump station and rising main upgrades will be linked to the areas/pump stations with known issues, expected flows identified in the wastewater network model, overflow prevalence and development of areas.

Nelson City Council has a rolling programme of installing and renewing flow meters at pump stations.

Treatment Capacity

Nelson Wastewater Treatment Plant*:* The Wastewater treatment plant was designed to the following requirements:

- Hydraulic loadings – to year 2050.
- Load (Biochemical oxygen demand, suspended solids etc.) – to year 2050 (assessments will be undertaken during the period of this Plan to determine the state of actual loadings against the design parameters).

The treatment loading and capacity and plant performance is monitored to ensure treatment capacity continues to meet demand. It is expected that future regulatory changes will increase the level of treatment required.

Bell Island Wastewater Treatment Plant

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

Strategic Planning

There are a variety of strategic projects within the wastewater activity (e.g. Climate change strategies/programmes, Overflow Reduction etc.) and a variety of strategic pieces of work external to the activity that influence it (e.g. the Future Develop Strategy). Over the period of this Plan these will be bought together in an overarching strategic plan that integrates internal and external strategic thinking.

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.

As with many other urban areas across the country, much of the 3 waters network in Nelson was developed during a period of intense urbanisation and conversion to public servicing from the 1960s and 70s. The average age of Nelson's wastewater pipe assets is approximately 40 years which sits slightly above the national average at about 37 years.

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 outlined in Table 4-1.

Table 4-1: Asset Lifecycle

New ↕ 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 NCC. 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 are outlined in Table 4-2.

Table 4-2: Asset Failure Modes

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	Includes where the cost to operate and maintain 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 identified in Table 4-3.

Table 4-3: Lifecycle Management Programmes

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

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 and changing expectations (regulatory and community).

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. Key Issues for the Wastewater Activity

Key issues for the 2021 – 2031 wastewater activity are summarised as follows:

Issue 1: *The location and disposal route for Nelson's wastewater treatment in the future.*

Issue 2: *Damage to the wastewater network from natural hazards (Asset resilience).*

Issue 3: *Planned levels of service for the wastewater network will not be met unless assets are maintained, renewed and upgraded*.

Issue 4: *Wastewater overflows.*

Issue 5: *Failures of the Atawhai Rising Main are occasionally causing untreated wastewater discharges directly into Nelson Haven.*

Issue 6: *Management of increased wastewater flows associated with urban intensification and growth.*

Issue 1: The location and disposal route for Nelson's wastewater treatment in the future

The current Nelson Wastewater Treatment Plant (NWWTP) – note the NRSBU facility Bell Island WWTP is the subject of its own Activity Management Plan - is in a location that may be prone to impacts from sea level rise and fluvial flooding in the long term. The NWWTP is located in an area that has been naturally reclaimed from the sea by a combination of the formation of the boulder bank and the gradual sedimentation (as is continuing today) of the estuary.

It is expected that the NWWTP will remain in this location for the medium term however work programmed as part of this Plan will be seeking to define the options available into the future and the levels of risk and cost associated with these options as well as better understanding the risks associated with climate change at the current location.

Figures 4-1 and 4-2 outline flooding at the NWWTP site, based on modelling undertaken in 2020, with the respect to extreme rainfall and tide events in 2070. From these figures it is clear that whilst causing elevated water levels in various locations around the site, the site itself is not inundated through these events.

Regardless of the lack of inundation at the site shown by the modelling in 2070 it is considered prudent, due to uncertainties related to climate change predictions, to examine the options available for the future treatment of Nelsons wastewater.

Figure 4-1: River Flow Flooding 2070 RCP 8.5M 1 in 100 year rainfall event

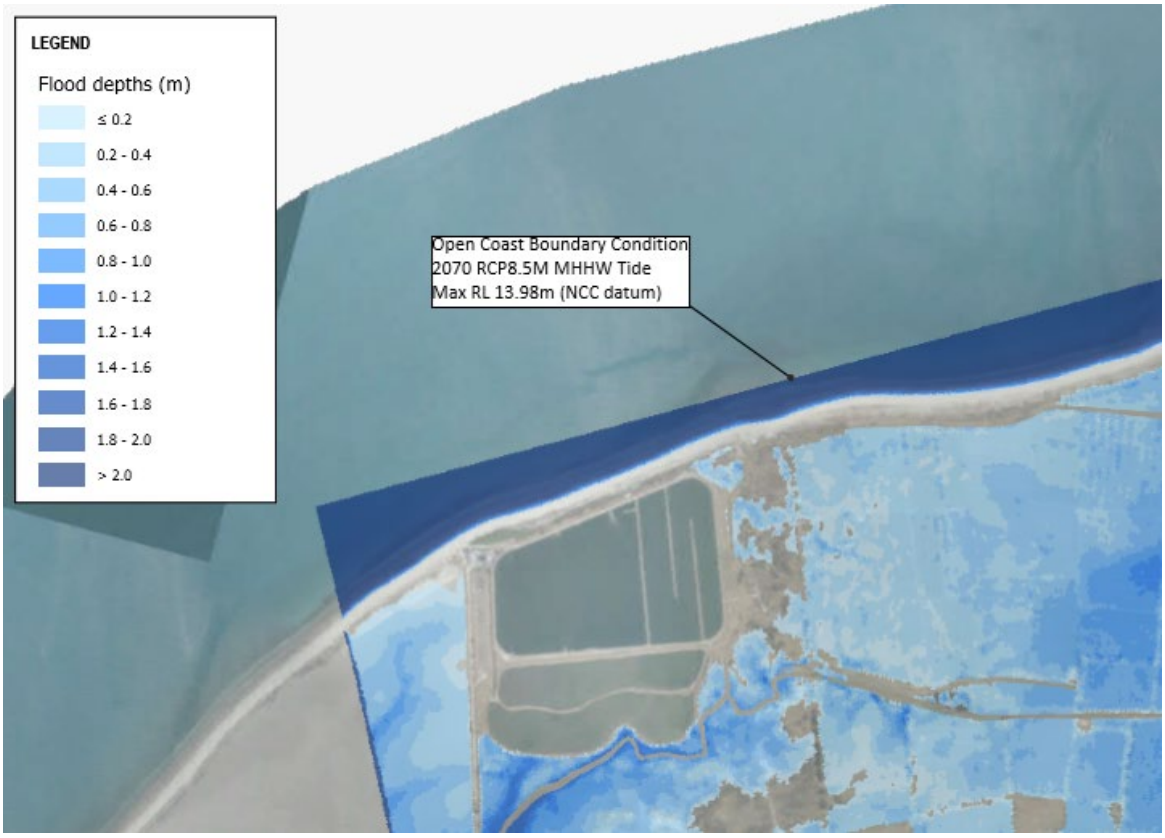
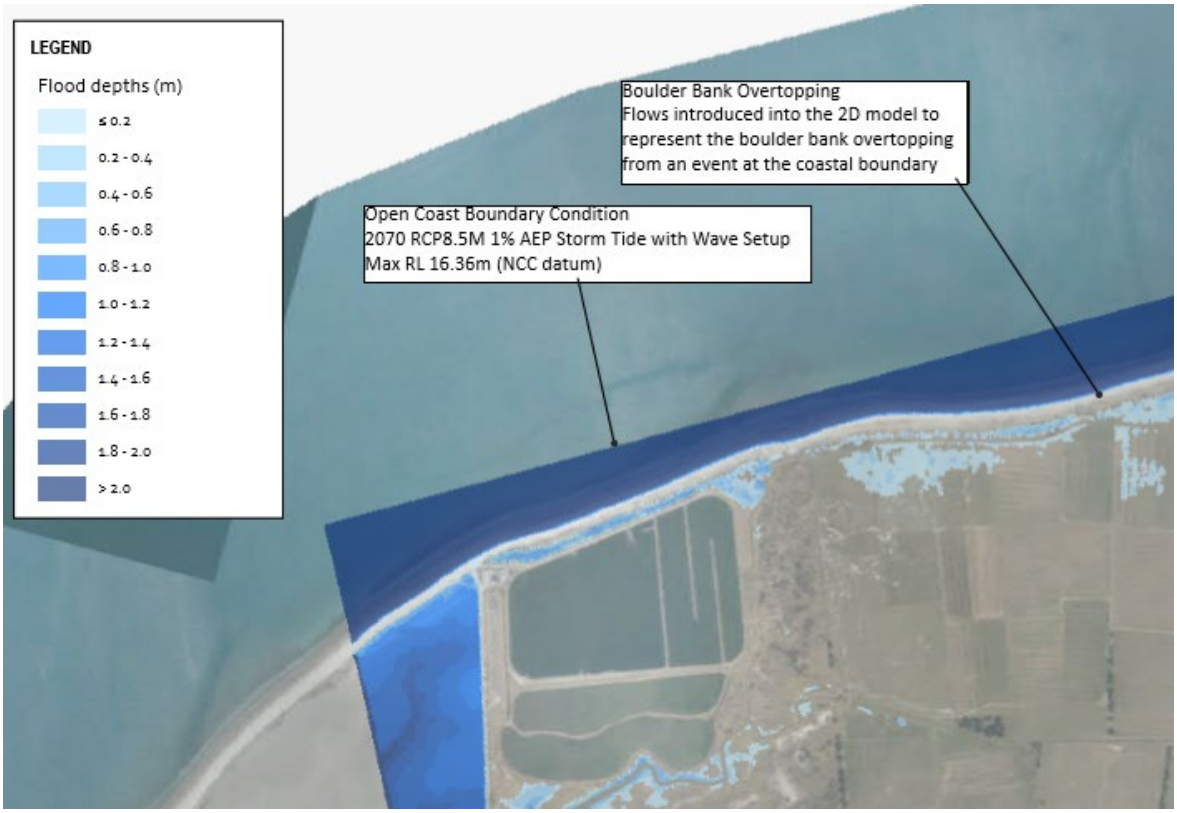


Figure 4-2: Coastal Flooding 2070 RCP 8.5M 1 in 100 year storm tide event



Issue 2: Damage to the wastewater network from natural hazards (Asset resilience)

Natural hazard events over the last decade have highlighted that parts of any utility network can be exposed to natural hazard events and that different natural hazards may impact on different parts of the network.

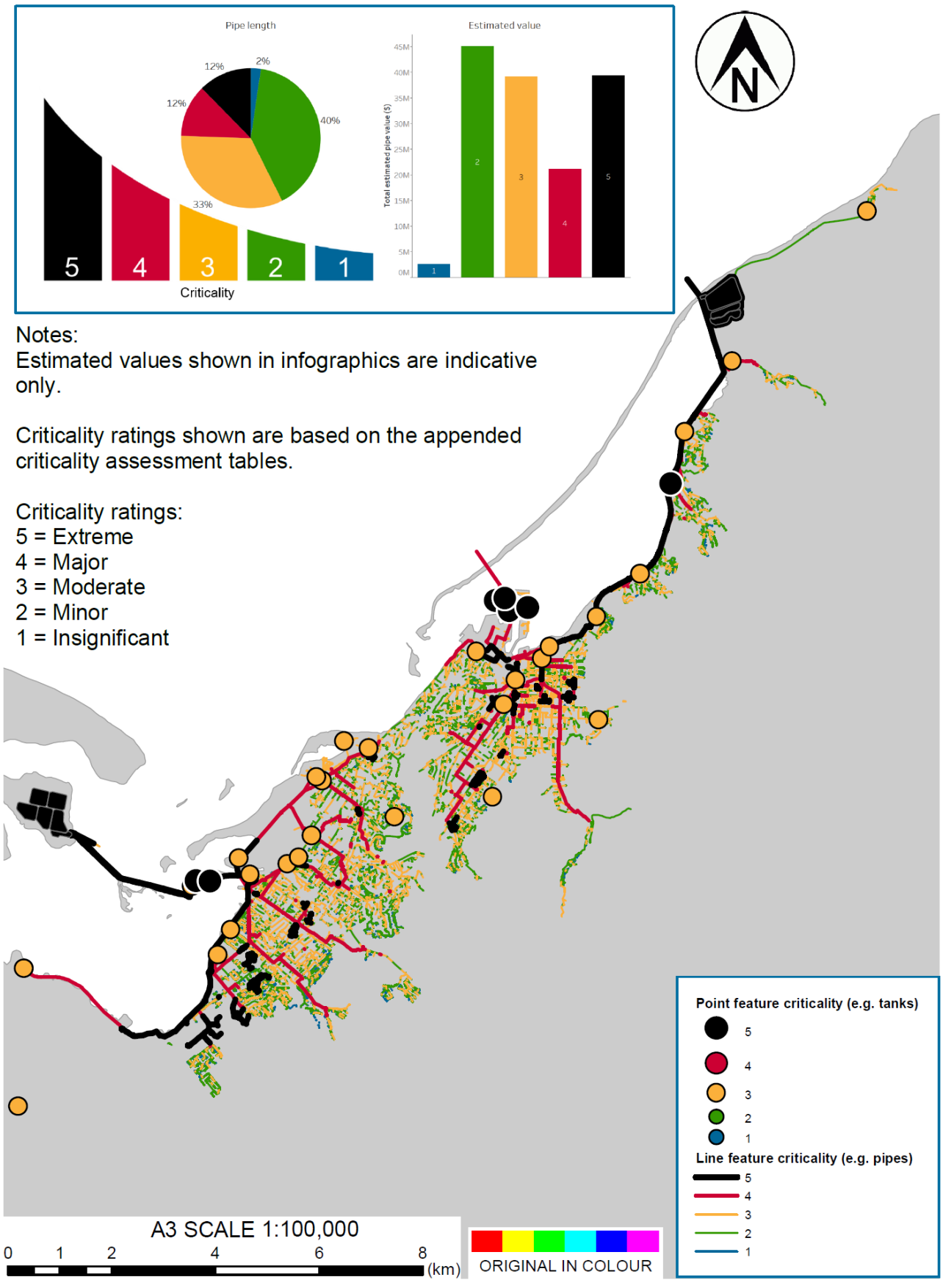
Council has recently undertaken a 3 Waters Natural Hazards study (Study) to establish the critical aspects of the 3 Waters networks and to understand what natural hazards events are likely to impact on these. A key aspect of this work is outlined in Figure 4-3 that identifies the criticality of various parts of the network. Unsurprisingly a large portion of the assets identified as most critical are those at the bottom of the catchments (and hence serve a greater number of ratepayers).

The focus of increased resilience will be on assets that have a higher criticality rating. To further refine the prioritisation of assets the Study reviewed available hazard information and compared this against the criticality layer – this effectively defines critical assets that are likely to be susceptible to specific natural hazard events. The natural hazards considered as part of the Study are:

- Earthquake – ground shaking.
- Earthquake – liquefaction.
- Earthquake – fault rupture.
- Storm inundation and coastal erosion.
- Sea level rise.
- Tsunami.
- Wind/treefall.
- Fire hazard.
- Landslide hazard.

This piece of work is ongoing and long term. In time it will develop into a programme under which a variety of specific projects will be undertaken. A capital and operational budget placeholder for this work has been included within this Plan.

Figure 4-3: Criticality of the components of the wastewater network.



Issue 3: Planned levels of service for the wastewater network will not be met unless assets are maintained, renewed and upgraded

Significant sections of the Nelson wastewater network were installed in the city from the 1950's -1970's as part of a surge of new developments. These earlier networks are now approximately 60-70 years old and some pipe materials have already reached the end of their service life.

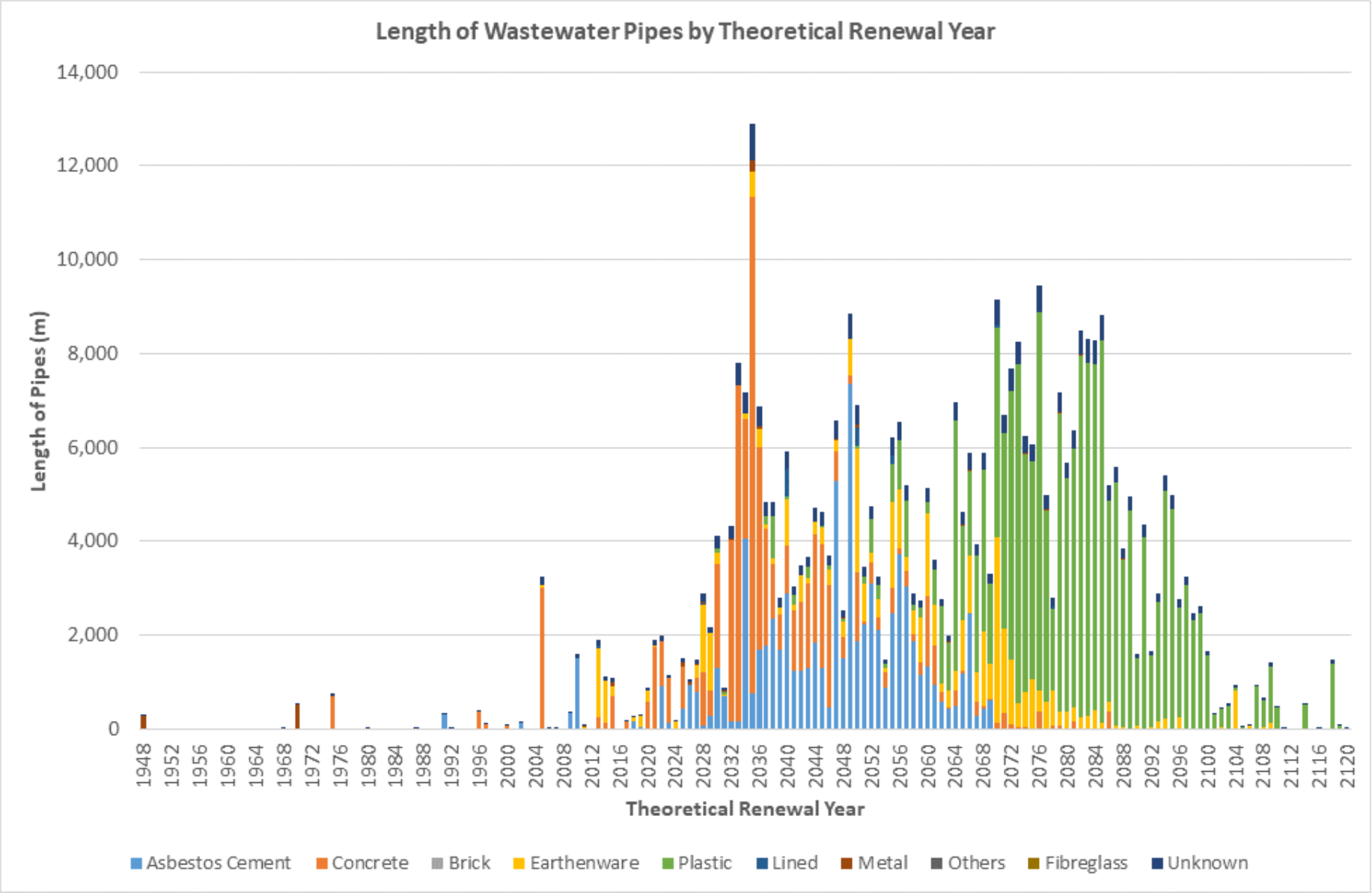
It is clear from the pipe renewals graph (Figure 4-4) that there is a significant lift in the amount of renewals required in the period from the mid 2030's onwards (a renewals "bow wave").

In order to ensure assets are able to be renewed, in terms of affordability, prior to their associated levels of service dropping then it is likely some assets will be renewed early (most likely coinciding with upgrades) and some renewals will be deferred where asset condition merits this approach.

The budget approach taken within this plan will be to ramp up spending (from $1.2 million in 2021/22 to $4 million in 2030/31) on pipe renewals and then maintain a degree of consistency of spend over a period of time (5 or 10 years). This will encourage efficiency and provide a degree of certainty to the market (that will hopefully also encourage efficiencies).

The Atawhai Rising Main (pumped pipe that connects the majority of the city to the NWWTP) has been excluded from Figure 4-4. The reason this has been done is that it is a significant asset that is budgeted for separately in the Plan budget programme; additionally there has been remedial work undertaken on the pipe at critical locations that have extended the base life of this asset. Condition assessment work is ongoing.

Figure 4-4: Theoretical Renewal Year / Material Distribution



Issue 4: Wastewater overflows

Overflows occur in the network when, for a variety of reasons, the network is overwhelmed and excess wastewater volumes are released at "weak" points. Overflows are primarily linked to wet weather events however they are also caused by blockages and breakages within the system. A significant issue that contributes to wet weather overflows occurring is Inflow and Infiltration (I&I). In summary I&I is the entry of water (typically groundwater or stormwater) into the wastewater network, typically, unintentionally. It is an urban issue nationally and around the globe.

Above ground, inflows during rain events can happen when stormwater flows through manhole lids, low gully traps, crossed connections between stormwater pipes and sewer pipes and deliberate redirection of stormwater into sewer mains.

Below ground, infiltration occurs when groundwater 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 groundwater levels arise from existing natural seepages, rain saturation, tidal and river effects and on site stormwater soakage; these exacerbate the below ground issues. As sea levels rise an increased focus on parts of the network that is susceptible to tidal inflows will be required. Addressing the issues of inflow and infiltration requires the efforts of both council and the community.

Central government regulatory and Whakamahere Whakatū Nelson Plan changes are expected to provide some degree of guidance with respect to this issue particularly in regards to the level of overflows that are acceptable.

The Ministry for the Environments *Action for Healthy Waterways* has outlined the intention to consult upon and develop a National Environmental Standard – Wastewater (NES-WW). As wastewater overflows are a national issue it is expected that the NES-WW will provide guidance related to how an approach to managing wastewater overflows should be developed.

The updating and calibration/verification of the two hydraulic models is key to understanding network performance and where constraints exist. Therefore enabling better decision making and investing appropriately to reduce wastewater overflows. This work has commenced.

Misconnections to NCC's reticulation system and broken pipes on private property are challenging to resolve either through education or regulation and will be the subject of ongoing educational efforts.

To have the best chance of completely solving the issue, Council would have to replace most of the wastewater network, including privately owned pipes and pump stations, and ensure stormwater was being disposed of appropriately across the city (which itself is a challenging piece of work particularly where there is no existing stormwater network).

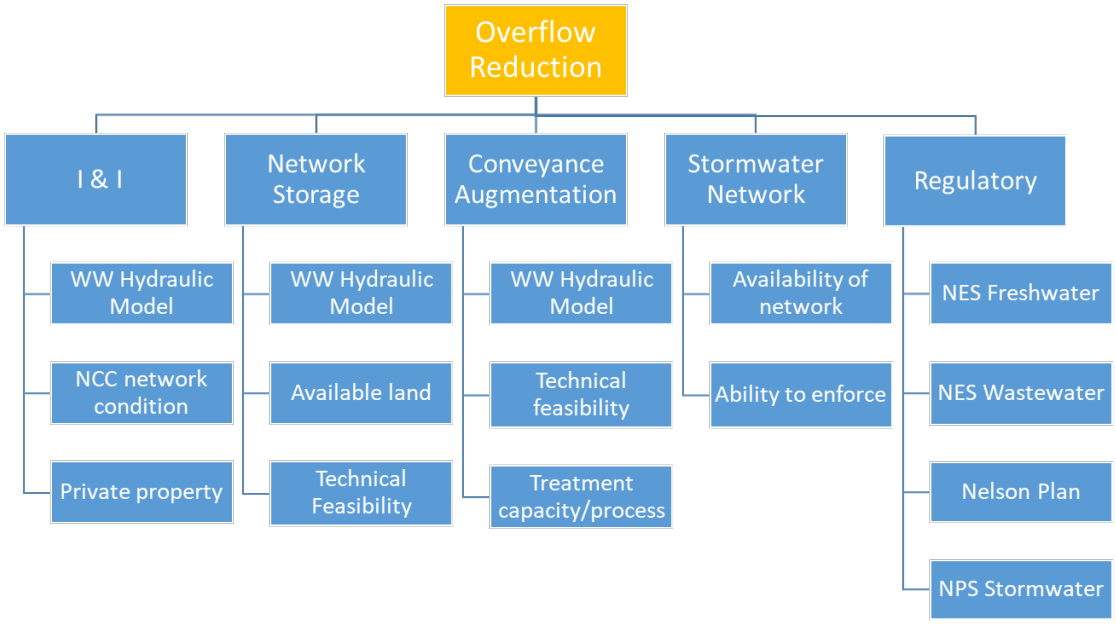
One approach, and likely a part of any solution to limiting wastewater overflows, is to upgrade the system downstream (to carry flow away from areas prone to overflows) and/or provide storage to minimise overflows by:

- Developing a holistic strategy, using the hydraulic model to predict where there is a higher likelihood of overflows.
- Factoring in the entry of some stormwater and groundwater into the wastewater system by increasing network capacity, potentially including the ability to store limited amounts of wastewater.

- Continuing to investigate high E.coli readings in water samples and repair any damage in the public network with urgency (noting that the network is, in the natural order of things, constantly degrading).

Figure 4-5 Outlines the intricacies associated with the overflow reduction programme.

Figure 4-5: Overflow Reduction work streams



The Plan budgets reflect this as an ongoing area of focus and reaffirm Council's commitment to minimise the impact of wastewater overflows on the community. Projects/programmes specifically linked to overflow reduction work include:

- Inflow and Infiltration/Overflow Reduction Programme.
- Washington Valley/Hastings St Sewer Upgrade.
- Hydraulic Model Upgrade.
- Pump Station Resilience.
- System Performance Improvements.
- Wastewater Pipeline Renewal Programme.

Issue 5: Failures of the Atawhai Rising Main are occasionally causing untreated wastewater discharges directly into Nelson Haven

The history of this pipeline is given in section 4.1.2 of this Plan. It is a high value and fragile asset and it requires replacement in the near future. Figure 4-6 identifies the alignment of this key asset.

The pipes that make up the Atawhai Rising Main are mostly concrete. The primary issue associated with this pipe is the degradation of the concrete and reinforcing steel by sulphuric acid. Sulphuric acid is generated by the release of hydrogen sulphide gas at air pockets along the length of the pipe.

Extensive repairs were carried out in the 1990s replacing some of the concrete pipes with fibreglass, however further failures have occasionally caused small volumes of untreated wastewater to directly discharge into the Haven.

These occasional untreated wastewater discharges impact on coastal water quality, cultural values, and public perceptions of the quality of the environment. They also have the potential to affect Council's compliance with future resource consent conditions, as the regulatory environment related to discharges of wastewater to the environment is likely to become more stringent over time in particular in relation to the National Policy Statement – Fresh Water Management.

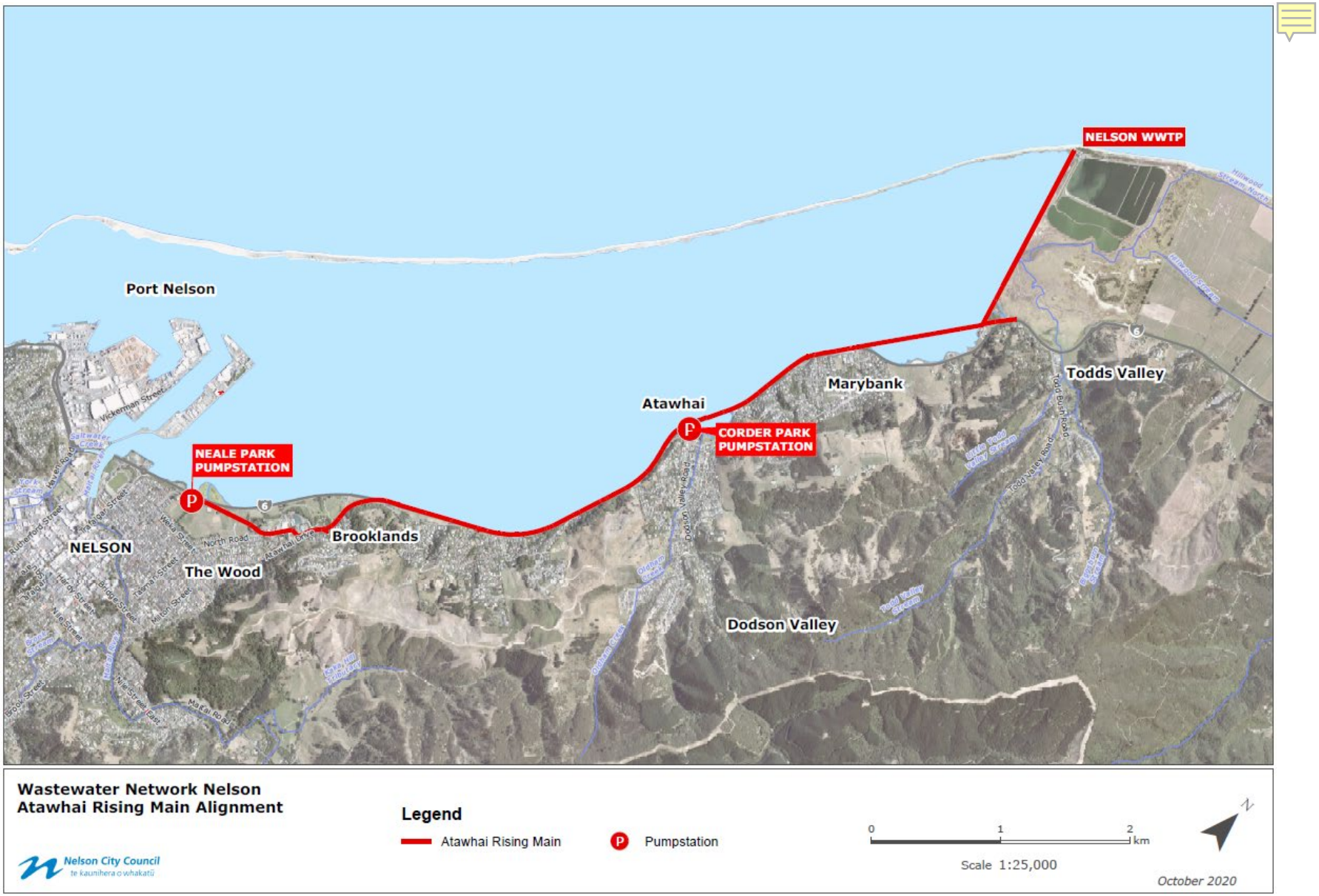
Investigation and condition assessment of the Atawhai Rising Main has been a focus since 2019 and will continue until the pipe is replaced. Given the pipe is pumped and there are a lack of access points to allow entry (whilst still being pumped), finding technology that provides a reliable data outcome relating to the internal condition of the pipe is challenging. Current efforts are focussing on manual inspection of access points, mechanical joints and fittings (these points tend to be more prone to failure), and on identifying the best "smart" option for internal condition assessment.

The upgrades of Neale Park and Corder Park Pump Stations are key elements of reducing the risk of pipeline failure through enhanced management of the pumping pressures.

During the period of the Plan work will commence on identifying the most appropriate way of replacing the pipe. This is likely to focus on the identification of high risk areas, sequencing of replacement and where the new alignment will run.

However, decisions on early renewal (replacement) of the rising main will depend on whether Council is able to gain consent for the NWWTP to continue in its current location. It is not cost-effective to upgrade the existing rising main if the future location of the NWWTP is not going to be in the Nelson North area. At this stage however, it is assumed that the NWWTP will remain in its current location in the short to medium term or within the Nelson North area for the long term.

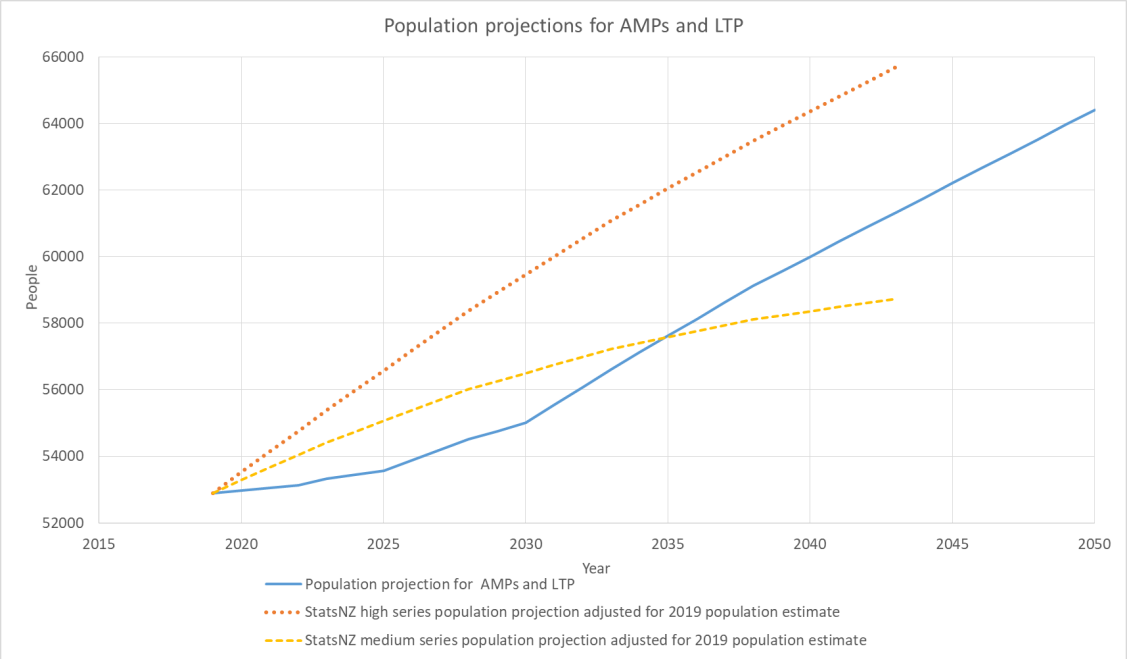
Figure 4-6: Atawhai Rising Main



Issue 6: Management of increased wastewater flows associated with urban intensification and growth

Between 2001 and 2008 the population of Nelson grew by around 330 people per year on average. Since 2008 the rate of population growth has increased to around 700 additional residents or 290 additional households per year. Figure 4-7 is based on statistics New Zealand growth projections for the city out to 2043. An increase in population to 64,400 by 2050 is expected under post-COVID 2020 population projections (as outlined in the publicly available NCC report *Population Growth and Demographics (Long Term Plan and Activity Management Plans 2021)*).

Figure 4-7: Population growth and projections, 2020-50, Nelson



The need to respond to growth/intensification is expected to be a constant into the future and that there will not always be clarity on exactly how this will unfold. As such whilst programmes will be planned/developed to support this there will be a need to be responsive and to ensure costs are apportioned appropriately.

The following documents set out the city's future urban capacity requirements and identify where urban intensity and growth are planned to take place over the next 30 years in Nelson.

- National Policy Statement – Urban Development (2020)
- Future Development Strategy (2019)

National Policy Statement – Urban Development (2020)

The National Policy Statement on Urban Development 2020 (NPS-UD) replaces the National Policy Statement on Urban Development Capacity 2016 (NPS-UDC) and requires local authorities to ensure there is sufficient development capacity to meet demand over the next 30 years with specific zoning and servicing requirements over different time frames:

- in the short term (within 3 years)
- medium term (3-10 years)
- long term (10-30 years)

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 *section 3.5 - Asset programmes to meet demand*.

Future Development Strategy and Intensification Action Plan

The Future Development Strategy (FDS) sets out where it is feasible and likely for future housing to be located within the next 30 years, in Nelson and Tasman, and the likely timing of these developments. Community feedback on the FDS supported growth through intensification of existing urban areas rather than expansion onto rural land, although greenfield development also plays a role. The FDS identifies space for 8,166 extra dwellings in the Nelson Urban Area (which includes Richmond and surrounds), with about 60% of this growth to be achieved by adding new housing into existing urban areas including the City Centre and Stoke.

Council does not have control over the location or level of uptake of intensification or urban expansion opportunities, as this is largely dependent on decisions by individual land owners and/or developers. The intensification objectives of the FDS are supported by an Intensification Action Plan (IAP). The IAP actions that relate to the programming of infrastructure are:

- Bulk programming of infrastructure investment to enable sufficient capacity for intensification development.
- Development of neighbourhood asset upgrade plans
- Refinement of infrastructure investment through the Long Term Plan process for the next thirty years.

The focus areas for the next ten years are the City Centre and Victory. Washington Valley is also programmed for an upgrade and therefore will have infrastructure capacity for greater intensification.

Two greenfield areas within Nelson which have been identified as being suitable for new urban development in the medium term are Mahitahi and Saxton.

Ensuring wastewater capacity is available to facilitate growth and intensification.

The nature of development with its market driven uncertainties relating to location and timing mean that, while some pre planning can be undertaken, there is a need to have some flexibility in relation to where work is undertaken to meet demand requirements.

Reducing inflow and infiltration and freeing up network capacity is supportive of growth and development. There is some opportunity to increase the current pipe diameters when the network is renewed.

The wastewater hydraulic model is the key tool that enables a good understanding of current constraints within the system and future constraints based on what is currently known about growth/intensification areas. This will enable key decision making when considering network renewals, upgrades and storage.

4.1.2. Physical Parameters

Summary of Assets

Nelson City Council is responsible for a wide variety of assets that constitute the Council Wastewater System. Table 4-4 shows the wastewater assets managed by Utilities as of June 2020.

Table 4-4: Summary of Assets

Asset Category	Quantity June 2020		Replacement Value
	km	units	$M
Reticulation Pipes (gravity – up to 150mm diameter)	337		184.78
Trunk Mains (gravity – 200mm diameter and above)	36.2		23.06
Swallow Mains (pressure gravity – 200 – 525mm diameter)	5.5		4.40
Rising Mains (pressure – 100mm to 900mm diameter)	25.1		27.72
Access points		986	1.07
Manholes		6985	62.87
Tanks (flushing and storage)		7	0.04
Valves		293	0.77
Neale Park Detention Tank		1	0.70
Pump Stations		25	9.69
Neale Park Pump Station		1	7.74
Corder Park Pump Station		1	7.02
Nelson Wastewater Treatment Plant		1	21.53
		Total	**351.39**

Note that historically the asset summary has included private assets which have been excluded in this case.

Wastewater Treatment Plant and Disposal

The Nelson Wastewater Treatment Plant (NWWTP) serves the central and northern catchments 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 (via Corder Park Pump Station) along the 9.8 kilometre, 750-900mm diameter rising main (Atawhai rising main) to the NWWTP at the northern end of the Nelson Haven. The NWWTP currently treats approximately 6,000-8,000 m^3 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 Council constructed the present oxidation pond to treat the wastewater prior to discharge.

In 1996 the NWWTP was upgraded by constructing a bund to divide the single oxidation pond into a primary facultative pond and a secondary maturation pond. This largely achieved the intended improvement in effluent quality, particularly in regard to faecal coliform reduction.

The ponds "crashed" (caused by an imbalance between loading rates and the available algal/bacteria to process the waste) for a three month period in 1999 and it was concluded that the facultative pond 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 Wastewater treatment plant has been monitored comprehensively since 1999, in terms of flow, load, pond algal condition, and other parameters.

Nelson Wastewater Treatment Plant

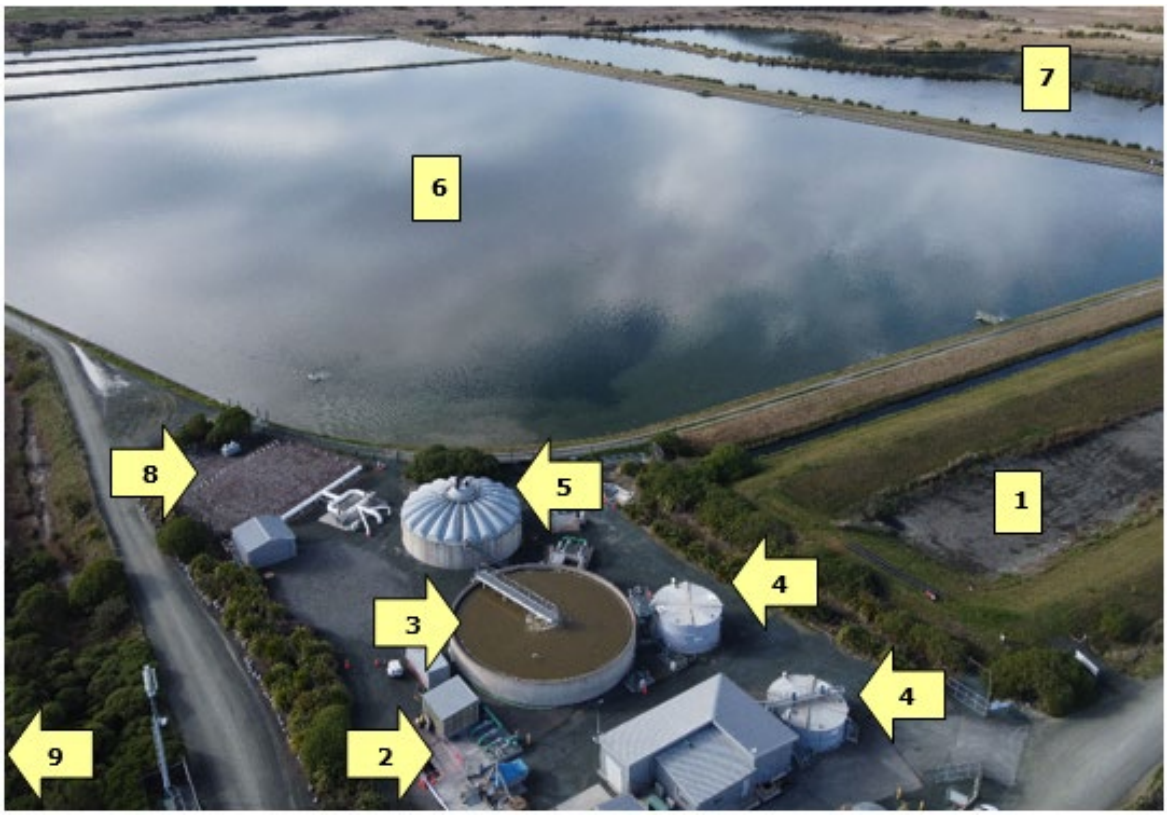
The Nelson Wastewater Treatment Plant (NWWTP) upgrade, substantially completed in 2008, was designed to comply with the requirements of the 2004 resource consent. The design of the new plant has allowed for better management of variable inflows and allows adjustments in operation to be made to reduce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

- Removing gross solids through the inlet works.
- Pre-treating the influent flow to remove Biochemical oxygen demand (BOD).
- Pond based treatment for the removal of BOD 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.

Periodically the oxidation pond compartments require desludging. Desludging was last completed in 2014.

Figure 4-8: Nelson Wastewater Treatment Plant



The main components of the NWWTP (as numbered in Figure 4-8) are:

1 – Flow Buffer

During periods of high rainfall, inflow to the plant can be directed to the flow buffer to keep the plant from being overwhelmed. Once flows have dropped off, this wastewater is returned to the plant for treatment.

2 – Screening and Grit Removal

The screening and grit removal system removes non-organic material (typically sanitary products and stone/sand) from the wastewater. This is compressed and taken to landfill for disposal.

3 – Clarifier

The clarifier removes suspended solids from the wastewater by gravity. 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 and pumped into the sludge tank.

4 – Sludge Tanks

Organic sludge from the clarifier is thickened by the mechanical removal of some of the liquid content and then stored, before being transported to Bell Island Wastewater Treatment Plant where it is further treated and sprayed as fertiliser on Rabbit Island pine forests.

5 – Trickling Filter

The trickling filter contains plastic media over which wastewater pumped from the clarifier is distributed via rotating arms. The trickling filter utilises a fixed growth process designed to further reduce the BOD of the wastewater.

6 – Oxidation Ponds

There are two oxidation ponds at the Nelson Wastewater Treatment Plant, a facultative pond and a maturation pond. The ponds use biological, natural treatment (algae, wind, sunlight and settlement) to reduce the level of BOD, suspended solids and faecal coliforms in the wastewater.

7 – Wetlands

The wetlands provide a degree of further effluent treatment (or polishing) before treated wastewater is discharged out to sea. The wetlands also meet the cultural aspirations of local iwi.

8 – Bio-filter

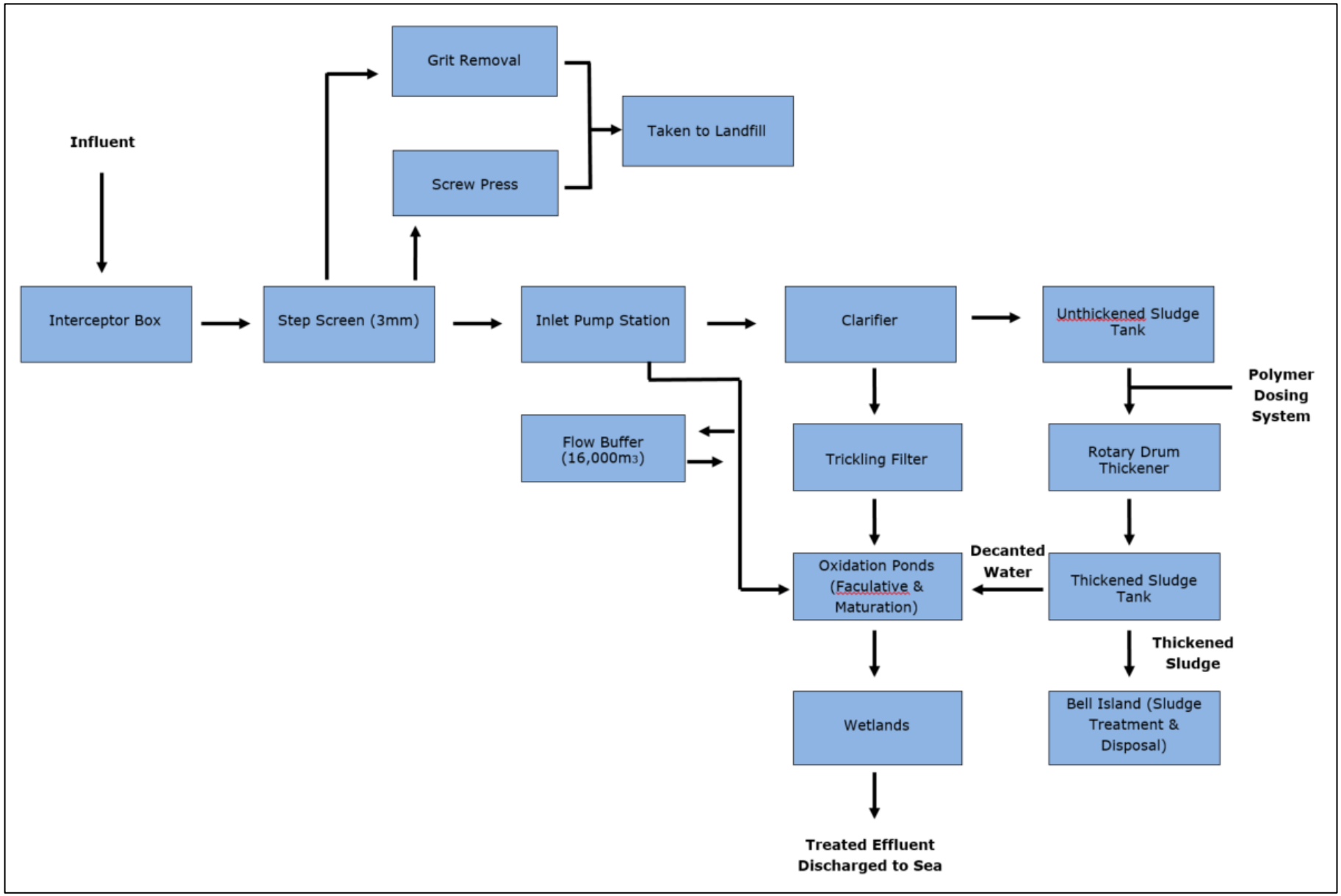
The bio-filter uses air, water and bark to neutralise odours which are extracted from the treatment plant components (excluding oxidation ponds).

9 – Outfall

The outfall pipe goes 350m into Tasman Bay

The Schematic of the treatment process is shown in Figure 4-9 and also refer to Appendix B for the process flow diagram.

Figure 4-9: Nelson Wastewater Treatment Plant Process Schematic



NWWTP Effluent Quality - Performance

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

Odour Events Originating from the NWWTP

The NWWTP 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/spring months. Prior to the upgrade, treatment relied solely on the oxidation ponds which is a form of treatment that uses naturally occurring bacteria and algae to break down the products in the waste stream in an aerobic process; however this form of treatment is sometimes susceptible to seasonal climatic fluctuations.

One of the most significant challenges with this type of operation is maintaining a balance between pond loading and available algae to process the waste. When the balance is not sufficiently consistent, either through elevated waste loading or seasonal changes in algae, the ponds are susceptible to "crashes" in algal populations which can lead to odour. An additional possible source of odour is the accumulation of sludge which settles to the base of the oxidation ponds.

The 2008 upgrade to the NWWTP introduced a range of measures that allow the plant operator to manage the pond loading by removing solid waste as sludge before it enters the pond.

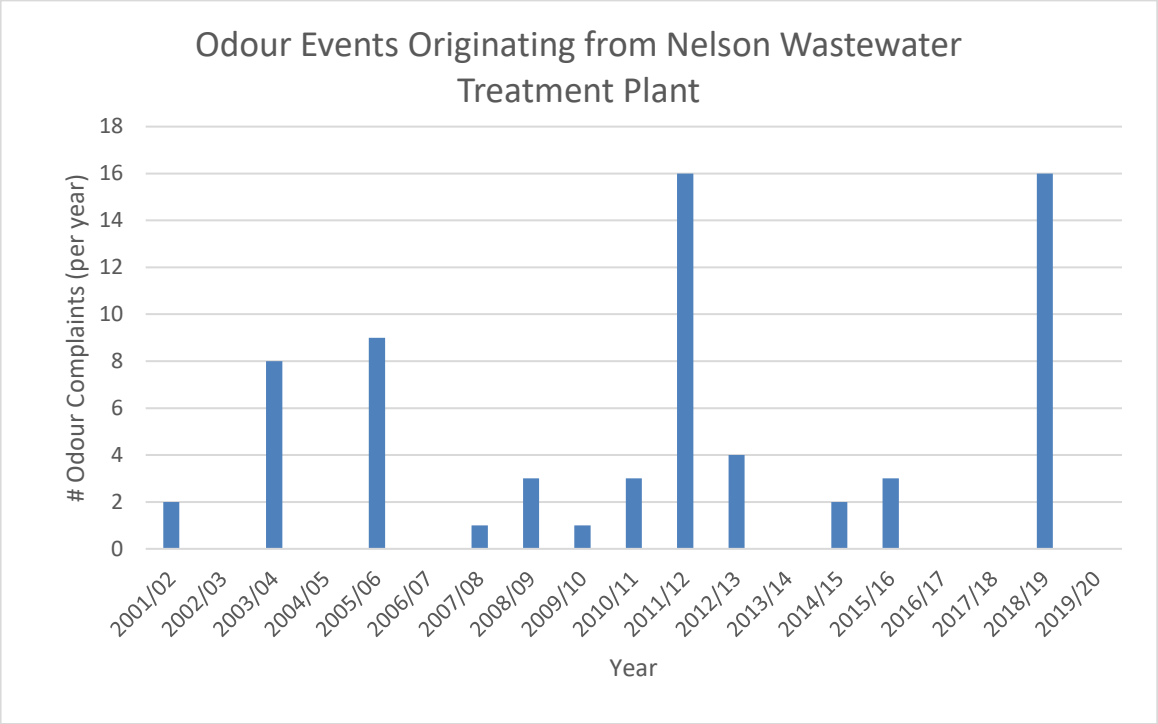
The current resource consent (expiring in 2024) has the following condition for odours: "There shall be no discharges to air from the wastewater treatment plant which are objectionable or offensive at any point on or south of SH6".

To date it has not been possible to continuously comply with this condition. A detailed investigation between Council, engineering consultants and the plant operator in 2013-14 centred on the accumulation of sludge in the oxidation pond (and the subsequent anaerobic decomposition processes) as a likely source of odour production. In 2014 Council de-sludged the ponds. A cover was also constructed over the trickling filter. Compliance with the resource consent improved.

In October 2018, an infection in the main algal population led to the ponds crashing and resulted in odour complaints. After this event, a Pond Management Team was formed (consisting of the plant operator and treatment process and algal experts) who monitor pond conditions closely (algae samples, dissolved oxygen, temperature, etc) and respond to any changes to keep the ponds in balance. This could be in the form of reducing load via the treatment plant and sludge removal process, or via algal seeding, where wastewater is recirculated between the ponds or from the wetlands back to the ponds.

Additionally minor process changes have been undertaken to enable a quicker response to changes in pond conditions. Compliance with the resource consent will continue to be closely monitored.

Figure 4-10: Odour Events Originating from Wastewater 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.

  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.

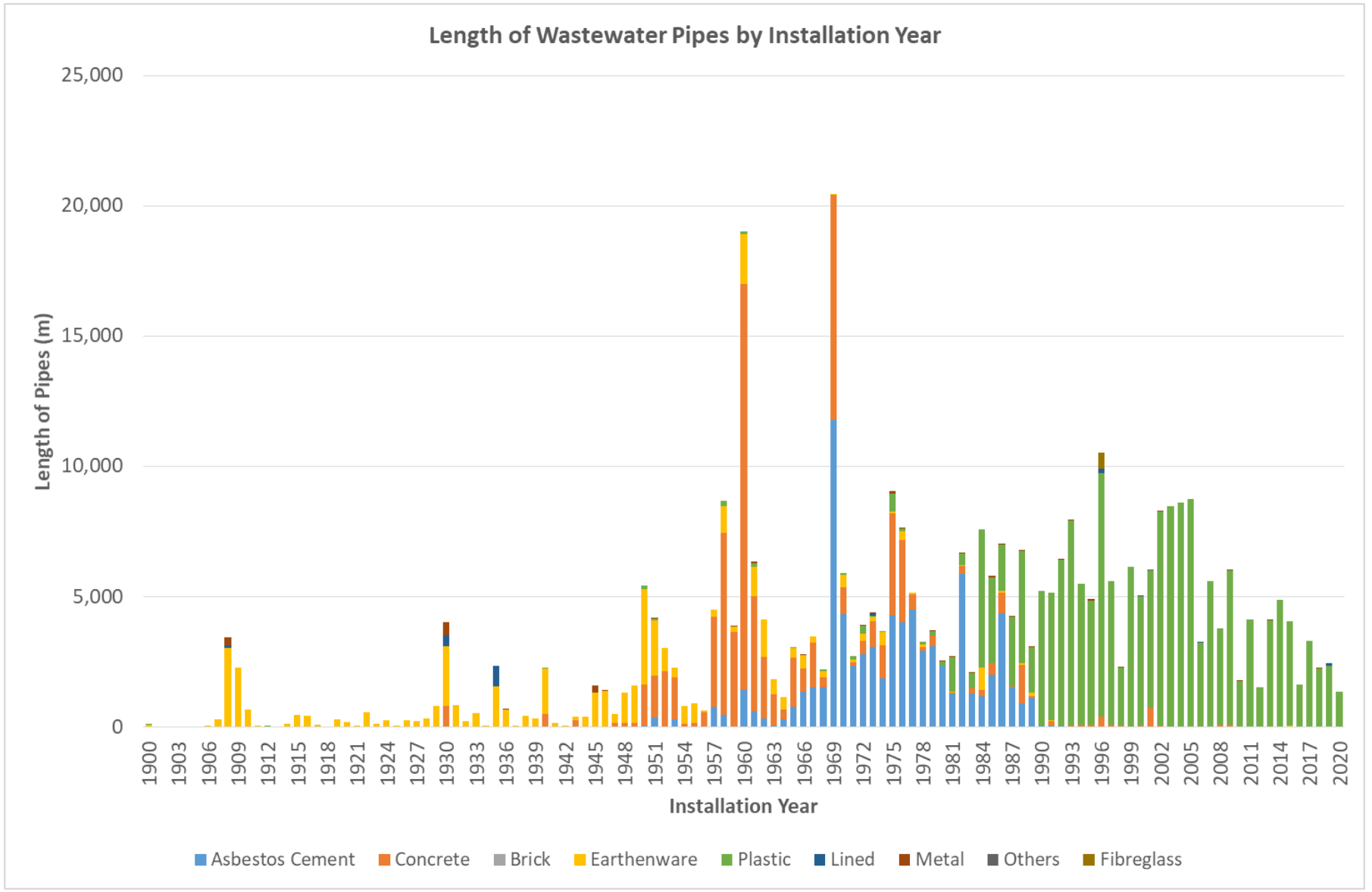
Reticulation

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 (some of these are private, some public and some private common).
- 150mm -200mm diameter gravity reticulation mains.
- Gravity trunk mains >200mm diameter.
- Manholes/Lamp Hole Cleaning Eyes.
- Swallow mains (gravity pressure pipes).
- Rising mains (pumped pressure pipes).

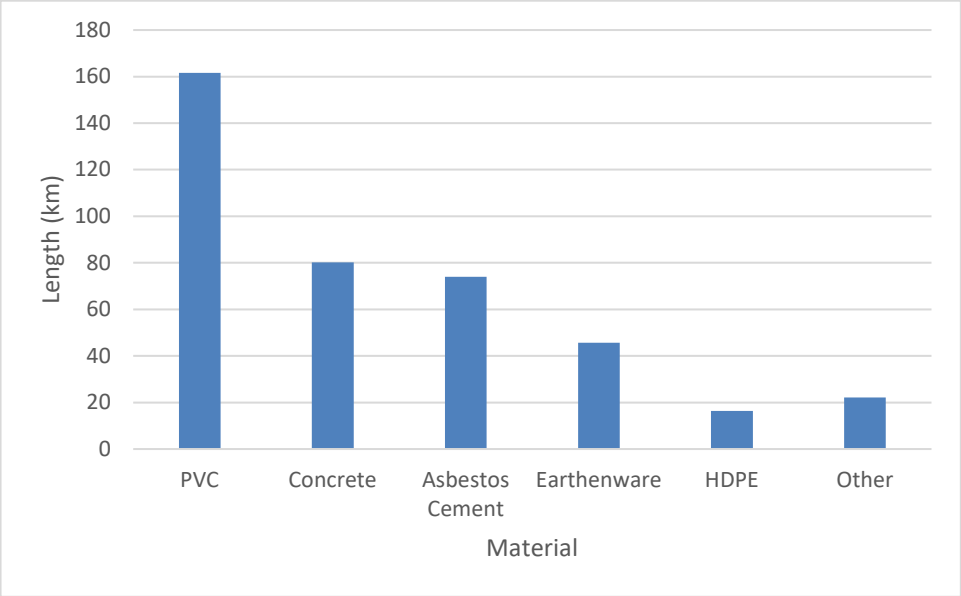
The Nelson City Council has wastewater pipe assets ranging from new to about 110 years of age. The distribution of pipe length verses age can be seen in Figure 4-11.

Figure 4-11: Year of Installation / Material Distribution



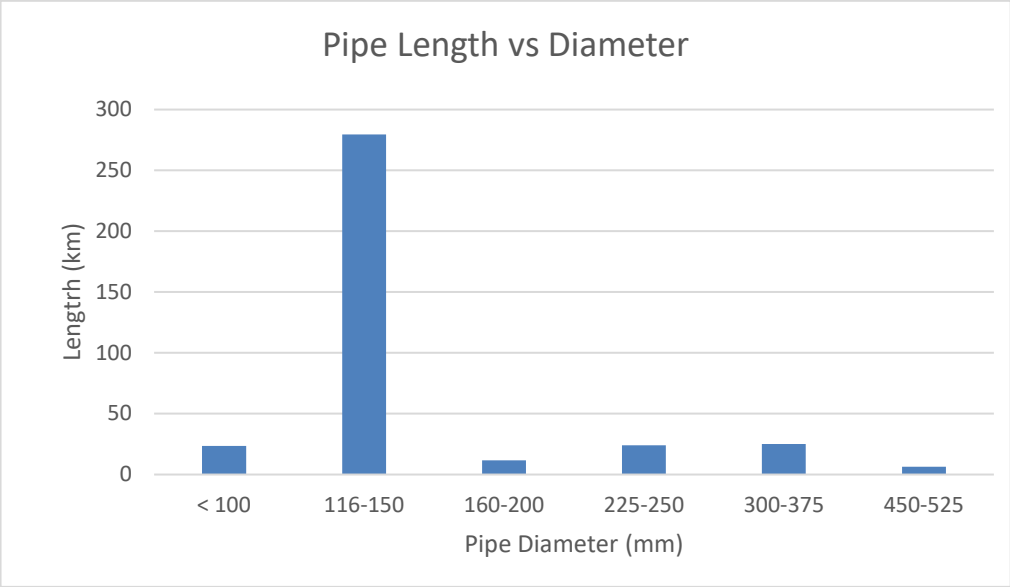
The pipe install date distribution continues at a relatively steady rate for the pipes installed from the 1950's to the present date. This is in line with the population growth in Nelson over the last 60 years and increases in Levels of Service.

Figure 4-12: Summary of Pipe Materials - 2020



PVC has been the predominant pipe material used and this can be seen in Figure 4-12 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 1950s to 1980s.

Figure 4-13: Gravity Main Length vs Diameter – 2020



The pipe diameter that forms the majority of Nelson City Council's pipe assets are 150mm diameter pipes as outlined in Figure 4-13. This is the default minimum for public sewers typically used in New Zealand.

Table 4-5 shows typical useful lives of network pipelines; this has been derived from industry knowledge and local performance data.

Table 4-5: Working Life of Wastewater Reticulation Assets (Years)

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	N/A
Ductile Cast Iron	65	55	50	40
PitCast Iron	85	75	70	40
Spun Cast Iron	90	80	75	40
Cast Iron	80	70	60	N/A
Concrete (InsituFORM lined)	70	70	70	40
Concrete	85	75	70	45
Earthenware	120	110	105	N/A
Earthenware Synthetic Lined (ESWL)	120	120	105	N/A
Fibreglass	90	90	90	60
MDPE/HDPE	105	105	105	60
PVC	80	80	80	50
Steel Concrete Lined	85	75	70	45
Unknown	85	75	70	N/A
Atawhai Rising Main Life	N/A	N/A	N/A	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

It is important to note the "bow wave" present in both Figures 4-14 and 4-15 commencing about 2040; also refer to section 4.1.1 Issue 3.

Figure 4-14: Estimated Renewal Cost Year / Material Distribution

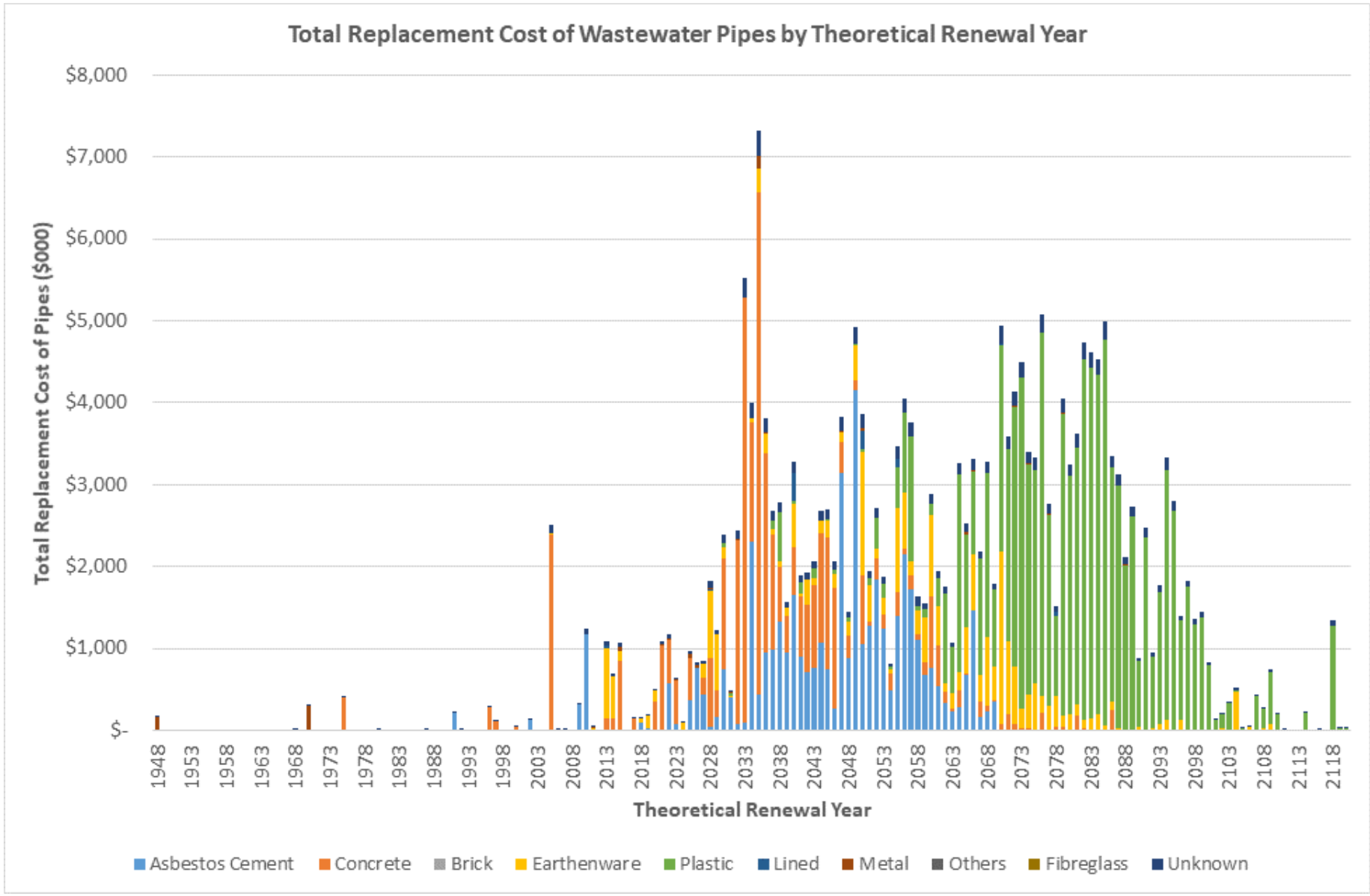
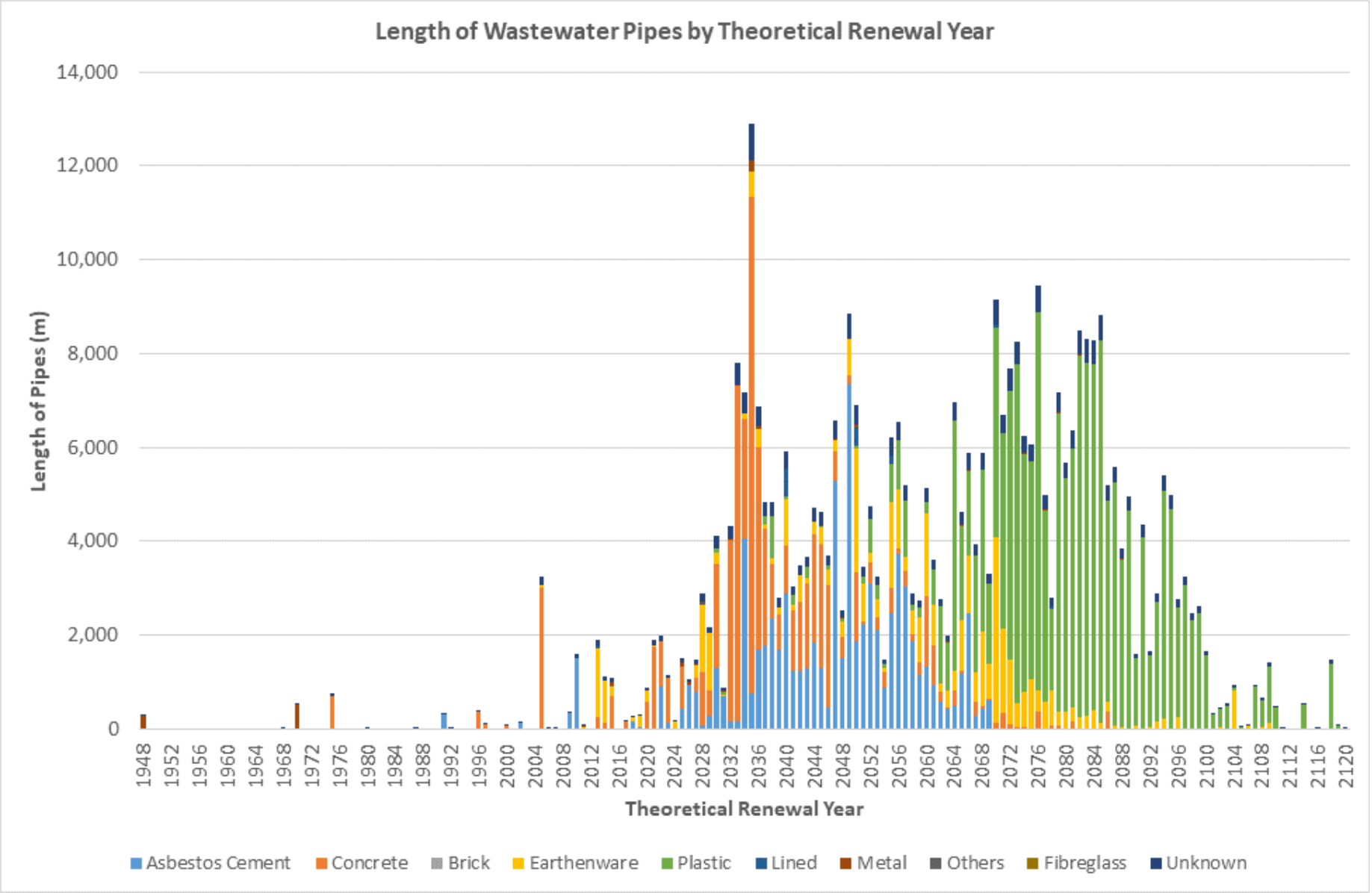


Figure 4-15: Theoretical Renewal Year / Material Distribution



Wastewater network odour issues

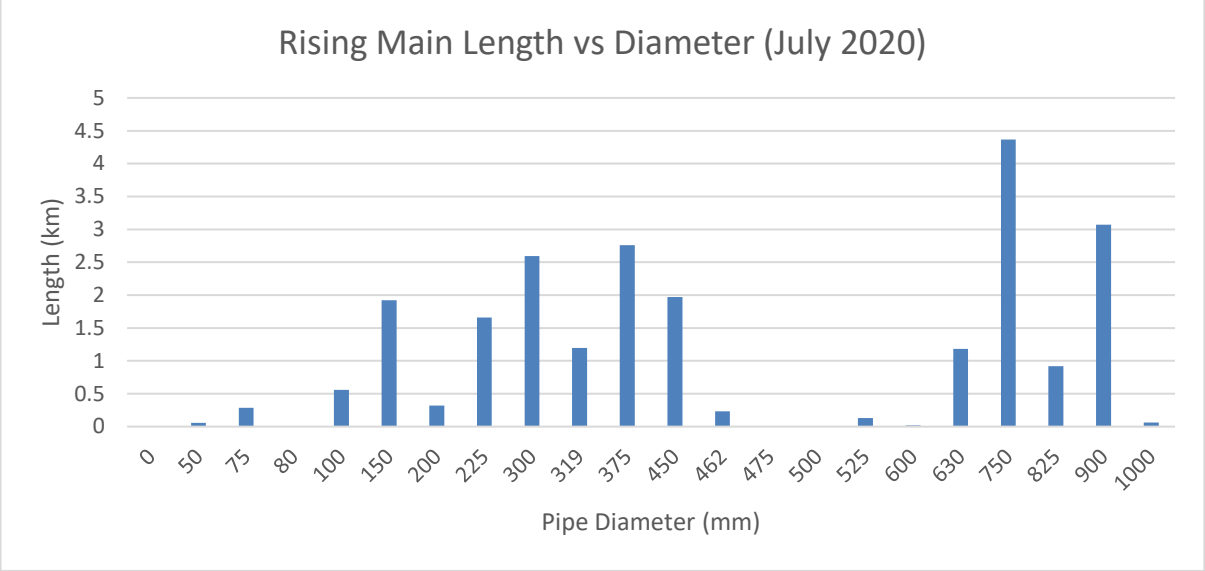
Odour complaints from different areas of the network do occur. Most complaints come from the operation of pump stations (and associated air valves) and the Nelson Wastewater Treatment Plant.

Odour complaints from pump stations and air valves have resulted in the installation of activated carbon filters which have proved to be very successful. When odour complaints are received they are investigated when identified to be more than a "one off" event with a view to developing a solution.

Rising Mains

Rising mains are the pressurised lines that transfer wastewater from a low point to a higher point within the network. For total length information see Table 4-4. Figure 4-16 outlines length vs diameter information.

Figure 4-16: Rising main length versus Diameter – 2020



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 sections of this pipe in the early 1990's from sulphuric acid attack led to a comprehensive inspection and remediation project to extend the rising main's service life. These 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 to 2016/17 five incidents occurred on 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.
- One from a displaced rubber ring joint in a pipe close to Founders Park on Atawhai Drive.

These failures have prompted further investigation into the condition of the Atawhai Rising Main. Due to the complexities of access to undertake internal inspections these

have only been partially conclusive and consequently the planned renewal of this pipe has been bought forward.

The renewal and upgrade of the Corder Park and Neale Park pump stations have reduced the pressure on the Atawhai Rising Main consequently reducing the risk of pipe failures.

Swallow Mains (Pressurised gravity pipes)

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. For total length information see Table 4-4.

Manholes/Lamp Hole Cleaning Eyes

Newer manholes in Nelson are typically concrete and 1050mm in diameter. Older manholes are constructed of bricks and of varying sizes. Most manholes installed since the 1950s are constructed of pre-cast concrete. Lamp hole cleaning eyes 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. Lamp hole cleaning eyes are typically constructed from small diameter pipes and do not allow person access to the reticulation.

Gravity Trunk Mains

Trunk mains are defined as all sewers greater than 150mm in diameter. They generally carry high flows (as a consequence of conveying wastewater from relatively high numbers of properties) and are the lines that discharge into the pump stations. For total length information see Table 4-4.

Pump Stations

The Nelson City Council is responsible for 27 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.

Work is currently underway to ensure that pump stations have adequate storage or are as resilient as feasible to guard against overflow events. Table 4-6 outline typical asset lives for pump station components and figure 4-17 is a schematic identifying each of the pump stations.

Table 4-6: Asset Lives Pump Stations

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

The general layout of the pumping system is detailed in Figure 4-17.

Neale Park and Corder Park Pumping Station (Atawhai Rising Main Pump Stations)

Wastewater from the central city is reticulated via gravity and pumped main to the Neale Park Pump Station and then pumped to Nelson Wastewater Treatment Plant via the Corder Park Pump Station. The route of the rising main (pressurised pipe) follows Atawhai Drive and then the State Highway. Along the length of this pipe several smaller catchments connect to the rising main through injector pump stations.

Council has undertaken a comprehensive upgrade of Neale Park and Corder Park Pump Stations in recent years which includes the installation of fixed emergency power generation. Additionally, most of the injector pump stations have also been upgraded to standardise electronic controls and install variable speed drives. These units electronically control the speed of the pumps to match the pumping rate with the flow of wastewater into the pump station. This extends the life of the pumps and reduces electricity costs. Several of the injector pump stations have also had pumps renewed in recent years.

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

In the Stoke/Tahuna area the two pump stations in Parkers Road are currently (during the period of this Plan) being replaced with a single new pump station adjacent to Awatea Place. The current pump stations are close to the end of their service life and being situated very close to residential buildings have odour control issues. The new pump station will connect to the Nelson Regional Sewerage Business Unit pump station at Nelson Airport. 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

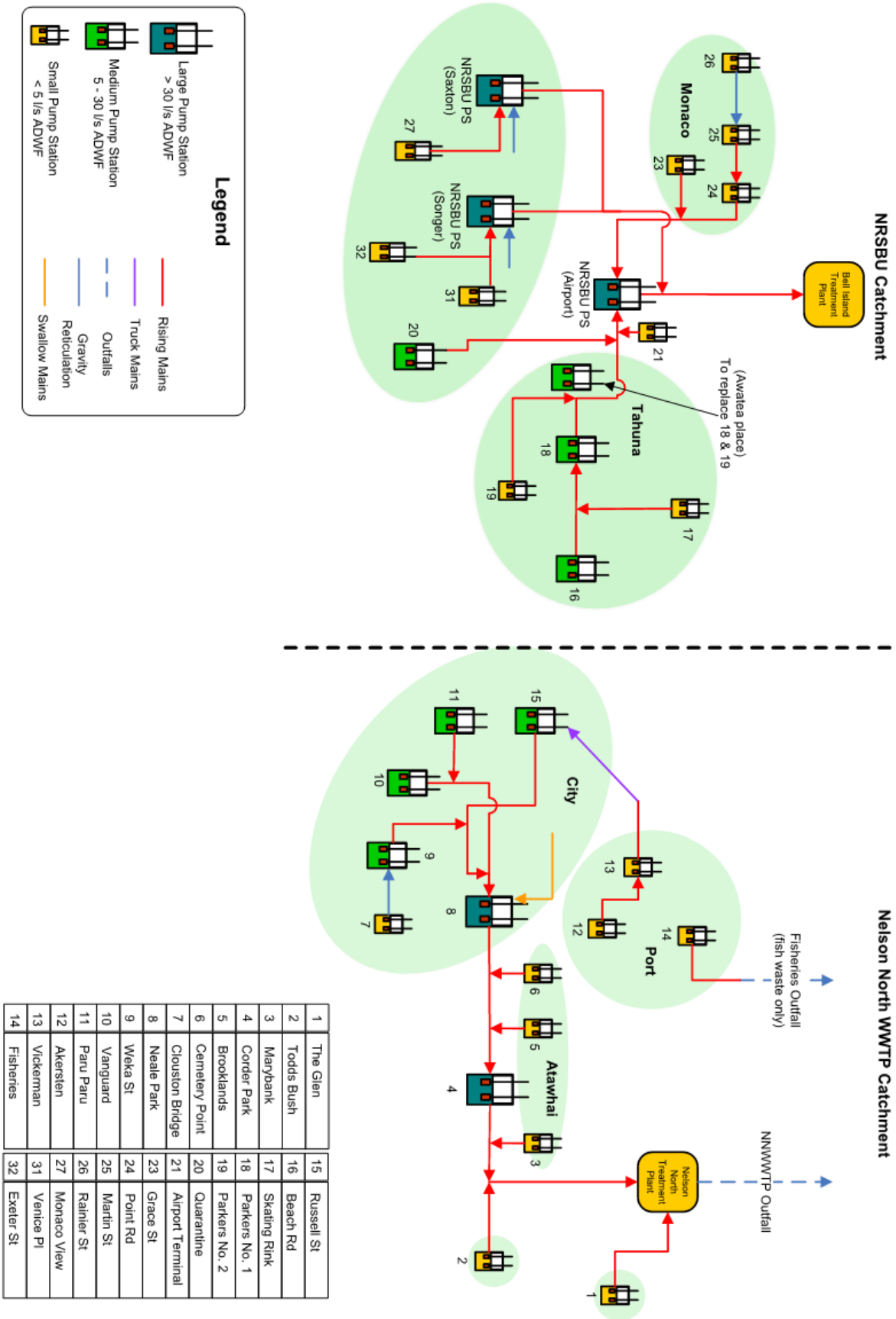
All pump stations are monitored by a Supervisory Control and Data Acquisition (SCADA) / telemetry system. In the event of a system or power failure, the system notifies on-call operators to take the necessary action.

The options available to cope with the consequences of a power failure event are standby power and emergency storage. Details of Council's standby power generators are in Appendix C.

Pump Stations and Network Storage

Both the Nelson Tasman Land Development Manual and resource consents RM105388 & RM105388A require all new pump stations to have a four hour dry weather flow storage capacity. This is seen as a key element in minimising the risk of dry weather overflows from the network.

Figure 4-17: Schematic of Nelson City Council Wastewater System



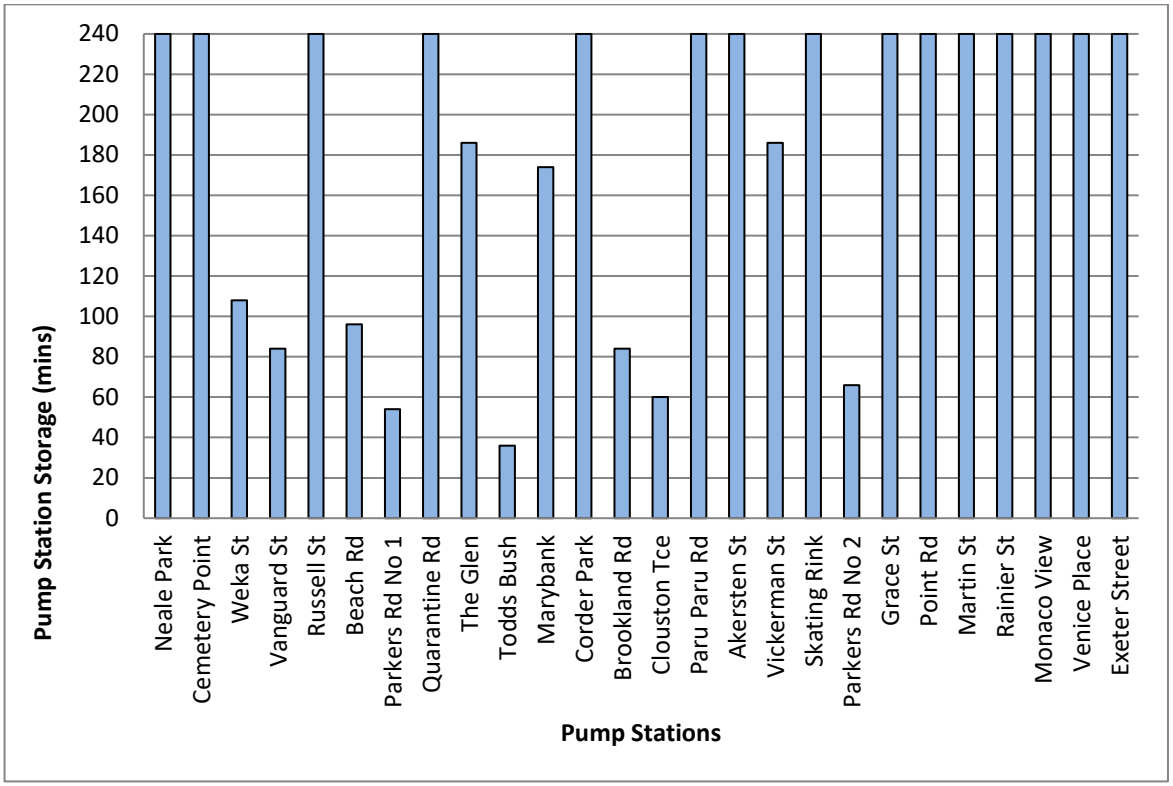
1	The Glen	15	Russell St
2	Todds Bush	16	Beach Rd
3	Marybank	17	Skating Rink
4	Corder Park	18	Parkers No. 1
5	Brooklands	19	Parkers No. 2
6	Cemetery Point	20	Quarantine
7	Clouston Bridge	21	Airport Terminal
8	Neale Park	23	Grace St
9	Weka St	24	Point Rd
10	Vanguard	25	Martin St
11	Paru Paru	26	Rainier St
12	Akersten	27	Monaco View
13	Vickerman	31	Venice Pl
14	Fisheries	32	Exeter St

Some pump stations, for historical reasons or physical constraints, do not have this level of storage and consequently there is work underway to increase resilience of these pump stations. This work focuses on the provision of storage or the ability to continue to operate the pump station in the event of a pump failure.

Figure 4-18 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 4-18 is capped at that amount. Some pump stations have storage that exceeds this amount.

Figure 4-18: Pump Station Storage Capacity June 2020



The Airport Storage Pump Station has been excluded from this graph because there is no pump in this chamber but it has suction and discharge pipework so that a mobile pump can be connected and used at this location if required. See sections 4.1.2. and 4.1.3. for all pump station performance and condition ratings.

Significant storage is also available within the reticulation network (from pipes and manholes only flowing part full most of the time).

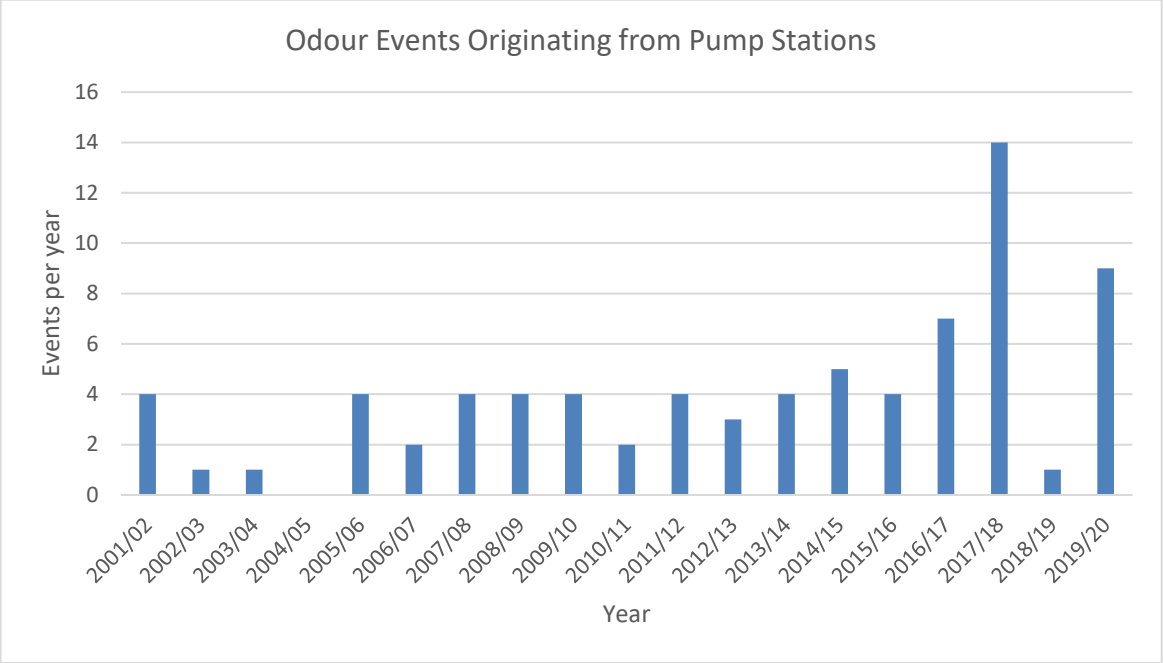
Parkers Rd No 1 and No 2 pump stations will be decommissioned when Awatea Pump Station is put on line. This new pump station will have 4 hours storage. As part of the Awatea Pump Station Project the Beach Road Pump Station is having additional storage capacity installed.

Odour Events at Pump Stations

Odours can originate from wastewater pump stations and associated manholes, air valves and fittings. The upgrade of Corder Park and Neale Park pump stations included specifically designed odour extraction and treatment systems (ozone). If complaints occur at individual pump stations investigations are carried out to determine if odour treatment measures need to be installed.

Figure 4-19 outlines the reported odour events that are attributed to Nelson's wastewater pump stations. Of particular note is the spike in 2017/18 which was related commissioning work at Corder Park pump station which identified a capacity issue with the odour control system; this has since been rectified.

Figure 4-19: Odour Events Originating from Wastewater Pump Stations



Private/public Connections

The landowner is responsible for maintaining the sewer lateral which is the pipe from the Council main to the dwelling. Where a sewer pipe passes through private property and serves more than one house the ownership tends to be dictated by historical circumstance. The current arrangements are under review to ensure that the fairest and most equitable outcome is maintained.

Unintended discharges

During dry weather overflows in the network can occur through a network fault (e.g. blockages caused by wet wipes, pump failure etc.).

During rain events stormwater enters the wastewater network through faults in pipes and as a result of cross connections between stormwater pipes (private and public) 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 in the network.

On 1 April 2012, Resource Consent (RM105388A) was granted for accidental discharges. The consent duration is 20 years.

A feature of the consent is the requirement that Council reduces overflows from pump stations over the period of the consent and establishes 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, Te Tau Ihu Iwi representatives, Friends of Nelson Haven and Tasman Bay Inc, New Zealand Fish and Game Council, and Nelson Public Health Services.

Wet Weather Overflow Reduction/Inflow and Infiltration

Overflows occur in the network when, for a variety of reasons, the network is overwhelmed and excess wastewater volumes are released at "weak" points. A significant issue that contributes to this occurring is Inflow and infiltration (I&I). In summary I&I is the entry of water (typically groundwater or stormwater) into the wastewater network, typically, unintentionally. It is an urban issue nationally and around the globe.

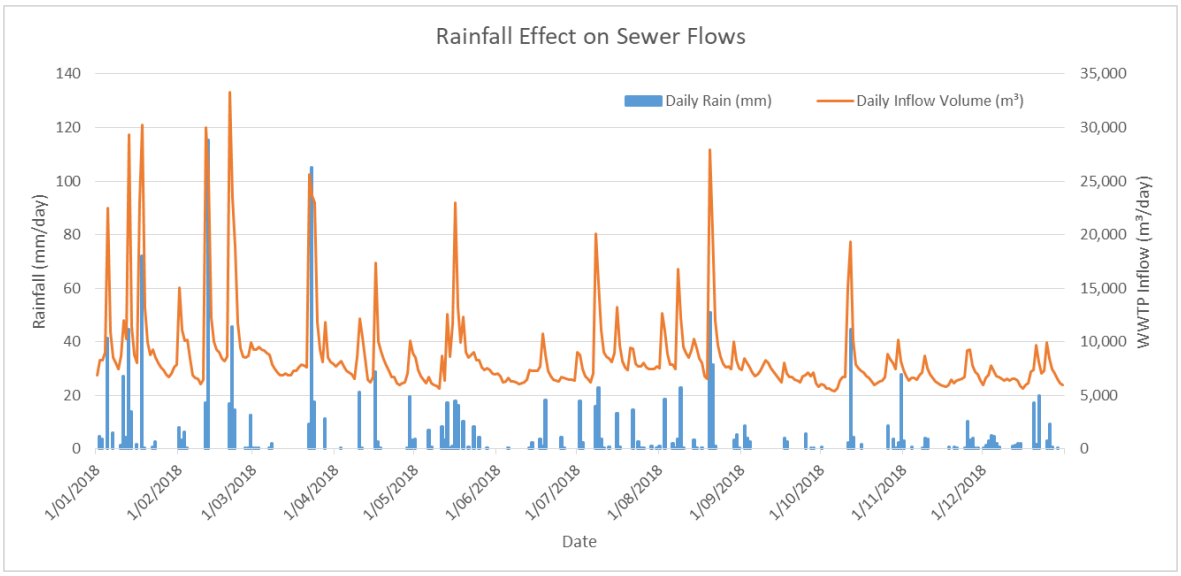
Above ground, inflow occurs during rain events when stormwater flows through manhole lids, low gully traps, emergency overflow points in pump stations, crossed connections (between stormwater pipes and sewer pipes) and deliberate redirection of stormwater into sewer pipes.

Below ground, infiltration occurs when groundwater 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 groundwater levels arise from existing natural seepages, rain saturation, tidal and river effects and on site stormwater soakage; these exacerbate the below ground issues. As sea levels rise an increased focus on parts of the network that are susceptible to tidal infiltration will be required. Addressing the issues of inflow and infiltration requires the efforts of both council and the community.

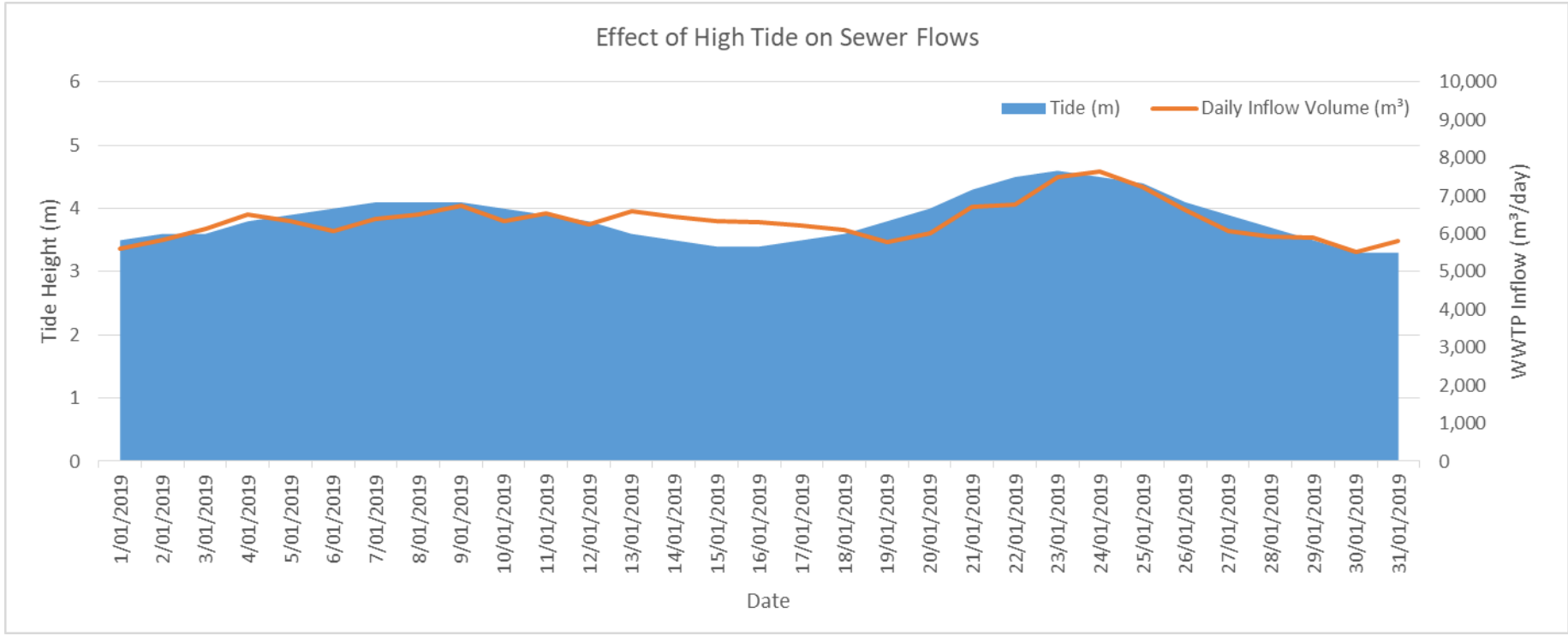
Figure 4-20 details the impact of rainfall on wastewater flows recorded at the NWWTP during the period January 2018 – December 2018. Flows increased from 6,000 m³/day to 30,000 m³/day following a significant rainfall event.

Figure 4-20: Rainfall Effects on Sewer Flows at Nelson Wastewater Treatment Plant



Tidal influences on flows to the NWWTP have also been recorded. Figure 4-21 details the high tide levels and the changing flows to the treatment plant during January 2019. This indicates the likely influence the height of the tide has on groundwater levels and associated infiltration. Daily flows increase by approximately 1,000 m³/day from a 3.4m tide to a 4.4m tide.

Figure 4-21: Effect of High Tides on Sewer Flows



The ingress of water into the sewer system through I&I 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. This is a key focus of the wastewater activity and in particular the Wet Weather Overflow Reduction/Inflow and Infiltration programme.

4.1.3. Asset Capacity/Performance

Treatment Plant Capacity

Future estimated design flow parameters (Nelson City Council Wastewater Treatment Plant Upgrade – Final Report Date October 2006) for various time-related flow periods for the upgraded Wastewater treatment plant are set out in Table 4-7 below. The actual flows from 2018/19 are outlined in Table 4-8.

Table 4-7: Design Flow Parameters

Year	Population	Municipal Flow (cubic metres/ day	Industrial Flow (cubic metres/day)	Average Dry Weather Flow (cubic metres/day)	Peak Dry Weather Flow (cubic meters/ hour)	Peak Wet Weather Day (cubic metres/ day)	Instantaneous Flow (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 Flows

Actual Flow Parameter	2018/19	Consent Capacity (discharge)
Average plant inflow	7,316 m³/day	
Peak one-day pond inflow (equivalent to PWWD)	27,990 m³/day	38,000m³/day

Performance of Reticulation

Reticulation performance is monitored through actual records of work/repairs undertaken and the hydraulic models.

The Nelson south and central city catchments have been modelled; an update and calibration process is currently underway. 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 Performance

As noted previously in this document pump stations consist of a number of different assets with differing asset lives. As such it is important to regularly monitor performance and condition. Table 4-9 outlines the latest performance assessment undertaken in 19/20.

Table 4-9: Pump Station Performance as at June 2020

Name	Electrical	Pumping
Neale Park	1	1
Cemetery Point	3	2
Weka Street	3	2
Vanguard Street	2	3
Russell Street	1	2
Beach Road	3	2
Parkers Road No 1**	3	4
Quarantine Road	3	3
The Glen	3	2
Todds Bush	3	2
Marybank	3	2
Corder Park	1	1
Brooklands	2	2
Clouston Terrace	3	2
Paru Paru Road	3	3
Akersten Street	3	2
Vickerman Street	3	2
Skating Rink	2	3
Parkers Road No 2**	3	3
Grace Street	3	2
Point Road	3	3
Martin Street	3	3
Rainier Street	2	2
Monaco View	4	2
Venice Place	2	2
Exeter Street	1	1
Airport Storage	3	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

4.1.4. 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 (CCTV) 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).

As technology evolves new methods and tools are developed for condition assessment. It is important to keep in touch with technological developments that will allow optimal use of assets.

Current Position on Condition Assessment

Within the reticulation network, condition assessment is undertaken on a selective basis. Typically asset issues are identified through a variety of means, this subsequently leads to a condition assessment to determine if further steps are required. The primary condition assessment tool in the reticulation network is CCTV.

Significant assets (the NWWTP, Atawhai Rising Main etc.) require a more structured approach. In the case of these assets condition assessments tend to occur on a scheduled basis or as new technology becomes available.

Whenever the maintenance contractor is working on pipe repairs a report is made and entered into the Asset Management System. This is used to understand areas of the network with issues and allow relationships between pipe types, construction techniques, age and geology to be developed.

Table 4-10 outlines the current estimates of condition of the reticulation network.

Table 4-10: Condition of Mains Estimates

%	Very Good	Good	Moderate	Poor	Very Poor	Total
100mm diameter lines	10%	20%	20%	30%	20%	25km
Reticulation	10%	20%	20%	20%	30%	312km
Trunk Mains	10%	20%	20%	20%	30%	36.2km
Rising Mains	10%	80%	10%	0%	0%	25.1km
Swallow Mains	10%	80%	10%	0%	0%	5.5km
Manholes	15%	35%	30%	10%	10%	6985
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 4-11 below.

The typically 'moderate' condition of the pump stations is mainly due to their age, and an extensive renewal programme is underway to replace electrical and pumping components as required.

Table 4-11: Pump Station Condition as at June 2020

	Name	Electrical		Pumping		Structural	
		Year Upgraded	Condition	Year Upgraded	Condition	Year Upgraded	Condition
1	The Glen	2004	3	2004	2	2004	1
2	Todds Bush	2003	3	2006	2	1985	2
3	Marybank	2003	3	2020/2007	1/2	1969	3
4	Corder Park	2016	1	2016	1	2016	1
5	Brooklands	2019	1	2019	1	1969	3
6	Cemetery Point	2003	3	2019	1	1979	2
7	Clouston Bridge	2005	3	2006	2	1985	3
8	Neale Park	2019	1	2019	1	1989	1
9	Weka St	2002	3	2004	3	1984	2
10	Vanguard St	2007	4	2006	3	1986	2
11	Paru Paru Road	2004	4	2006	3	1995	3
12	Akersten St	2004	3	2006	3	1986	3
13	Vickerman St	2004	3	2006/2009	3	1970	3
15	Russell St	2019	1	2015	2	1980	3
16	Beach Road	2004	3	2014	2	1950	3
17	Skating Rink	2004	3	2014	2	1960	3
18	Parkers Road No 1**	2004	3	1981/2008	4/3	1951	3
19	Parkers Road No 2**	2004	3	2011	2	1982	3
20	Quarantine Road	2005	3	2006	2	1981	3
23	Grace Street	2004	3	2004	3	1976	2
24	Point Road	2004	3	2004	3	1976	3
25	Martin St	2014	5	2013/2010	3	1976	3
26	Rainier St	2014	2	2010	3	1976	3
27	Monaco View	2001	3	2001/2004	2	2001	2
31	Venice Place	2013	2	2009	2	2009	1
	Exeter	2018	1	2018	1	2018	1
	Airport Storage	2001	3	2001/2004	2	2001	2

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 good confidence in the attributes, condition and performance data as outlined in Table 4-12 below. Where the confidence rating is required to be increased additional resources will be required. 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.

Table 4-12: Confidence Rating in Attributes, Condition and Performance

Attribute	All Data Estimated	Significant Data Estimated	50% Estimated	Minor Inaccuracies	Accurate	Comment
Attributes						
Retic - 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, diameter, material and age and entered this information into the Geographical Information System
Retic - Depth						
Retic - Material						
Retic - Install Date						
Retic - Location						
Retic - Pipe Length						
Wastewater Treatment Plant – all components						High level of knowledge of the treatment plant through proactive ongoing monitoring. Site records (as-built drawings, asset mgmt. info, etc) could be improved upon.
Pump Stations– all components						High level of knowledge on the pump stations through proactive ongoing monitoring. Site records (as-built drawings, asset mgmt. info, etc) could be improved upon.
Condition						
Reticulation pipes (100 – 200mm dia gravity)						Huge network. Not cost effective to inspect all.
Gravity Trunk Mains						Huge network. Not cost effective to inspect all.
Rising Mains						Particular challenges associated with pressure pipes. Full physical inspection often impossible.
Swallow Mains						Particular challenges associated with pressure pipes. Full physical inspection often impossible.
Manholes						Huge network. Not cost effective to inspect all.
Pump Stations– all components						High level of knowledge known on the majority of pump stations due to maintenance records
Electronics– all components						

Attribute	All Data Estimated	Significant Data Estimated	50% Estimated	Minor Inaccuracies	Accurate	Comment
Wastewater treatment plant						Upgraded in 2008. High level of knowledge due to maintenance records
Outfall						
Performance						
Reticulation						Limited inspections to date
Trunk Mains						
Rising Mains						
Swallow Mains						
Manholes						Limited inspections to date
Pump Stations– all components						
Electronics						
Waste water treatment plant – all components						
Outfall						

4.1.5. Asset valuations

The replacement value of the wastewater assets are $351.5m at June 2020 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's network and industry knowledge. This work is peer reviewed by WSP (Engineering Consultants). 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 WSP after allowing for known asset additions and disposals. In addition major assets, (dams, Pump stations etc.) are revalued by WSP 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 – June 2020

Asset Category	June 2020				
	Quantity		Replacement Value	Depreciated Replacement Value	Depreciation
	Km	units	($)	($)	($)
Reticulation Mains	337.0		184,781,343	98,670,476	2,251,637
Trunk Mains	36.2		23,057,907	9,931,945	308,043
Swallow Mains	5.5		4,402,987	415,312	73,462
Rising Mains	25.1		27,719,453	7,309,400	484,588
Access points		986	1,065,038	759,385	13,316
Manholes		6,985	62,865,000	34,205,679	776,084
Tanks		17	104,365	58,584	1,305
Valves		293	767,074	221,720	25,338
Neale Park Retention Tank		1	701,712	495,641	8,771
Pump Stations		25	9,689,349	2,537,638	295,836
Neale park Pump Station		1	7,739,300	7,600,200	139,100
Corder Park Pump Station		1	7,019,200	6,675,700	114,500
Nelson Wastewater Treatment Plant		1	21,534,800	14,385,100	437,200
Total			**351,447,528**	**183,266,781**	**4,929,180**

4.2. Operations and maintenance

Operations and Maintenance plans 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 plans cover activities such as energy usage, control of mechanical and electrical plant, inspections and service management.

Maintenance - Maintenance plans 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 through other work programmes.

4.2.1. Operations and maintenance approach

Maintenance Planning

Currently the asset maintenance is a mix of programmed and reactive. Programmed maintenance is pre-planned work determined on the basis of criticality, remaining useful life and available budget. Reactive is unplanned work related to system failures. This approach aims to maximise 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:

- Utilities Operations Team 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, PLC programming etc.

Minimise Sewer Blockages

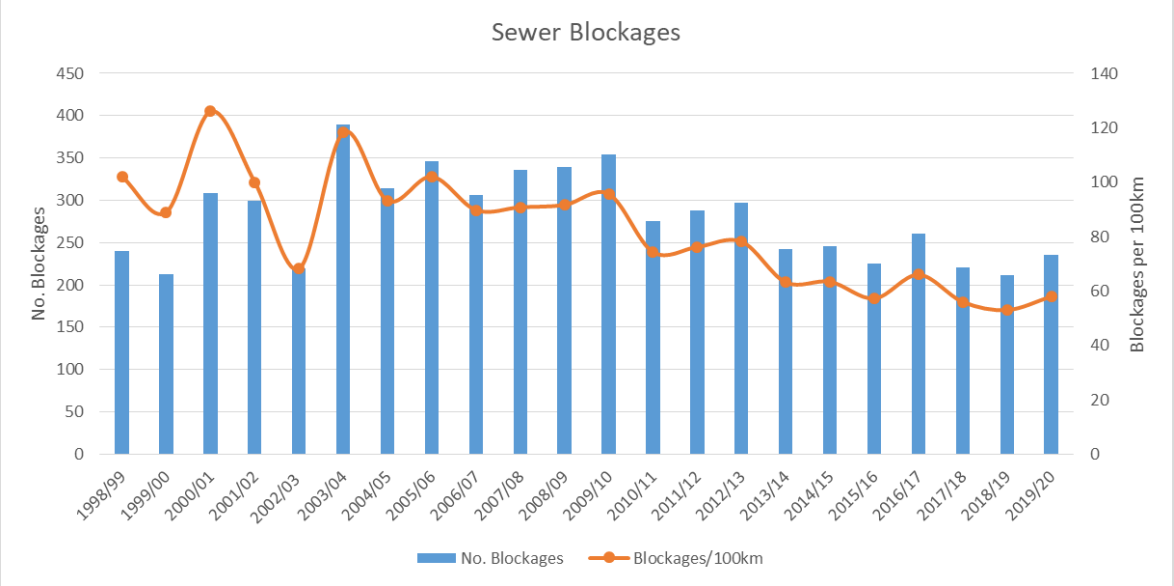
Blockages in the sewer reticulation can lead to overflows and odour complaints with associated health issues.

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 CCTV and either cleaned or replaced. Regular flushing occurs at predetermined points around the city. CCTV survey work is also carried out at regular intervals in response to persistent issues with a pipe.

Figure 4-22 indicates the historical trend of sewer blockages.

Figure 4-22: Sewer Blockages



4.2.2. Operations and Maintenance key considerations/focus areas

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.

The Pump Station Resilience and the Natural Hazards Programmes are focussed on decreasing the operational risk to critical assets.

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.

Table 4-14 sets out the operations and maintenance key focus areas.

Table 4-14: Operations and Maintenance Key Focus Areas

Focus Area	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.
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.
Resilience	Involves identifying key assets and their critical components/modes of failures. Once identified contingency measures are determined to increase the level of resilience of that key asset. An example is to ensure adequate generators are available to increase resilience against power failure.

Focus Area	Objective/ Description
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 Activity Engineers will become involved in serious incidents.
System control and monitoring	Council will utilise Supervisory control and data acquisition (SCADA) systems to monitor operation of the wastewater facilities. The SCADA 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 SCADA system also records operating data from the NWWTP.

4.2.3. Summary of future costs

Refer to the section 6. Financial Summary for Financial Projections.

4.3. Renewal/Replacement

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 i.e. joint displacement or root intrusion.

Condition assessment is a typical failure mode assessment activity.

To evaluate cost and obsolescence of 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.

Infrastructure strategy

The thirty year infrastructure strategy sets out the longer term renewal forecast for the wastewater activity. The overarching strategy is based on renewing the network just in time to avoid disruption to the service and as demands of growth or other asset renewals offer opportunities to reduce both cost and community disruption.

4.3.2. Renewal/Replacement key considerations and selection

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 impact on the whole lifecycle costs of the asset.

Renewal Prioritisation

The core renewal approach is outlined in Table 4-15.

Table 4-15: Renewal Selection Process

Aspect	Objective/ Description
Prioritise Renewals	To avoid a concentration of asset renewals in a short window of time, when they all reach the end of their life, additional factors are considered including: • Potential development in the city. • Other Council projects. • Issues identified with asset by location and or materials. • Condition reports, maintenance records (asset failure and expenditure history), wastewater infiltration studies, request for service (RFS) records, and observations from public, staff and contractors. • Capacity issues within the network. • Asset criticality. • Future asset renewal "bow waves" – the need to bring forward or defer some renewals.
Project options	Decision Criteria are weighted. Then Business Case 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.
Design/ Construct	Develop the design of the preferred option to a point where physical works services can be procured. Renewal works are designed and undertaken in accordance with the Nelson City Council Land Development Manual that stresses 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 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 liability.

Reticulation (Sewer) Renewals

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, are linked to development, show capacity issues, have a high degree of criticality, present an opportunity (by other utilities or transportation works) 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.

It is important to note the "bow wave" present in both Figures 4-14 and 4-15 commencing about 2040; also refer to section 4.1.1 Issue 3; this is an important renewal consideration.

Rising Mains and Swallows (gravity pressure main) Renewals

The main feature differentiating these pipes from reticulation 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 (than rising mains). 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; however age, material type and usage profile coupled with national experience can also indicate replacement priorities.

Atawhai Rising Main

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

An initial phase which will focus on understanding the asset as fully as possible including the development of up to date as-built drawings, creating pressure profiles and understanding potential internal condition assessment tools. It is probable that no ideal internal condition assessment tools will be identified which will lead to subsequent phases being more reliant on physical investigation – this carries some risk considering the fragility of the Atawhai Rising Main.

If an internal condition assessment tool is identified, that is affordable, an assessment will be undertaken. In conjunction with this an external inspection of key points (e.g. fittings/mechanical joints etc.) on the rising main is programmed to take place.

The latter phases of this work will lead to a determination of how and when this pipe will be replaced.

4.3.3. Summary of Future Costs

Refer to the section 6. Financial Summary for Financial Projections.

Deferred Renewals

This plan indicates no specific deferred renewals.

4.4. Creation/Acquisition/Augmentation

Capital Creation/Upgrading

Creation/Acquisition/Augmentation (capital) 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 and 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 e.g. 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. Capital Creation/upgrade project identification and strategies

Capital Creation/upgrade projects are typically linked to external drivers. This means that while some projects can be predicted/planned, many are subject to factors such as market demand and availability of appropriately zoned development land which change over time. Therefore it is key that project identification is responsive to external requirements.

4.4.2. Capital Creation/upgrade key considerations

Level of Service Implication

Capital creation/upgrade works for wastewater network are to address problems with wastewater reticulation, treatment and disposal where the current arrangements do not meet required levels of service.

Demand Implications

As development occurs and the city grows or urban areas are more intensively developed the level of demand on the wastewater network is increased. Capital creation/upgrade works will be required to meet the increased level of demand. Failure to meet growth requirements will impact on Levels of Service.

Risk Implications

Capital creation/upgrade works address the need to decrease the risk to the city from inadequate response to wet weather overflows, inadequate capacity for growth and failure of the ongoing functioning of NWWTP (particularly in meeting the resource consent requirements).

Lifecycle Implications

Decisions made to construct an asset 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 Approach

Table 4-16 outlines the approach used to determine capital creation/upgrade capital works selection and priority.

Table 4-16: Capital Works Selection

Criteria	Objective/ Description
Identification of upgrade needs	Asset capital works needs are identified from analysis of: • Demand forecasts (development/intensification). • System performance monitoring (hydraulic models, pressure, flow, leakage rates, etc.). • Network modelling. • 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. • Changes in regulation (Freshwater NPS).
Upgrade Project Categorisation	Capital works Projects will be separated into projects to close service gaps and projects required to accommodate growth. Capital works projects to close service gaps are generally funded entirely by Nelson City Council. Capital works projects to accommodate growth may be partly or wholly funded through Development Contributions.
Prioritisation of projects	Capital works projects are justified and prioritised on the basis of levels of risk. 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 asset. • Multiple network project (e.g. incorporating road work, sewer, water assets etc.).
Project Approval	A long-term programme is prepared from significant projects meeting the assessment criteria, this is communicated and 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.

4.4.3. Capital Investment Approach

Table 4-17 below sets out the strategies used for developing capital works programmes for the wastewater system. 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 4-17: Creation/Acquisition/Augmentation Plan

Aspect	Objective/ Description
Project design	All asset upgrade works will be designed and constructed in accordance with Nelson Tasman Land Development Manual. In determining capital or asset upgrade work requirements the short and long term effects on the operation and integrity of the system are considered, together with the demands of any forecast increase in loading upon the system. The design process will allow for 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 education/media messaging, are considered. Low impact urban design is used where appropriate. Various components of the wastewater goal are considered when developing the final detailed design including: • 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	Considers and allows for the development potential of the part of the network the upgrade will serve.
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.

4.4.4. Summary of Future Costs

Refer to the section 6. Financial Summary for Financial Projections

4.5. Disposal

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 4-18: Disposal Approach

Aspect	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. Possible use of abandoned pipes for telecommunication ducts is reviewed on a case by case basis. Currently Chorus and Network Tasman lease utilise abandoned gas mains and abandoned water and wastewater pipes in some instances.
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.
Record of Abandonment	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.

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 possibly backfilled with cement grout.

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 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

Critical assets are defined as those which have a high consequence of failure. Similarly, critical failure modes are those which have the highest consequences. By identifying critical assets and critical failure modes, Council can target and refine investigative activities, maintenance plans and capital expenditure plans at the critical areas. Examples would include development of condition assessment programmes, and prioritisation of renewals.

Critical assets can be targeted for a more detailed risk analysis approach to understand the cause and probability of failure. Whilst they will have a high consequence of failure, they do not necessarily have a high likelihood of failure. Generally the failure of critical assets is considered to be unacceptable given the difficulty of repair and/or the strategic role they play, as this would result in a major disruption or inability to achieve one or more levels of service.

Council has undertaken a criticality assessment for physical assets under the wastewater activity as part of a wider Natural Hazards Risk Assessment for the 3 Waters Infrastructure within the city. For this assessment a criticality matrix was developed to align as closely as practical with the Council's corporate consequence matrix. The range of impacts criteria included:

- Safety.
- Health.
- Asset Performance / Service Delivery.
- Environmental / Historical / Cultural.
- Financial.
- Political / Community / Reputational.
- Proximity of Asset to other Infrastructure.
- Critical Facilities (Serviced by asset).

A robust framework for identification of critical assets and their interaction with natural hazards is currently being developed and is noted in the improvement programme. See appendix D for the wastewater network criticality assessment.

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

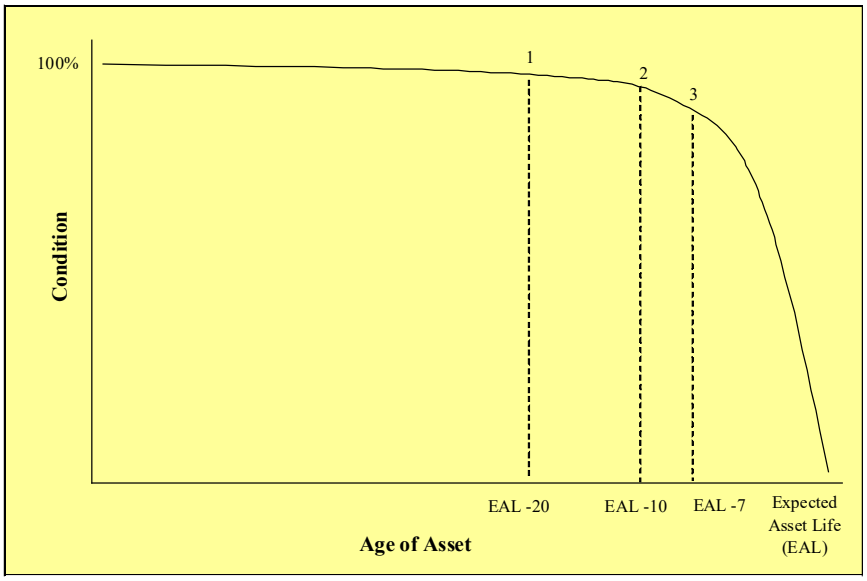
- All pump stations.
- Rising mains.
- Trunk mains.
- The wastewater treatment plant.
- Assets within an area widely prone to a specific hazard e.g. liquefaction.

By contrast non-critical assets are relatively quickly and easily repaired or replaced and their failure does 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 in their life. Conversely non-critical assets can be expected to undergo a higher level of repair before complete replacement is considered.

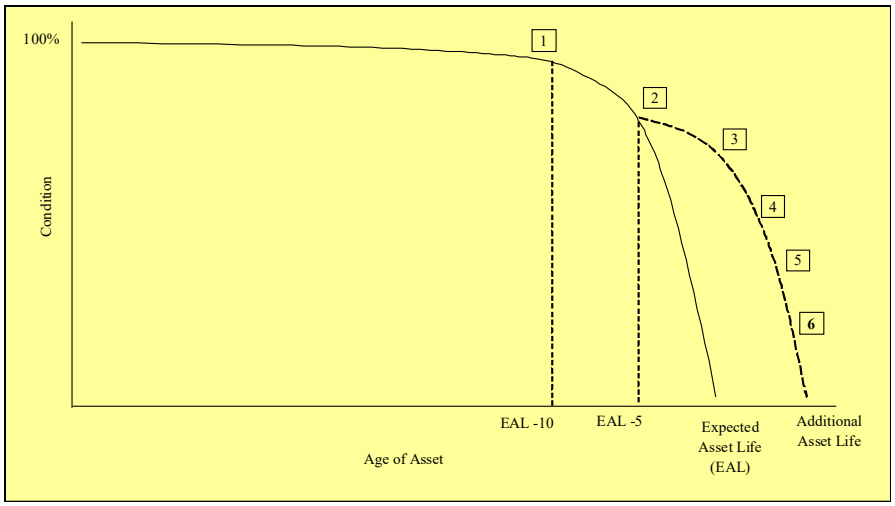
The following shows an ideal approximation of the nature and timing of interventions for both critical and non-critical assets.

Figure 5-1: Interventions for Critical Assets



Intervention: 1 Desktop review of asset and performance supported by Closed circuit television inspection/other physical inspection, 2 Physical inspection of asset and performance review (potentially repeated depending on condition). 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/other physical inspection and decision made on extending expected asset life, 3 Repair, 4 Repair, 5 Repair, 6 Replace asset.

Criticality of an asset impacts on 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.

Asset criticality is currently being integrated into the ongoing operation, maintenance, renewals and capital programmes for this activity. This includes incorporation of asset criticality into the decision making framework used to prioritise renewals and level of service upgrades, as well as updating inspections and programmed maintenance schedules for assets.

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 if the event happened and estimating a corresponding likelihood. Consequences and likelihoods are estimated using the Council's agreed risk criteria. See Appendix E.
- The likelihood/consequence combination determine the level of risk associated with a particular event.

As this Plan is developed (future AMPs) it will progressively apply the criteria required by the Council's updated risk management policy 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.

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.

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

The following consequences are considered:

- Health.
- Safety.
- 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 five specific Community Outcomes that guide the Wastewater Activity risk analysis are also used to inform the Wastewater Activity levels of service:

- 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.

There is potential for future Level of Service changes around the Freshwater NPS / NES, urban growth, and implementation of a risk-based decision making framework in this area.

5.2.2. Top risks and how these will be managed

The level of risk established through the assessment process (formally called residual risk) is compared with the Council's residual risk tolerance as set out in Appendix E.

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. This is an ongoing process.

Table 5-1 provides a summary 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 E.

Table 5-1: Summary of High Risks to the Wastewater Supply Activity (See Appendix E for the full risk table)

Identification			Analysis: Residual Risk		
Event Description	**Asset Group**	**Consequence**	**Existing Controls**	**Current Risk Level**	**Treatments**
Lack of Staff (NCC) and operator (Nelmac) experience/resilience	All	Inefficiency. Risk of operational failures or errors is increased.	Employ experienced people where possible.	High (12)	Employ appropriately qualified and skilled staff. Pay and conditions should be competitive.
Climate Change /Sea Level Rise	All	Failure of part or component parts of the network.	Nelson Tasman Emergency Management Plan. Emergency procedures manual and exercises. Programmes related to resilience/adaptation underway	High (12)	Continue to develop criticality and natural hazards understanding with a view to progressing to the development of solutions (that will minimise the risk of failure due to a natural hazard event) in order of priority.
Harm to operators from exposure to sewage	All	Operator becomes ill from exposure to sewage.	Health and Safety training. Preventative inoculation of staff. Use of barrier protection where possible.	High (12)	Ongoing health and Safety training. Identify hazardous areas at facilities and employ processes to minimise risk.
Failure to achieve consent conditions.	WWTP	Failure to comply with resource consents. Customer complaints.	Pond management team recently set up to routinely monitor pond performance in order to minimise the risk to the ponds "crashing" and causing odour issues. Pre-treatment processes minimise loading fluctuations. The plant is operated and maintained in a manner that minimises risk of consent breaches within the capabilities of the current processes. Wide ranging sampling and monitoring programme. Buffering provides a factor of safety. Proactive desluding programme is being developed.	High (12)	Ensure and maintain adequate sampling and monitoring. React rapidly to potential breaches or indications that breaches are coming. Continue to invest in the pond management team.
Atawhai Rising Main Failure.	Atawhai Rising main	Volume of spills dependent on nature of failure - occurs into or adjacent to a sensitive area (Nelson Haven).	Stock spares available to facilitate rapid repair. Effective systems for reporting and response in place. Staff and contractors aware of the significance of this main. Work underway to assess the internal condition of this rising main and the risk of failure of key external components. "Dry run" exercises on failure response undertaken from time to time.	High (12)	Continue with internal and external condition assessment programme. Ensure critical spares are readily available.
Equipment/ component Failure	All pump stations	Wastewater discharges to the environment having a negative impact on environmental, cultural and health issues. Customer complaints. Wastewater not able to be pumped from the city to NWWTP.	Processes within pump stations have contingencies for failure (duplication of pumps) or alarm systems (Supervisory control and data acquisition) installed. Many PS have additional storage capacity	High (12)	Pump station resilience programme to identify appropriate solutions to decrease risk levels associated with critical equipment failure. Operations team to develop a critical spares list and develop a business case to procure these. Increase "Dry run" exercises on critical pump stations.
Insufficient Storage Capacity	All Pump stations	Insufficient storage or capacity resulting in wastewater discharges to the environment. Environmental and cultural issues and increase in public health risk	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions. A programme of work associated with better understanding key risks (and developing associated solutions) related to pump stations is underway.	High (12)	Investigate storage capacity of network, document, & develop mitigation strategy. Pump station resilience programme to identify appropriate solutions.

5.2.3. 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. It is important to regularly review the risk register to ensure that it is current.

5.2.4. 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 Activity Management Plans will be adjusted to address impacts as they become better understood.

Climate change is an evolving area of research and as such involves significant assumptions with associated uncertainties. Council seeks to limit the impact of those uncertainties by relying on expert guidance from Central Government. Future upgrades of the wastewater network are based on ensuring the work is designed for demand and conditions anticipated during the service life of the asset. Refer to Section 1.2 for further details on Climate Change.

5.2.5. Natural Hazards

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

- A wider review of how hazards interact with the 3 Waters network which along with an assessment of criticality is enabling a clear establishment of priorities. This work confirmed that critical assets that are susceptible to natural hazard events include the NWWTP and Atawhai Rising Main.
- 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.

In February 2018 the remnants of two tropical cyclones hit the Nelson Tasman region. Both caused extensive damage. In 2019 the Pigeon Valley fire highlighted a hazard that had to date a relatively low profile. These events highlight that natural hazards occur in a variety of guises and the consequent importance of resilience within the network.

The wastewater network activity is likely to be impacted by sea level rise more than some of the other utilities because the reticulation is essentially gravity based, with pipes of varying depth, age and integrity and key assets typically being located in the coastal zone. Pump stations are set at the lowest points in a network/catchment; this inherently makes them prone to flooding and groundwater/tidal affects, particularly in the Port Nelson, The Wood and Tahunanui areas. Inflow and infiltration rates would be expected to rise, with base groundwater 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

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. This would have risk to key assets located in known liquefaction areas such as Tahunanui.

5.2.6. Ability to Maintain Adequate level of Network Renewals

From figures throughout this document it is clear that in the near future there a large quantum of asset renewals that the city will be required to undertake (see figures 4-14 & 4-15). It is unlikely to be feasible to undertake these renewals as they become due and a clear strategy needs to be developed all focussing on how this can be best managed to optimise the asset life and be financially sustainable. Refer to Section 4.3 on how this risk will be managed.

5.2.7. Risk summary

There are no extreme risks identified within the network. High risks are identified in Table 5-1.

Work is ongoing to ensure that risk levels are maintained at levels that balance the communities willingness to pay and the likelihood of a particular risk occurring.

5.3. Infrastructure resilience approach

5.3.1. Resilience

Resilience is commonly defined as the capacity for 'bouncing back faster after stress, enduring greater stresses, and being disturbed less by a given amount of stress'. However, major risks are often systemic in nature, and a system may demonstrate resilience not by returning exactly to its previous state, but instead by finding different ways to carry out essential functions. The following capabilities contribute to system resilience:

- Adapt to changing contexts.
- Withstand sudden shocks.
- Recover to a desired equilibrium, either the previous one or a new one, while preserving the continuity of its operations.

While risks tend to focus on the negative consequences from uncertainty, the concept of resilience encourages us to grasp opportunities and innovate to reduce our exposure and vulnerability to the impact from shocks and stresses as they occur.

5.3.2. Development of resilient infrastructure

As a result of geographical constraints the bulk of wastewater pump stations and the NWWTP 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 (NIWA) 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 and modifications/upgrades at the NWWTP are designed to withstand expected sea level rise predictions for the service life of the asset.

Further work is proposed in this Plan to build on the hazard and criticality studies carried out in 18/19 and 19/20. Natural hazard resilience will include wider network hazards such as earthquake fault line rupture and liquefaction as well more specific issues such as sea level rise. Much of this work is expected to focus on the NWWTP, Atawhai Rising Main, pump stations and key parts of the piped network across the city. The work will link with similar projects in the stormwater and water supply activities.

Within the period of this LTP budget has been allocated to undertaking work associated with further understanding levels of vulnerability across the wastewater network and creating resilient solutions to these vulnerabilities.

For temporary power outages Council's NWWTP and three largest pump stations have 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 C for details.

5.3.3. 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 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.

5.3.4. 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.
- 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 Nelson Tasman and Land Development Manual (NTLDM). 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.

5.3.5. Rainfall

Rainfall events of increased intensity are predicted for the region. Design work associated with the wastewater activity will be undertaken in accordance with the NTLDM requirements or where appropriate more up to date information.

5.3.6. 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	Marsh 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.

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 $180 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 $180m was deemed to be the mean 1 in 750 ARI (annual return interval) loss estimate.

5.3.7. Emergency Management

Local Authority Responsibility

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"

Exercises are carried out approximately every six months to ensure staff are familiar with the procedures documented in the Nelson City Council Emergency Management Procedures Manual.

When a serious emergency event occurs an Incident Management Team (IMT) is activated to lead Council's response, to ensure a clear decision making structure. The lead role of incident manager is filled by a member of Nelson City Council's Senior Leadership Team, and the other IMT members generally include the applicable manager(s) according to the type of event. More staff are added depending on the scale and complexity of the event.

Local Emergency Management Arrangements

Nelson Tasman Emergency Management Group is a joint committee of both NCC and TDC.

The Nelson Tasman Emergency Management Group Plan provides for an 'all hazards' approach to emergency management planning and activity within Nelson and the Tasman District. The Nelson Tasman Emergency Management Group Plan states the 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 support lifeline utilities as follows:

60 Duties of lifeline utilities

Every lifeline utility 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

Nelson City Council participated in the 2015/16 Nelson Tasman Engineering Lifelines Group project as a life line utility. And Nelson City Council is a member of the Nelson Tasman Emergency Management Group Lifelines committee.

Nelson Tasman Emergency Management and Nelson City Council Emergency Response Plans

The following documents are available for guidance:

- Nelson Tasman Emergency Management Group Plan.
- Nelson City Council Emergency Procedures Manual.

Table 5-3 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	Wastewater Status
Risk Reduction	Identifying hazards, describing risks, and taking actions to reduce the probability or consequences of potential events.	Asset Management Risk Register. Wastewater Management Strategies.
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.	Emergency procedures manual and exercises. Operations and maintenance response by contractor (Nelmac).
Recovery	Addressing the long-term rehabilitation of the community.	Nelson-Tasman Emergency Management Group.

5.3.8. WaterNZ

Nelson City Councils membership of WaterNZ give it access to a wide pool of expertise both during times of emergency and in general.

5.3.9. Electricity Supply

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

Electricity supply is currently via a contract with Genesis.

5.3.10. 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.

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.

5.3.11. 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 through having separate Activity Engineers for each Three Waters Activity, the utilisation of the Activity Management Plans as a central repository for knowledge and the development of strategies associated with key work streams and/or geographical areas. In order to ensure lower risk related to succession planning there is a need to improve staff interconnectedness, staff numbers working at the long term planning/strategic level and planning/recording of strategies over the next three years.

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).

This Plan provides the basis for meeting these requirements.

6.1. Financial statements and projections

6.1.1. Budget Projections

Definition of Expenditure Categories

All expenditure on infrastructure assets falls into one of the following categories:

- Capital Expenditure
  - Renewals / Replacement expenditure
  - Creation/Acquisition/Augmentation
    - Capital increased level of service
    - Capital growth
- Operations and Maintenance Expenditure
  - Base Expenditure
  - Unprogrammed expenses
  - Programmed expenses

Budget projections

Tables 6-1 and 6-2 set out the projected capital and operational expenditure for this activity over the 10 years of this Plan.

- The period 2021 – 31 in terms of operational expenditure is steady with the exception of the final year showing a significant lift corresponding with the programmed desludging of the oxidation ponds at the Nelson Wastewater Treatment Plant. Though considered operational expenditure, the desludging of the oxidation ponds in 2013/14 was loan funded, and therefore had a similar impact on rates as capital expenditure.
- Capital expenditure for the period 2021 – 31 is steadily increasing with the exception of a dip in the 23/24 year that is reflective of a large project, Awatea Pump Station, being completed. The steady increase in capital expenditure is a response to the direction taken to increase renewals spending (smooth out the renewals "bow wave") and to service expected growth areas – these are both key issues identified in this Plan.

Some key operational projects/programmes over the period of the AMP include:

- Climate change – Emissions Reduction.
- Climate Change – Vulnerability Assessment.

- Climate Change – Adaptation Strategy.
- NWWTP Strategic Scoping/Options.
- Atawhai Rising Main Investigation.
- Natural Hazards Risk Assessment.
- Inflow and Infiltration (Overflow Reduction).

Some key capital projects/programmes over the period of the AMP include:

- NWWTP Resource Consent Renewal.
- Atawhai Rising Main - Replacement (Stage 1).
- Pump Station Upgrades.
- Pump Station Resilience.
- System Performance Improvements.
- Climate change – Emissions Reduction Implementation.
- Climate Change – Vulnerability Assessment Implementation.
- Climate Change – Adaptation Strategy Implementation.
- Natural Hazards Risk Remediation.

Central government has made some finance available to organisations who control and manage 3 Waters networks. This has been used to support a variety of wastewater activity projects (including the NWWTP Resource Consent Project and Awatea Pump Station Project) as well as allowing some initiatives to be bought forward (such as the Emissions Reduction Study and an urban heat mapping study).

Table 6-1: Wastewater Capital Expenditure Year 1-10 of the 2021/31 Long Term Plan ($000)

Account	2021/22 AMP (2021/31)	2022/23 AMP (2021/31)	2023/24 AMP (2021/31)	2024/25 AMP (2021/31)	2025/26 AMP (2021/31)	2026/27 AMP (2021/31)	2027/28 AMP (2021/31)	2028/29 AMP (2021/31)	2029/30 AMP (2021/31)	2030/31 AMP (2021/31)
6405 Wastewater	**8,170,063**	**7,288,500**	**5,074,521**	**8,574,500**	**9,519,812**	**12,407,700**	**10,761,700**	**14,250,000**	**16,970,000**	**15,848,500**
Renewals	**3,691,500**	**3,581,000**	**3,550,000**	**3,983,500**	**5,005,000**	**6,456,000**	**6,964,000**	**10,195,000**	**10,165,000**	**9,937,500**
640571403358. Data Gathering equipment	50,000	50,000	60,000	70,000	80,000	90,000	100,000	100,000	100,000	100,000
640571901648. Wastewater model calibration	350,000	150,000	25,000	25,000	25,000	300,000	25,000	25,000	25,000	25,000
640573101564. Wastewater Pipe Renewals	1,200,000	1,500,000	2,000,000	2,000,000	3,000,000	3,000,000	3,000,000	4,000,000	4,000,000	4,000,000
640573102100. Hampden Street East Little Go Stream: Sewer	500,000	200,000	0	0	0	0	0	0	0	0
640573102739. Washington Rd (wolfe - arrow) sewer renewal	0	0	0	687,000	710,000	960,000	0	0	0	0
640573151563. Rising/swallows renewals	100,000	100,000	100,000	200,000	300,000	1,000,000	1,000,000	100,000	100,000	100,000
640573152879. Atawhai Rising Main - Stage 1	100,000	100,000	100,000	100,000	200,000	400,000	2,000,000	5,000,000	5,000,000	5,000,000
640573153361. Capital WW network small upgrades	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
640573201502. Renewals Pump stations	280,000	280,000	280,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000
640573251493. Flow meter renewals	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
640573302768. NWWTP renewals	280,000	305,000	305,000	330,000	330,000	330,000	330,000	330,000	330,000	330,000
640573303362. NWWTP Wetlands Plant renewal	100,000	250,000	250,000	0	0	0	0	0	0	0
640573402877. NWWTP - Resource Consent	570,000	500,000	300,000	200,000	0	0	0	0	0	0
640573403410. Wastewater Overflows Resource Consent renewal	0	0	0	0	0	0	0	250,000	250,000	0
640573902990. SCADA Renewals	31,500	16,000	0	11,500	0	16,000	149,000	30,000	0	22,500

Account	2021/22 AMP (2021/31)	2022/23 AMP (2021/31)	2023/24 AMP (2021/31)	2024/25 AMP (2021/31)	2025/26 AMP (2021/31)	2026/27 AMP (2021/31)	2027/28 AMP (2021/31)	2028/29 AMP (2021/31)	2029/30 AMP (2021/31)	2030/31 AMP (2021/31)
Capital Growth	**175,000**	**275,000**	**950,000**	**3,940,000**	**3,850,000**	**4,300,000**	**2,990,000**	**3,100,000**	**5,000,000**	**4,950,000**
640576152876. Ngawhatu Valley TM - Stage 2	0	0	0	0	0	0	0	0	0	200,000
640576153322. Intensification City Centre (Maitai Precinct) N270	0	0	50,000	140,000	200,000	400,000	750,000	750,000	750,000	750,000
640576153326. Intensification Victory N23	0	0	0	0	0	50,000	140,000	600,000	2,000,000	2,000,000
640576153328. Intensification Mahitahi Bayview Development	0	0	500,000	2,300,000	2,000,000	2,000,000	0	0	0	0
640576203355. Pump Station upgrades	100,000	200,000	300,000	1,250,000	1,250,000	1,250,000	1,250,000	500,000	1,250,000	1,250,000
640576903368. Climate Change - Emissions Reduction Strategy Implementation	75,000	75,000	100,000	250,000	250,000	0	250,000	250,000	0	250,000
640576903369. Climate Change - Vulnerability Assessment Implementation	0	0	0	0	150,000	500,000	500,000	500,000	500,000	0
640576903370. Climate Change - Adaptation Strategy Implementation	0	0	0	0	0	100,000	100,000	500,000	500,000	500,000
Capital Increased LOS	**4,303,563**	**3,432,500**	**574,521**	**651,000**	**664,812**	**1,651,700**	**807,700**	**955,000**	**1,805,000**	**961,000**
640579102890. Natural Hazards Risk Remediation	100,000	100,000	100,000	100,000	100,000	1,000,000	100,000	200,000	1,000,000	100,000
640579153359. LoS network problem/issues upgrade/renewal appraisal	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
640579201716. Awatea Place Pump station	3,910,000	2,770,000	0	0	0	0	0	0	0	0
640579201914. Pump station resilience improvement programme	100,000	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000
640579301191. NNWWTP Minor Upgrades	100,000	100,000	100,000	100,000	106,700	106,700	106,700	110,000	110,000	110,000
640579503230. System Performance Improvements	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
640579902990. SCADA Upgrade	18,500	122,500	5,000	11,000	5,000	5,000	11,000	5,000	5,000	11,000
64057997. LoS: investigation, options, testing, engagement	(64,937)	0	(20,479)	0	(36,888)	0	0	0	0	0

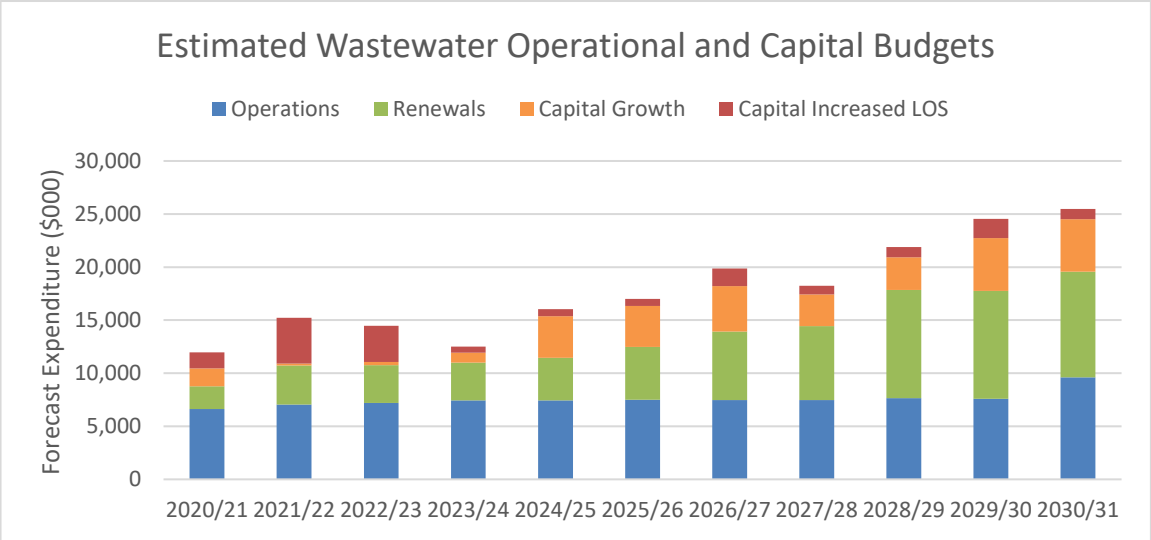
Table 6-2: Wastewater Operational Expenditure Year 1-10 of the 2021/31 Long Term Plan ($000)

Account	2021/22 AMP (2021/31)	2022/23 AMP (2021/31)	2023/24 AMP (2021/31)	2024/25 AMP (2021/31)	2025/26 AMP (2021/31)	2026/27 AMP (2021/31)	2027/28 AMP (2021/31)	2028/29 AMP (2021/31)	2029/30 AMP (2021/31)	2030/31 AMP (2021/31)
6405 Wastewater	**7,043,478**	**7,190,978**	**7,444,078**	**7,455,978**	**7,487,153**	**7,456,653**	**7,476,653**	**7,643,278**	**7,583,278**	**9,626,590**
Base Expenditure	**5,681,878**	**5,966,878**	**6,119,978**	**6,071,878**	**6,238,053**	**6,180,053**	**6,130,053**	**6,211,678**	**6,261,678**	**6,304,990**
64052010. Wastewater Reticulation Programmed Maintenance	278,250	278,250	278,250	278,250	278,250	278,250	278,250	300,000	300,000	300,000
64052017. After Hours Duty Officer	22,575	22,575	22,575	22,575	22,575	22,575	22,575	22,575	22,575	22,575
64052018. Mtce: NN Treatment Plant	630,000	630,000	630,000	630,000	790,125	790,125	790,125	850,000	850,000	850,000
64052310. Trade Waste Monitoring	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500
640523100473. Regional Sewerage: NCC Share	4,116,000	4,326,000	4,349,100	4,326,000	4,432,050	4,474,050	4,474,050	4,474,050	4,474,050	4,474,050
640523982311. Staff Contra - Inflow & Infiltration Reduction Programme	(85,054)	(85,054)	(85,054)	(85,054)	(85,054)	(85,054)	(85,054)	(85,054)	(85,054)	(85,054)
64052617. Electricity	232,428	232,428	232,428	232,428	232,428	232,428	232,428	232,428	232,428	232,428
64052621. Rates	23,328	23,328	23,328	23,328	23,328	23,328	23,328	23,328	23,328	116,640
64052625. Water by Meter	7,065	7,065	7,065	7,065	7,065	7,065	7,065	7,065	7,065	7,065
64052637. Insurance	313,660	313,660	313,660	313,660	313,660	313,660	313,660	313,660	313,660	313,660
64052699. Plant / Vehicle Operating Expense	898	898	898	898	898	898	898	898	898	898
64052710. Legal Expenses	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123	1,123
64052720. Valuation Fees	10,105	10,105	10,105	10,105	10,105	10,105	10,105	10,105	10,105	10,105
640527302929. Wastewater Business Plan	0	0	25,000	100,000	100,000	0	0	0	0	0
640527303364. Climate Change - Emissions Reduction Strategy	75,000	75,000	100,000	0	0	50,000	0	0	50,000	0
640527303365. WW Activity and Growth studies	0	0	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
640527303366. Climate Change - Vulnerability Assessment	25,000	75,000	100,000	100,000	0	0	0	0	0	0
640527303367. Climate Change - Adaptation Strategy	0	25,000	50,000	50,000	50,000	0	0	0	0	0

Account	2021/22 AMP (2021/31)	2022/23 AMP (2021/31)	2023/24 AMP (2021/31)	2024/25 AMP (2021/31)	2025/26 AMP (2021/31)	2026/27 AMP (2021/31)	2027/28 AMP (2021/31)	2028/29 AMP (2021/31)	2029/30 AMP (2021/31)	2030/31 AMP (2021/31)
Unprogrammed Expenses	**577,500**	**577,500**	**577,500**	**577,500**	**577,500**	**577,500**	**577,500**	**650,000**	**650,000**	**650,000**
64053010. Wastewater Reticulation Reactive Maintenance	577,500	577,500	577,500	577,500	577,500	577,500	577,500	650,000	650,000	650,000
Programmed Expenses	**784,100**	**646,600**	**746,600**	**806,600**	**671,600**	**699,100**	**769,100**	**781,600**	**671,600**	**2,671,600**
640540100493. Mtce: Flow Monitor	23,100	23,100	23,100	23,100	23,100	23,100	23,100	23,100	23,100	23,100
640540101191. NWWTP Desludging	0	0	100,000	135,000	0	0	70,000	135,000	0	2,000,000
640540102311. Inflow & Infiltration Reduction Programme	330,000	367,500	367,500	367,500	367,500	367,500	367,500	367,500	367,500	367,500
640540102312. Mtce: CCTV Inspections	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
640540210240. Mtce: Ex-Filtrator	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
64054032. Performance & condition assessments	0	0	0	0	0	52,500	52,500	0	0	0
640543102446. Wastewater Bylaw review	0	0	0	25,000	25,000	0	0	0	25,000	25,000
640543102808. Network Capacity Confirmation for Growth Areas	21,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000
640543102890. Natural Hazards Risk Assessment	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
640543722720. Atawhai Rising Main Investigation	200,000	0	0	0	0	0	0	0	0	0
640543723357. NWWTP Strategic Scoping/Options	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
640547601647. wastewater asset mgmt support	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000

Figure 6-1 outlines the spend profile for the various expenditure categories within the wastewater activity.

Figure 6-1: Wastewater Budgets - Ten Years



Nelson Regional Sewerage Business Unit (NRSBU)

Nelson City Council as a contributor to the NRSBU for the Nelson South area has a quota based agreement detailing Nelson City Council existing and future requirements. Table 6-3 sets out the projected Nelson Regional Sewerage Business Unit expenses to be covered by Nelson City Council.

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

To be updated following adoption of the LTP

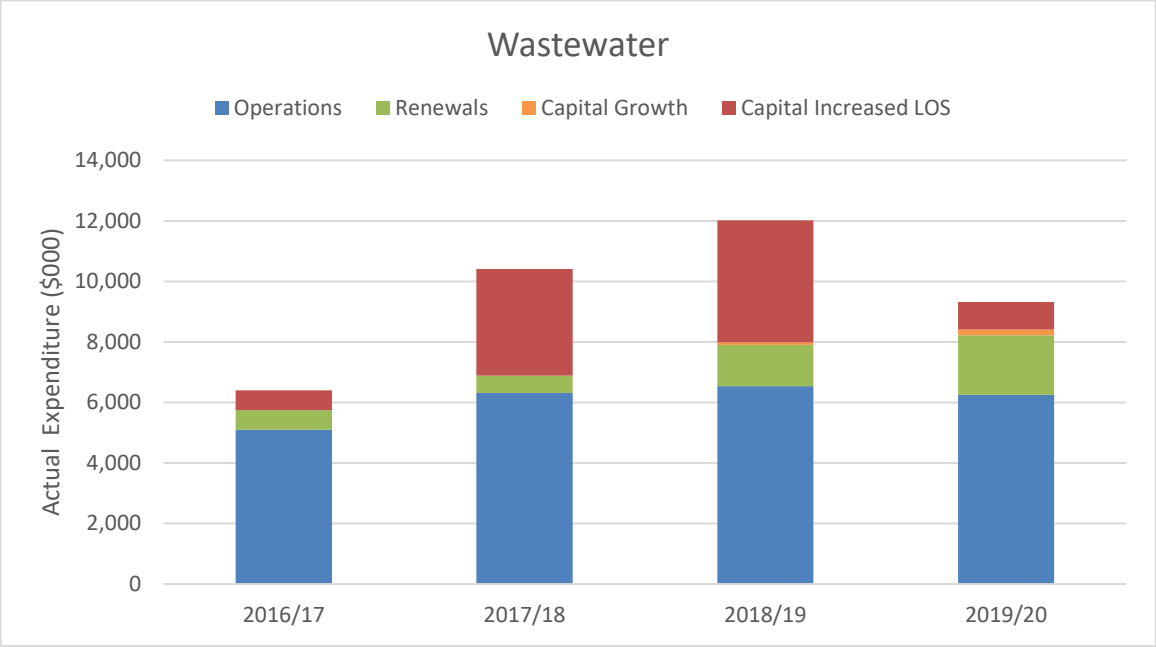
Year	Fixed ($,000s)	Operations and Maintenance ($,000s)
21/22	$2,134	$2,247
22/23	$2,217	$2,231
23/24	$2,419	$2,248
24/25	$2,481	$2,410
25/26	$2,799	$2,804

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 NRSBU.

6.1.2. Trends from the Previous 4 Years

Figure 6-2 outlines expenditure over recent years.

Figure 6-2: Recent Wastewater Expenditure



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/organisations contribute to the need to incur expenditure (user pays principle).
- 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 large volumes 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 differ distinctly from other Activities

The benefits of wastewater system primarily accrue to those properties that are connected to the system and therefore a targeted rate is considered most appropriate way of funding this activity. Council use the Wastewater Bylaw 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 (a unit is defined as a rating unit) to which the Council's wastewater and sewage disposal service is provided. Wastewater charges for previous three years are outlined in table 6-4.

Table 6-4: Residential Wastewater Charge

Year	$ per unit (including GST)
2019/20	$477.93
2018/19	$432.30
2017/18	$407.97

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

Historically, the estimated depreciation of wastewater assets, based on expected asset life, has exceeded the value of wastewater renewals. The reason for this is that where the renewal of a wastewater asset is required, sometimes it is replaced by an asset with greater capacity which is considered as a level of service improvement, rather than a renewal.

Figure 6-3: Forecasts of depreciation

To be updated according to LTP process

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:

- 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.
- The Atawhai rising main was installed in 1969 with an 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 remaining life of 45 years at that point in time. Given recent failures on the Atawhai Rising Main, the significant level of consequence associated with failures and awareness that it is a fragile asset, replacement work is scheduled to commence prior to the life determined in 1994 on the assumption that the expected life nominated in 1996 is not valid.
- 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.
- 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 increasing and evolving analysis over time and it is expected in the longer term there will be significant impacts to be dealt with – planning for this is incorporated in current work programmes.
- 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.
- The long term future of the Nelson Wastewater Treatment Plant will be in the vicinity of its current location (north Atawhai area).

- That the "bow wave" of renewal work in commencing in approximately 2040 requires smoothing out and that this will mean bringing some renewal/replacement work forward and pushing some back (where asset condition allows).

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 6-5: 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 3 - 4%.	Low	Level of debt is moderate. Interest costs are not expected to vary significantly however an increase in interest rates would lead to an increase in borrowing costs and a consequent decrease in the finance available to fund operational or capital work.
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.	High	Changes in replacement values could lead to significant changes in asset renewal projections, depreciation and renewal budgets. Replacement values have gone through a review process, however market prices have increased significantly in recent years.
5	In recent years the regional construction market has tended to price physical works above council estimates. At the time of setting the budgets it is assumed that the work will be able to be completed within the set budget.	High	Costs of upgrades are estimated without detailed project planning. If market price is above budget/estimate then there is less budget available for other works.
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 condition assessments indicate that Councils mains have decreased useful lives, depreciation presently taken will be less than that required for replacement.
8	That the "bow wave" of renewals commencing approximately 2040 will need to be bought forward (at a lower rate of renewal) to be sustainable/affordable.	Medium	Asset condition will deteriorate increasing the risks associated with failure and burdening future generations with a back log of asset renewal.

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.

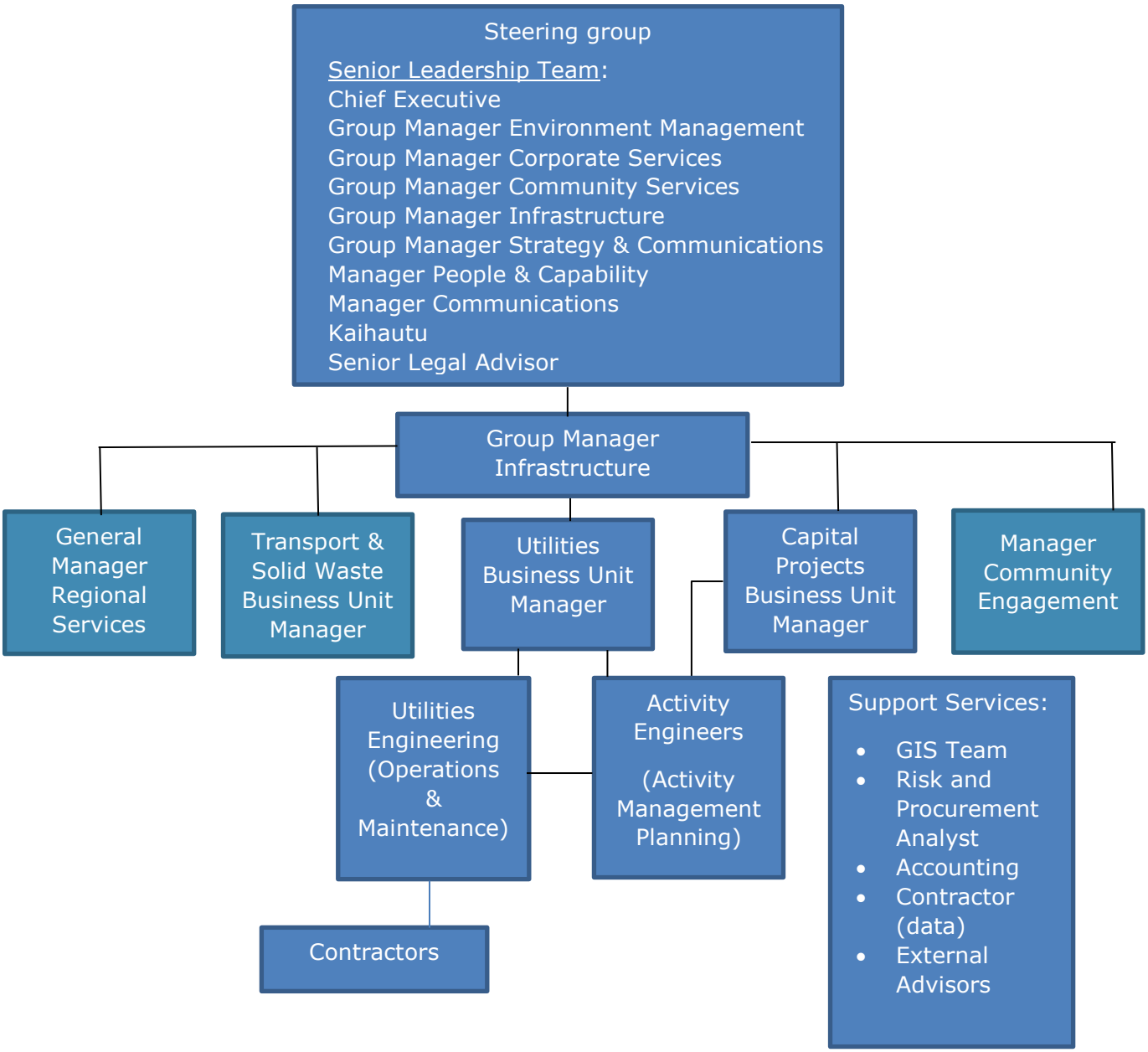
The key elements of infrastructure asset management are as shown in Figure 7-1 below.

Figure 7-1: Key Elements of Infrastructure Asset Management

7.1. AM leadership and structure

Council's infrastructure activity management structure is outlined in Figure 7-2.

Figure 7-2: Activity Management 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.

Table 7-1: 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 Plan will support the achievement of relevant Community Outcomes for Nelson City Council, as 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 Section 2 of this 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 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 ongoing upgrading, updating and calibration of the two computer-based hydraulic models of the wastewater reticulation network. These enable Nelson City Council to: • Determine accurately the existing capacity of the network. • Identify inadequate sections of the network. • Operate the network in the most efficient and sustainable manner. • Determine the impact of further development/intensification on the network. • Identify network upgrading requirements. • Compare options for upgrading the wastewater network. • Ensure the network has appropriate capacity for the future.
Data Collection	Data collection occurs as distinct programmes (condition, performance, asset registers) and as parts of other projects. With advances in technology data is becoming easier and cheaper to access. Good data management is an essential part of being able to optimise the use of the collected data. Systematic processes are being introduced for the collection, storage and use of collected data at both an asset and network level.
Geographical Information System (GIS) Data	GIS data will be the subject of defined quality assurance processes. Nelson City Council has quality processes to ensure that all data entered to the GIS meets defined quality standards and supports asset management.
Business Processes	
Activity Management Plan Updates	This 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, hazard identification and assessment, condition monitoring of critical assets, preventative maintenance, use of Supervisory Control and Data Acquisition (SCADA), 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 the wastewater activity is contributing to the community outcomes 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. • SCADA. • Legislative compliance.
Financial Management	
Budgeting	Expenditure programmes for the wastewater activity indicates Council funding and budgets with a 10 year projection Use the activity management plans to provide sufficient detail to demonstrate the decision making process for those 10 year projections. 30 year budgets are also considered in the Infrastructure Strategy
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 activity 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.

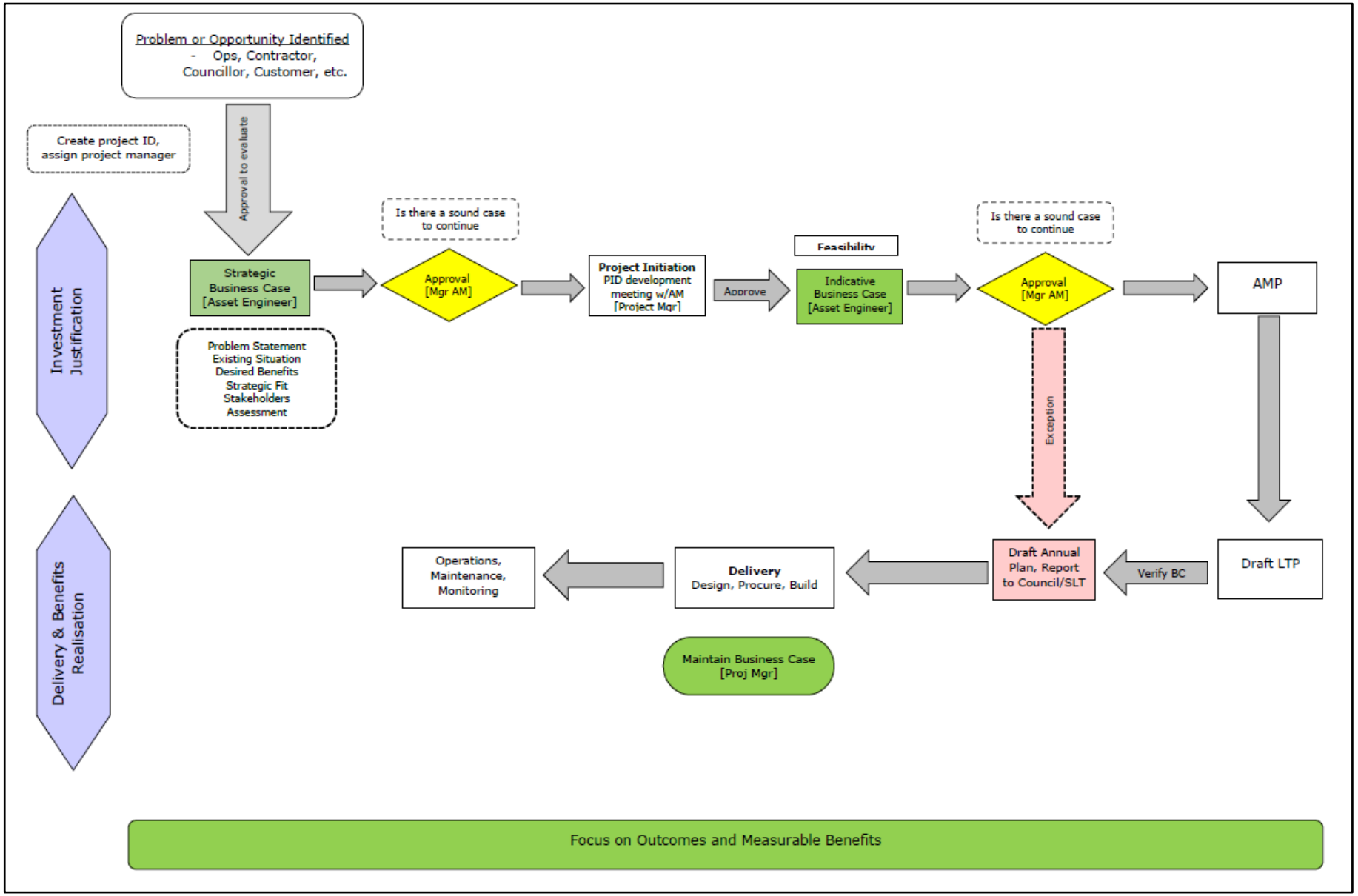
Quality Management

The quality management system is process management based on a quality management lifecycle (see appendix F). 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.

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. See figure 7-3 for an overview.

Figure 7-3: 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 Infor and linked with GIS. An overview of the asset information system is depicted below in figure 7-4. 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, SCADA System Platform, Network Model, Azure database and closed circuit television for internal pipe inspections) 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.

Asset Improvement Register (ongoing AM practice)

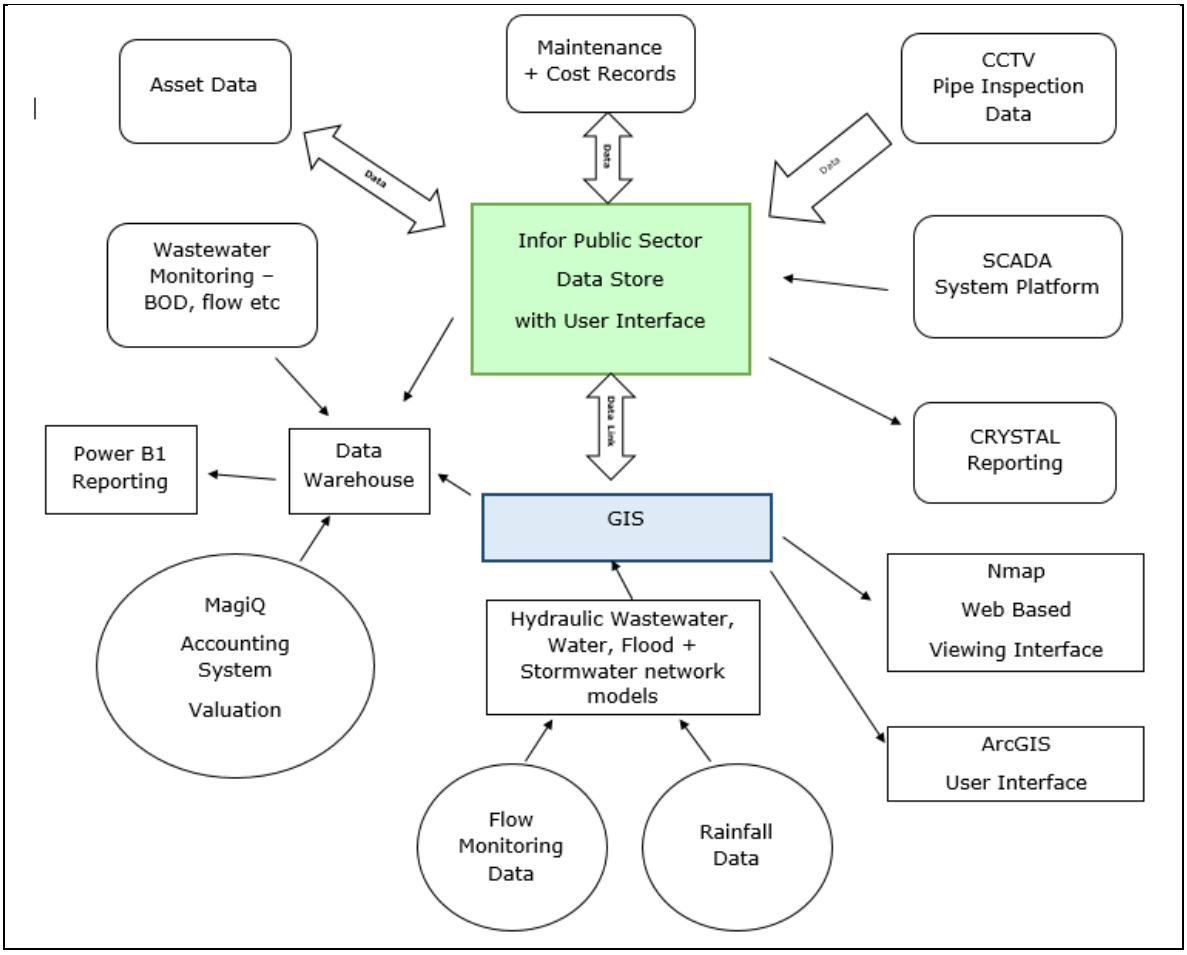
The Asset Improvement Register is used to capture, store, and share discussions, thoughts and concerns with regards to issues identified in relation to asset performance and improvement.

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.

Figure 7-4: Asset Information Systems



Electronic Document and Records Management System

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

Geographical Information System

The Geographical information system (GIS) was initially implemented in 1994 with data captured using photogrammetry. Nelson City Council staff carry out routine checks on the accuracy of the GIS as part of day to day operational work.

GIS 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 bring new data (from renewed, altered or new assets) into the GIS on a regular basis.

New assets are recorded from the "as built" plans supplied by the sub-divider (for vested assets) or Council's Capital Projects team (for capital work).

Closed Circuit Television

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

A storage and access system is currently being developed to ensure CCTV information is readily accessible and the extent of existing surveys is clear.

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.

ProMapp

ProMapp is Nelson City Council's procedures library. This is constantly being updated and serves as a repository for a large amount of institutional knowledge.

Supervisory Control and Data Acquisition System

The Supervisory Control and Data Acquisition (SCADA) 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 SCADA 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.

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.

Appendix G details the over view of the SCADA 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 SCADA system has grown to the point that without the current SCADA system, maintaining the

existing Levels of Service would be difficult. SCADA 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 SCADA system is a critical system in Council's operation.

Review and Upgrade

In 2016/17 an extensive upgrade of the SCADA system was completed.

Council's strategy for the ongoing use of SCADA is:

- Maintain SCADA 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 the wastewater hydraulic models cover the Stoke/Tahuna catchment and the central Nelson city catchment for the pumping and reticulation components of the wastewater system.

The models are currently undergoing a major update and recalibration exercise. This process requires repeating periodically dependent on the rate of growth.

Pumping: An EPANET model is used to run different pumping scenarios (especially in linked pump stations) and maximum flow rates from key pump stations. Not all pump stations are modelled on this system.

Reticulation: The modelling software package used is InfoWorks. External consultants are used to support Councils use of the models. Over time it is intended to build more in house capacity to run and maintain the models.

To provide modelling data for ongoing calibration/verification requirements the Council uses portable flow meters and permanent flow meters (installed at pump stations). Rain gauges are installed at key sites within the city and linked to the SCADA system.

7.4. Service delivery models

Maintenance contracts are in place for routine and emergency maintenance and operation of the network and key assets (pump stations and wastewater treatment plant). The methods used to procure capital projects will differ depending on the size of the project and levels of risk.

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 to maintain delivery levels or where specialist skill sets are required.

8. Plan Improvement and Monitoring

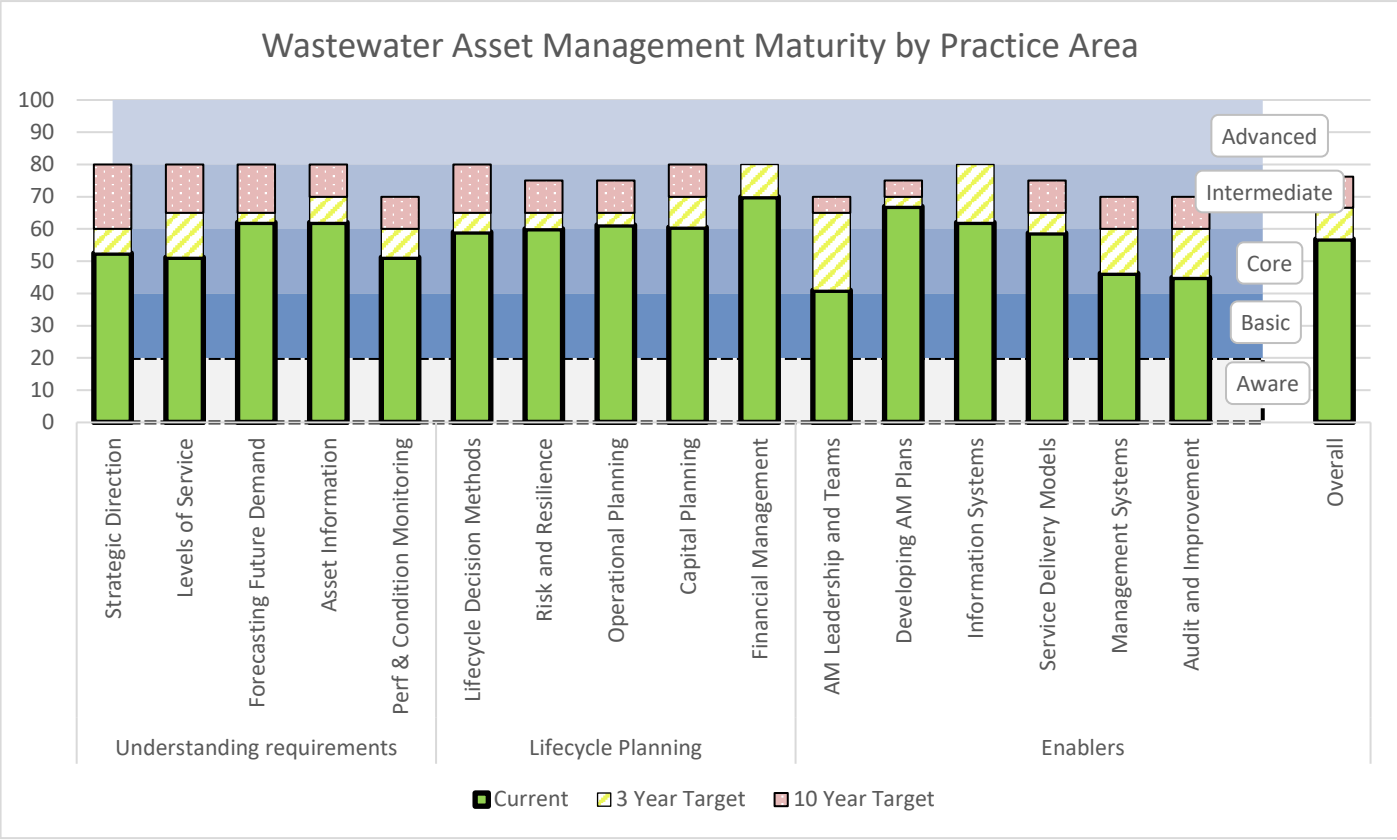
This section provides details on planning for monitoring the performance of the Asset Management Plan.

8.1. Status of AM practices

The status of asset management processes, systems and data for the Nelson City Council wastewater activity is shown in Figure 8-1. This figure is based on the grading framework given in Appendix H.

Updates to the 2018 – 2028 Asset Management Plan Gap Analysis and Appropriate Practice scores have been made for this Activity management Plan.

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



8.2. Improvement programme

An important component of this Plan is the recognition that it is a "live" document in need of monitoring, change and improvement over time.

Improvement Plan

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

Table 8-1: Improvement Programme

Improvement Action	Priority	Responsibility	Estimated cost
Review, clarify and add to the strategic direction of the WW Activity.	1	Activity Engineer	N/A
Ensure clear links between growth forecasts and budgets exists.	2	Activity Engineer	N/A
Update and regularly (annually) review the WW Activity Risk Register.	1	Activity Engineer	N/A
Improve accuracy of asset data through review and modification of collection, storage, and auditing.	3	Activity Engineer	$100,000
Contingency planning for critical asset failure.	2	Operations Team Leader	$10,000 pa
Robust and succinct lifecycle decision making; clear links to strategic intent.	3	Activity Engineer	In budgets
Improve accuracy and coverage of condition assessments.	3	Operations Staff	$50,000 pa
Upgrade of WW Hydraulic Models and increased use of them (and other technological improvements) to inform decision making.	1	Activity Engineer	Average of $50,000 pa – ongoing
Ensure supporting suppliers (consultants and contractors) are well aligned with the WW Activity requirements.	3	All	In budgets
Ensure an effective Asset Improvement Register is in place and is used to develop project scopes.	1	Operations Team Leader	N/A

Improvement Action	Priority	Responsibility	Estimated cost
Update emergency management response plan.	2	Operations Team Leader	$10,000
Improve resourcing to ensure better scope and cost estimates for inclusion in business cases.	1	Activity engineer	$100,000 pa
Ensure asset valuations reflect market value.	3	Activity Engineer	Finance budget
More trend analysis to optimise decision making.	1	Activity Engineer	$30,000 pa
Develop Plan content to be more usable and succinct.	2	Activity Engineer	$10,000 pa
Ongoing professional development for utilities staff to ensure they are up to date with best practice.	1	Utilities Manager	$10,000 pa

1	1 – 3 years
2	4 – 5 years
3	6 – 10 years

8.3. Monitoring and review procedures

The 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 NCC policy changes that may impact on the levels of service.

The 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. NCC is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the NCC assets. Additionally historic versions of the Plan will be retained to ensure information within these documents is available in the future.

Council will report variations in the adopted annual plan budgets against the original Activity Management Plan forecasts and explain the level of service implications of budget variations.

Internal Review

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.

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 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.

WaterNZ annual performance reviews include benchmarking of a range of measures across all territorial and unitary authorities that are operators of 3 Waters networks. Results for the wastewater activity in 2018/19 can be found through the following link https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=4271

How the effectiveness of the AM plan will be measured

The effectiveness of the 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 KPI report (monthly basis).
- The ongoing updating of the asset register of the wastewater assets when repairs/remedials are carried out and the attributes are compared with the asset register attributes.

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.

GLOSSARY OF TERMS

Term	Definition
Activity	The work undertaken on an asset or group of assets to achieve a desired outcome
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
Activity Management Plan	A plan developed for the management of an Activity 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
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

Term	Definition
	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/asset 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
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

Term	Definition
Geographic Information System (GIS)	Software which provides a means of spatially viewing, searching, manipulating, and analysing an electronic data-base
InTouch	The brand name of a Graphical User Interface
Infrastructure Assets	Stationary structures and utilities and software 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.
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 Gravity Pipe Inspection Manual 4th Edition 2019 - National manual for inspecting and scoring wastewater pipes. Published by WaterNZ
Operations & Maintenance Expenditure (Opex)	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
Operation	The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials.
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

Term	Definition
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 Activity Management Plan. The system as a whole is maintained in perpetuity and therefore does not need to be 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

Term	Definition
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
Acronyms	
Term	**Definition**
AC	Asbestos cement
ADWF	Average dry weather flow
ATAD	Autothermal thermophilic aerobic digestion
AV	Average flow
BNR	Biological nutrient removal
BOD	Biochemical oxygen demand
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
NAMS	National Asset Management Steering Group
NPV	Net present value
NRSBU	Nelson Regional Sewerage Business Unit
NTL	Network Tasman Limited
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

Term	Definition
RMA	Resource management act
SCADA	Supervisory control and data acquisition
SS	Suspended solids
TA	Territorial Authority
TKN	Total kjeldahl nitrogen
TP	Total potassium
TSS	Total suspended solids
uPVC	Unplasticised Polyvinyl Chloride pipe
WWTP	Wastewater treatment plant

Bibliography

Title	Date	Author
Nelson City Council Wastewater Activity Management Plan	2018	Nelson City Council
New Zealand Infrastructure Assets Grading Guidelines	1999	New Zealand Water and Waste Association
Nelson City Council Long Term Plan 2018 – 28	2018	
Nelson City Council Trade Waste Bylaw	2014	Nelson City Council
High intensity Rainfall Analysis for Nelson Urban Area	2008	NIWA

Appendices

APPENDIX A: CEMARS Action Plan

CEMARS ACTION PLAN

1. Introduction:

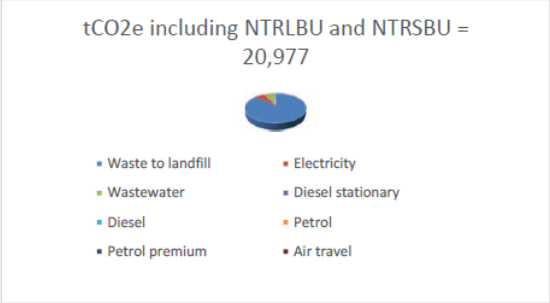
The purpose of this plan is to provide a range of projects ranked in order of priority to enable Council to reduce its greenhouse gas emissions. This plan has been compiled based on activities and projects identified in Council's CEMARS (Certified Emissions Measurement and Reduction Scheme) Emissions Inventory for the baseline year 2017/18 (Appendix One). The assessment period for achieving reductions in greenhouse gas emissions is over five years from 2018 to 2023.

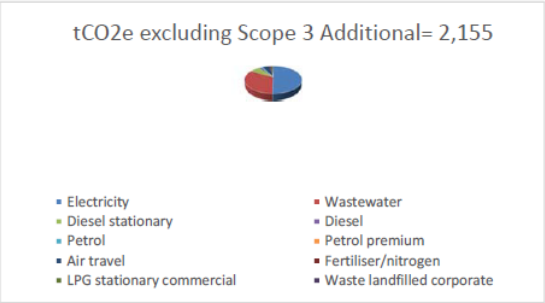
2. Funding:

Confirmed projects are funded through existing funding. All investigation work will be carried out within existing project budgets, or through the funding allocated for climate change through the 2019 Annual Plan. Opportunities to secure external funding, such as business energy reduction funding through EECA (Energy Efficiency and Conservation Authority), will be reviewed during the investigations where appropriate.

Subsequent actions identified will need to be funded through the Long Term Plan business case process, or other processes as appropriate.

3. Primary emissions sources for 2017/18 (baseline year):





4. Projects:

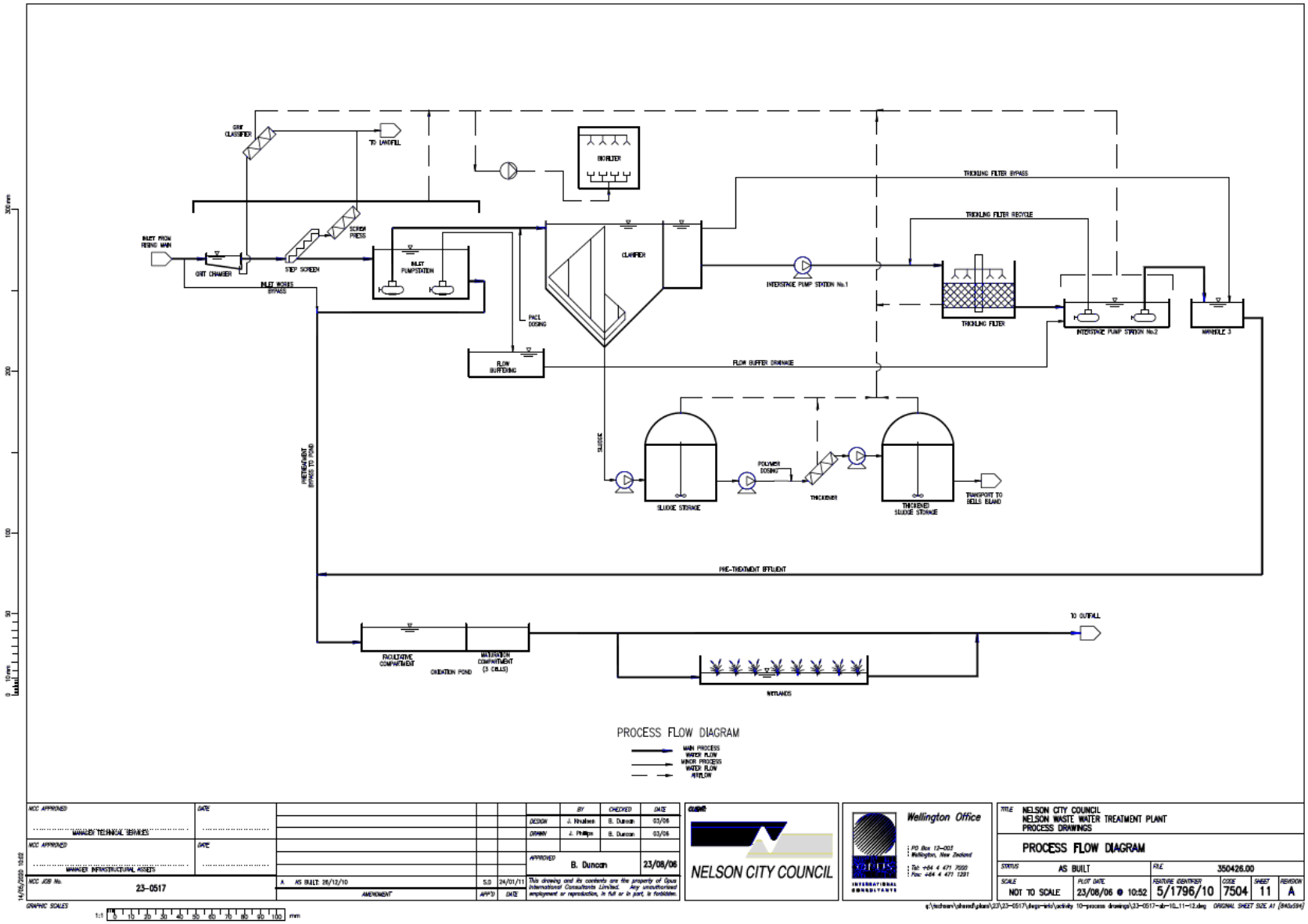
(Projects highlighted in green are priority projects for emissions reduction)

CONFIRMED PROJECTS FOR YEAR 1 (2018/19)			
Responsible	**Action**	**Completion date**	**Objective**
Infrastructure/Transport	Replace existing street lights with energy-efficient LED streetlights	June 2019	Reduce electricity usage
Corporate Services/Property	Procure two electric vans to replace one existing and one proposed new vehicle	June 2019	Reduce fossil fuel usage
CONFIRMED PROJECTS FOR YEAR 2 (2019/20)			
Responsible	**Action**	**Completion date**	**Objective**
All	Design and deliver carbon reduction plan	June 2023	Manage Council carbon reduction
Corporate Services/Property	Implement electric vehicle first policy when replacing existing or procuring new vehicles.	June 2023	Reduce fossil fuel usage
Years 1 to 5 (2019/2020) PROJECTS FOR INVESTIGATION (all projects will be subject to standard business case approval process where required) PRIORITY WILL BE GIVEN TO INVESTIGATION WITH BEST POTENTIAL TO REDUCE EMISSIONS			
Responsible	**Action**	**Completion date**	**Objective**

Infrastructure	Investigate collaboration with the NRSBU/NTRLBU to evaluate/reduce emissions from assets jointly-owned with Tasman District Council	June 2020	Reduce emissions
Infrastructure/ Utilities	Investigate emissions from Nelson North Wastewater Treatment Plant	June 2020	Reduce emissions
All/Senior Leadership/Strategy/Asset and Activity Managers	Investigate building climate change impact assessment into Council planning processes, including asset and activity management plans, policies, management plans and strategies	June 2020	Reduce emissions
Corporate Services	Establish feasibility of assessing carbon impact during the procurement process, including developing policy and criteria to guide significant purchases towards lower emission options, eg in infrastructure and building investments (new builds and refurbishments), equipment, electricity supply and service contracts	June 2020	Reduce emissions
Corporate Services	Investigate reducing and offsetting air travel	June 2023	Reduce emissions
Community Services/Facilities	Investigate energy efficiency opportunities such as energy audits on Council facilities that have emissions greater than 10tCO2e/yr	June 2023	Reduce electricity usage
Corporate Services/Finance	Investigate zero carbon energy suppliers	June 2020	Reduce emissions
Activity management/all	Investigate installing solar PV systems at Council buildings and facilities	June 2023	Reduce electricity usage
Senior Leadership Team	Investigate encouraging CCOs to measure, report and reduce carbon emissions	June 2020	Reduce emissions

Corporate Services/Property	Investigate removal of oil boilers and replacement with heat pumps	June 2020	Reduce fossil fuel usage
Corporate Services/Property	Water heating improvements at Riverside Pool	June 2020	Reduce electricity usage
Corporate Services/Parks	Investigate replacing park lighting with LEDS	June 2023	Reduce electricity usage
Infrastructure/transport & Corporate Services/Parks	Investigate installing outdoor lighting controllers on LED lights to reduce power use late at night	June 2023	Reduce electricity usage
Corporate Services/Parks	Investigate reducing nitrogen fertiliser use	June 2023	Reduce emissions
Corporate Services/Parks	Investigate replacement of grazing land with carbon forestry	June 2023	Increase carbon sequestration
Science and Environment	Investigate reducing waste at Council facilities	June 2023	Reduce emissions

APPENDIX B: Nelson Wastewater Treatment Plant Process Flow Diagram



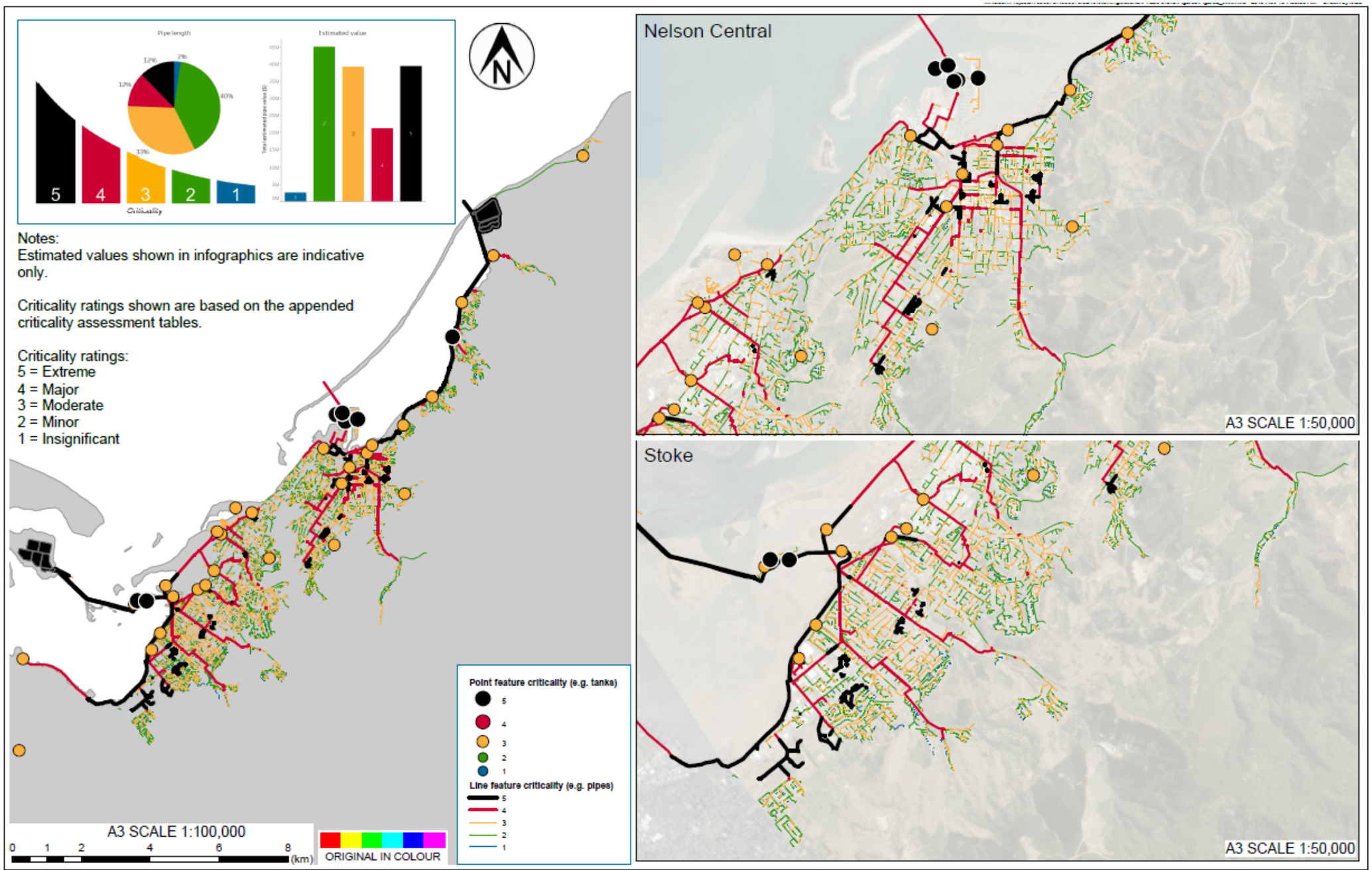
APPENDIX C: Emergency Generator Inventory as at June 2020

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 – Vanguard (Oxford St)	Duty Operator 0272 268 662	NA	Permanently wired	Automatic start on mains power failure	Vanguard
3	NCC 300kVA – Corder Park	Duty Operator 0272 268 662	NA	Permanently wired	Automatic start on mains power failure	Corder Park
4	NCC 3x 500kVA – Neale Park	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 SGEN1 - Green Baifa 50kVA – Nelmac Depot, Bullen St	Duty Operator 0272 268 662	GW 1860kg *	32 AMP 5 PIN	Runs one pump	**Quarantine,** Point, Grace, Martin, Rainier, Venice
6	NCC SGEN2 - White Baifa 50kVA - Trafalgar Park Storage	Duty Operator 0272 268 662	GW 1880kg *	32 AMP 5 PIN	Runs one pump	**Paru Paru,** Brooklands, Akersten, Vickerman
7	NCC SGEN3 - Lister 35kVA - Trafalgar Park Storage	Duty Operator 0272 268 662	GW 1620kg *	32 AMP 5 PIN	Runs one pump	**Weka,** Clouston, Cemetery
8	NCC SGEN4 - Chinese 30kVA - Trafalgar Park Storage	Duty Operator 0272 268 662	GW 1220kg *	32 AMP 5 PIN	Runs one pump	**Marybank,** Todds Bush, The Glen
9	NCC SGEN5 - Powerlink 137kVA - Trafalgar Park Storage	Duty Operator 0272 268 662	GW 2860kg *	125 AMP 5 PIN & bolted direct lugged connection	Will run two pumps	**Russell**
10	NCC SGEN6 - Powerlink 80kVA - Trafalgar Park Storage	Duty Operator 0272 268 663	GW 2240kg *	32 AMP 5 PIN	Will run two pumps at most stations	**Parkers #1**, Parker #2, Beach Rd, Skating Rink, Exeter, Monaco View
11	Industrial Marine Electrical (IME) – 60kVA, 110kVA	IME 03 548 5804 (24hrs)	Generator on trailers	Cables provided with generator, may need to be connected by electrician		Stations as required
12	Hirepool Nayland Rd – 30kVA, 50kVA, 110kVA, 250kVA – check generator availability	Hirepool 03 546 9259	Check transport availability	Cables provided with generator, may need to be connected by electrician		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 D: Wastewater Network Criticality Assessment



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NOTES:
This map is part of the report "3 Waters Natural Hazards Risk Assessment Phases 2 and 3" prepared by T+T for NCC in 2019. Refer to the report for further detail and applicability limitations.

REV	DESCRIPTION	GIS	CHK	DATE
1	Initial issue	MLO	DJA	18/10/19

LOCATION PLAN

PROJECT No.	1006675.0210	
DESIGNED	MLO	NOV.19
DRAWN	MLO	NOV.19
CHECKED		
APPROVED		DATE

CLIENT NESLON CITY COUNCIL
PROJECT 3 WATERS NATURAL HAZARD RISK ASSESSMENT
TITLE WASTEWATER NETWORK CRITICALITY
SCALE (A3) 1:100,000 FIG No. 1006675.0210-P3-F2 REV 1

APPENDIX E: Risk

Identification			Analysis: Residual Risk					
Event Description	**Asset Group**	**Consequence**	**Existing Controls**	**Consequence**	**Likelihood**	**Current Risk Level**	**Response**	**Treatments**
	General/Network wide							
Lack of Staff (NCC) and operator (Nelmac) experience/resilience	All	Inefficiency. Risk of operational failures or errors is increased.	Employ experienced people where possible.	Major (4)	Possible (3)	High (12)		Employ appropriately qualified and skilled staff. Pay and conditions should be competitive.
Lack of or poor access to data	Whole network/strategic planning	Lack of/or poor data limits understanding of the network and increases the likelihood that inefficient solutions are developed.	Limited - data stored in hard copy format or soft copy in "Objective"	Moderate (3)	Possible (3)	Medium (9)		Develop a data strategy.
Lack of access to as-builts/O&M manuals (NCC IP)	All	Inefficiencies. Creates rework and associated cost. Increases risk of operational or project failure.	Hard copy storage of some O&M manuals/as-builts (sometimes out of date). Some documents in "Objective"	Moderate (3)	Possible (3)	Medium (9)		Develop a data strategy. Establish a programme to bring all hard copy data online.
Stock/supply/shortage of critical materials/labour due to global supply chain failure	All	Loss of network functionality. Increased risk of failure where inappropriate components are used to ensure network continues to function.	Some critical spares in stock; others ordered as needed (with a historically rapid and efficient supply chain to support this approach).	Major (4)	Unlikely (2)	Medium (8)		Operations team to develop a critical spares list and develop a business case to procure these. Increase "Dry run" exercises on critical parts of the network with the handicap of the ideal spares not being available.
Odours	All	Customer complaints	Trunk mains vented. Some odour scrubbers at key locations in the network. Sealing at some pump stations.	Minor (2)	Possible (3)	Medium (6)		Investigate odour. Provide control or masking if necessary.
Stormwater Infiltration	All	Overflows - discharges to the environment having a negative impact on environmental and cultural issues. Possible issues with WWTP processes.	Renewal of old pipelines. Focus on NCC network issues in trial areas. Developing a process relating to private property I&I issues. Development of System Performance Improvement solutions.	Minor (2)	Possible (3)	Medium (6)		Continue to develop understanding of this issue (by upgrading the model and studying the trial areas). Develop approaches to convince private property owners to rectify issues at their property.
Inaccurate and/or Unknown Location of asset	All	Increased risk related to detection/other works/replacement. Increased costs.	Existing As-Built Plan of reticulation where available. Trial pitting to establish location of underground services. Contact and stand overs from other network providers.	Minor (2)	Possible (3)	Medium (6)		Update GIS as opportunities allow. Continue to investigate service location before digging and use developments in technology.
Discharge of hazardous substances to the sewer; or non compliant Trade Waste discharges	All	Significant health and safety risks to operations and contracting personnel. Deterioration and failure of wastewater assets 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)		Continue with the improvements to the Trade Waste process. Ensure adequate staffing is available.
Corrosion/acid attack	All "hard" WW infrastructure.	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. Impact on ability pump waste water to treatment plant.	Prevention through inspection and remedial strategy.	Moderate (3)	Unlikely (2)	Medium (6)		Continue with the improvements to the Trade Waste process. Ensure adequate staffing is available. Investigate high incidences of corrosion with a view to tracing the source of any problem flows.
Failure caused by, Earthquake, landslide or settlement/ liquefaction.	All	Failure of part or component parts of the network.	Nelson Tasman Emergency Management Plan. Emergency procedures manual and exercises. Identification of critical assets that have an increased risk profile.	Major (4)	Rare (1)	Medium (4)		Continue to develop criticality and natural hazards understanding with a view to progressing to the development of solutions (that will minimise the risk of failure due to a natural hazard event) in order of priority.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
Tsunami/Storm surge	All	Failure of part or component parts of the network.	Nelson Tasman Emergency Management Plan. Emergency procedures manual and exercises. Identification of critical assets that have an increased risk profile.	Major (4)	Rare (1)	Medium (4)		Continue to develop criticality and natural hazards understanding with a view to progressing to the development of solutions (that will minimise the risk of failure due to a natural hazard event) in order of priority.
Climate Change /Sea Level Rise	All	Failure of part or component parts of the network.	Nelson Tasman Emergency Management Plan. Emergency procedures manual and exercises. Programmes related to resilience/adaptation underway	Moderate (3)	Likely (4)	High (12)		Continue to develop criticality and natural hazards understanding with a view to progressing to the development of solutions (that will minimise the risk of failure due to a natural hazard event) in order of priority.
Harm to operators from exposure to sewage	All	Operator becomes ill from exposure to sewage.	Health and Safety training. Preventative inoculation of staff. Use of barrier protection where possible.	Major (4)	Rare (1)	High (12)		Ongoing health and Safety training. Identify hazardous areas at facilities and employ processes to minimise risk.
Pipe failure	All pipes	Wastewater discharges to the environment- environmental and cultural issues. Pumping to waste water treatment plant suspended. Minor health and safety issues.	KPI response times to incentivise rapid repairs. Some CCTV work. Encourage reporting of overflows/unusual odours. Replacement of older pipes.	Minor (2)	Possible (3)	Medium (8)		Ongoing renewal programme. Continue with CCTV programme. Use failure analysis of the network to identify areas with high incidences of failure.
Entry of gravels/sediment into the wastewater system.	All	Silt and gravel in the sewer system can obstruct and block sewer pipelines as well as cause excessive wear to pump stations. At the WWTP it can cause increased sedimentation. 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. Grit traps at WWTP and key PS.	Minor (2)	Possible (3)	Medium (6)		Continue with the improvements to the Trade Waste process. Ensure adequate staffing is available. Investigate high incidences of sedimentation with a view to tracing the source of any problem flows.
Pipe blockage	All pipes	Wastewater discharges to the environment - environment and cultural issues. Minor health and safety issues.	KPI response times to incentivise rapid repairs. Some CCTV work. Encourage reporting of overflows/unusual odours. Replacement of older pipes.	Minor (2)	Likely (4)	Medium (8)		Ongoing renewal programme. Public education about waste disposal. Appoint additional Trade Waste monitoring resource.
Staff unavailability (caused through illness, pandemic, natural hazard event)	All	Failure of the WW system or component parts of the WW system.	Resilience built into contractor staffing levels. Some O&M manuals readily available.	Major (4)	Unlikely (2)	Medium (8)		Work to ensure data systems are up to date allowing remote accessibility of both data and O&M information. Ensure a wide pool of appropriately skilled staff available. Where possible ensure the system has redundancy.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
	TREATMENT							
Overloading of plant treatment capacity	WWTP	Odour beyond plant boundaries. Discharge 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 water quantity/quality against long term trends for quality and quantity of wastewater treated. Processes within treatment plant have contingencies for failure (duplication of pumps) and alarm systems. Processes and consequently 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. Buffering available within the ponds to allow long retention times.	Moderate (3)	Rare (1)	Low (3)		Review future demand from growth. Remedial de-sludging. Ensure data from pump station flow meters is of a good quality. Ensure trade waste process is adequate to inform understanding of high load flows.
Toxic Discharge to network where it reaches the treatment plant	WWTP	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 in planning for increased rigour. Regular inspections and maintenance programme. Emergency Action Plan. Emergency Procedures Manual. Monitor water quantity/quality against long term trends for quality and quantity of wastewater treated. Processes within treatment plant have contingencies for failure (duplication of pumps) and alarm systems. Processes and consequently 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. Buffering available within the ponds to allow long retention times.	Moderate (3)	Rare (1)	Low (3)		Ensure trade waste process is adequate to inform understanding of high load flows.
Failure to achieve consent conditions.	WWTP	Failure to comply with resource consents. Customer complaints.	Pond management team recently set up to routinely monitor pond performance in order to minimise the risk to the ponds "crashing" and causing odour issues. Pre-treatment processes minimise loading fluctuations. The plant is operated and maintained in a manner that minimises risk of consent breaches within the capabilities of the current processes. Wide ranging sampling and monitoring programme. Buffering provides a factor of safety. Proactive desluding programme is being developed.	Moderate (3)	Likely (4)	High (12)		Ensure and maintain adequate sampling and monitoring. React rapidly to potential breaches or indications that breaches are coming. Continue to invest in the pond management team.
Sludge build up reduces capacity and effectiveness of the ponds.	WWTP	Failure to comply with resource consents. Customer complaints.	Ponds de-sludged in 2014. Sludge build-up will be monitored and ponds de-sludged when required - anticipated to be more frequently and at lower volumes than has been done historically. Future budget is included in 30 year tables.	Moderate (3)	Possible (3)	Medium (9)		Monitor sludge build-up in ponds and clarifier. Develop long term programme of anticipated desludging.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
	RISING MAINS							
Atawhai Rising Main Failure.	Atawhai Rising main	Volume of spills dependent on nature of failure - occurs into or adjacent to a sensitive area (Nelson Haven).	Stock spares available to facilitate rapid repair. Effective systems for reporting and response in place. Staff and contractors aware of the significance of this main. Work underway to assess the internal condition of this rising main and the risk of failure of key external components. "Dry run" exercises on failure response undertaken from time to time.	Major (4)	Possible (3)	High (12)		Continue with internal and external condition assessment programme. Ensure critical spares are readily available.
Mains up to 150mm dia. Failure	Rising mains	Relatively small volumes of wastewater spill. Environmental impacts. Public health and safety hazard.	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. Rapid repairs incentivised through the O & M contract.	Moderate (3)	Unlikely (2)	Medium (6)		Investigate storage options and 'pump around' options. Understand options for rising main condition assessment.
Mains > 150mm Failure	Rising mains	Relatively large volumes of wastewater spill. Environmental impacts. Public health and safety hazard.	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. Rapid repairs incentivised through the O & M contract.	Major (4)	Unlikely (2)	Medium (8)		Investigate storage options and 'pump around' options. Understand options for rising main condition assessment.
	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. Rapid response times incentivised in O&M contract.	Moderate (3)	Possible (3)	Medium (9)		Ongoing renewal programme. Continue with CCTV programme. Use failure analysis of the network to identify areas with high incidences of failure.
Pipe collapse	Gravity - trunk mains	Overflow- discharges to the environment having an negative impact on environmental and cultural issues	Strategic approach to renewal. Rapid response times incentivised in O&M contract.	Moderate (3)	Unlikely (2)	Medium (6)		Ongoing renewal programme. Continue with CCTV programme. Use failure analysis of the network to identify areas with high incidences of failure.
Discharge of high flows to the WW network	Gravity network.	High peak flows to the sewer increase the likelihood of overflows at manholes and pump stations.	Regular monitoring of pump station flows. Upgrading of the wastewater hydraulic model. Rapid response times incentivised in O&M contract. Strategic renewal of pipe assets to provide additional conveyance and storage.	Moderate (3)	Possible (3)	Medium (9)		Investigate high inflow sources with a view minimising inflow or increasing capacity.

Identification			Analysis: Residual Risk	Consequence	Likelihood	Current Risk Level	Response	Treatments
Event Description	**Asset Group**	**Consequence**	**Existing Controls**					
	PUMP STATIONS							
Power failure/System failure	All Pump stations	Overflows - discharges to the environment having a negative impact on environmental and cultural issues. Customer complaints.	Stand-by generators, mobile generators and additional storage capacity [reduces probability of failure].	Major (4)	Unlikely (2)	Medium (8)		Ensure spare mobile generators are well serviced. Pump station resilience programme to identify appropriate solutions to decrease risk levels associated with critical equipment failure.
Equipment/ component Failure	All pump stations	Wastewater discharges to the environment having a negative impact on environmental, cultural and health issues. Customer complaints. Wastewater not able to be pumped from the city to NWWTP.	Processes within pump stations have contingencies for failure (duplication of pumps) or alarm systems (Supervisory control and data acquisition) installed. Many PS have additional storage capacity	Major (4)	Possible (3)	High (12)		Pump station resilience programme to identify appropriate solutions to decrease risk levels associated with critical equipment failure. Operations team to develop a critical spares list and develop a business case to procure these. Increase "Dry run" exercises on critical pump stations.
Insufficient Storage Capacity	All Pump stations	Insufficient storage or capacity resulting in wastewater discharges to the environment. Environmental and cultural issues and increase in public health risk	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions. A programme of work associated with better understanding key risks (and developing associated solutions) related to pump stations is underway.	Major (4)	Possible (3)	High (12)		Investigate storage capacity of network, document, & develop mitigation strategy. Pump station resilience programme to identify appropriate solutions.
Vandalism	All Pump stations	Poor public perception of wastewater facilities. Potential H&S issues with the public coming into close proximity to pumps stations.	Construct compounds of vandal resistant materials. Install security fences where appropriate.	Minor (2)	Unlikely (2)	Low (4)		Construct compounds of vandal resistant materials. Install security fences where appropriate. Upgrade security lighting and cameras.
Storm surge inundation	Low lying Pump stations	Inoperative pumps. Loss of service. Wastewater overflows. High operational costs.	Raised electrics. Nelson Tasman Emergency Management Plan. Emergency Procedures Manual.	Moderate (3)	Unlikely (2)	Medium (6)		Pump station resilience programme to identify key measures to protect Level of service.

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

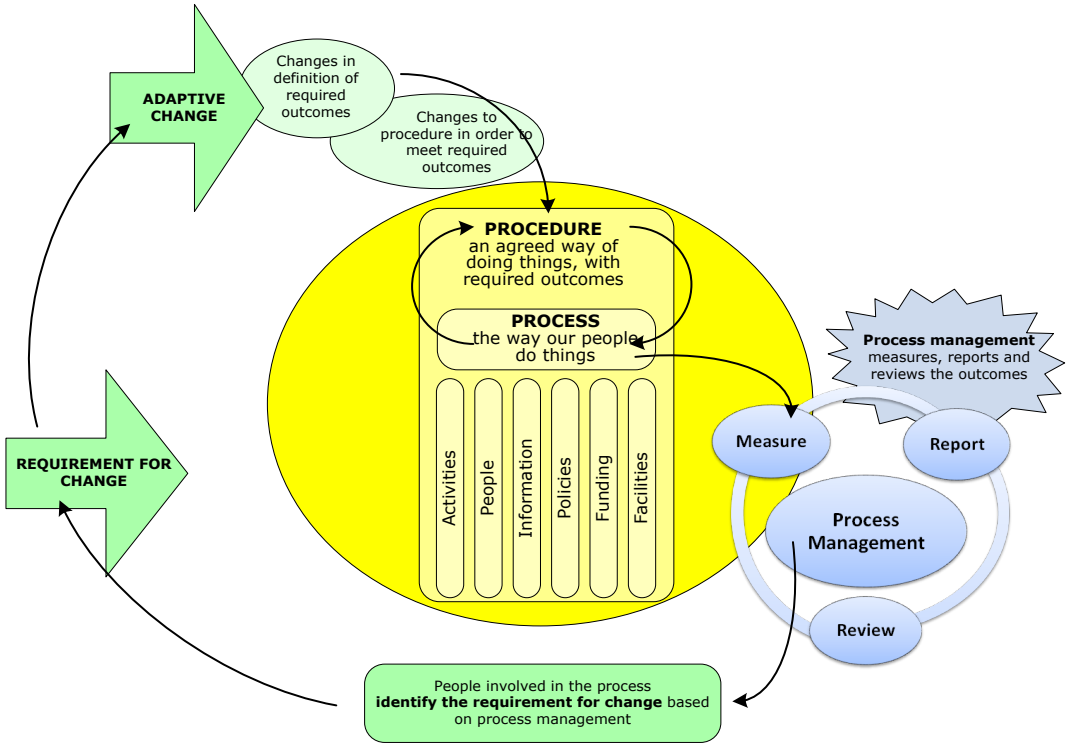
Risk Matrix – Consequences x Likelihood

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

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

APPENDIX F: Quality Management Lifecycles



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)

1: Define the Process: Document the Procedure

- 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 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

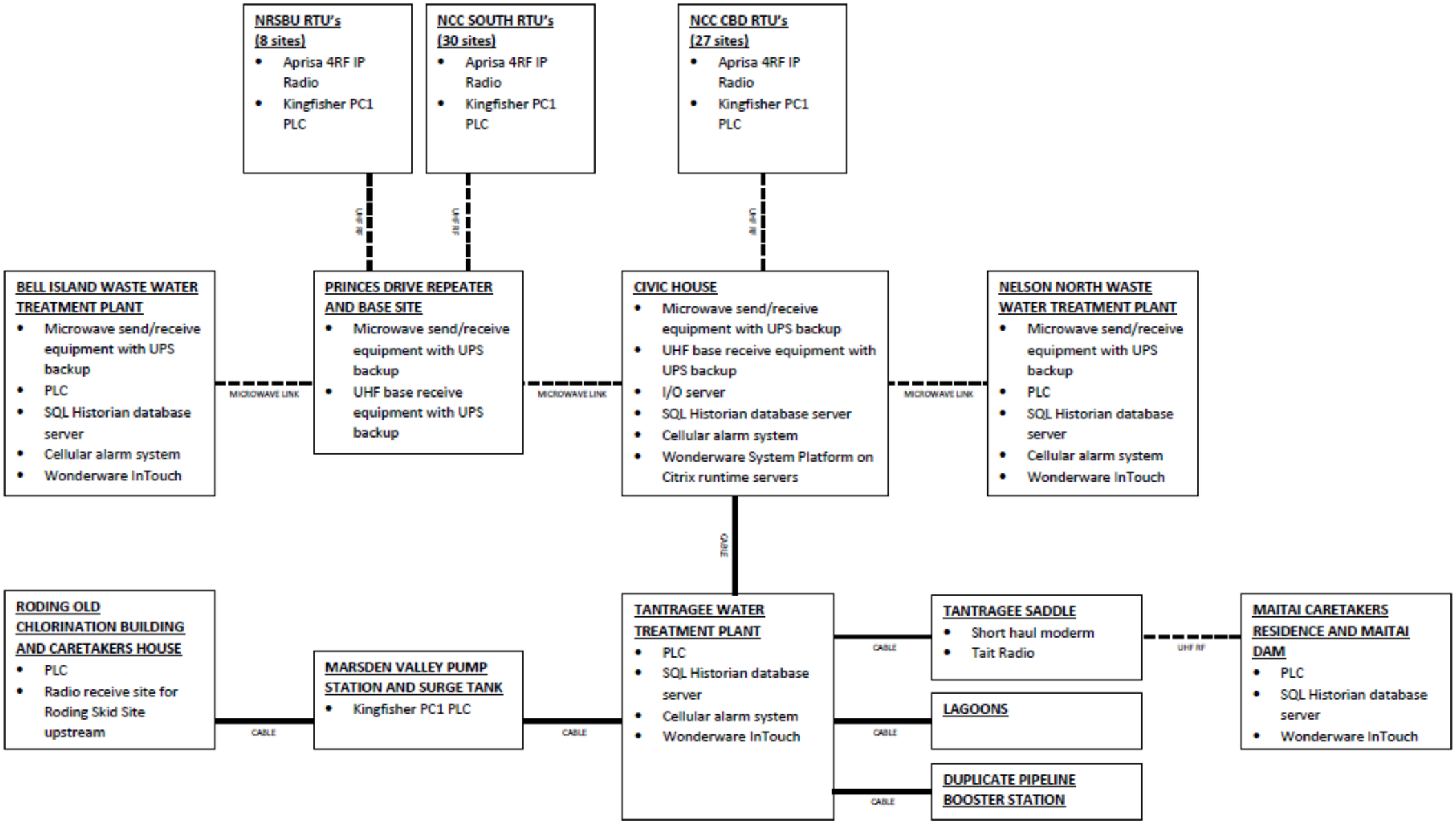
3: Improve the procedure: Requirement for Change, then Adaptive Change

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?

APPENDIX G: Supervisory Control and Data Acquisition (SCADA) Schematic



APPENDIX H: GAP Analysis and Appropriate Practice

Wastewater					Maturity Levels										w	
Reference	Question	IIMM Descriptors			Aware	Basic	Core	Intermediate	Advanced	Element %	Element Score (out of 100)	Current Score	Appropriate Target (3 yrs)	Target (10 years)		
		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						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.			52.5	60	80		
		Strategic context (internal / external) analysed and AM implications understood.								25%	50					
		AM Policy sets out AM expectations, objectives and accountabilities								25%	40				Assume AMP provides a lot of the policy direction. Promapp has some info though requires updating.	
		The organisation's AM System / Framework is defined								25%	60				Fairly well established though connections could be stronger.	
		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.			51.25	65	80		
		Customer engagement to understand level of service requirements.								25%	50				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%	50					
		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 project development	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.			62	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%	60					Better use of model	
		Demand management strategies identified and impacts on future demand quantified									20%	50				Somewhat linked to water usage - demand management on water will positively impact on wastewater.	Better use of model. Clearer outputs from the city development team	
		Risk associated with demand uncertainty understood, scenarios are developed and managed									20%	50				Wet weather events. Tidla influences. Development	Better use of model. Mor einvestigative work in problem areas.	
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.			**62**	**70**	**80**			
		Asset hierarchy defined and data requirements for each level of the hierarchy specified.									20%	40				Good pipe data, WWTP and PS data less well defined.	Establish an asset heirachy for more complex asset groups	
		Basic physical information captured against assets (age, material, type, etc)									20%	60				Good pipe data, WWTP and PS data less well defined.	Establish an asset heirachy for more complex asset groups	
		Spatial / location information recorded or links to GIS from asset register (if separate)									20%	70				Good pipe data, WWTP and PS data less well defined.	Establish an asset heirachy for more complex asset groups	
		Asset age / life / replacement cost recorded at asset level (information for valuation / renewals)									20%	70				Good pipe data, WWTP and PS data less well defined.	Establish an asset heirachy for more complex asset groups	
		Asset criticality data recorded at asset level									20%	70				Natural hazard project has lifted this.	Need to test the Natural hazard/criticality outpus undertaken 19/20.	
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.			**51.25**	**60**	**70**			
		Condition and performance monitoring programmes established									25%	55					Need to establish an ongoing programme of condition assessments.	
		Condition data captured in asset register									25%	45				Not checked, no trend data analysis	Need to better use Infor	
		Performance data captured in asset register (eg: service outages)									25%	55					Need to better use Infor	
		Works costs recorded at asset level									25%	50				depends on piece of work. Reactive maintenance yes.	Need to better use Infor	
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%	60					Refine/simplify business case process	
		Agreed frameworks / techniques applied to support decision making									20%	60					Refine/simplify business case process	
		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%	60						Refine/simplify business case process
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; allocate mitigation measures.
		Strategy for management of critical assets in place								20%	50				Key risks are fairly obvious and therefore the organisation is inherently aware of them.		Extend natural hazard assessment; develop contingencies for critical assets.
		Assessments of network resilience to major hazards								20%	60						Extend natural hazard assessment; develop contingencies for critical assets.
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.			61.25	65	75		
		Operational programmes and processes are developed and optimised								25%	65						Mor eeffort require to align operational activites with AMP and organisational strategies
		Operational objectives and intervention criteria are defined								25%	65						Mor eeffort require to align operational activites with AMP and organisational strategies
		Emergency response arrangements are in place and tested								25%	50				Some scenrios tested for critical assets. Could widen scope.		More contingency planning.
		Operational performance is monitored and improvements identified								25%	65						Improve monitoring of KPI
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.			60.5	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; high level at time of AMP and adjusted through the AP process.
		Capital projects are prioritised within and between activities and work areas								25%	50				Prioritised within activities.		Need to priroritse between activites.
		Renewal forecasts are modelled based on age, condition, performance								25%	50				Recent analysis of valuation data indicates that this lags behind market rates.		Improve valution data
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.			70	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%	70						Wider range of tendered rates; need to confirm valuation rates are appropriate.
		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			41	65	70		
		Leadership supports and actively advocates investment in AM.								20%	40				Staff resources short, resilience limited.	Investment in AM team and training.	
		AM roles and role interfaces are defined.								20%	40				Activity Eng role covers a very wide remit. This does not allow adequate focus.	Improve job description and organisational structure/resourcing.	
		Resources (internal and external) to support an effective 'AM System' are in place.								20%	40				Staff resources short, resilience limited.	Investment in AM team and training.	
		All staff understand AM and their role / contribution to the AM System.								20%	45				Activity Eng role covers a very wide remit. This does not allow adequate focus.	Improve job description and organisational structure/resourcing.	
		AM capability requirements are reviewed and provided								20%	40						
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				Iwi engagement happens but quite late. Staff resourcing limits ability to do more in this area.	Improve resourcing and resilience.	
		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. Make doucments (including exec summary) more succinct.	
		AMPs are integration with other business processes / plans								20%	55				Very difficult to do again resourcing a limiting factor.	Improve activity integration	
		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				Some but sparodic	Better integration required. Also growing need for enhanced data management.	
		AM processes are documented within a management system framework								25%	45				Business cases/PIDs/Data Analysis/Computer models, Promapp	Promapp requires updating.	
		Processes are subject to review, audit and continual improvement								25%	45						
		AM System is aligned / certified to ISO 55001								25%	35					Need organisational support.	

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			**62**	**80**	**80**		
		IS records asset data within a hierarchy									20%	70					
		IS enables tracking of service requests and scheduling of planned maintenance									20%	80					
		IS suports AM analysis (performance evaluation, valuation / renewal forecasting)									20%	60					Background capability is high, more could be done to use this capability.
		IS reporting supports management and AMP requirements									20%	50					More to be done to formalise asset queries to ensure consistency between data outputs. Better use of infor over GIS. Reporting needs to be moe focussed towards providing usable data/outputs.
		Information systems share / exchange data									20%	50					Background capability is high, more could be done to use this capability.
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.			**58.75**	**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	More robust AM staffing required.
		Contracts / SLAs are in place for outsourced / in house service delivery									25%	50				External agreements well documented. Internal agreements not in place.	Formalise internal SLAs
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				Resourcing a limiting factor.	Appropriate resourcing
		Improvement tasks prioritised and developed into an AM improvement plan with allocated resources / timeframes / deliverables									25%	50				Resourcing a limiting factor.	Appropriate resourcing
		Project scope / brief developed for major improvement tasks.									25%	40				Resourcing a limiting factor.	Appropriate resourcing
		Progress against the AM improvement programme is regularly monitored and reported to management									25%	40				Resourcing a limiting factor.	Appropriate resourcing