

Draft Infrastructure Strategy 2024 - 2054



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Executive Summary

The purpose of an infrastructure strategy is to identify significant infrastructure issues during the period covered by the strategy (which needs to be at least 30 years), the principal options for managing those issues, and the implications of those options.

Part One of this strategy summarises how Council's strategic direction, which is driven by both local and national objectives, influences the provision of infrastructure.

Part Two discusses the specific issues Council needs to address related to water supply, wastewater, stormwater, flood protection, transport, and solid waste management, to achieve objectives related to:

- managing risks related to natural hazards and climate change
- maintaining, renewing, and upgrading infrastructure
- meeting the needs of growth
- maintaining and enhancing public health and safety outcomes, and the
- environment

Part Two also includes options tables which estimate the cost of alternative options to address the issues. This includes the potential costs of failing to prepare for climate change impacts.

Part Three provides an overview of the financial implications of Council's proposed approach to infrastructure management.

A separate infrastructure strategy will be prepared for the Regional Landfill Business Unit and Nelson Regional Sewerage Business Unit which manages the Bell Island Wastewater Treatment Plant which processes approximately half of Nelson's wastewater.

Recovery from August 2022 severe weather event

In August 2022, a severe weather event caused significant damage to both public and private property.

Flooding and numerous slips impacted Council's land, roading and piped infrastructure network, gravel build-up in rivers and streams has been significant. The scale and impact of the August 2022 severe weather event, and the February 2023 national emergency associated with Cyclone Gabrielle, show our climate is changing and that the impacts are becoming more frequent and severe. The events highlight the importance of preparing for, and adapting to, the effects of climate change and reinforce the priority Council has given to climate change response in the Long-Term Plan and the work underway through the weather event recovery to build back better and more resilient.

The full recovery work program is expected to take until 2028 to complete. This timeframe is driven primarily by the need to build back better and more resilient. However, other factors are also influencing the program, including consultant and

contractor availability, supply and transport issues driven by continued COVID-19 and Cyclone Gabrielle impacts.

The total estimated cost of the recovery is \$87.2 million, with some of this to be paid for by insurance and central government. That leaves about \$60 million for us to pay.

Council is having to borrow to fund the recovery costs. To repay the loans, we are proposing a uniform targeted rate of \$300 (incl GST) which will apply to all separately used or inhabited parts of a rating unit (SUIP) in Nelson. We think this is the most transparent way to pay for the recovery. We need to pay this off over a relatively short period because we expect more natural disasters and intense storm events to come our way in the future. But paying off this debt faster means higher costs in the short term.

Council considers debt funding recovery work is appropriate to keep rates increases lower for its community. Council is aware of the impacts of rates increases, particularly when households are facing escalations in their cost of living due to higher-than-expected inflation rate.

The frequency and impact of severe weather events may impact central government funding and NZ Transport Agency Waka Kotahi opportunities for Nelson, which may mean a higher reliance on rates to cover the costs of recovery from future weather events.

Transport

Strategic changes related to transport include:

- Tri-annual amendments to the Government Policy Statement on Land Transport
- Increasing commitments at a national and local level to climate change adaptation and mitigation targets.
- Implementation of the Nelson Future Access Strategy to address capacity constraints on Nelson's transport network that impact on the city's ability to accommodate growth and intensification.

Significant transport issues considered in this infrastructure strategy include:

- Amendments to the Government Policy Statement on Land Transport
- Increasing commitments at a national and local level to climate change adaptation and mitigation targets.
- Implementation of the Nelson Future Access Strategy to address capacity constraints on Nelson's transport network that impact on the city's ability to accommodate growth and intensification.

The transport network is critical to enable all other utilities to get up and running following natural hazard events, by enabling essential service vehicles to access affected areas, issues include:

- Incomplete data on the roading network assets.

The current transport system is in a highly constrained geographic environment, with hills on one side and the Tasman Sea on the other, issues include:

- The growing demand for travel is being squeezed along historical corridors that must function as 'all things to all users'.
- When and where and how to safely accommodate increased demand on the transport network to provide for urban intensification and growth.
- Increasing demand for alternative transport options on the existing road network.
- Public transport services and facilities.
- Reduced capacity and resilience due to more intense storms and sea level rise projected with climate change.
- Damage to road assets from natural hazards. Recovery from the August 2022 will extend over the first several years of this Infrastructure Strategy. Resilience issues identified by these floods will inform future asset renewals and upgrades.
- Managing road water run off to the stormwater network to meet new freshwater quality objectives and standards set under future freshwater plans drafted to meet the National Policy Statement for Freshwater Management (NPS-FM), and the National Environmental Standard for Freshwater Management (NES-FM).
- Use of road corridors to implement the Urban Greening Strategy.

[Find out more on page 39](#)



Water Supply

Strategic changes related to the water supply include:

- The increasing potential for extended periods of dry weather as a result of climate change, affecting water security.

- The need to meet the requirements of the National Policy Statement for Freshwater Management and National Environmental Standards and comply with the 2017 and 2019 water supply resource consent conditions.
- The new Government has repealed the previous government's water services entities legislation and will instead implement a new plan for water services over the next two years. In anticipation of this Nelson City Council has prepared activity management plans and this Infrastructure Strategy based on the activity remaining in Council ownership and control.
- Nelson's water supply catchments have capacity to meet water demands well into the latter part of the century. However, there are constraints in some areas of the city reticulation that impact on the city's ability to accommodate growth and intensification. This is particularly the case in the Maitai Valley, south Nelson and parts of the inner city.

Significant water supply issues considered in this infrastructure strategy include:

- The older piped water reticulation network which is at risk of damage during earthquakes and flood events.
- Water supply assets are starting to show signs of age, resulting in increased failures. Due to a greater proportion of the network reaching the end of its design life, a significant length of watermains will need to be renewed within the next 30-50 years
- Levels of service for water supply will reduce unless assets are maintained, renewed, and upgraded in a timely fashion.
- 20-25% of water supplied is not able to be accounted for in the water supply. This due to a combination of water being lost as it travels through the pipes, water meters reading over and difficulties estimating volumes lost through pipe breaks.
- Being able to access water from the Maitai Dam increases the resilience of the water supply network. The presence of Lindavia intermedia in the Maitai Dam Lake is being investigated to ensure that any future impacts on the Water Treatment Plant processing system are managed by the plant operators.
- Deposits in cast-iron pipes are discolouring the water supply received by some customers.
- Improving the quality of water discharges from the Maitai Dam into the Maitai River to avoid impacts on the downstream environment.
- Meeting Government requirements for fluoride in the water supply.

[Find out more on page 58](#)

Wastewater

Strategic changes related to wastewater include

- In the long term the need to consider relocation of the Nelson Wastewater Treatment Plant (NWWTP) considering the impacts of climate change and cultural

values including any regional approach/philosophy, agreed with iwi partners, to dealing with the region's wastewater.

- In the short term the renewal of the resource consents for the operation of the NWWTP for a period up to 35 years that will be decided through the consenting process.
- The renewal of the Atawhai Rising Main – a significant, aged lifeline asset that takes half of Nelsons wastewater to the NWWTP.
- The new Government has repealed the previous government's water services entities legislation and will instead implement a new plan for water services over the next two years. In anticipation of this Nelson City Council has prepared activity management plans and this Infrastructure Strategy based on the activity remaining in Council ownership and control.
- The need to manage, reduce and mitigate wastewater greenhouse gas emissions in line with new climate change legislation and targets.
- Nelson's wastewater network has capacity constraints that impact on the city's ability to accommodate intensification and growth.

Significant wastewater issues considered in this infrastructure strategy includes:

- The impact of climate change and new requirements for wastewater discharges on the long-term viability of the NWWTP's current location and treatment processes/disposal routes
- The desire of iwi partners to eliminate or minimise discharge of treated wastewater to water noting that the magnitude of a change of this kind is significant and will take decades as opposed to years to give effect to.
- Planned levels of service for wastewater will not be met unless assets are maintained, renewed, and upgraded
- Inflow and infiltration cause overflows from the wastewater network
- Failures of the Atawhai rising main could result in untreated wastewater discharges directly into Nelson Haven
- Nelson's wastewater network has capacity constraints that impact on the city's ability to accommodate growth and intensification.

Find out more on page 74

Stormwater

Strategic changes related to stormwater include

- The Affordable Water Reforms (previously Three Waters Reform) required a separation of the stormwater and flood protection functions and assets that were previously covered under a single activity management plan. These have now been split into two separate activity management plans.

- The new Government has repealed the previous government's water services entities legislation and will instead implement a new plan for water services over the next two years. In anticipation of this Nelson City Council has prepared activity management plans and this Infrastructure Strategy based on the activity remaining in Council ownership and control.
- The Long Term Plan for 2024-2034 includes a proposal with respect to stormwater and flood protection rating arrangements to include a uniform charge for the former and a rate based on land value for the latter. It is also proposed that the rating area for stormwater is modified to exclude properties within the rural zone.
- Recovery from the August 2022 flood event is on-going. The recovery program is due to extend from 2022/23 to 2027/28.

Significant stormwater issues considered in this infrastructure strategy include:

- Unless additional capacity is allowed for, the level of service provided by existing stormwater assets will progressively reduce over time due to more intense storm events and sea level rise projected with climate change
- Damage to the stormwater network from natural hazards.
- Planned levels of service for stormwater will not be met unless assets are maintained, renewed and upgraded.
- Management of increased stormwater flows associated with urban intensification and growth.
- Meeting new freshwater quality objectives and standards set under future freshwater plans drafted to meet the National Policy Statement for Freshwater Management (NPS-FM), and the National Environmental Standard for Freshwater Management (NES-FM). Council will need to see what changes (if any) the government will make to these.

Find out more on page 87

Flood Protection

Strategic changes related to the Flood Protection Activity include

- The RMA reforms are expected to include new direction on how existing and future development is managed in floodplains and low-lying coastal areas. The flood protection activity needs to be considered within the wider context of adaptive pathways planning for these areas.
- The new Government has repealed the previous government's water services entities legislation and will instead implement a new plan for water services over the next two years. In anticipation of this Nelson City Council has prepared activity management plans and this Infrastructure Strategy based on the activity remaining in Council ownership and control.
- Recovery from the August 2022 flood event is on-going. The recovery program is due to extend from 2022/23 to 2027/28.

Significant flood protection issues considered in this infrastructure strategy include:

- Unless additional capacity is allowed for, the level of service provided by existing flood protection assets will progressively reduce over time due to more intense storms and sea level rise projected with climate change.
- Damage to flood protection assets from natural hazards: Recovery from the August 2022 flood event will extend over the first several years of this Infrastructure Strategy and will include a significant program of works to repair, reinstate and upgrade assets.
- The risk of flood protection asset failures will increase over time unless assets are maintained, renewed, upgraded and adapted (eg. Nature-based solutions).
- Responding to new freshwater objectives and standards set under future freshwater plans drafted to meet the National Policy Statement for Freshwater Management (NPS-FM), and the National Environmental Standard for Freshwater Management (NES-FM).

Find out more on page 100

Solid Waste

Strategic changes related to solid waste include:

- The introduction of mandatory construction and demolition waste reduction,
- Introducing Council-led management of commodities in line with a container return scheme, and legislation relating to performance standards and recycling collection methodology.
- Developing commitments to reducing operational greenhouse gas emissions as part of a transition to a low carbon society.
- Direct engagement with commercial waste providers and builders to achieve coordinated waste minimisation.
- Direct engagement with industry to support both voluntary and mandatory product stewardship, including diversion of soft plastics and refrigerants.
- Developing strategies for the increasing requirements of protecting the environment from outputs from closed landfills and waste related to weather events

Significant solid waste issues considered in this infrastructure strategy include:

- Meeting Council's legislative obligations to reduce greenhouse gas emissions, as well as cost-effectively diverting waste from landfill, and using these decisions to proactively contribute to a low carbon future.
- 'Te Rautaki Para - the New Zealand Waste Strategy - was updated and released in March 2023. The new strategy aligns more closely to action on climate change and signals new directions around improving recovery of resources and moving to a circular economy model, for example creating solutions for 'reuse' rather than 'recycle'.

- The effects of the increases in the cost of disposal due to the cost of emission units
- Meeting services within a changing transport and roading infrastructure
- Commodity value of recovered recyclables.
- Unpredictable timetable for the introduction of legislation and central government schemes.
- Expectation to extending the range of council infrastructure and services used to divert and recover waste.
- Where economically and operationally practical (and subject to a business case) the introduction of Council-led diversion of organic materials such as kitchenwaste, where this will reduce emissions and assist Council to meet emission ambitions.
- Increased requirement for management of waste related to weather and other natural disaster events.

Find out more on page 114

Financial implications — most likely scenario

Infrastructure costs for the next 30 years are shown in the graph below. These estimates are based on the likely options outlined in this strategy and the work programs included in the 2024–2034 activity management plans.

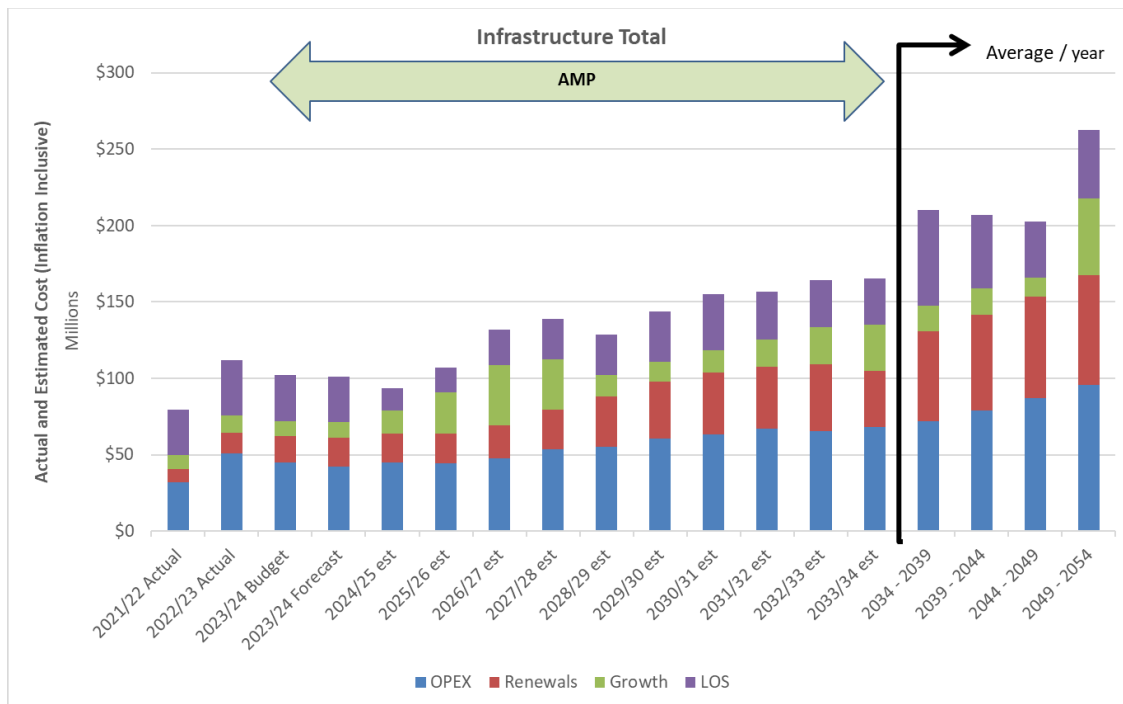


Figure ES1: Financial implications — most likely scenario graph

Part One: Strategic Direction

Context

Background

Nelson's unique coastal location and its identity attracts residents, businesses, investment, and visitors. Climate change, ageing infrastructure, development to meet the needs of an increasing population and the need to improve environmental outcomes will require changes to how Council provides infrastructure services. This strategy identifies innovative and effective ways to meet the future needs of the community.

Purpose of infrastructure strategy

The purpose of this infrastructure strategy is to identify significant infrastructure issues during the period covered by the strategy (which needs to be at least 30 years), the principal options for managing those issues, and the implications of those options.

Section 101B of the Local Government Act requires Council to outline how it intends to manage its infrastructure assets, considering the need to:

- renew or replace existing assets; and
- respond to growth or decline in the demand for services reliant on those assets; and
- allow for planned increases or decreases in levels of service provided through those assets; and
- maintain or improve public health and environmental outcomes or mitigate adverse effects on them; and
- provide for the resilience of infrastructure assets by identifying and managing risks relating to natural hazards and by making appropriate financial provision for those risks.

The infrastructure strategy must also outline the most likely scenario for the management of the local authority's infrastructure assets of water supply, wastewater, stormwater, flood protection, transport and solid waste over the period of the strategy.

Structure and scope of this strategy

Part One of this strategy summarises how Council's strategic direction, which is driven by both local and national objectives, influences the provision of infrastructure.

Part Two discusses the specific issues Council needs to address related to water supply, wastewater, stormwater & flood protection, transport and solid waste management, in order to achieve objectives related to:

- managing risks related to natural hazards and climate change
- maintaining, renewing, and upgrading infrastructure

- meeting the needs of growth
- maintaining and enhancing public health and safety outcomes, and the environment

Part Two also includes options tables which estimate the cost of both preferred and alternative options to address the issues. This includes the potential costs of failing to prepare for climate change impacts.

Part Three provides an overview of the financial implications of Council's proposed approach to infrastructure management.

Public and active transport and solid waste services are included in this strategy, in addition to the activities which the Local Government Act requires councils to include — water supply, sewerage, stormwater and flood protection as well as roads and footpaths

The Nelson Tasman Regional Business Units manage infrastructure on behalf of both the Tasman and Nelson councils (York Valley Landfill and Eves Valley with respect to landfill and Bell Island with respect to wastewater). These are reported separately to their own boards and to both Councils.

Implementation of the strategy

Effective implementation of this infrastructure strategy relies on good information flow and alignment between three different levels:

- strategic documents (10-30 years) including the Infrastructure, Financial Strategy, Nelson Tasman Future Development Strategy 2022 (FDS) , and the Nelson Plan
- tactical plans (1-10 years) including the Long-Term Plan, activity management plans, the Intensification Action Plan, the operative Nelson Resource Management Plan
- operational activities (year to year) including work programs and service delivery contracts.

Good levels of service statements and effective performance monitoring are key to aligning outcomes at each of these levels.

Infrastructure projects are spread over three to five years, depending on their complexity. Council has been able to increase the number of projects it delivers, and continues a commitment to month on month, year on year improvements in the delivery of capital projects. This reflects that the level of project management maturity is increasing, and that Council's delivery model has most of the technical component of the work delivered by consultants who have access to more staff. As Council's project managers become increasingly skilled, they can increase the number of projects they deliver, this has been seen over the last few years and continues.

Council's processes, procedures and procurement strategies are improving and becoming more streamlined, which also increases delivery capacity.

Strategic Direction

- Overview
 - Our vision for Whakatū Nelson is a creative, prosperous, and innovative city. Our community is inclusive, resilient, and connected – we care for each other and our environment.
- Council has set priorities as:
 - Support our communities to be prosperous, connected and inclusive.
 - Transform our city and commercial centres to be thriving, accessible and people-focused
 - Foster a healthy environment and a climate resilient, low-emissions community.
- Iwi partnership
- Council's approach to community engagement
- Financial Strategy
- Climate change
- Future development (including intensification)
- Resource management
- Legislative changes, Government Policy Statements, and proposals

Overview

Many changes have occurred since the previous infrastructure strategy was adopted in 2021. This section of the infrastructure strategy outlines how the following changes affect infrastructure management in Nelson.

Additional strategic direction at a government level that affects infrastructure management includes:

- the Government's Climate Change targets of zero net emissions by 2050 (excluding methane) and a series of emissions budgets to meet these targets (the first three of which were set in 2022)
- the National Adaptation Plan and Emissions Reduction Plan which contain objectives and policies to reduce embodied and operational emissions from infrastructure and reduce exposure to climate change risks.
- a Government Policy Statement on Land Transport has been adopted with a strong focus on safety, multi modal transport systems and emission reductions.
- NZ Transport Agency Waka Kotahi Road to Zero Program plans for zero deaths or serious injury crashes on the road network by 2050.
- a new National Policy Statement on Urban Development with additional requirements to meet the needs of communities and encourage well-functioning, liveable urban environments.

- the new agency – Taumata Arowai to administer and enforce a new drinking water regulatory system and improve the environmental performance of wastewater and stormwater networks.
- the National Policy Statement for Freshwater Management 2020 with higher freshwater quality standards
- the Government review into the future of local government. The review includes, but is not limited to, roles and functions of local government, as well as representation, governance, funding, and financing.
- the Resource Management Act Reform will result in changes to the Resource Management Act 1991,
- A National Policy Statement for Indigenous Biodiversity is under development.
- A proposed increase to the landfill levy has been confirmed.
- In addition, new Nelson City Council strategies and plans include:
- The Nelson Tasman Future Development Strategy 2022
- Waka Kotahi Nelson Future Access Study 2021
- Te Ara o Whakatu -City Centre Spatial Plan 2021
- E Tu Whakatu – walking and cycling strategy 2022
- Parking Strategy 2022
- Draft Urban Greening Strategy 2022
- Nelson Tasman Speed Management Plan 2024
- Traffic & Parking Bylaw 2023
- Regional Public Transport Plan (updated 2024)
- Regional Land Transport Plan (Mid term review 2024-34)

The Vision

Our vision for Whakatū Nelson is a creative, prosperous, and innovative city. Our community is inclusive, resilient, and connected – we care for each other and our environment.

Specific examples of how the Vision relates to infrastructure management include:

- encouraging the shift towards a more active and sustainable transport culture
- investing in infrastructure to support intensification of residential areas.
- increasing research and preparedness to adapt new methodologies and materials which deliver innovative solutions.
- prioritise low emissions infrastructure and nature-based solutions in the delivery of projects and services
- consider of climate change impacts in the location, design and operation of our infrastructure.

- sufficient appropriately zoned land to accommodate growth and enable affordable housing in accordance with the Future Development Strategy

Council priorities

In implementing the three priorities for the 2024–34 period, Council will be paying particular attention to projects that deliver multiple benefits.

- Support our communities to be prosperous, connected and inclusive.
- Transform our city and commercial centres to be thriving, accessible and people-focused
- Foster a healthy environment and a climate resilient, low-emissions community

Resilient Infrastructure

- Infrastructure is about people – our lives, health and wellbeing ultimately depend on it. Infrastructure is critical to the wellbeing of the city, the Nelson Region, its residents, and visitors.
- Continuing our significant levels of investment in Nelson’s core infrastructure is of fundamental importance to Council. Despite being largely unseen, our infrastructure provides the foundation for our city to develop, grow, thrive, and meet central government requirements.

Environment

Nelson’s stunning natural environment is treasured by residents and visitors alike – it is part of what makes Nelson an extraordinary place. A healthy environment is essential to our health and wellbeing, and we all have a duty to care for it. The challenge of climate change and the desired freshwater outcomes for streams, for making the city greener, healthier, and more resilient using the concept of urban greening.

City Centre development

The activation and revitalisation of our City Centre is focused around Six Key Moves that Council has developed to address the significant transformative opportunities in Nelson City: Destination Nelson, Walkable Nelson, Blue-Green Heart, Smart Development, Liveable Centre, and Clever Business. That transformation will be guided by the spatial plan Te Ara ō Whakatū that defines the changes needed to make sure that our city centre meets everyone’s needs, now and in the future. The plan will create a people-focused, place-based vision for the city centre that attracts investment, residents, talent, thriving business, families, and events – the foundations of a creative, prosperous, and innovative city allowing our community to be inclusive, resilient, and connected Housing affordability and intensification.

Housing

Housing is one of the most basic needs for people, and stable housing is linked to positive economic, educational, and social outcomes for individuals and communities. The lack of affordable housing is one of the most significant challenges facing the Nelson

region. Council will continue to work with others, including central government, the private sector, and community groups, to address the housing crisis.

Creating a sustainable transport culture

The community is demanding better facilities to safely transition to more sustainable modes – choosing active transport (including walking, cycling, skateboarding, riding scooters), and public transport more often for their journeys. Catering for this demand support social and environmental wellbeing and reduce the City's greenhouse gas emissions, fostering a healthy environment and a climate resilient, low-emissions community.

Iwi partnership

The Council recognises Ngāti Koata, Ngāti Rārua, Ngāti Tama, Te Ātiawa, Ngāti Toa and Ngāti Kuia as Tangata Whenua. The Council also recognises the traditional customary association and statutory acknowledgements of Ngāti Apa ki te Rā Tō and Rangitāne ki Wairau within the Whakatū region, as acknowledged through Treaty Settlements.

Council is committed to strengthening partnerships with iwi and Māori of Te Tau Ihu, and providing opportunities for Māori involvement in Council decision-making processes in a meaningful way.

Council's approach to community engagement

Council is continuing its focus on working closely with the community when planning, designing, and implementing projects. This means staff will take a proactive, best practice approach to engagement, including the development of communications and engagement plans during the initiation stage of new projects, and aims to introduce more pre-project engagement, in particular for transport cycleway projects. Engagement and Communications teams aid the infrastructure project managers and members of the community to engage with Council about upcoming and current infrastructure projects. Translation tools enable residents to follow projects in their respective language.

Council recognises that not everyone wants to use digital communication methods. Multiple communication channels are used including printed publications (Our Nelson, letter box drops) or face to face (public meetings). Engagement will be included in all stages of projects where feedback can help shape the project. Post project engagement reviews will be undertaken to inform future projects.

More consultation and engagement results in slower progress initially, but once agreements are made the projects are more robust. It enables Council to identify the right solution at the right time and right place, with support from the majority of the community, and why cycleways are especially highlighted for pre-project engagement.

Key stakeholders

Council works alongside a variety of stakeholders and partners to share knowledge and views, make the most of resources, and achieve shared goals. Key stakeholders are identified at project initiation stage. These stakeholders include Iwi, organisations

focused on community development, arts, sport, recreation, environment and transport, other territorial authorities (particularly Tasman and Marlborough District Councils), other road controlling authorities (Waka Kotahi - state highways,) health bodies, NMIT, central government agencies, suppliers, businesses and residents' associations.

Financial Strategy Summary

This Infrastructure Strategy is aligned with Council's Financial Strategy. The Financial Strategy 2024-2034 demonstrates how Council will:

- Ensure that the level of rates and borrowing are financially sustainable and are kept within pre-set limits
- Fund delivery of the work programme, including network infrastructure, and deliver the levels of service in the Long Term Plan.

Over the next 10 years, we will support our community's wellbeing through transforming our city centre, fostering a healthy environment and climate resilience, and continuing recovery from the August 2022 severe weather event. We are also budgeting to make sure we have enough infrastructure in place so that houses can be built for the extra 5,000 people we expect to be living in Nelson in 10 years' time, bringing the population up to about 60,400.

Over recent years we have maintained relatively modest rates increases (including a 0% rise in 2020/2021) and kept our debt level to \$168.9 million as at June 2023. That approach is unsustainable going forward. Council is facing a perfect storm, brought about by increasing interest rates, higher insurance costs, higher inflation costs, increases in the cost of depreciation after a revaluation of Council assets, population growth, the earthquake prone status of the current civic building, and costs associated with recovery from the August 2022 severe weather event.

Council's goal is to set affordable and predictable rates over the long term. To do this Council has to strike a balance between providing levels of service that meet customer and legislative requirements, and the public's ability to pay for these services.

Council is budgeting carefully during this time of increasing costs. That has meant finding savings where we can, while continuing to pay for the essentials, including our roading network and water services pipes.

Proposed Investments in Services and Assets

We are continuing to invest in the services and assets that make a real difference to our residents and our environment. Some examples of the specific benefits of this proposed investment for Council's infrastructure services and assets include:

- Recovery from the August 2022 severe weather event that has not only repaired damaged infrastructure but has included betterment (ie building back better) to provide resilience for future weather events that will offer some security with assets being less likely to fail in future severe weather events
- The Bridge to Better infrastructure project in the inner city provides infrastructure capacity and resilience for increased city centre intensification and to revitalise Bridge Street. This project is also supported by central government funding
- Extending the east-west cycle way link, estimated costs \$4.9 million

- Detailed design, consenting and construction of the Atawhai rising main between 2024-2033, estimated cost \$58.7 million
- The availability of land serviced, with infrastructure to support more intensive living in existing urban areas and some greenfields development, will enable housing development to keep pace with our increasing population

Rates and Debt Limits

To fund Council's work, our annual rates revenue rises cap will remain at Local Government Cost Index (LGCI) plus 2.5% and an allowance for growth. The rates rises are projected to be 8.2% plus \$300 including GST per separately used or inhabited part of a rating unit for the Recovery targeted rate in 2024/25, 5.4% in 2025/26, 4.8% in 2026/27 and average 3.3% for the remaining 7 years. Our debt cap will increase from a 175% debt to revenue ratio to a 200% debt to revenue ratio. The net debt level at 30 June 2025 is projected to be \$247.7 million and to be \$526.3 million by 30 June 2034.

Forecast Capital and Operating Expenditure

The ten year forecast capital expenditure was \$645 million (including inflation, excluding vested assets and the joint business units) in the Long Term Plan 2021-2031. This is proposed to increase to \$1.041 billion in the Long Term Plan 2024-2034 Consultation Document, of which \$436 million is for renewals. Overall capital expenditure is proposed to increase by \$396 million. This significant capital expenditure programme reflects the need to undertake renewals, meet growth needs and the greatly increased costs of doing the work.

The forecast operational expenditure is proposed to increase from \$169.9 million in 2023/24 to \$177.3 million in 2024/25, rising to \$250.7 million at the end of the 10 year period in 2033/34.

General Emergency Fund

Due to the ongoing impacts of COVID over the last 4 years, including the 0% rates increase in 2020/21, the General Emergency Fund has a projected overdrawn balance at 30 June 2024 of \$14.8 million. At the next Long Term Plan Council will consider how to replenish the overdrawn General Emergency Fund which will likely lead to increased rates in the later years of the Long Term Plan.

Extreme weather events are unpredictable but expected to increase due to climate change. Should an event occur while the Emergency Fund has insufficient funds, Council will need to borrow to cover the shortfall. Council may also reconsider, from time to time, the amount transferred to this Fund from rates, particularly if a significant event should occur.

Asset Revaluations and Depreciation

Council has seen very large infrastructure valuation increases during the last four years. At 30 June 2023, our assets were worth \$2.4 billion, compared with \$1.6 billion in 2019. It is not affordable for current ratepayers to fully fund the increased depreciation on the revaluations in one step, as it would add a further 9.3% onto rates in the 2024/25 year. Therefore, Council has chosen to phase in the depreciation funding over the 10 years of the Long Term Plan. Council plans to fully fund renewals through depreciation by 2034. This ensures that current users of infrastructure pay their fair share of the costs of wear and tear on our assets.

Our debt will still be well controlled, serviceable through our income streams and will keep interest payments manageable. Debt headroom will be available earlier in the Long Term Plan to respond to emergencies caused by natural disasters.

Climate Change

Climate change is our biggest global challenge and Council is committed to reducing carbon emissions and adapting to climate change impacts.

At a local level, Council has a key role to play by reducing its corporate emissions, supporting and providing leadership on mitigation actions across the community, and managing and reducing risk by helping Nelson to adapt to climate change effects, especially in relation to:

Sea level rise: sea level rise is a significant climate challenge for Nelson as a large proportion of its urban infrastructure is coastal or low lying. These areas will become more vulnerable to coastal inundation over time.

Heavy rainfall and flooding events: higher intensity rainfall events mean Nelson will experience more regular and extensive flooding from streams, rivers and stormwater overflows, which will increase the risk of landslips.

Droughts and high temperatures: with a warmer climate, the temperature of the water within our rivers and streams will increase and affect habitats. Droughts will result in a higher risk of fires.

Responding to Climate Change

Mitigation

Mitigation is about reducing greenhouse gas (GHG) emissions and enhancing carbon sinks (sequestration to remove greenhouse gases from the atmosphere). Council is committed to emissions reduction targets for its own activities in line with government targets:

- Net zero emissions of all GHGs other than biogenic methane by and beyond 2050,
- 10% reduction below 2017 biogenic methane emissions by 2030,
- 24-47% reduction below 2017 biogenic methane emissions by 2050.

Adaptation

Adaptation is the process of responding to current and future climate related impacts and risks. To manage these impacts and risks, Council is following the Ministry for the Environment guidance and is using the Dynamic Adaptive Pathways Planning (DAPP) approach. This means managing our assets in a way that makes them more resilient, or in some instances, it may mean moving those assets.

What Council is doing

How Council delivers its services will play a key role in meeting emissions reduction targets and building community resilience.

Acknowledging the need for urgent action, Council declared a climate emergency in May 2019. Council adopted Te Mahere Mahi a te Āhuarangi Climate Action Plan in 2021, a living document which outlines what Council is doing to address climate change over the next decade. In 2022, Council also began developing a Climate Change Strategy, which will set the long-term direction and guide Council and community investment in climate action.

Council is working with Tasman District Council on a regional climate change risk assessment, which will build a comprehensive picture of how climate change will impact the region.

The impact climate change will have on infrastructure

The key climate change effects that are likely to impact Nelson are sea level rise, heavy rainfall, slips, flooding, drought, and extreme temperatures. These effects will have differing impacts on infrastructure. It is critical that new infrastructure is built to withstand future climate change and existing infrastructure is made more resilient, for example through upgrades or relocation. A summary of the key impacts climate change will have on infrastructure is included in this section. Further information on specific impacts is detailed within the various 2024-34 Infrastructure Activity Management Plans.

A Nelson Tasman Climate Change Risk Assessment is being developed. This assessment will provide a more comprehensive picture of climate change risks across Nelson and Tasman. A separate Nelson built environment exposure assessment has been undertaken for various coastal areas across a range of future sea level rise scenarios. This quantifies increasing exposure with increasing sea level for a range of assets and land use zones.

Sea level rise

Sea level rise is one of the biggest climate challenges for Nelson as a large proportion of our urban infrastructure is coastal or low lying. These areas will become more vulnerable to coastal inundation (flooding) as tides and storm surges extend further inland over time.

In 2019, LGNZ released two reports 'Vulnerable: the quantum of local government infrastructure exposed to sea level rise' and 'Exposed: Climate change and infrastructure'. These reports are based on information LGNZ requested in 2018 from most councils within New Zealand. This information included asset type, quantity, and replacement value of infrastructure assets that could be exposed to the impacts of varying sea level rise. These reports highlight that for 1.0m sea level rise (above Mean High Water Spring (MHWS)), approximately \$56m of Nelson infrastructure (three waters and roads) could be affected.

For the Nelson community, the main impacts will be the more regular inundation of areas around The Wood, lower lying streets within the CBD, and areas of Monaco and Tahunanui.

Areas on the open coast that are more exposed to coastal swell such as Glenduan, state highway 6 - Wakefield Quay/ Rocks Road and Whakatu Drive,

Some of the key impacts this will have on infrastructure activities are as follows:

Roads, including the state highway in low lying areas, will not always be accessible. Diverting traffic to alternative routes will increase congestion and asset deterioration on residential and arterial routes.

Increased coastal erosion, because of sea-level rise, cyclones and storm surge, has the potential to damage roads, and other infrastructure assets located in vulnerable coastal areas.

Over the long term, coastal inundation has the potential to affect the wastewater network and the Nelson Wastewater Treatment Plant, (NWWTP) potentially resulting in wastewater overflows and contaminants discharging into the receiving environment.

Other anticipated impacts include:

- The hydraulic flow capacity of watercourses and drains is anticipated to reduce within low lying areas as the outlets will be submerged more often. The culverted urban stream network has the potential to act as a conduit for sea level rise resulting in high tides potentially backflowing into lower lying areas of the city.
- Sea level rise has the potential to affect the Atawhai (closed) landfill in the long-term resulting in contaminants potentially discharging into the coastal marine environment.
- Increased risk of liquefaction to Council assets and urban areas generally due to higher water table in coastal areas

Heavy rainfall and flooding events

Higher intensity rainfall events will result in an increase in surface water, stormwater, and stream flows, as well as causing slope instability/landslides. The implication for the community is that without measures to avoid or reduce these effects by Council, they may experience more regular and extensive land slips, flooding from streams, rivers, and stormwater overflows. The impacts this will have on Council infrastructure activities is as follows:

- Roads affected by flooding/slips will not be always accessible. Diverting traffic to alternative routes will increase congestion on residential and arterial routes (including state highway traffic onto local roads)
- Undersized road culverts increase the risk of flood waters over-topping, damaging the road network and resilience of lifeline routes and disrupting access, especially to rural communities.
- Slope instability/landslides, causing damage to infrastructure, is likely to occur.

- Water, wastewater pipelines, bridges, and culverts that cross streams and rivers are at risk of being damaged during high flow events.
- Increased rainfall intensity has the potential to increase the likelihood of sewer overflows contaminating the environment, from stormwater inflow and infiltration.
- Flooding has the potential to affect the wastewater network and the NWWTP potentially resulting in wastewater overflows and contaminants discharging into the receiving environment.
- The increase in storm rainfall intensity will result in higher sediment volumes entering the rivers, streams and drainage network which is expected to increase maintenance requirements as well as risks associated with blockages.
- Refuse and recycling materials is at a greater risk of entering the freshwater/coastal marine environment from flooding and storm events.

Drought and extreme temperatures

With a warmer climate, the community will be exposed to more extreme temperatures and longer and more severe droughts. This will also have a negative impact on the environment, particularly with our streams and rivers, including new biosecurity risks. The impact this will have on infrastructure activities is as follows:

- Increase in water supply abstraction from the rivers and reservoir due to increased demand. This will have an impact on the flows within the rivers and increase the likelihood of moving to water restrictions.
- Droughts are expected to become more regular and potentially more severe. This may result in the water restriction requirements for residential and commercial use becoming more severe than those at present.
- Droughts will increase the likelihood of forest fires within the river catchments. This will influence water quality, access to reserve areas and increased costs for the community if three water utilities are impacted.
- Increased temperatures of water off extensive areas of hot black road surfaces increases stream and river water temperatures.
- The temperature of the wastewater within our network will increase, which could lead to an increase in the gas, hydrogen sulphide. This would result in greater issues with odour and corrosion of susceptible assets (particularly those made of concrete)
- An increase in river temperature and a reduction of flow will have a negative impact on the stream health and biodiversity. Potential increase in aquatic weeds and algae as well as the emergence of new pest organisms that are better adapted to warmer temperatures. This has the potential to further reduce stream health, biodiversity, and hydraulic capacity.

Mitigation actions:

Key projects that are featured within the Infrastructure Activity Management Plans that will contribute to the Council and community GHG reduction initiatives are:

Emissions reduction strategies

Implementing initiatives identified in the Energy Audits for water, wastewater, and stormwater activity. Wastewater, will focus on refining the measurement methodology developed at the NWWTP and identifying potential changes to processes that produce GHG emissions.

Most of the GHG emissions related to Solid Waste disposal produced at the landfill are managed by the Nelson Tasman Regional Landfill Business Unit (NTRLBU)

Solid waste, through the application of the Joint Waste Management and Minimisation Plan, is developing initiatives and programs to reduce the production and disposal of waste such as rethink waste program, construction and demolition waste reduction, and organic waste reduction.

Climate change adaptation – responding to the effects of climate change

The effects from climate change will vary depending on the activity, and so will the adaptation response. The LGNZ 2019 report 'Exposed: Climate Change and Infrastructure' provides guidance for Council particularly on the gathering of relevant, accurate and up to date information. This is to lead the way to better informed decisions around improving the long-term resilience of infrastructure.

Accurate data collection is critical to better understanding the exposure of infrastructure to climate changes hazards and to plan for impacts caused by climate change. These include both long term gradual impacts (stressors), as well as event- based changes/hazards, such as extreme weather events.

The delivery of the climate adaptation work program sits outside the Infrastructure Strategy but will be critical to inform future infrastructure decisions.

Council-wide climate adaptation framework

To prepare for the impacts of climate change, Council is following the Dynamic Adaptive Pathways Planning (DAPP) process recommended in the Ministry for the Environment's *Coastal Hazards and Climate Change: Guidance for Local Government*. The DAPP process involves 10 steps centered around five key questions: what is happening; what matters most; what can we do about it; how can we implement the strategy; and how is it working?

The DAPP process assists Council and the community to identify different options for adaptation and assess these against various climate change scenarios. This process will help Council and the community with the management of change and adaptation to unavoidable climate change impacts. The intention of the adaptation framework is to provide for truly long-term planning (50 to 100+ years) and a transition toward 'adaptive

planning’ that allows for increasing flexibility in at-risk areas (or areas that may become exposed to risk in the future). Better understanding of trigger points, retreat locations, and adaptation options is expected to provide greater certainty for communities and allow for longer term infrastructure planning and investment.

Application of the DAPP process

Council released coastal inundation maps in 2020 and river and stream flooding maps in 2021 and engaged on these as part of the development of the draft Nelson Plan.

In June – August 2022, Council engaged with the community to provide information on sea-level rise and Maitai River flooding, and present on the types of adaptation options available. The purpose of the consultation was to find out what is important to the community to achieve through Nelson’s adaptation response. In 2023, Council is continuing to identify and understand the community’s values that may be impacted by climate change (step 3).

Over the remainder of 2023, and in accordance with direction from Council, staff are engaging with groups that were less represented during the community workshops in 2022, including iwi, youth, and young families. Council will consider the feedback from the community alongside direction in existing strategies, such as Te Tauihu Intergenerational Strategy and the Long Term Plan, to form proposed objectives for guiding Nelson’s adaptation response.

In parallel, Nelson City Council and Tasman District Council are undertaking a joint Regional Climate Change Risk Assessment from January to December 2023 to build a comprehensive understanding of how climate change will impact the region (step 4). This risk assessment will build on existing natural hazards information to identify key climate change risks related to five key domains: human, natural environment, governance, economy and the built environment. The assessment outputs will be a technical report, summary report, and an interactive Risk Explorer (digital map) that spatially map the findings for the region so they are accessible for Council staff and the community. Initial findings and version 1 of the Risk Explorer were presented in April 2023 to inform the revision of Activity Management Plans, and the risk explorer tool is expected to be finalised in April 2024.

From 2023 onwards, Council will develop location-specific adaptation options for Nelson (step 5) and these options will be evaluated and engaged on with the community in 2024/2025 (step 6).

Use of sea-level rise projections for planning

Dynamic Adaptive Pathways Planning is a long-term process, and some decisions will need to be made before a adaptation framework is in place.

In 2022, Ministry for the Environment released *Interim guidance on the use of new sea-level rise projections*. The updated projections reflect the latest sea-level rise scenarios from the Intergovernmental Panel on Climate Change (IPCC) and new localised information on changes in land levels around the coast, known as vertical land movement

(VLM). <https://environment.govt.nz/publications/interim-guidance-on-the-use-of-new-sea-level-rise-projections/>

Strategies that infrastructure activities will be implementing in their relevant activity management plans are:

- Vulnerability Assessment Strategies – This considers combination of step 1 & 2 of the LGNZ climate change adaptation process. This involves:
- Data gathering (Environmental/ topographical and infrastructure),
- Establishing a collaborative process to explore values & objectives to guide the adaptive decision-making process.
- Assessing the vulnerability and risk (potential likelihood and consequences)
- Adaptation strategies - This considers combination of step 3 & 4 of the LGNZ climate change adaptation process. This involves:
- Developing and understanding options/ pathways for adaptation over the short, medium, and long term.
- Developing adaptation plans, including options, timeframes, funding sources and responsibilities.

It is anticipated that future projects will be identified following the conclusion of these strategies and a placeholder for capital expenditure has been included within the 2024-34 Activity Management Plans for adaptation projects.

The Flood Projection Activity Management Plan is an activity that is critical to providing protection to Nelson City from the impacts of heavy rain and flooding, at least over the short to medium term. Key projects included within the flood projection activity that will provide protection to urban areas from the effects of stream and river flood overflows include:

- Maitai Flood Mitigation Project
- Brook Stream catchment Improvements
- York Stream Upgrade
- Jenkins Creek Upgrade
- Poormans Valley Stream Upgrade
- These projects will form part of the Council-wide climate change adaptation framework as detailed in section 2.7.4.

Further information on specific projects relating to adaptation projects is detailed within the various 2024-34 Activity Management Plans.

Community engagement

Climate change is a significant issue facing Council. For Council to respond to future challenges, community engagement is required to understand the values of residents. This is expected to come from several Council activities as follows:

- 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). While the Nelson Plan has been parked, engagement and consultation on these matters, in addition to new technical information, has informed Plan Change 29 – the Housing Plan change.
- Maitai Flood Management Options: Consultation is to be undertaken in the first five years of this Strategy to inform a risk-based approach to identification and prioritisation of response options.
- Flood Management Plans: Consultation on flood protection in other catchments will be undertaken in subsequent years, starting with the Jenkins Creek and Poorman Valley Stream. These catchments have been prioritised based on the extent of flooding predicted, and the number of affected properties and structures.
- Working with adjoining road controlling authorities (Tasman District Council and Waka Kotahi) to provide a resilient transport network.
- Notification of resource consents where required, including for flood protection upgrades.
- Coastal Hazard Adaptation: Consultation is to be undertaken with the wider community on this significant issue.
- Publication of annual Council operational footprint to track reduction of greenhouse gas emissions against Council's baseline.
- Identification of greenhouse gas reduction initiatives for community emissions, such as in the transport and energy sectors, and the opportunity to influence the community to reduce these emissions through behaviour change and education.

Knowledge gaps

The following knowledge gaps have been identified. Further information on specific knowledge gaps is detailed within the various 2024 - 34 Infrastructure Activity Management Plans.

- A comprehensive risk exposure and vulnerability assessment of the impact's climate change will have on infrastructure assets.
- Assessment of the drainage capacity to accommodate flows predicted in flood models for the rural road network.
- A better understanding of adaptation responses required, and community priorities is needed to drive development of climate change adaptation options, and adaptive pathways planning.
- Data collection equipment and data visibility
- Flow gauge stations are required on a number of streams where no recording is currently undertaken, for instance the Jenkins Creek, Poorman Valley Stream and streams in Atawhai and the Hillwood catchment.

- Stormwater network flows across the urban area, and how these may contribute to land instability issues, for instance on hillslopes.
- Groundwater levels, particularly in low-lying areas where a tidal signal is present.

Future Development Strategy

The Nelson Tasman Future Development Strategy 2022 (FDS) provides capacity for about 24,000 houses over the next 30 years in the combined urban environment.

In Nelson, the FDS identifies capacity for about 11,500 new dwellings, with 78% of this growth to be achieved by adding new housing into existing urban areas, and the remaining 22% expected to be through new greenfield expansions. This proportion reflects community feedback supporting growth through intensification of existing urban areas rather than expansion onto rural land.

Provision of intensification infrastructure is identified for the City Centre, Stoke and Nelson South, where higher density and mixed-use environments will see growth consolidated. Most of the new greenfield potential identified are within the Maitai, Marsden, and Ngawhatu valleys. Parts of Nelson Central are subject to flood risks and future intensification will be guided by the outcome of a Dynamic Adaptive Planning Pathways process, which is currently underway.

Implementation of intensification projects is more complex than traditional expansion. The 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. Where the Council can take a lead include:

- Identify priority areas in which to undertake this neighbourhood planning.
- Lead investment in urban amenity and public transport to encourage growth in specific areas, such as the City Centre.
- Provide for wastewater reticulation, and treatment facilities that have capacity to service intensification.

Infrastructure underpins all development and having high-quality, reliable infrastructure provides certainty to developers that there is sufficient capacity in each intensification area and encourages development by achieving a coordinated plan for high-quality intensification development in agreed areas, and development of neighbourhood asset upgrade plans and refinement of infrastructure investment through the Long-Term Plan process for the next thirty years. The role of high-quality public transport, safe walking and cycling options and access to suitable greenspaces also become more important in intensified neighbourhoods. This has led to a program of reserves redevelopment in intensification areas, and the alignment of transport investment with intensification areas.

Resource Management

The Nelson Resource Management Plan, Nelson Regional Policy Statement and the Nelson Air Quality Plan include objectives, policies, rules, and standards for managing effects from transport and infrastructure. The documents also control management of natural hazard risks, freshwater and coastal environments.

Council has paused the full review of the resource management plans, due primarily to the implications of the resource management law reforms underway. In the interim, plan changes relating to housing intensification, natural hazard management and freshwater are being prepared.

The plan change for housing is expected to implement the FDS by explicitly stating where new urban expansion can occur (Development Areas) and enables intensification through zoning (new High and Medium Density Residential Zones) and introduce rules relating to residential density.

Climate change and natural hazard provisions

Climate change

Plan Change 29 (the Housing Plan Change) is one of the early steps to recognize the potentially significant effects of climate change on Whakatū Nelson's natural and physical resources. Initially, the Plan Change limits opportunities for intensification in low lying areas. Subsequent plan changes will be required to increase the resilience of the community, including its regionally significant infrastructure.

Natural hazards

There is recognition within the Housing Plan Change that some of Whakatū Nelson's regionally significant infrastructure is in areas subject to natural hazards. The high-level approach of the plan change is to provide for the operation, maintenance and upgrading of regionally significant infrastructure that is in areas subject to natural hazards. Construction of new infrastructure in hazard areas should generally only occur if it is functionally or operationally required to locate in a hazard area, or there is no reasonable alternative. The infrastructure should also be designed, maintained, and managed to be resilient to the hazard event, and to avoid, remedy or mitigate any potential adverse effects.

Flood maps produced for Plan Change 29 – the Housing Plan Change take into consideration climate warming and sea level rise out to 2130. The effects of climate change that are shown in this mapping include the extent to which significant areas of the city would be more regularly and severely impacted by river and coastal flooding in future, particularly low-lying areas exposed to tidal inundation. Sea level rise projections have been taken from the latest SeaRise data and direction from the Ministry for the Environment guidance for Local Government. Allowances for future temperature warming, and the associated increases in storm rainfall intensity, are based on NIWA projections and statistical analysis of rainfall data.

Legislative Changes, Government Policy Statements and Proposals

Local Government Act 2002

The purpose of local government was amended by deleting references to good quality (efficient and effective) infrastructure, and reinstating promotion of the social, economic, environmental, and cultural well-being of communities in the present and for the future.

Examples of how this directs Council's management of infrastructure are:

- environment, health, and safety outcomes are the transport priorities, above vehicle capacity outcomes.
- Freshwater improvement program
- Urban Greening Strategy
- the need to consider the effects of climate change on infrastructure, with flow on effects for the four wellbeing's.

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 methane⁴) to zero by 2050.
- establishes a system of emissions budgets to act as steppingstones towards the long-term target.
- requires the development of an emissions reduction plan for each budget period that sets out the policies and strategies for achieving the emissions budget.
- 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.
- requires the Commission to prepare a national climate change risk assessment every six years
- requires the Government to develop a national adaptation plan that responds to the Commission's risk assessment.

Emission budgets and Aotearoa New Zealand's first emission reduction plan

In May 2022, the Government published New Zealand's first emissions reduction plan (mapped below), setting out the policies and strategies for how New Zealand will meet its first emissions budget and ultimately the 2050 targets.

These policies and strategies form a balanced , strategic package with a mutually supportive and balanced mix of emissions pricing, well-targeted regulations, tailored sectoral policies, direct investment (public and private), innovation and mechanisms to

meet climate targets, while supporting an equitable transition to a low-emissions economy.

Future emissions reduction plans will continue to build on these policies and strategies, and the mix of policy tools will change over time, responding to changing circumstances. The next emissions reduction plan for the 2026–30 period is to be published by the end of 2024.

Aotearoa New Zealand's first national adaptation plan

In August 2022, Aotearoa New Zealand released its first national adaptation plan 2022–28 in response to the risks identified in the National Climate Change Risk Assessment 2020.

The emissions reduction plan and the national adaptation plan are both key strategies and are interlinked. For further details on adaptation, refer to chapter 6.

New Zealand Emissions Trading Scheme

The new government outlined in the “Blueprint for a Better Environment” report that it will take a technology-led approach to lower agricultural emissions by:

1. Giving farmers the tools they need to reduce emissions
2. Introducing fair and sustainable pricing of on-farm emissions by 2030
3. Limiting on farm conversions to forestry on high-quality land from 2024 to protect highly productive farm land.

Draft Government Policy Statement on Land Transport

The Government Policy Statement on Land Transport (GPS) sets out the government's priorities for expenditure from the National Land Transport Fund over the next 10 years. The new government has signalled it will be rewriting the draft Government Policy Statement on land transport (GPS 2024). The draft is expected to be released early in 2024.

The past Government Policy Statement on Land Transport had a strong focus on safety, accessibility, resilient and liveable cities, the environment, mode neutrality, reducing dependency on vehicles, and recognizing how the transport system can improve access to economic and social opportunities.

The GPS includes the Road to Zero program target of 0 deaths and serious injury crashes on roads by 2050. The new government has signalled a safety focus on drinking and drugged drivers and less emphasis on speed reduction.

Future changes to the GPS could include more emphasis on network resilience following nationally significant flood events in multiple parts of the country in 2022 and 2023.

National Policy Statement on Urban Development

The National Policy Statement on Urban Development (NPS-UD) objectives are:

- Well-functioning urban environments that enable all people and communities to provide for their social, economic, and cultural wellbeing, and for their health and safety, now and into the future.
- Planning decisions improve housing affordability by supporting competitive land and development markets.
- Regional policy statements and district plans enable more people to live in, and more business and community services to be in, areas of an urban environment near a city zone or other area with employment opportunities, areas well serviced by existing or planned public transport, areas with high housing demand.
- Urban environments that develop and change over time in response to the changing diverse and changing needs of people, communities, and future generations.
- Planning decisions relating to urban environments and FDS take into consideration the principles of the Treaty of Waitangi.
- Urban environment decisions are integrated with infrastructure planning and funding decisions, strategic over the medium and long term, responsive, particularly in relation to proposals that would supply significant development capacity.
- Councils to have robust and frequent updated information on their urban environments.
- Urban environments that support reductions in greenhouse gas emissions and are resilient to the current and future effects of climate change.

Local Water Done Well - central government's review of the previous Affordable Water Reforms (formerly Three Waters Review)

The Affordable Water Reforms (formerly Three Waters Review) was looking at how to improve the management of drinking water, stormwater, and wastewater (three waters) to address issues identified by the Havelock North Drinking Water Inquiry and improve overall management of our water resources.

The new Government has repealed the previous government's water services entities legislation and will instead implement a new plan for water services over the next two years. In anticipation of this Nelson City Council has prepared activity management plans and this Infrastructure Strategy based on the activities remaining in Council ownership and control.

Freshwater changes through the Action for Healthy Waterways Package

The Action for Healthy Waterways package includes amendments to the Resource Management Act, a new National Policy Statement for Freshwater Management (NPS-FM 2020), new regulations around the measurement and reporting of water takes, and new National Environmental Standards for Freshwater (NES-FM 2020). The NPS-FM 2020 is a

full replacement of the National Policy Statement for Freshwater Management 2014 (as amended in 2017).

Key changes:

- speed up the implementation of freshwater regulations through amendments to the RMA.
- change the hierarchy of obligations towards water management, so that the priority is to maintain the health of the waterway (known as Te Mana o Te Wai)
- strengthen and clarify the requirement to manage freshwater in a way that gives effect to Te Mana o te Wai.
- set and clarify policy direction to bring our freshwater to a healthy state within a generation but start making immediate improvements so water quality improves within five years. Raise the bar on freshwater ecosystem health by introducing new attributes and requirements in the NPS-FM to protect threatened species and habitats.
- support the delivery of safe drinking water through amending the National Environmental Standard for Sources of Human Drinking Water. This will involve Council both through resource management regulation and the operation of the network.
- better manage stormwater and wastewater to stop things getting worse and improve freshwater health in a generation, through new regulations and potentially new legislation. This will also involve Council through resource management regulation and the operation of the networks.
- increase Māori participation in water management.
- improve farming practices where needed to stop things getting worse and improve freshwater health in a generation, through new National Environmental Standards for Freshwater and regulations.

Water supply implications

Amendments are proposed to the National Environmental Standards for Sources of Human Drinking Water (NES-DW) to:

In early 2022 the Government consulted on proposed amendments to the NES-DW to improve the protection of human drinking water sources.

The Ministry for the Environment has since revised proposals based on feedback received during consultation and engagement to:

Proposal 1: To map three categories of source water risk management area (SWRMA) — remains unchanged.

Proposal 2: To control activities within the different SWRMAs. The proposal is to retain the existing protections of the NES-DW and to introduce controls for specific high-risk activities within SWRMA 1 and 2.

Proposal 3: Extending the protections of the NES-DW to smaller registered drinking water supplies — will not be actioned. The Ministry now intends to keep the scope of the existing NES-DW, which provides protection to source water that serves 82 per cent of the population.

Work is now underway to draft these changes to the NES-DW

Wastewater implications

The Government is proposing to require wastewater network operators to prepare a risk management plan, and to introduce a new National Environmental Standard for Wastewater (Wastewater NES). It is likely to require consent conditions to include:

- minimum treatment standards
- targets or limits on the volume and frequency of wet weather overflows (which is a challenge in the face of climate change impacts, particularly increased intensity of storms)
- methods for monitoring compliance
- approaches for incorporating culturally acceptable wastewater treatment processes.

Council's stormwater activities will need to contribute to achieving a reduction in wet weather overflows, through upgrades that reduce inflow and infiltration of stormwater into the wastewater network. Reductions of inflow and infiltration can be achieved by providing a stormwater network where there currently is not one or it is under capacity.

Stormwater implications

The Government proposes to require stormwater network operators to prepare a risk management plan (RMP). This is similar to the proposal for wastewater operators, but would address specific stormwater risks, including at a minimum:

- meeting stormwater discharge resource consents and/or permitted activity requirements.
- ensuring public health risks associated with stormwater are managed where community values exist, such as for recreation or mahinga kai.
- proactively managing the risk of flooding in and around buildings and habitable areas (which will be exacerbated by climate change).

Waste disposal levy

The Government has confirmed an increase in the landfill disposal levy. This will mean more money is available for waste minimisation initiatives at both a national and regional level. The broadening of the levy to other types of landfills will also influence how waste disposal occurs in future.

The government is also proposing to introduce product stewardship for a range of waste streams. Depending on how these programs are delivered, this could have implications on cost of future delivery of services such as kerbside recycling.

Central Government review of local government

Central government has established a Ministerial Inquiry into the future of local government. The review includes, but is not limited to, roles and functions of local government, as well as representation, governance, funding, and financing. Council considers it unlikely that any recommendations could take effect before 1 July 2024 – particularly for changes to roles or functions.

Part Two: Issues and Options

Transport

Asset description

The Transport services and assets associated with this activity are primarily focused on connecting people and moving goods across Nelson safely, efficiently, and effectively. This includes the provision, operation, and maintenance of physical infrastructure on the road reserve such as for driving, parking, cycling, walking and amenity, as well as the provision of safety, traffic control and public transport services.

Table T1: Summary of Transport Assets

Asset	Quantity	
	Km	Units
Roads	272km (256km sealed and 16km unsealed)	
Bridges (including footbridges)		98
Retaining walls		460 comprising 34,363m ²
Footpaths, walkways and cycle ways	380km	
Off street carpark areas		6 (1100 spaces)
Kerb and channel	464km	
Culverts	50km	
Sumps /drainage assets		6,591
Streetlights		5,351
Other transport assets include 33 bus shelters, 14 sets of traffic signals and 9 cameras, signs, 1 stock effluent disposal facility, 28 electronic signs and land for legal roads. Parks bridges are not included unless they are part of the transport network.		

One of the key findings of the Nelson Tasman Lifelines Project (2017) was that roads, bridges and retaining structures are vitally important to allow reinstatement of the other services the community needs to rebound from natural hazard events. If resources are stretched following an emergency, Council will follow the One Network Road Classification (ONRC) hierarchy when prioritizing which roads to open first. The road network gives access to the water supply, sewer, and stormwater networks as well as critical telecommunications and power reticulation. It also provides the means for accessing food and fuel, and for emergency services to be moved around the region, which is critical to enabling the community to respond and recover.

Climate change can influence the frequency and intensity of events or one-off emergencies. However, Council will also need to plan for slow onset change associated with climate change, such as increasing average temperatures and sea level rise. Trees and green spaces

will become increasingly important for the contribution they make to adapting to the climate change impacts such as increasing temperatures and higher intensity rainfall, by providing shade to cool paved areas and limiting the rates of water run-off from roads, as well as adapting to demand changes in intensification areas.

Key risks to the transport network — earthquakes, slips and flooding

Earthquakes are a considerable risk to the transport network, especially in areas of reclaimed coastal margins and steep hillside terrain. The transport assets at most risk of earthquake damage are bridges and retaining walls. Council also needs to manage transport risks associated with unsupported hill slopes above and below roads.

The Waimea-Flaxmore fault line passes through Bishopdale and the Grampians, so Waimea Road may be at risk of slips during a rupture of this fault line.

Due to Nelson's hilly topography, many high value retaining walls and structures are required to support the transport network compared to other cities located on flatter ground. An earthquake or storm event could result in slope failure that results in the need for new structures to remake the road.

Unplanned road network closures as a result of flooding and landslips cause disruptions in the functioning of the city (as occurred in 2011, 2013, 2018 Fehi and Gita, along with the August 2022 and March 2023 rain events). Nelson is a network of very long cul-de-sacs. Many single road closures result in isolated communities.

Service disruptions to the transport network associated with severe weather are typically due to flooding from under-capacity or overwhelmed drainage and bridge structures, the road acting as the secondary flow path, slope and retaining wall failures blocking roads, and fallen trees due to the occurrence of high winds, which are often associated with major storm events.

Active transport pathways within esplanade reserves are vulnerable to flooding from rivers and the sea. This has implications for decisions on the surface type (e.g., asphalt or concrete) and construction methods to use in areas where coastal erosion and/or flooding is occurring regularly. There are also longer-term considerations related to the viability/cost of continuing to operate that activity in that area, and the need to assess the full range of adaptation options, which are protection, accommodation, and retreat.

Key risks to the transport network — safety

Police close roads to manage fire and emergency events, like a house fire, road crash or armed offender response. The frequency of these events is expected to increase as road space becomes more intensely used with urban intensification and growth factors. Managing network resilience to these events is like natural hazard planning with the same benefits.

Key risks to the transport network — demand changes

Electric vehicles are heavier than petrol/diesel so are expected to put new pressures on the road pavements requiring more rehabilitations. The new bus routes, and areas with poor drainage are particularly vulnerable.

Financial implications

Where transport activities that are subsidised by Waka Kotahi NZ Transport Agency (NZTA) are damaged by natural hazards, Waka Kotahi pays 51% for small events and up to 95% for very large events.

Council needs to plan for contributing the local share of these costs, or take out sufficient insurance to manage this risk, and to consider what the picture looks like when Nelson has more frequent and larger events, and access to insurance or Waka Kotahi funding is less certain. (Council's Emergency Fund is discussed in Part One of this strategy.

Council assumes the NZ Transport Agency Waka Kotahi Financial Assistance Rate (FAR) will remain at the same rate (51%) over the term of the Long Term Plan 2024-2034. Changes to the funding priorities of Waka Kotahi are outside Council's control, however any significant change to the FAR or National Land Transport Fund eligible works may require Council to reassess its transport work programme to reduce costs and/or to make up operational and/or capital shortfalls. If the FAR is reduced, Council will need to decide whether to increase its funding (which would impact on rates and/or debt) or to remove work from the work plan (which may impact services). Note:

- Petrol taxes have been one source of funding for Waka Kotahi to pass on to councils. However, as New Zealand transitions to increasing use of electric vehicles, the amount of money collected by the Government through petrol taxes will decline. This also has potential implications for future.
- Waka Kotahi subsidies of Council's renewals and maintenance work. Other regions and state highways are also experiencing significant storm damage impacting the Government funding reserves to support recovery programs. This may impact the conditions and quantity of future recovery funding.

Table 1 (T1) issue: The transport network is critical to enable all other utilities to get up and running following natural hazard events, or closures for safety (eg fire, armed offenders, or road crash) by enabling essential service vehicles to access affected areas.

Desired Benefits/Investment Objectives:

- Community resilience. People can access the services they need in an emergency
- Resilience of the network so essential service operators are able to access the parts of the network which are critical for recovery from natural hazard events.
- Value for Money maintenance, renewal and resilience planning integrated with state highway and Tasman networks
- Minimise the number of journeys affected by closures.
- Businesses and other activities can return to normal as soon as possible

- People can move about and interact with others, which is a key ingredient of community resilience.

Table T2: Principal options to ensure the transport network is resilient to natural hazards, climate change and safety closures

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
<p>Preferred Option 1</p> <p>Implement the future works schedule which:</p> <ul style="list-style-type: none"> · uses lifeline route status and ONRC as factors when prioritising structure renewals and resilience- related capex works · considers ONRC, and if alternative routes or sole access is available to customers, when prioritising structure renewals and resilience-related capex works. · Caters for an alternative parallel resilience route for heavy traffic when the state highway is closed via Waimea Road/Main Road Stoke. · Review ownership of very low volume roads to concentrate resources where needs are more efficiently managed as public assets. 	<p>The works schedule prioritises renewals which reduce resilience risks for the network and lifeline routes.</p> <p>Right time right intervention (value for money) is a focus of the AMP. For example, renewal in coastal areas which are being flooded more often might not be prioritised due to the natural hazard making the demand redundant.</p> <p>Existing networks may need to be supplemented/ replaced with new networks with greater resilience and lower risk exposure. This includes working with Waka Kotahi where the state highway is more at risk than the local network.</p>	<p>x</p> <p>✓</p>	<p>\$15–30M over the next 30 years.</p>
<p>Preferred Option 2</p> <p>New infrastructure and new developments are constructed in a manner that increases resilience, such as providing connections to adjacent networks so there are multiple access/ egress points for each community.</p> <p>This approach will have less focus on car access by multiple access routes.</p>	<p>These requirements help to future- proof new development and are reflected in the LDM 2019.</p> <p>One of the problems for Nelson is the high number of areas with a single entry and exit, including the Maitai, Brook and Stoke valleys, as well as the Glen and Cable Bay.</p> <p>This option does not fix the lifeline routes which are constrained by terrain and unlikely to be developed further in the 30-year period to fix the resilience issues.</p> <p>Caution is required to avoid inheriting high maintenance options.</p>		<p>Some of the costs of new infrastructure are developer costs.</p>
<p>Preferred Option 3</p> <p>Zoning to encourage more small commercial community hubs eg for medical practitioners and basic food supplies</p>	<p>Review of the Nelson Plan zoning requirements, plan change and consultation.</p>	<p>✓</p>	<p>Staff time & consultation costs.</p> <p>Long term enabler for communities to create the community hubs they need.</p>
<p>Preferred Option 4</p> <p>Civil Defence Emergency Response plans ensure lifeline infrastructure is back up and running as quickly as possible following natural hazard events.</p> <p>Maintain emergency management plans with contractors.</p>	<p>While improvements can be made it is not practicable, affordable or foreseeable to build all infrastructure capable of withstanding all natural hazard or safety events within the 30year period.</p>	<p>✓</p>	<p>Existing resources, as well as insurances or Waka Kotahi funding.</p> <p>Ongoing response to emergency events.</p>

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 5 Coastal hazards work to include agreed decision points at which to reconsider ongoing investment in maintaining and/or renewing existing infrastructure, including transport assets.	Examples include Monaco and the Glen. However, these decisions will be part of the Council and community-wide conversations as part of the dynamic adaptive pathways planning approach and is not a transport decision alone.	✓	No cost estimates are available at this stage. Community consultation commences in April 2023 to develop this option further.
Preferred Option 6 Maintain existing road assets and stormwater drainage on roads.	Carry out renewals and drainage maintenance and improvements based on the need to improve the resilience of the transport assets and ONF priorities. Catchment check and upsizing culverts identified as deficient for new flood model scenario. Transport infrastructure to support the road as the secondary flow path, and an inlet to the drainage network. (This work needs to be managed alongside desired freshwater improvements.)	✓	\$100k/year for Additional staff resource to lead drainage programme.
Alternative Option 7 Maintain status quo.	Known and future hazard areas will not be addressed and customers will continue to be exposed to access disruption. Does not consider the impacts of climate change, including sea level rise. Does not improve the access resilience of the lifeline routes.	✗	Estimated Transport costs of \$10-30M every 10 years, plus community costs.
Investigations/CAPEX decisions Structural inspections are ongoing. New inspections identify new issues. Decision for scale of funding programme to manage network changes and demands. Catchment calculations require reassessment to understand capacity issues for culverts especially in rural areas, lifeline routes and bridge structures. Renewal funding to include upgrading culverts and sumps.			
Key assumptions Climate change will increase the frequency and intensity of natural hazards. Climate change will also have slow, ongoing impacts related to sea level rise and higher average temperatures. Safety events have similar resilience demands to natural events and need to be included in the resilience planning. Safety events can include lane or road closures for maintenance or construction projects. Community consultation and adaption. Retreat or mitigation priorities options considered before decisions to change transport LOS.			

Infrastructure Objective 2: Maintain, renew, and upgrade existing assets in a cost-effective way

Incomplete network data creates uncertainty about the level of renewal investment that is required. Council is improving its understanding of asset age and asset performance through testing, investigations and analysis, and use of data on useful life/renewal options, which will help form the future works plan. Work is also underway to better forecast the useful life of assets and/or asset components to determine depreciation and where maintenance can improve lifespan.

In the meantime, visual inspection, analysis of the cost of maintenance, and maintenance records are the primary means of assessing renewal programs, while also co-ordination with capital works programs and utility providers to maintain alignment of programs as much as possible. (In other words, when Council needs to dig up the road as part of the renewals program it is important to consider opportunities to renew power, phone,

wastewater, water supply and/or stormwater pipes buried beneath that road, and vice versa. This also applies to decisions to provide new transport facilities or improved LOS (levels of service), like cycleways on roads).

Other assets have robust condition assessments (including bridges and retaining walls) and it is a matter of maintaining a good routine for ongoing assessments.

The RAMM data platform (an asset management database) is changing to meet industry demand for better data and is required by our funding partner Waka Kotahi NZTA. This change will benefit Nelson provided alignment is maintained with data quality standards and reporting platforms.

Renewals

In general, the transport assets are performing as expected for most areas. However, weak road pavement layers provide poor support for expensive asphalt surfaces. The understanding of the pavement asset and medium- term management is being addressed through the Long Term Plan 2024-2034 and will require ongoing development.

Maintenance and renewals of transport and stormwater assets needs to be integrated to keep the drainage system operating. Roads form secondary flow paths which are likely to be increasingly important due to increasing flooding frequency and intensity as a result of climate change. In addition, stormwater pipes and sumps within roads are a major collector of pollutants.

Historical network growth (lower Stoke areas) and a large capital works program (e.g. city centre redevelopment) in the 1990's bring a lot of assets into the renewal program in the 30year Infrastructure Strategy period. Understanding condition and future demands is required to ensure new assets are fit for purpose for the future.

Theoretical Renewal Forecasts

Transport asset data has been combined to map the future theoretical renewal demand for assets. This does not include new assets which would be included in the 3 yearly updates of the strategy. It does not include maintenance or operational costs. Future lifecycle forecasts would be updated as interventions or demands or investigations reveal longer and shorter lifespans of assets with view to closer alignment between theoretical and actual renewal demands to enable accurate forward works planning. High renewal forecasts in year 1 reflect poor data quality, and do not reflect a renewals backlog because the asset conditions are generally acceptable.

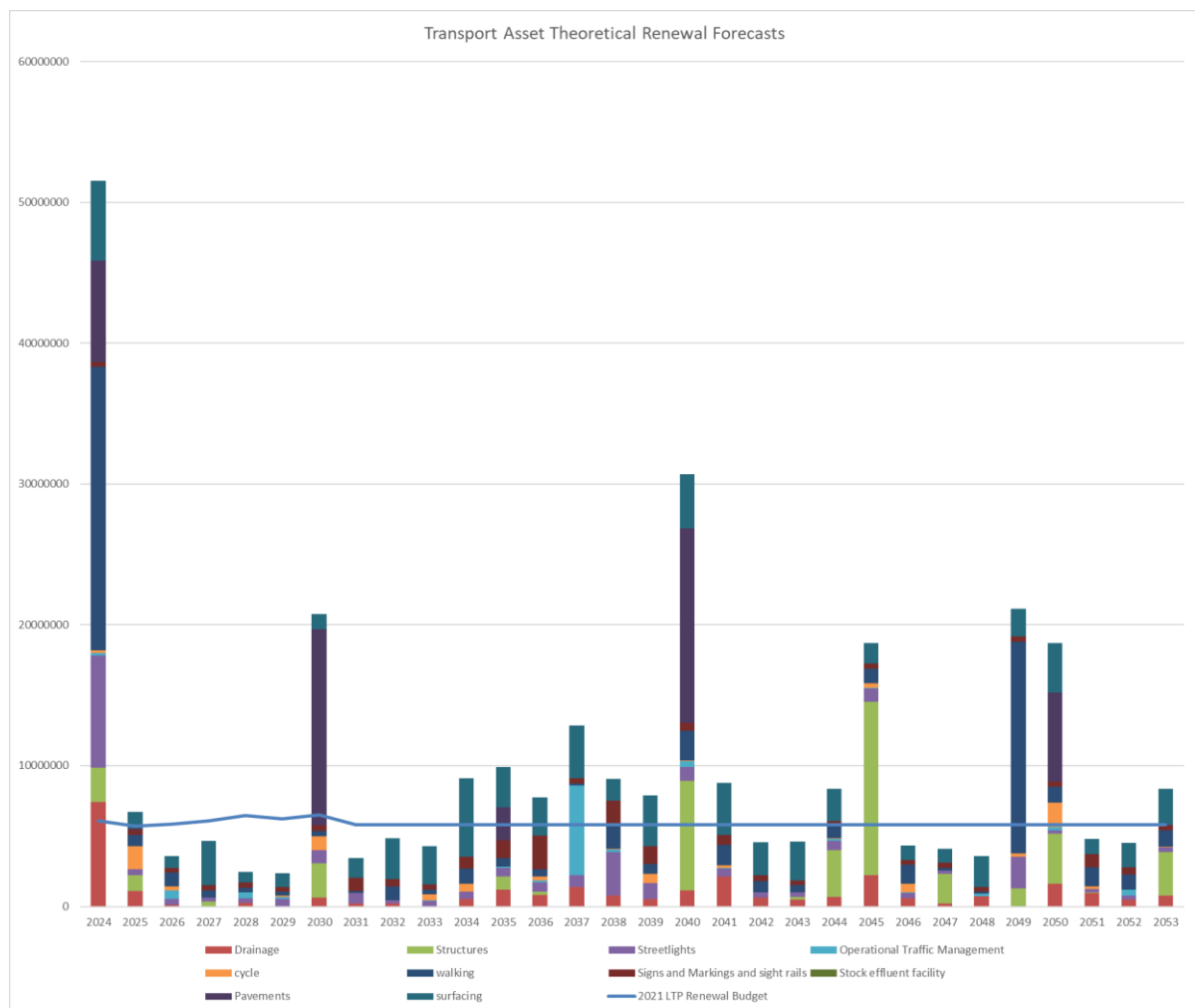


Figure T1: Depreciation model versus actual renewals

Figure 4 plots the depreciation based on the book value of the transport assets and their expected life, whilst the bars represent the actual proposed capital spend based on observed asset performance. Bridges are the biggest ticket item, but their renewal is not imminent. For example, with good maintenance Collingwood and Trafalgar Street bridges should last another 30 years before they need to be replaced but are being monitored and have load restrictions.

Further work is required to align valuations, depreciation, and asset life expectancy to ensure of depreciation forecasts are accurate. Further detail of the lifecycle forecasting, and data improvement plan are given in the transport AMP.

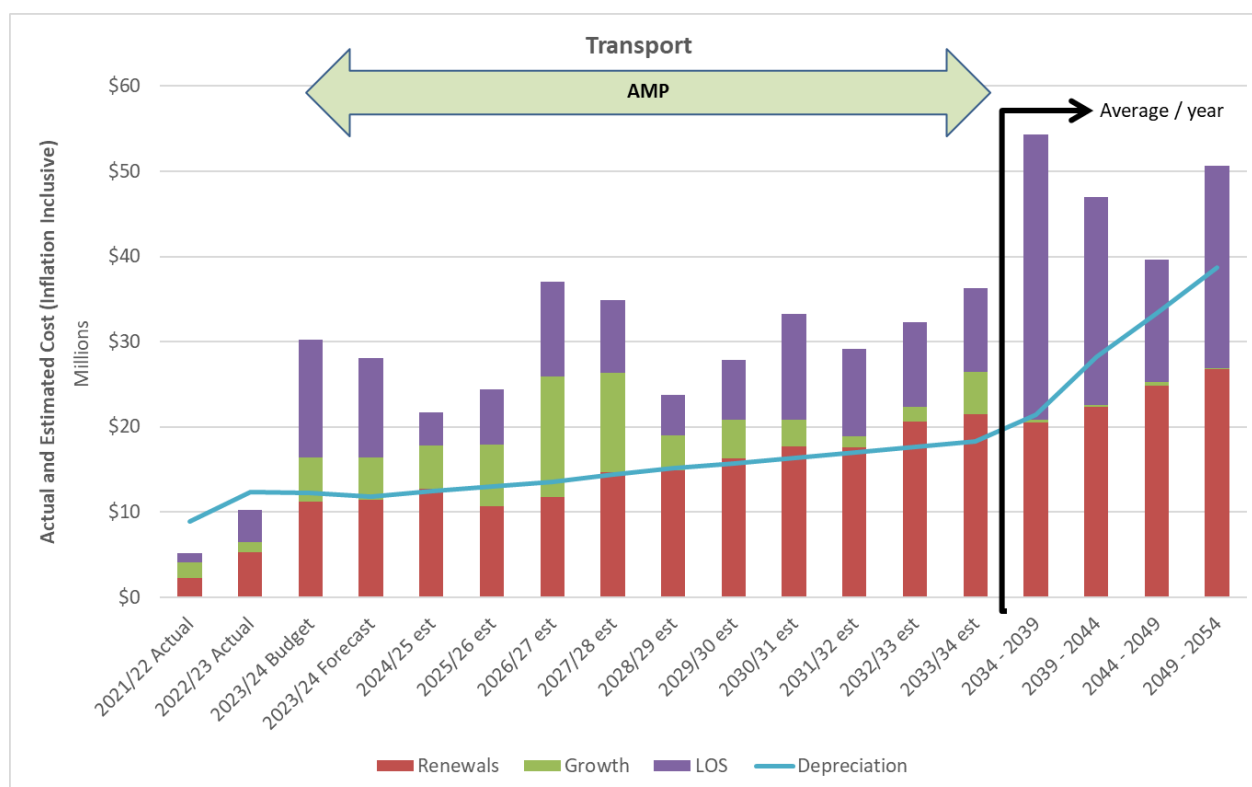


Figure T2: Transport Capital Funding compared to Renewal forecast and Depreciation Expense

Budgets for renewals are inadequate to meet the future demand. Asset condition is generally average, but this is forecast to decline as assets age if not addressed. Refining asset lifecycle forecasts is critical to understanding and managing this more closely over a longer period.

Urban Stream Culverts

Urban streams are contained in large box section culverts where these lie under roads. These box culverts are maintained as a transport structure due to the structural integrity required for transport loading, and because the road cannot exist without the culvert to contain the stream in these situations. The flood protection activity will maintain the waterway and take ownership of renewals for urban stream culverts not located under roads. Future proofing the flood capacity and decisions to daylight the streams under roads, for future environmental benefits, would require trade off road capacity if required.

Freshwater Standards

Future freshwater plans developed under the National Policy Statement on Freshwater will set new standards for freshwater management. Meeting these standards will require the quality of the water runoff from roads to be managed. Water quality off roads has been determined to vary depending on road use and surrounding land use. High volume roads, and industrial areas requiring improvement. Low volume roads and residential areas contribute least contamination. The preferred option identified for the transport activity is to invest in a sump filter program. Long term sump renewals with deeper and

more efficient designs can remove the need for in sump filters and extend the program to lower volume roads.

Vehicle designs may reduce the contamination from the transport activity, but brake pad wear from heavier electric vehicles, and ongoing combustion engine emissions are expected to continue for the duration of this infrastructure strategy. Natural and freshwater environments are being maintained or enhanced through best practice and nature-based solutions, associated with:

- natural gravel management in beds where practicable to protect bridge structures and drainage capacity
- Retreat from natural riverbanks where possible
- moving away from using rock armouring for stream bank protection to using geotextile soil- filled bags which grow vegetation, and look like green walls
- Sump filter and sump improvement programs
- Green wall retaining and slope stability solutions
- Urban Greening in the road corridor to provide shade for people and reduce road surface temperatures.

Additional environmental mitigation that could be adopted in the future include:

- Future consideration of dark sky outcomes could be timed for future renewal cycles. LED light renewals are due within the infrastructure strategy period with like for like renewal planned.
- Smart technology to manage and dim streetlights to reduce light spill and energy consumption.

In general, the transport assets are performing as expected for most areas.

Issue T2: Incomplete network data creates uncertainty about the level of renewal investment that is required.

Desired Benefits/Investment Objectives:

- The total cost of ownership of the assets (operating, maintaining, and replacing them) is minimised over time
- Better network knowledge
- Renewals are not a surprise. They are well planned, efficient, effective, and timely
- Opportunity is maximised to adapt renewed assets for future demands

Table T3: Principal options to maintain and renew existing transport assets in a cost-effective way

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Retain flexibility in the budget to allocate additional (or reduced) renewal budget as network gaps are identified. Optimise levels of service, as appropriate, using good data and the ONRC framework as a guide. Maintain network inspections and the maintenance and renewal program.	Improved data and analysis methods will help Council understand existing, underlying issues in the pavement that the historical process didn't always identify. Failure of roads or poor levels of service may be experienced due to risks with optimisation. Heavy commercial vehicles (HCV) and buses are increasing in their gross mass and overall numbers which impacts on road pavement lives.	✓	There should be no additional costs from this option if good asset management and good budget principles are applied
Alternative Option 2 Introduce differential LOS to suit demand metrics and provide value for money outcomes based on road classification.	Differential LOS provides services to match the needs of the area. It could result in lower LOS on some roads. Lower LOS requires consultation with affected residents to manage expectations. Lower LOS requires management to avoid deterioration and sustain the lower criteria. Integrated planning is required to ensure appropriate activities on roads with appropriate LOS (e.g. don't want heavy vehicle traffic on weak roads with low LOS) Ongoing data improvement required to determine current and future road hierarchy to quantify the gaps for program delivery. Options may be required to use temporary works to bridge the gap between LOS delivery and the asset renewal program. Drainage improvements to filter road water run off to meet the NPS Freshwater standards.	✓	Temporary works have additional monitoring and maintenance costs, but can be less than consultant and design costs. Otherwise, a net increase in costs would only result from net LOS increases.
Alternative Option 3 Emergency capacity and resilience assessments Review drainage catchment assessments and culvert sizing, and unretained slope stability and create a resilience improvement plan	Work with flood protection to integrate flood capacity across and under road networks (rural and urban) and update asset data and renewal forecasts to reflect changing climate conditions. Undertake culvert renewals to mitigate capacity risks. Install new culverts and drainage where required, especially rural roads for resilience. Drainage improvements to control road water run off where it affects private property. Slope stability risk assessments and mitigation planning alongside growth and development demands.	✓	To be confirmed, following assessment \$100k per annum to manage water run off from road where it affects private property.
Investigations/CAPEX decisions Increased data collection, improved analysis, and ongoing asset optimisation, and LOS discussions as part of the Transport AMP improvement plan to improve the quality of data for decision making. Testing of pavements, including test pits to inform assessment and future designs. Degree of temporary works required, and acceleration or delay of the renewals program required to manage LOS demands and whether these are capital or operational works. Condition assessments of the urban stream box culverts, these are incomplete, to inform expected life and renewal forecasting.			

Assumptions

Sealed surface LOS follows national best practice, i.e. asphaltic concrete (AC) will only be applied where it provides best value for money outcomes. This is typically where traffic volumes are greater than 15,000 vehicles per day and where buses and HCV generate high stress movements on the pavements.

Increased renewal budgets are required to minimise increasing maintenance and reactive budgets as assets age and reach end of life.

Consultation is required to inform the community of the future network hierarchy and LOS framework.

Structural improvements

Inspections, age, and condition are used to prioritise projects related to structures based on need, using a number of ranking criteria. The renewal phase is an opportunity to make improvements to increase the capacity of bridges, in terms of vehicles, walking and cycle facilities, and flood flow capacity.

Trees are another ageing asset on road reserves, as older trees pose a bigger risk to infrastructural assets and the public if they are not well maintained.

Mode shift and road space allocation maybe a method of reducing pavement assets but also increase traffic loading demands on narrower lanes thus increasing the operational cost of maintaining the asset. Priority bus lanes and cycle lanes within the road corridor will also introduce new assets and Levels Of Service to maintain.

Infrastructure Objective 3: Provide infrastructure to enable growth and development.

The future network will be required to balance vehicle traffic congestion with a connected walking and cycle network, bus and freight routes and resilience when the roads need to perform against the extreme events. Safety and differential LOS are the primary tools to manage the competing priorities.

Differential LOS

In the future, Waka Kotahi will require all Councils to manage their road networks by a One Network Framework (ONF) hierarchy. The ONF hierarchy will enable Council to deliver differential LOS along the roads in the network. Initially this includes stronger pavements on freight routes, bus priority at intersections, street cleaning in the city centre or industrial areas and determining the facility required for pedestrians and cyclists.

Within time this is expected to include time management as well as place and traffic volumes. Ultimately the priority would be managed, for example children access across a road before and after school but vehicle access along the arterials at morning and evening peaks, and side road access interpeak. Higher quality IT systems are likely to be required to manage these demands. Traffic signals are the initial management tool, thus more manipulation of traffic signal phasing is expected in the short term as the network evolves.

Traffic congestion

Some parts of the urban road network are operating at or near capacity. This is causing peak hour delays in some areas. These peak delays are likely to increase in volume and time as travel demand increases (with population and freight forecasts).

Travel time variability remains static on Waimea Road and Rocks Road, but the overall travel time is increasing since monitoring began in 2015. The travel time variability and overall travel time is easily affected by works on or near the arterial routes, which indicate that the resilience of these routes is vulnerable to disruption. This type of arterial road congestion has a flow-on effect for other areas, as some motorists are rerouting via residential streets to avoid arterial road congestion, reducing amenity, and increasing safety risk in the affected residential areas. This can also occur during works or disruptions on the arterial routes.

Multimodal increases in transport capacity will be needed to meet the projected demand in the Nelson Urban Area (which includes both Nelson and Richmond). Nelson has slightly below medium growth, but the Richmond area is a high growth area.

The level of increased congestion pressure on the road network is related to where new development occurs, which is a compelling reason for:

- the focus on intensified development in FDS
- encouraging people to live closer to where they work, or along public and active transport networks
- Public transport improvements
- Walking and cycling network improvements
- Coordinated planning and resilience improvements in consultation with Tasman District Council and Waka Kotahi state highway planning.

In the medium term, predicted growth in population in both Nelson and Tasman has the potential to further increase congestion on the road network.

Transport data indicates demand is likely to flatten off over the longer time scale of this strategy. Increased congestion also encourages people to change transport modes.

Nelson Future Access Project

The Waka Kotahi Nelson Future Access Project concluded in 2021 with recommendations to create a future proof transport system for Nelson including:

- Develop a multi modal transport system
- Improve SH6 Rocks Road for walking and cycling
- Keep state highway traffic on Rocks Road
- Improve public transport infrastructure and services
- Priority bus lanes on the Waimea Road routes and state highway 6

The Nelson Future Access Project recommendations align with the FDS which encourages a greater level of intensification in key areas including those with good access to public and active transport networks and the Waka Kotahi Vehicle Kilometres Travelled (VKT) reduction program to address climate change. However, uncertainties about future vehicle choices will make some long-term projections challenging.

These recommendations align with the concurrent Tasman Regional Land Transport Strategy. The concepts can be extended to the wider network for Nelson, especially Stoke and public transport routes which sit between the two areas.

Walking and Cycle Strategy

Nelson adopted E Tu Whakatu, walking, and cycling strategy in 2022 which sets out the principles and routes for further development of the active transport network. The network is expected to be a combination of separated cycle facilities, a phasing out of shared facilities, and a slowing of speeds where cyclists mix with vehicle traffic. This aligns with the similar Tasman strategy, and Nelson Future Access Project to improve the infrastructure network for those choosing alternative modes than cars.

Long term strategies are expected to include closing roads to through traffic to improve access for adjoining land use, pedestrian, and cycle safety, e.g., Upper Trafalgar Street and Hampden Street at Waimea Road. These will require regular consultation of the strategy and options to ensure it remains current and informs the long-term goals for the network.

Waka Kotahi Road to Zero Program

Waka Kotahi prioritises funding to meet its Road to Zero target to reduce the death and serious injury (DSI) toll for New Zealand roads. The program aims for 0 DSI crashes on the land transport network by 2050. Council has a capital works program to contribute to this target. The program focuses on intersection and cycle safety infrastructure as these continue to be the sources of DSI crashes on the local network. The new government has signalled a safety focus on drinking and drugged drivers and less emphasis on speed reduction.

Speed Management Plan

In 2021 the Ministry of Transport introduced a new framework for the management of speeds on roads for nationally consistent speed setting for similar road environments and to prioritise speed management to address the national road toll. Speed management is a factor for improving the options for cyclists to use the network and survivable outcomes for pedestrians, cyclists, and vehicle occupants in event of a crash. Regular review, and consultation of the speed management framework is required to ensure it remains current and informs the long-term goals for the network. The new government has removed the mandatory requirement and deadline for authorities to submit and then implement speed management plans, and work has begun on developing new policy at central government level.

Te Ara O Whakatu – City Centre Program Plan

The City Centre Programme Plan was adopted in 2019 and refreshes the Heart of Nelson Strategy 2009, closely followed by the adoption of Te Ara o Whakatu (city centre spatial Plan) in 2021. Te ara o Whakatu is people focused, aiming to create a social hub where people 'linger longer'. The Plan seeks to create a successful regional heart attracting high quality development. The plan will inform the renewal and development of the transport assets with and around the City Centre to create a place that will draw talent, offers great hospitality, and celebrates events and activation, connected to and enveloped by stunning natural landscapes in conjunction with property development, introduction of inner city living and utility upgrades.

Significant Renewals

Trafalgar Street Bridge and Collingwood Street Bridges are due for renewal in approximately 30 years. They are currently restricted for weight of heavy traffic. This program may be extended by timely maintenance and component renewal programs or could be earlier if maintenance is insufficient or condition deteriorates quicker than modelled. Renewal will provide opportunities to review walking, cycle, and traffic facilities along with Maitai River flood capacity.

Clouston Bridge, Nile Street Bridge and Gibbs Bridge are all due for renewal in the 30–55-year period. Demand from the Mahitahi residential subdivision and other proposed developments in the Maitai Valley, and resilience demands to access the Maitai Dam will require review of the network in the 30-year period to inform these major renewals. Improvements may be required before the bridge renewal timeframe to address the changing LOS demands.

Parking Strategy

The Council adopted a Parking Strategy in 2022. It has a decision-making framework to manage the available parking space within and around the City Centre and high demand locations. Properties no longer need to have onsite parking. The impact of this change is in the strategy with options to develop residents parking areas. The Parking Strategy is supported by the Traffic Control and Parking Bylaw.

Subdivision Interconnection

Most greenfield development in Nelson is in foothills and valleys. These are all currently served by single points of access. Working with developers to connect the subdivisions between the valleys will increase resilience and congestion potential as an alternative route for some journeys. Interconnection will also increase the efficiency of future public transport service routes. Interconnecting roads potentially come with high costs as the terrain between valleys is steep and unstable. Establishing and maintaining such routes will include structures (such as retaining walls), gradient and stability issues.

Subdivision connections being planned in the 30-year period are:

- Marsden to Ngawhatu
- Bay View to Mahitahi

- Hill Street to Suffolk Road

Future potential connections (not yet investigated) may include:

- Enner Glynn to Marsden
- Market Road to Enner Glynn
- Market Road or Enner Glynn to Brook
- Bay View to Walters Bluff

Future connections are typically more challenging terrain to the current subdivision areas but could become economic as sea level rise impacts coastal and river areas and growth areas reach capacity.

Issue T3: The current transport system is in a highly constrained geographic environment, with hills on one side and the Tasman Sea on the other.

The growing demand for travel is being squeezed along historical road corridors that must function as 'all things to all users.'

Desired Benefits/Investment Objectives:

- Maintain agreed levels of service for travel time, and efficiency
- Provide resilience for lifeline routes
- A world class waterfront.
- City Centre revitalization
- Safe and connected road network for all road users

Table T4: Principal options to provide a future-proofed transport system which considers the needs of all users

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred option 1: continue to develop the transport improvement program off the deficiency database which relies on customer complaints	The deficiency database records faults identified in the network Customer complaints are a valid feedback process for identifying where gaps in LOS are causing problems for network users. Relying on the deficiency database alone generates site specific physical works projects only where better value for money and systematic improvement for the transport network could be achieved by planning and using all the tools available to manage LOS and demands. Option is unlikely to be effective at gaining Waka Kotahi funding for renewal or improvement works in the future.	✗	Budgets are set on the 3-year work program and ability of Council and Waka Kotahi to fund desired improvements.
Preferred option 2: use the identified planning strategies, and deterioration modelling for renewals and develop Waka Kotahi One Network Framework (ONF) to create and support a future proofed	Waka Kotahi have developed the ONF to standardise network descriptions and include land use planning across the country. It caters for the current state, future desired state, all know transport modes and activity alongside road corridors. The vehicle-based road network is well defined. The active travel network is less defined and disconnected, hence requires additional input. Interrelationship between modes and between modes and land use planning is also currently	✓	Rough order estimates of \$200M over 30 years to create the walking and cycling network and local road improvements

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
connected resilient networks for all modes of transport.	less well defined. A forward works plan will help identify best value for money options to deliver the renewal and improvement programs and a long-term view towards consultation with the community. A forward works program looks 10-30 years in advance so allows coordination of major renewals and improvement activities over a longer time for better financial, risk and value for money outcomes. Community facing planning documents allow for no surprises and long-term views towards consultation and activity management that affects the transport system.		
Preferred Option 3: City Centre Revitalisation	Working with developers to create liveable city centre spaces Renewal of City Centre footpaths and infrastructure to provide and maintain attractive environments Implementation of the City Centre Spatial Plan and Palette NRMP plan change 29 is underway and required to enable residential living in the City Centre	✓	Speed and scale of redevelopment of urban spaces is yet to be determined.
Preferred option 4 Investigate more sea connections to Nelson, passenger, vehicle, and freight	Coastal shipping is now included in the transport network for Waka Kotahi co-funding of eligible services. Investigate ferry, and vehicle passenger options and destinations. Support Port Nelson to further develop coastal shipping.	✓	No research into demand or options has been undertaken.
Investigations/CAPEX decisions Priorities to be placed on the different aspects of the program to balance resilience, LOS, traffic, bus, and walking and cycling demands for delivery of improvement works LTP funding budgets will be allocated for the capital works program Future Proof includes the capacity to manage emergency events. Long term spoil site/s are required to dispose of spoil material. Port Nelson land for growth, storage, and logistics to manage coastal shipping demand increases.			
Assumptions Program development will include the Government Policy Statement for Transport priorities for the subsidised program. Council can choose to accelerate other programs as unsubsidised works Safety will continue to be highest priority in the decision matrix. Resources will be available to implement and manage the Parking Management Strategy Maintenance budgets can increase as higher risk development areas are subdivided and vested in Council. Port Nelson has undertaken so feasibility, and demand research but this information has not been used for Waka Kotahi funding research. Any coastal shipping, or passenger or vehicle ferry services would be jointly investigated with TDC and Port Nelson.			

Increasing road network capacity to provide for urban growth and development

Council is planning to make multi modal transport options attractive to the current population in intensification areas because these are close to amenities and the city centre. However, the timing of urban development is dependent on several factors which are outside of Council's control which means there is a risk that urban growth and development won't occur at the projected rate.

To manage this risk, some services may be provided ahead of time to create the right conditions for development and to encourage it to occur, and others will be provided once the demand is created by growth (as discussed in Part One of this strategy). Safety is monitored to manage the implementation program where there is uncertainty.

Issue T4: When and where to provide increased capacity of the transport network to provide for urban intensification and growth.

Desired Benefits/Investment Objectives:

Local road capacity meets LOS. (Approaching unstable flow where all drivers are severely restricted in their freedom to select desired speed and manoeuvre within the traffic stream. Delays at intersections of 25–35 seconds per vehicle or better and road safety is managed in growth areas.)

People have access to travel options to suit their journey, method of travel and ability.

Table T5: Principal options to provide increased capacity of the road network to reflect the impacts of urban growth and development

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Prioritise areas to deliver the agreed capacity and safety level of service 'just in time' to match or slightly lag actual development.	This option is likely to result in traffic congestion getting worse before it gets better. Unplanned/unforeseen development areas could be delayed by the lack of road infrastructure until this can be planned, funded, and implemented. Development contributions will provide partial funding (approximately 30%) with the remainder to be funded by rates. Waka Kotahi funding would only be sought when LOS/safety outcomes match the current GPS outcomes. Working with developers to identify and facilitate road connections between valley subdivisions. Work with developers and flood protection to understand resilience and drainage implications of growth areas upstream of the existing network to plan for drainage and secondary flow path upgrades where these affect transport culverts and roads. The Councils traffic model is historical and now an unsupported format. A new model would be required if this is to be used for future planning. New models can be multimodal.	✓	Rough order estimates of \$146M over 30 years to create the walking and cycling network and local road improvements in addition to developer costs. Rough order cost estimate \$250k, plus 1 staff resource to develop a new transport model, plus ongoing management costs.
Alternative Option 2 Deliver capacity level of service improvements across the city to enable distributed development.	This option would almost certainly result in Council investing in infrastructure in areas that don't end up being developed.	✗	Costs relate to poor utilisation of facilities and poor value for money outcomes
Alternative Option 3 Priority Bus Lanes and walking and cycling infrastructure improvements and parking management	Nelson Future Access Project recommends higher frequency buses, extended bus service network priority bus lanes on the Waimea Road route, and state highway 6 and the attractiveness of the public transport service will cap the congestion experienced by growth on the vehicle network. Providing facilities that support people who choose or need to walk and cycle around the network will improve the attractiveness and cap the vehicle congestion experienced by growth on the network. Parking availability and attractiveness are factors that increase traditional vehicle behaviour patterns. Managing parking to ensure all customers and businesses have fair access to facilities is a congestion demand management tool and maximises the use of the city centre assets.	✗	\$114M over 30 years (incl 51% Waka Kotahi contribution) Rough order estimates of \$30M over 30 years for new and additional public transport service routes and timetables

	Improving public transport services to meet growth demand.		
Investigation/CAPEX decisions Priorities to be placed on the different aspects of the program to balance resilience, LOS, traffic, bus, and walking and cycling demands for delivery of improvement works LTP funding budgets for the capital works program			
Assumptions <ul style="list-style-type: none"> · Demand (growth) occurs as forecast by Council. · Development Contributions Policy will provide partial funding (approximately 30%), of local share of growth projects. · Travel demand, which is not related to new, isolated development continues at current levels. 			

Infrastructure Objective 4: Maintain or improve public health and safety, and environmental outcomes

The transport activity can improve environmental outcomes through a reduction in fossil-fueled vehicles on Nelson roads, alternative construction materials (in future, as these become viable options), stormwater filtration, increased active travel and improved amenity such as shade and green space. However, the rate of single occupancy car use has gone up, even while more people are walking and cycling.

Considering Northern European examples where there is much higher utilisation of cycling, with separated cycleways for user safety, and a wider range of footpath usage, with wider footpaths being deployed, it is likely that New Zealand will further embrace these trends. Micro-mobility options (such as skateboards, invalid carriages, electric bikes, and electric scooters) may make a significant difference to transport choices in future.

Reconfiguration of the existing transport corridors, speed management and redesigned shared spaces are required to facilitate these changes.

Issue T5: Growth in the number of car users, and demand for alternative transport options, has increased the demands on the existing road network.

Desired Benefits/Investment Objectives:

- Transport corridors are appropriate for the through traffic demand and adjoining land use
- Reduced transport-related emissions
- Land transport network caters for all modes and abilities equally
- Parking assets deliver appropriate LOS for customers

Other environmental improvements

Increased uptake of alternative fuel sources and technology such as electricity and hydrogen will lead to:

- lower carbon emissions
- less pollution associated with use of vehicle brakes

However, these options could also lead to ongoing demand for vehicles, resulting in road congestion. Council permits the use of recycled materials in road and road surface construction and is monitoring industry developments to make more improvements as these become viable to reduce the impact of the transport network on the environment.

Table T6: Principal options to reduce traffic congestion and incentivize reductions in transport-related carbon emissions

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Implement more travel demand management (TDM) activities including: <ul style="list-style-type: none"> · education · a rideshare program. 	Travel demand management activities typically require social change, which can be difficult to achieve without significant incentives such as increased parking charges and new alternative facilities. Can be very difficult to access target audiences and only effective long term if the audience want to change.	✗	Ongoing work
Alternative Option 2 Potentially increase parking charges.	Increased parking charges would provide a significant incentive not to travel to the city centre by car and would improve the success of travel demand management initiatives.	✓	Potential to generate income to offset management costs.
Alternative Option 3 Speed Management program and implement the Walking and cycling strategy and bus priority lanes to cater for growth and those users who prefer these modes. Parking management to ensure fair use of the available facilities,	Option aligns with Option 3 T4. Include more consultation to identify and plan physical interventions with the community to improve value for money and efficiency of the capital works programme	✓	\$200k per year for 2 new staff resources to improve consultation and co-design with communities. \$114M over 30 years (incl 51% Waka Kotahi contribution) Rough order estimates of \$30M over 30 years for new and additional public transport service routes and timetables
Investigation/CAPEX decisions Ongoing review of the Regional Public Transport Plan Parking Policy and walking and cycling strategy. Consultation and community co-design of future facilities.			
Key Assumptions Future transport choices will be influenced by micro-mobility options, improved public transport options and technological advancements. Customer travel choices are influenced by where they work, live and play. The quantum and location of these for the transport activity will be influenced by the Future Development Strategy and rate of urban intensification or outlying greenfield growth development. Coastal Shipping and the change this could introduce to the Port and local network will be considered in future Infrastructure Strategies.			



Water Supply

Asset description

The inventory of public water services assets owned by Nelson City Council and managed by the Infrastructure Group is shown in **Table WS1**.

Table WS1: Summary of Water Services Assets as at June 2022.

Asset Category	km	units	Replacement Value(\$M)
Reticulation including rider mains	354		160.48
Trunk Mains	45.7		51.68
Maitai Pipelines	17.2		39.58
Roding Pipeline	10.7		9.61
Maitai Water Supply Scheme		1	32.46
Roding Dam		1	4.4
Treatment Plant		1	29.8
Tunnels		3	17.2
Reservoirs and Tanks		39	24.95
Pump Stations		13	7.24
Pressure Reducing / Control Valves		55	1.14
Air & Non-Return Valves		196	.89
Backflow Prevention Valves		814	.57
Gate Valves		4,487	9.87
Manholes		111	.51
Hydrants		2,668	9.14
Residential Meters		19,610	5.15
Commercial Meters		1,804	
Network reticulation meters		56	
Customer Connections (including unmetered sprinkler connections)		21,458	34.36
		Total	437.03

Issue WS1: The piped water supply network is at risk of damage during earthquakes and flood events.

Increase resilience to natural hazards

The Maitai Dam is a critically important asset which has been designed to withstand extreme seismic and flood events with only limited damage. However, the pipes between the Maitai and Roding rivers, the Water Treatment Plant, and water users are more vulnerable than the dam to natural hazards, particularly the above ground trunk mains

and pipes which cross earthquake faults and waterways. In 2014 Council completed a new duplicate pipeline between the Dam and the Water Treatment Plant to provide resilience for the raw water supply for the city.

Ensuring there are several water supply options available to the city in the event of emergency is critical to the wellbeing of the community. Currently the city has three river based raw water sources that supply water via pipelines to one treatment plant. Recent experience in the August 2022 storm event highlighted essential vulnerabilities in the supply pipelines and the operation of the treatment plant. Projects to improve the resilience of the supply of water include improving the linkage of the network with the Tasman District Council supply, constructing addition emergency power supplies at the treatment plant, expanding the ability for direct chlorination of raw water for urgent supply to the network if the treatment plant is damaged and constructing mobile treatment trailers for small volume supply in an absolute worst-case scenario.

Council has also commissioned work to review the potential natural hazard risks for the three waters reticulation (water supply, wastewater, and stormwater). Generally, all the water supply network is considered a critical asset because of its importance to life. Within the network, pipelines that also serve other critical activities have been identified and will be given priority weighting to improve resilience. The underlying resilience of the network comes from it being a pressure-based system. This means if one pipe is closed off, due to a breakage, Council often has choices on how to deliver water via other connected pipes. For example, if the main pipeline under Waimea Road to the hospital broke, this section of pipeline could be turned off, and water could be redirected to the hospital via the Vanguard Street and Motueka Street pipelines.

Liquefaction and sea level rise are potential risks to the network in coastal areas. Following the assessment of critical network assets, the next step has been to set up a program of work to bolster these assets:

- improve treatment plant resilience.
- prioritise renewals (and renewal in a pipe material that is more robust).
- more valves to isolate sections of the raw water pipelines and complete the project to configure the urban reticulation into district metered zones.
- ability to use lower criticality pipes (e.g., Vanguard Street/Motueka Street) if there is a failure of a critical pipe (e.g. Waimea Road).
- continue development of storage reservoirs across the city.

Desired Benefit/Investment Objective:

Improve the resilience of the network and the speed of post-disaster recovery.

Table WS2: Principal options to improve the resilience of the water supply and the speed of post-disaster recovery

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Proactively identify and assess risks to the water supply network from significant flooding and earthquakes. Continue to invest in insurance to assist with recovery costs.	Risks associated with natural hazards are being assessed on an ongoing basis. A better understanding of the likely impacts on the city will allow improvements in future construction – and the costs of enhancing the network resilience will be better identified following completion of the investigation. Significant resilience to natural hazards will be 'built-in' through the renewals and capital upgrade program for the dams and the Water Treatment Plant. Repairing significant damage to infrastructure from natural hazards is part-funded by insurance.	✓	A budget of \$1.45M has been included to support the recovery from the August 2022 storm event. These works will enhance the resilience of the water treatment plant and the raw water intakes. Costs and timing will not be determined until the investigation is completed. However: \$0.33M is identified for hazard mitigation to the Maitai raw water pipeline in years 2025–2028 a budget of \$6.8M over 30 years has been included to allow for any natural hazard risk remediation.
Alternative Option 2 Reactively respond to natural hazard events and rely on insurance to assist with recovery costs.	Repairing significant damage to infrastructure from natural hazards is part-funded by insurance.	✗	Costs depend on what events occur.
Investigation/CAPEX decisions The design and minor works costs in years 1-4 for the recovery from the August 2022 storm event will be approximately \$1.45M. In total the expected 30-year budget for natural hazard mitigation is \$10.85M.			
Key Assumptions <ul style="list-style-type: none"> · No specific level of service for recovery from natural hazards. · Current level of service continues for recording number of complaints about continuity of supply. · Water supply demand will increase with population growth. · Protection from damage from some natural hazards will be embedded in renewals and capital works. · The impacts of climate change will be monitored, and growth controls adjusted to respond to the latest information. · Earthquake risk will be reviewed as any future investigations provide additional information. · Existing information held about fault hazard areas of land instability are reliable, although it is expected that additional areas may be identified that are subject to liquefaction risk. · Renewal and upgrade of assets will be designed to minimise vulnerability to known natural hazards. 			

Adapting to climate change – droughts

A report by WSP showed that Nelson has sufficient water from current sources - Maitai Dam and Roding River, to provide drought security for the city out to 2070–2080. Demand strategies will support drought security, and work to reduce water losses (discussed under Objective 2) will also improve resilience to droughts.

Tasman District Council is currently constructing the Waimea Community Dam to enhance long term water security in the region. A benefit of this dam is that it can also provide the opportunity for Nelson to develop a further water source and improve the future water supply security for the city into the next century.

Council included a budget of \$5M for a contribution towards the construction of the Waimea Dam as part of the LTP 2018–28. This contribution will secure Nelson City Council's right to access up to 22,000m³/day from the Waimea aquifer once the dam is

constructed. This additional water supply would require new infrastructure to abstract, treat and distribute the water. A budget of \$28.7M has been included in the years 2045-2055 to signal the need for this work. The project will be further considered over the next few years and options included in future infrastructure strategies if demand or resilience shortfalls are identified.

Through an engineering services agreement, Tasman District Council supplies water to the residential areas in south Nelson adjacent to Champion Road, as well as the Wakatu Industrial Estate, Alliance Freezing Works and ENZA in Nayland Road. Although the demand is not a large volume of water (500,000–600,000m³/year) Nelson City Council does not have the appropriately sized reticulation in place to be able to supply the required fire flows to all areas. Additionally, the supply of these extra volumes in dry summers would reduce the long-term drought security provided by the Maitai Dam. The ongoing supply of water to these areas relies upon Tasman District Council being able to provide that water to the city economically. Future reviews of the agreement will continue to monitor the effectiveness of this arrangement.

Adapting to climate change — sea level rise

Sea level rise could change the demand profile in the long term. For example, if certain areas become uninhabitable because of sea level rise, it will impact where water supply needs to be provided.

Infrastructure Objective 2: Maintain, renew, and upgrade existing assets in a cost-effective way

Asset condition/data confidence

Water supply services are beginning to be impacted by ageing infrastructure, such as regular breakages of asbestos cement pipes. Council has an ongoing program of replacing the broken pipes and an increased budget is proposed (at 34M per year from 33/34 up from \$1.17 million per year in 23/24) to keep up with the work required. Years 1 to 4 of the 24/34 LTP have significant renewal budget of \$12.7M to allow for the redevelopment of the central city Bridge Street network.

Council is planning to prioritise replacing the weakest asbestos pipes in critical areas where failure would be unacceptable like in the CBD and industrial areas. Firefighting requirements for specific building types, including four, five and six story buildings often drive demand for larger capacity water supply pipes. Therefore, larger watermain are required around the city centre, which will also support intensification. Water supply capacity for firefighting is also a requirement in industrial areas.

An additional budget of \$29.5M has been included for infrastructure upgrades that will be required to service growth and intensification areas across the city.

Water supply pipes are generally under roads, so they are expensive to replace. In the past, some publicly owned pipes have also been sited under private property which can cause access issues.

Renewal of the water supply network

Water pipes are renewed when they fail to provide the required level of service, or where performance or reliability is compromised due to age and poor condition. Most water assets are relatively new, with an increase in renewals (based on design life) anticipated from the late 2030s onwards.

Figure 5 shows the theoretical renewal dates for pipe materials based on their average expected service life. The theoretical life expectancy is one indicator to help guide renewal funding and is helpful for assessing the longer-term funding needs, but it has limitations.

The current renewal strategy adapts the theoretical renewal dates by balancing the industry resourcing limits and construction costs, which have become apparent through the number of tenders and tendered prices received by Council, against the need to renew parts of the network that have met the end of their service lives or are not meeting expected service lives. Assets are prioritised based on criticality.

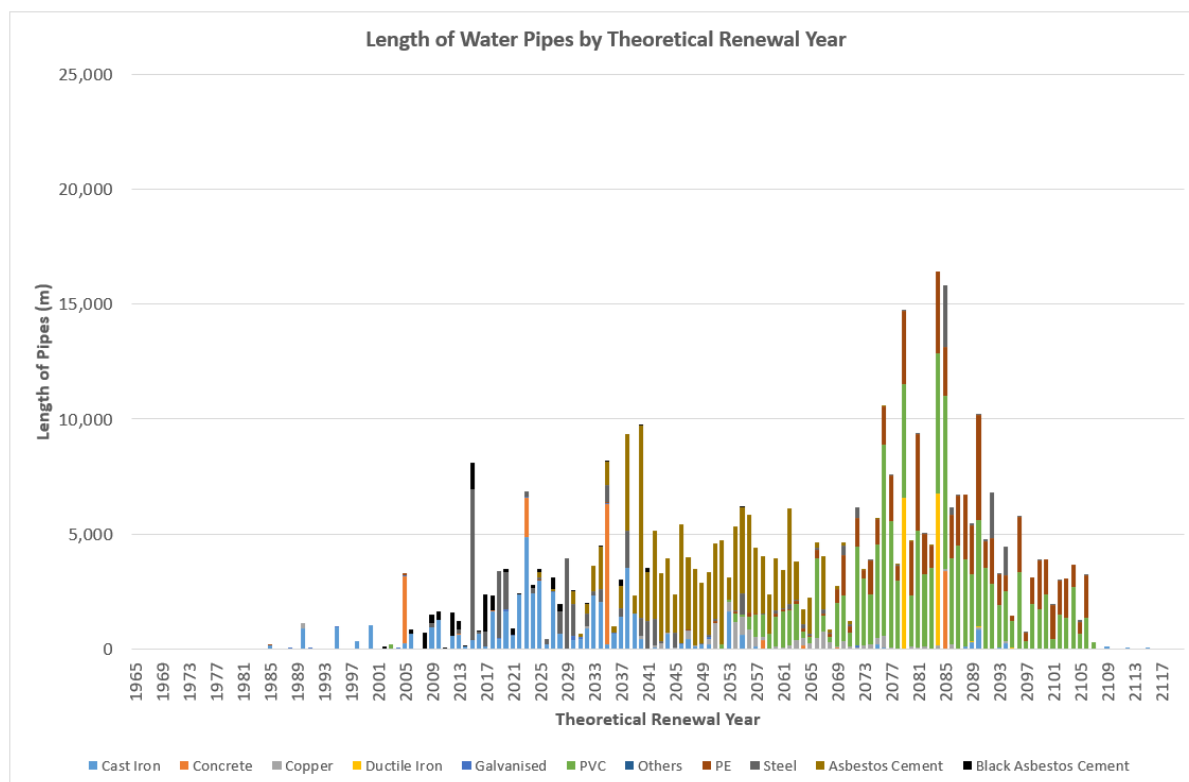
Council aims to ensure pipe life is maximised as much as possible and isn't renewed too early.

Council is also investigating ways of extending the service life of assets through measures such as water pressure reduction and pipe lining. In the future these investigations are expected to allow Figure 5 to be re-cast to reflect the renewal criteria based on a more accurate assessment of service lives.

However, Council has recognised that AC Black pipes (bituminous coated asbestos cement pipe) used in the water supply network are showing a larger number of failures than expected. These pipes are the current focus of the renewal program and have been funded to ensure replacement by 2030. As this material is known to be prone to failures, the rate of failures will be closely monitored and, if necessary, the renewal program will be adjusted through future Long-Term Plans.

Pipe renewals are expected to increase to approximately \$3M per year by the end of the first ten years of this strategy. A further increase to approximately \$6.5M per year by the end of this infrastructure strategy is planned to more evenly spread renewal costs predicted from the late 2030s onwards.

Figure WS1: Water Supply Theoretical Renewal Dates



Considering the increasing costs and general construction resources shortage, Council proposes to review the water network renewal strategy to address the increasing level of anticipated renewals required from the late 2030's onwards, and to identify renewals required earlier due to poor condition or growth. This will prioritise regular assessments of critical assets (including larger pipes and reservoirs) and include consideration of how to maintain critical infrastructure.

Specific renewal budgets are in place for critical assets such as pump stations, the Water Treatment Plant, and headworks (dams and raw water pipelines). Other critical assets are being identified through the natural hazards resilience assessment (discussed under Objective

Figure WS2: Water Supply Theoretical Pipe Renewal Year and Cost

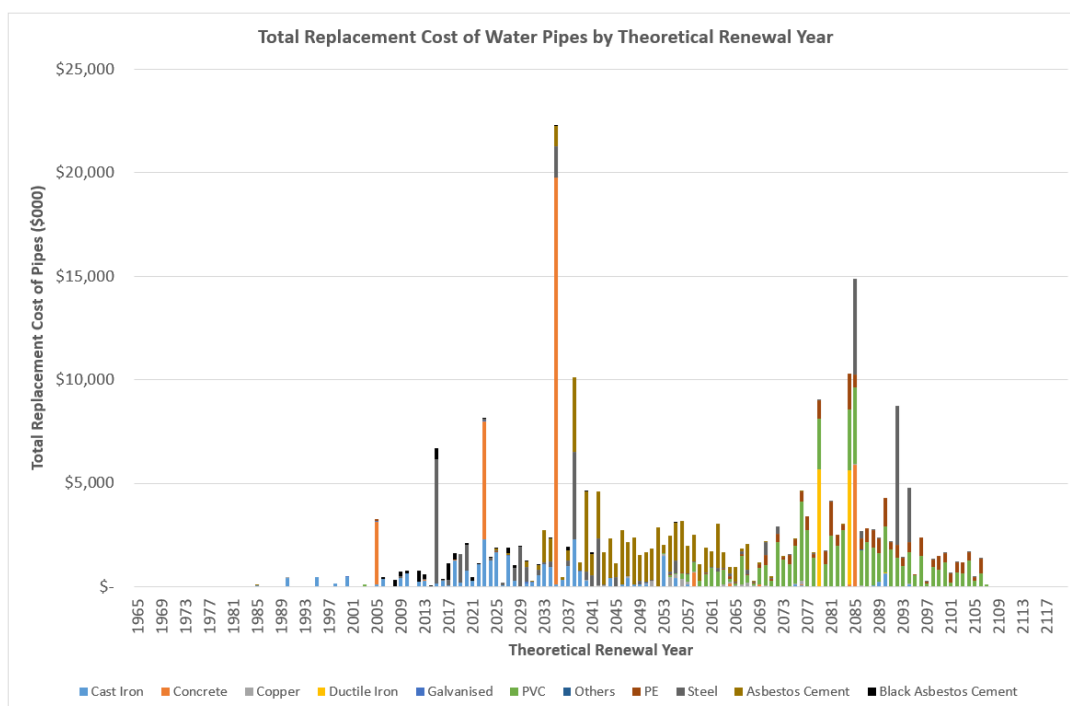


Figure WS2 highlights the issue that has led Council to focus on condition assessment of assets and greater investigation of rehabilitation techniques. The renewal strategy based on generic service lives necessarily establishes a level of depreciation to match and predicts either a shortfall in renewal activity or fails to identify the need for renewal of assets that do not meet their predicted service lives. In addition, this approach does not consider short term industry resourcing constraints that lead to higher renewal costs and a reduction in the overall renewal program to maintain affordability.

Figure WS2 will also be reviewed to match changes to Figure 6 above and better align renewal expenditure to the more accurate service lives.

Years 2031–2051 are the average of each of the respective five yearly block.

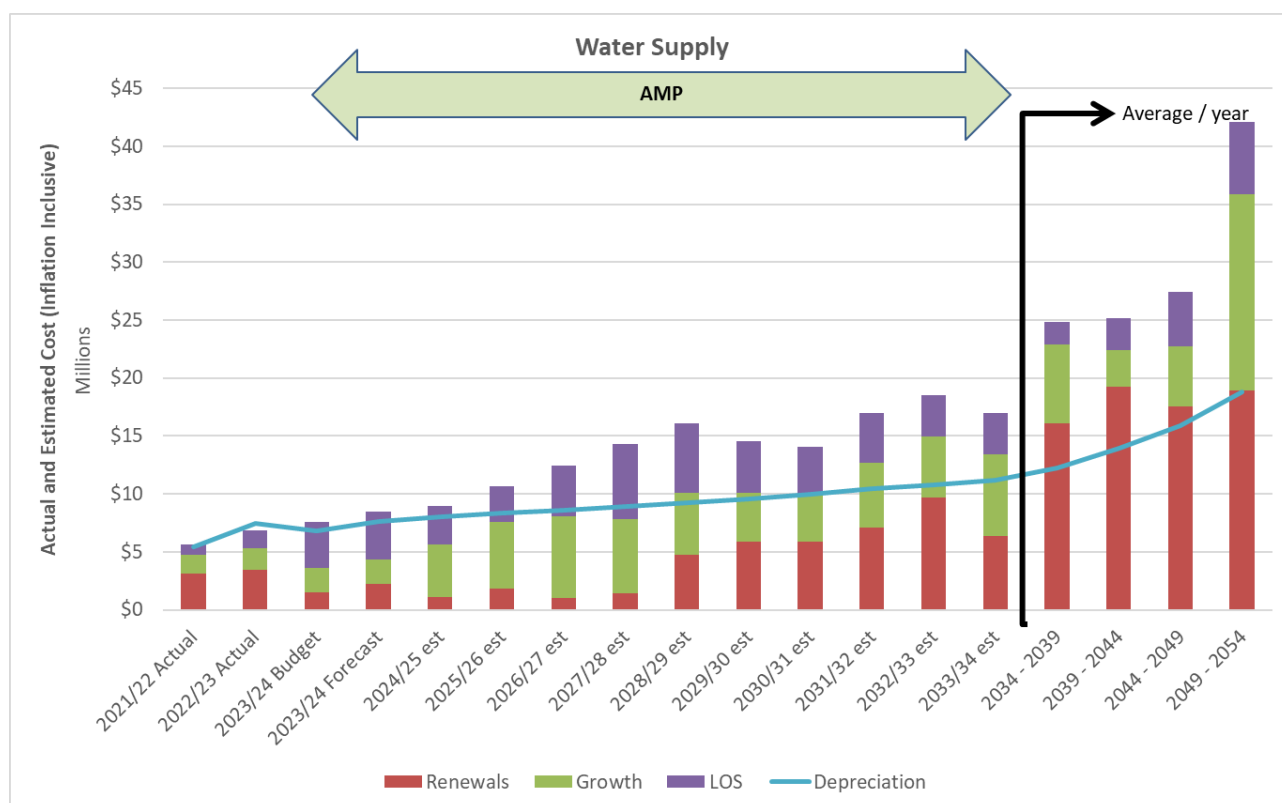


Figure WS3: Water Depreciation compared to Capital Expense

Issue WS3: Water supply assets are starting to show signs of age, resulting in regular failures. Due to a greater proportion of the network reaching the end of its design life, a significant length of watermain will need to be replaced within the next 30 years. This means a big wave of renewals will potentially be required in approximately 20 years' time.

Council's current renewal program has been impacted by the need to fund the recovery works after the August 2022 storm event. The proposed increased future renewals budgets will be required to allow Council to match the future impacts of the ageing infrastructure.

Desired Benefit/Investment Objective:

- Continue renewal of the network
- Upgrade of the network to meet increasing demand and firefighting requirements in growth, intensification, and industrial areas such as the city centre (enabling intensification including the development of multi-storey buildings)

Table WS3: Principal options for renewal of water supply assets

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Repair or replace broken pipes and introduce new strategic upgrades (including large diameter mains to the main areas of the city centre and future growth areas).	New strategic upgrades support the development of the city centre and the other growth areas.	✓	Up to \$3m per year for the first ten years with \$5M-\$6.5M per year for remainder of the strategy for the repair or renewal of broken pipes due to the need to get ahead of the upcoming wave of required renewals. The renewal budget is approximately \$162M over 30 years. A separate budget of \$38M over 30 years has also been included for future strategic upgrades to the raw water pipeline from the Maitai dam.
Alternative Option 2 Focus on the repair or renewal of broken pipes.	Limits options for growth and development.	✗	\$1.6M-\$2M per year.
Investigation/CAPEX decisions Costs of strategic upgrades.			
Key Assumptions Growth and development in the City Centre will enable the construction of multi-story buildings.			

Issue WS3: Planned levels of service for water supply will not be met unless assets are maintained, renewed, and upgraded.

Desired Benefits/Investment Objectives

- Updated asset ownership information, to reflect the standards in the LDM 2020
- A reticulation, maintenance and operation policy that reduces risks of property damage because of water supply being in poor condition, and from a non-maintained water supply network
- Minimal disruption to business and residential customers from day-to-day network activities
- Network renewal strategy which prioritises assets based on criticality, remaining design life, current condition, and level of service assessments

Table WS4: Principal options for improving the maintenance, renewal and upgrade of water supply assets

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Proactive focus on gaining a better understanding of water supply asset condition and developing a renewal strategy.	Increase the proportion of the network that has been assessed for condition, prioritising critical assets. This information is required to inform a renewal strategy. Condition assessment is generally an operational cost where this applies to regular assessment of critical assets or condition assessment of adjacent pipework at mains failures.	✓	Condition assessment of the water supply network as part of the renewal program, prioritising critical pipes and structures, at a cost of \$500k over 10 years.

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Alternative Option 2 Implement and update existing strategies that provide a consistent basis for prioritising upgrades of the water supply network.	An enhanced evidence base is required for improved prioritisation of water supply projects. This includes an assessment of existing levels of service across the water supply network and assessing the implications of growth areas on potable water demands and raw water sources.	✓	Development of three separate strategies, supported by operations contractors to cover the city in the first 10 years. Implementation will follow each strategy. Water supply strategies have been budgeted for: Total \$700k over 10 years.
Alternative Option 3 Status quo — reactive response to service requests for water supply upgrades.	Upgrades occur in the areas where the most complaints are made, which may not be the areas in most need of improvement.	✗	Piecemeal expenditure does not represent value for money.
Investigation/CAPEX decisions Water renewal and growth strategies are required for the whole city. Pipeline renewal strategies have been completed and treatment plant and headworks strategies are planned. These will assess current renewal provisions and set out appropriate options for each part of network, taking into consideration growth areas identified by council and the impact of growth on the normal renewal cycle.			
Key Assumptions Current levels of service focus on the reliability of the network as measured by pipe failures and the response to issues as measured by contractor response times. There is a focus on maintaining the serviceability of the existing infrastructure and ensuring appropriate water supply options are available across the city. Future demand for water supply services is primarily considered through subdivision consents, normal renewal cycles and city growth planning. Renewal planning aims to match renewals to the rate at which assets reach the end of their service lives and consider the opportunities to increase pipe capacity to allow for growth and changing demands e.g., pressure reduction and fire sprinkler requirements. Council only assumes full responsibility for the public water supply network as defined in the Water Supply Bylaw and the Nelson Tasman Land Development Manual 2020. Private laterals or common private supply mains (typically in private roads or rights of ways) are generally the responsibility of the landowners.			

Water losses from the water supply network

Water loss estimates are based on the difference between the three magnetic flow meters at the Water Treatment Plant and the 20,000 water meters on commercial and residential properties. Currently there is a gap of approximately 20% between the volume of treated water, and the water used.

Some of the reasons for this gap are:

- the need for scouring of cast-iron pipes (which involves flushing water at pressure through the pipes to waste, to address the discoloured water issue)
- contractors' and others' access to unmetered water (currently being addressed through requiring meters and backflow protection)
- water leaks from broken pipes (public and private pipes)
- inaccurate meters (currently being rectified through the meter renewal program and magnetic flow meter testing)

To understand the scale of the leakages on private property, every year \$80k to \$100k worth of water credits are granted to people who have had undetected water leaks on their properties – sometimes for months. This shows a large amount of water is lost from the system through privately owned water supply pipes.

As most of the water leaks are underground, it is difficult to detect these and to quantify the losses. There are also considerable leaks between the Maitai Dam and the Water Treatment Plant.

A significant investment to replace residential meters was completed in 2021-22. This will improve the accuracy of these meters.

The next steps are to:

- complete the checks on the magnetic flow meters at the Water Treatment Plant to ensure they are accurate, and then to check that the 2,000 individual commercial meters are accurate
- fix significant known leaks
- ensure all connections to the public network are metered.

These water losses mean:

- more water is being taken from the Maitai and Roding rivers than is needed to meet the community's needs, resulting in lower river levels and poorer freshwater habitats
- more limitations on how much water can be taken from the Maitai and Roding rivers as the population grows
- water is not being used efficiently, as required by the National Policy Statement for Freshwater Management (NPSFM) objective B3.

Issue WS4: Council is unable to account for approximately 20% of water supplied through the water supply network.

Desired Benefit/Investment Objective:

Ensuring the water take from the rivers is the minimum necessary to meet the reasonable demands of the city.

Table WS5: Principal options for reducing water losses from the water supply network

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Improve the accuracy of the water loss assumptions. Complete checks on the accuracy of the flow meters at the Water Treatment Plant and commercial meters across the city. Carry out an ongoing program of investigating water leaks, and repairing and renewing the public network of water pipes, and residential water meter replacement. This option also involves investigating how much water is actually taken from the network for fire flows, construction uses by contractors, other un-metered connections, plus pipe scouring by Council.	Identifying leaks and unmetered uses will help improve water use reporting. Some income could result from monitoring and charging for contractor usage. Monitoring needs to be ongoing to ensure compliance with backflow and metering requirements, and any drought restrictions.	✓	Ongoing over the next 30 years. Renewal of treated water pipes —\$205M over 30 years. Targeted water loss reduction program — x\$2.1M over 30 years.

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Alternative Option 2 Place a stronger emphasis on community responsibility for leaks in privately owned pipes through a charging regime that requires people to pay for all water taken from the public network.	This approach could incentivize the economical use of water and the fixing of leaks in privately owned water pipes. However, finding and repairing leaks can be costly, and this may create an affordability issue for some customers.	✓	Ongoing over the next 30 years. Charging regime based on recovering network costs.
Investigative work/CAPEX decision The 2024-34 Water Supply AMP includes funding to address this issue and investigations are currently underway to pinpoint priority areas of need.			
Key assumptions <ul style="list-style-type: none"> · The current level of service, which sets a limit of real water losses of less than 25%, will be retained. This measure matches the Non-Financial Performance Measures of the Department of Internal Affairs (DIA) and will be adjusted as required to follow central government requirements. · Demand will increase as population increases. · Current sources of raw water will be subject to resource consent conditions. · Expected demand will be met by current sources out to 2060-2080 if Tasman District Council continues to supply water to south Nelson. · Private landowners and contractors will support an increased focus on the issue and will comply with Council policy. · Council will enforce repairs of private leaks and the contractor use policy. 			

Impacts of Maitai Dam water on the Water Treatment Plant

During storm conditions the usual sources of the water supply (the Roding River and the South Branch of the Maitai River) are often too full of sediment to be used for water supply. In this situation water is taken directly from the Maitai Dam instead. The Water Treatment Plant processes this lower quality water using the ultra-filtration membranes and a coagulant to remove the high levels of organic material from the Dam water. (The organic material needs to be removed to ensure chlorination is successful.)

While adding coagulant into the water enables water treatment membranes to take the organic material out of the water, the additional cleaning of the membranes can reduce their service life.

One option Council is considering is having a primary clarifier between the dam and the treatment plant. This would be like constructing a swimming pool or reservoir, with the coagulant added there, creating a sludge before the water is filtered through the membranes. This would give the city a 'belts and braces' method of organic removal that would extend the life of the membranes and last well into the future. However, it would cost about \$20 million to set up.

A consultants' recommendation was to rely on working the Water Treatment Plant membranes harder and accept a reduced membrane life

Council considers full reliance on the membranes to be a less resilient approach. Council would need to keep a spare set of membranes available to swap out before anything

went wrong. As demand for water increases in the future this option could also require expenditure of \$10M - \$15M to reconfigure the Water Treatment Plant, to increase the number of 'trains' of membranes from five to eight sets.

Now there is no driver for either option. A decision on these options will not be required until (or if) Council needs to rely more heavily on Dam water as the primary source of the municipal water supply or environmental conditions change and require the use of more marginal water from the rivers.

In 2019 a freshwater diatom *Lindavia intermedia* was discovered in the Maitai Dam reservoir. This diatom has been known to cause 'Lake Snow' to develop in other freshwater lakes in New Zealand, particularly in Central Otago. 'Lakesnow' is described as a "suspended mucilaginous microaggregate" that can cause biofouling in the water treatment plant membranes leading to more frequent cleaning cycles and subsequent wear on the membranes. Further investigations are currently underway as to how we can identify the trigger(s) that might lead to the formation of 'Lake Snow' and how the city water supply might be protected from its impact.

Issue WS5: Using water from the Maitai Dam increases impacts on the Water Treatment Plant processing system.

Desired Benefits/Investment Objectives:

Ensure the Water Treatment Plant can meet the demand for water to the required level of service (LOS) in the most cost-effective manner, irrespective of raw water source
Maintain agreed LOS for customers while recognising that climate change may enhance the need for trade-offs between affordability and levels of service.

Table WS6: Principal options for processing Maitai Dam water at the Water Treatment Plant

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Invest in a primary clarifier above the Water Treatment Plant.	A primary clarifier will require changes to the layout of the site. Additional sludge will be produced that will require extra settlement lagoons or a lamellar thickener. This option could potentially extend the lives of the treatment plant membranes by 3–5 years.	✓	A primary clarifier would cost \$20M–\$25M.
Alternative Option 2 Install more membranes at the Water Treatment Plant.	Regular replacement of membranes will lead to replacement before the end of their service lives and some economic inefficiency.	✓	\$10M - \$15M for reconfiguration of the Water Treatment Plant. More regular replacement of membranes is estimated to cost \$7.5M - \$10M every 6–8 years.
Investigative work/CAPEX decision Detailed investigation of options and cost benefit analysis will be the first stage of the project. It is possible that the preferred option may change as a result.			
Key assumptions · The current levels of service require compliance with drinking water standards and resource consent conditions.			

- Current sources of raw water (with the Waimea Community Dam) are expected to meet demand out to 2070–2080.
- Climate change will occur at a gradual rate and allow time for the community to adapt to longer drought periods.
- Nationwide freshwater policy will not result in significant changes to water supply resource consent conditions.

Note: A decision on these options will not be required until (or if) Council needs to rely more heavily on Dam water or marginal quality river water as the primary source of the municipal water supply.

Discoloured drinking water

Some of the water supply network consists of cast iron pipes. These cast iron pipes are lasting well on the outside, but the insides of these pipes are accumulating a layer of iron and manganese. They also accumulate tubercles (lumps). If these lumps break off it causes discolouration of the water. Scouring is used to remove these deposits and potentially some of the lumps. The risk of breaking the tubercles and allowing the discolouration to spread into the network needs to be carefully managed.

While there is no specific level of service in the Water Supply Activity Management Plan regarding water colour, it does cause customer dissatisfaction with the water supply service.

Issue WS6: Deposits in the cast-iron pipes are discolouring the water supply received by some customers.

Desired Benefit/Investment Objective:

Meet reasonable requirements for water clarity and reduce customer dissatisfaction.

Table WS7: Principal options to resolve discoloration of the water supply

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Renewal of cast-iron pipes in problem areas with the modern equivalent earlier than the renewal plan indicates.	Most of the cast-iron pipes which have been tested have been found to be in good structural condition. It is increasingly expensive to replace pipes by trenching. This option will be desirable where the network must be upsized for growth. Investing in this option could mean Council has to delay renewal of other lower priority (asbestos cement, pvc, steel) pipes.	✓	Renewal (replacement) of 48 km of cast-iron pipes would cost \$70–\$90M over 10 years. Likely to begin after 2028.
Preferred Option 2 Reline the cast-iron pipes in problem areas depending upon accreditation of products which are suitable for pipes carrying potable water.	Regular replacement of membranes will lead to replacement before the end of their service lives and some economic inefficiency.	✓	Relining of cast-iron type pipes could cost approximately \$20–\$30M over 10 years. Would begin after 2028.
Investigative work/CAPEX decision Options for re-lining need to be investigated and proven for potable water. The focus would be the removal of iron and manganese oxides from the inside of the pipes and the sealing of the wall to prevent regrowth of tubercles (if possible).			

Key assumptions

- The current levels of service require monitoring of complaints about water clarity and compliance with the Water Services (Drinking-water Standards for New Zealand) Regulations 2022.
- Asbestos Cement (black bitumen coated) water mains involve more risk, and their renewal is more critical over the next eight years.
- Suitable products for relining of potable water supply pipes are available in New Zealand but uncertainty remains regarding their performance and success on a large scale.

Infrastructure Objective 3: Provide infrastructure to enable growth and development

The pipe network around the city centre has a mix of smaller pipes, which were designed to serve a smaller city. Now there is a need for larger trunk mains (250mm to 300mm) in the central city and in some other areas. This will support the higher flow capacity required to allow for growth and intensification, including meeting the sprinkler firefighting requirements of buildings with multi-storeys and pressure reduction initiatives.

Providing adequate water supply in greenfield growth areas (such as Saxton and Mahitahi/Bayview) is partly funded through development contributions for the growth component of any upgrading works. However, the funding of adequate water supplies for brownfield redevelopment and randomly distributed intensification is more complex.

The proposed approach of upgrading some pipework around key roads such as the existing ring road of Collingwood, Halifax, Rutherford, and Selwyn Place to match the normal renewal program or growth projections can be extended to other development areas. The details of any necessary upgrading can be considered as the timing and nature of any proposed growth developments are confirmed and when pipes are scheduled for renewal, which is likely to be in the first 10 years of this strategy.

A provisional budget of approximately \$45M has been included in the water supply cost estimates for renewals and upgrade proposals for growth areas.

Providing sufficient capacity for the next 100 years is the most cost-effective approach because this time closely matches the expected service life of trunk mains, and the material cost of upsizing pipes is only approximately 10% of the cost of digging up the roads to replace the water mains.

Infrastructure Objective 4: Maintain or improve public health and safety, and environmental outcomes

Usually, water for Nelson's water supply is taken directly from the 'run of the river', from the Roding River and the South Branch of the Maitai River. To compensate for this loss of water (particularly during times of low flow), water is released from the Maitai Dam to the Maitai River, to increase river flows to at least the level required by Council's resource consent.

The Maitai reservoir retains higher levels of organic material than run of river flows, and there are some slightly elevated levels of minerals because of the proximity to the Nelson Mineral Belt. However, the greatest impact on water quality come from the tendency of

the Maitai Dam to stratify, resulting in anoxic (oxygen-depleted) conditions at the base of the Dam. This variable water quality at different times of the year occurs in most large dams.

The lack of oxygen in the colder water (in the lower levels of the Dam) creates a challenging environment for freshwater aquatic life. In addition, elevated levels of iron and manganese occur in the water as these chemicals become soluble.

Discharging this water to the river can lead to a poor-quality environment until the water becomes oxygenated. In recent years Council has only discharged this water during storm events, when the impact is greatly reduced.

However, as the frequency and intensity of droughts are predicted to increase over the next 30 years because of climate change, it is likely Council will be more reliant on the release of Dam water to maintain flow levels, rather than only doing so during storms. This increases the need to address water quality in the Maitai Dam.

In addition, the desire for improved water quality and quantity in the Maitai River may drive increased use of the Maitai Dam water for the water supply. The new water supply resource consent gained in 2019 has increased the minimum flow from 175 litres per second to 230 litres per second (as the Dam gets emptier during dry periods this minimum flow reduces).

Currently, one cubic metre of water is added to the river (from the Dam) for every one cubic metre taken from the run of the river.

Under the new approach (a higher minimum flow) the drain on the Dam is significantly quicker due to the combined effect of augmenting the river flow and using water from the Maitai Dam for the water supply more frequently.

Ongoing trade-offs are likely between the need to keep the Dam full at the beginning of summer to maintain resilience to droughts and the need to enhance the Maitai River's environmental values.

Legislation changes regarding community water supplies to protect public health

At this stage it is not known whether legislative changes will require Council to take on responsibility for private community supplies serving small numbers of people (which would affect both the Glenwood and Maitai Valley supplies). More is expected to be known once the final shape of central governments water reforms is known. Both supplies are well away from the public supplies, so if this change does occur, it would likely be a matter of arranging for professional management of these water supplies rather than connecting these households to the municipal supply.

If legislation confirms Council must take on the responsibility, there would need to be a decision on who would pay for this change — the water users of these supplies, or the community:

- Council takes over these community supplies (and users pay)
- Council takes over these community supplies (management funded by all ratepayers)
- Council doesn't take over these community supplies

Other environmental actions

Other sustainable development improvement actions identified in the Water Supply Activity Management Plan 2024–34 are to develop demand management options, include: monitoring use of improved plumbing and appliance technology, reduced supply pressures in the public network to reduce losses, more structured water restrictions to match supply to available water resources, and possible Council support for on-site greywater and rainwater storage for reuse through future Resource Management Plans and pricing incentives.

Wastewater

Asset description

The inventory of public wastewater services assets owned by Nelson City Council and managed by the Infrastructure Group is shown in Table WW1.

Table WW1: Public Wastewater services assets owned by Nelson City Council

Asset	Quantity	
	km	units
Reticulation Pipes	341.6	
Trunk Mains	36.2	
Swallow Mains	5.8	
Rising Mains	25.9	
Access Points		1,053
Manholes		7,096
Tanks		7
Valves		293
Neale Park Detention Tank		1
Pump Stations		28
Nelson Wastewater Treatment Plant		1

Infrastructure Objective 1: Increase resilience to natural hazards and climate change

Note on Nelson Wastewater Treatment Plant

As outlined in Part One of this strategy, Council is also a joint owner in the Nelson Regional Sewerage Business Unit (NRSBU) which manages the Bell Island Wastewater Treatment Plant. The other joint owner is Tasman District Council. The two councils are the major customers of the scheme together with several primary industry processors (Alliance Nelson and Nelson Pine Industries) which have a significant demand for wastewater processing.

Increase resilience to natural hazards

Council's wastewater network covers a wide geographical area which has a range of natural hazards including liquefiable soils, slope instability, coastal hazards (including sea level rise), fault lines and flood hazard areas. The levels of risk associated with these hazards vary, as do the return periods associated with them. In addition, the level of knowledge varies between hazards.

The wastewater network for a city the size of Nelson contains the full range of assets required to effectively convey and treat the city's wastewater. These range from small diameter gravity pipes to large diameter pumped pipes, simple pipe connections, highly complex pump stations and a treatment plant.

The failure of some assets carries a significantly greater level of consequence than others. For example, a catastrophic failure of the Nelson Wastewater Treatment Plant would be of far greater consequence than the failure of a single property's connection to the wastewater network.

Work has been undertaken to map hazards, incorporating current climate change projections, and determine asset criticality. This enables identification and prioritisation (for risk mitigation/ upgrade work) of assets that have a high consequence of failure in relation to risk of failure from natural hazard events. This work was carried out in conjunction with the water and stormwater activities.

Adapting to climate change - the Nelson Wastewater Treatment Plant & resource consent

The Nelson Wastewater Treatment Plant (NWWTP) is located at Wakapuaka. Its low lying, coastal location means it is particularly exposed to the effects of climate change, including flooding, sea level rise and storm surges. This is significant because the NWWTP treats half of Nelson's wastewater, at around 7 million litres of wastewater on a dry summer's day. The remainder of Nelson's wastewater goes to the Bell Island Wastewater Treatment Plant in the Tasman district, operated by Nelson Regional Sewerage Business Unit.

The NWWTP is not currently exposed to a 1 in 100-year (1% AEP) flood event from either storm rainfall or tidal inundation. Council updated a catchment flood model in 2021 to evaluate storm rainfall impacts on the NWWTP, covering Hillwood Stream, Todd Valley Stream, and the Wakapuaka Flats drainage area. The model shows the NWWTP will not

be inundated, but will be surrounded, by flood water in a present day 1% AEP flood event.

Storm rainfall currently generates the highest flood levels across the Wakapuaka Flats. It is expected that in future, due to sea level rise and increased number and intensity of storms, coastal flooding will become the dominant source of flooding. Further assessment of coastal inundation levels is required which will involve modelling of overtopping volumes into the Wakapuaka Flats during storm surge events for future sea levels.

Resource consents granted in 2004 permit the use and operation of the NWWTP and the discharge of treated wastewater to the coastal marine area via an ocean outfall. These consents expire in December 2024 and preparations for renewing this resource consent began in 2019. A new consent application was lodged in December 2023 and Council will continue to support the consent process until a new consent is obtained. The proposal is to ensure that the existing plant continues to operate in its existing location until its long term future is decided.

As part of the consent application process for the NWWTP, funding has been allocated to undertake studies/investigations relating to:

- natural hazards and the impacts of climate change
- cultural views related to discharges of treated wastewater
- viability of other discharge options
- alternative treatment processes.

In addition to the investigations to inform the resource consent application, Council has begun to consider the long-term strategic viability of the current location.

Council also needs to consider it's small rating base, as this limits the community's ability to pay for the types of sophisticated technology used in larger centres, and the significant costs associated with changes in location or process/discharge type; additionally this consideration is an important factor in seeking maximum consent durations.

Issue WW1: The impact of climate change and vulnerability to other natural hazard events (as well as new requirements for wastewater discharges and greenhouse gas emissions) on:

- The long-term viability of the NWWTP's current location and treatment processes/disposal routes
- The resilience of the wider network.

Desired Benefits/Investment Objectives:

As a critical asset with significant capital investment, Council wishes to ensure the NWWTP continues to operate (with improvements to treatment processes as required) effectively in this location for as long as practicable, whilst planning for a future, possibly in a different location, with potentially different treatment/disposal processes.

Gain resource consent (prior to the expiry of the existing consent) for the continued operation of the NWWTP in its current location, recognising it could take 20 plus years to relocate the wastewater treatment after a decision is made.

Certainty on the location of the NWWTP to enable the renewal of the Atawhai rising main, as this large diameter (approximately 1m) pipe needs replacement.

Ensure that the NWWTP is operating as efficiently as possible and is operating to minimise the production of greenhouse gases.

Ensure the network is as resilient as realistically possible and undertake project work to ensure resilience is improved.

Table WW2: Principal options for managing natural hazard risk in the Wastewater Activity

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
<p>Preferred Option 1</p> <p>Continue to refine the Natural Hazard data in line with the latest available information. Use this data to inform programs of work and key projects with a view to mitigating risk and increasing network resilience.</p> <p>Investigate long term options for managing natural hazard risks affecting the NWWTP in its current location.</p> <p>Investigate alternative NWWTP locations or treatment options including:</p> <ul style="list-style-type: none"> · retreat further inland · dispose wastewater to land · treat all wastewater at Bell Island through the NRSBU. 	<p>Some geographical areas are more prone to natural hazards. In addition, some of the wastewater network has a higher consequence of failure. Combining these two factors establishes parts of the network that need to have a higher priority. This work increases our understanding of the natural hazards that impact on the NWWTP.</p> <p>The cost of any actions required in response to this investigation at the NWWTP are not yet known, but could be considerable, particularly if relocation is the most cost-effective option in the long term.</p> <p>Iwi partners perspectives and upcoming regulatory changes (related to greenhouse gas emissions and wastewater treatment plant discharge quality) will be an important factor in decision making relating to the future of the plant.</p>	✓	<p>As the city's wastewater network develops and evolves, and our awareness of risk levels associated with different natural hazards changes, there will be a need to review the strategy and program of works. This work will be ongoing.</p> <p>The processes related to a potential relocation of the NWWTP are likely to take between 10 and 20 years. . This is a significant piece of work and is expected to cost from \$100,000 to \$200,000 per annum over the 2024/5–2027/8 period.</p> <p>The resource consent for the NWWTP expires 1 Dec 2024. Preparation for the NWWTP replacement consents began in 2019/20. A new consent application was lodged in December 2023</p>
<p>Investigative work required/CAPEX decision</p> <p>Investigation work is required as part of the consenting process.</p> <p>Capex decisions are expected after the consenting process is complete in 2024/25. The consent application was lodged in December 2023 but the outcome of the application will not be known for some time after this. Timing depends on hearings and Environment Court proceedings.</p>			
<p>Key assumptions</p> <p>The existing treatment plant will have treatment capacity for dry weather flows out to at least 2050–2060. Replacement resource consents will be granted for the operation of the plant out to 2040– 2060.</p> <p>The impacts of climate change will be monitored, and planning timeframes adjusted to respond to the latest information on sea level rise.</p> <p>Existing information held about fault hazard areas of land instability are reliable, although it is expected that Council may identify additional areas which are subject to natural hazard risk.</p> <p>Renewal and upgrade of assets will be designed to minimise vulnerability to known natural hazards.</p> <p>The NWWTP will remain in its current location or within the Nelson North area for the medium to long term.</p>			

Other actions

Council has commissioned consultants to carry out an assessment of natural hazard risks for all three waters (water supply, wastewater, and stormwater). This investigation has identified opportunities to improve the resilience of critical assets within the wastewater network.

Infrastructure Objective 2: Maintain, renew, and upgrade existing assets in a cost-effective way

Asset condition/data confidence

Work is constantly being carried out to improve Council's understanding of the wastewater network. Recent changes include the use of new technology to improve real time understanding of how the network is operating. Related work is underway to improve Council's data management, visibility, and storage systems.

More remote monitoring technology is now available, allowing for more reliable and consistent monitoring of the wastewater network than has been the case historically. The availability of more information (also to be included in the hydraulic model and to monitor network performance) will provide Council with an increasingly full picture of how the whole network is operating.

Renewal of the wastewater network and theoretical renewal dates

Wastewater assets are renewed when they fail to provide the required level of service, or where performance or reliability is compromised due to age and poor condition.

Wastewater assets are a mixture of relatively new facilities/pipes through to pipes that are well past their theoretical design life, with an increase in renewals (based on design life) anticipated from 2030 onwards. When this increase occurs it is substantial; an increase from an average of about one million dollars per annum at present, to up to in excess of \$10 million per annum in the 2030s. There is also significant annual variation if following a "renew on expiry of life" philosophy. To manage this, the strategic approach will be to increase renewals to a relatively consistent and sustainable level over the next decade that will be maintained through the coming renewals "surge" (see Figure WW1).

Council has developed a wastewater pipe renewal approach that considers the following factors:

- asset criticality
- age
- condition
- material
- the ability to combine with other infrastructure work.

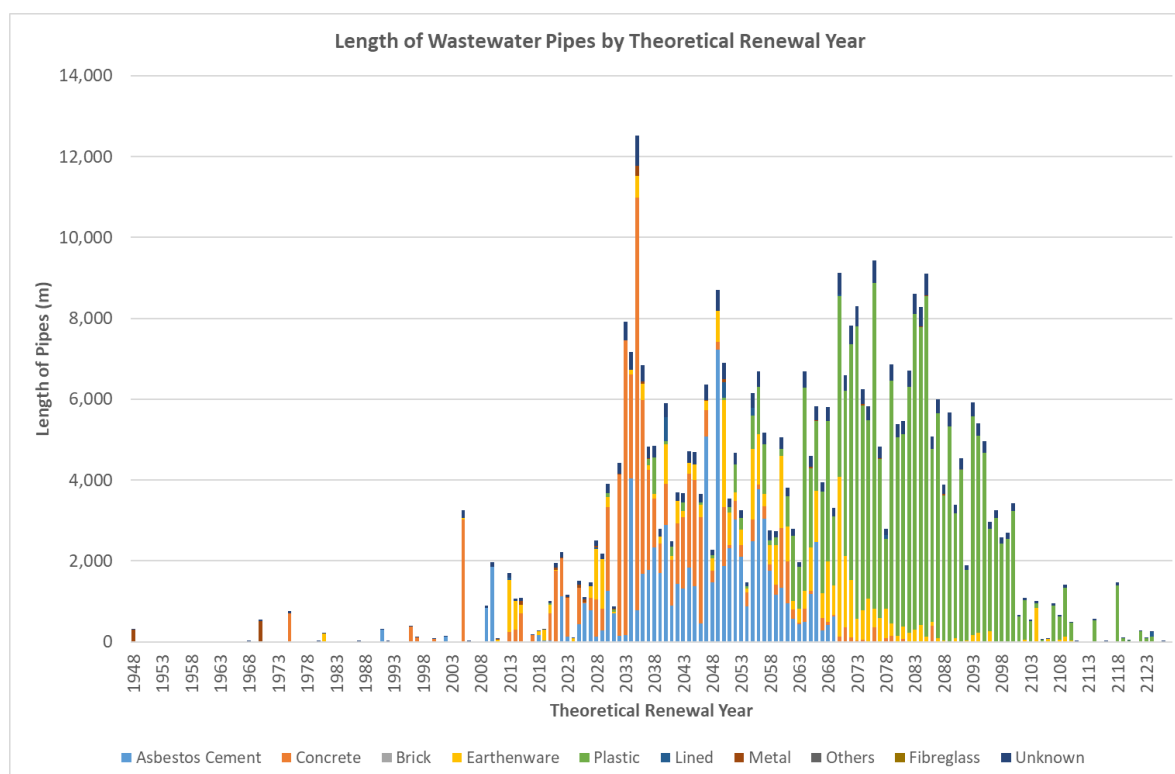


Figure WW1: Theoretical Wastewater Pipe Renewal Dates

The theoretical renewal dates in Figure WW1 are based on industry standards of expected lives of assets.

The current renewal approach is based on improving Council’s knowledge of the actual service lives of the network components through CCTV records, fault analysis, use of the hydraulic models, data analysis, establishing criticality and the Wastewater Overflow Reduction project.

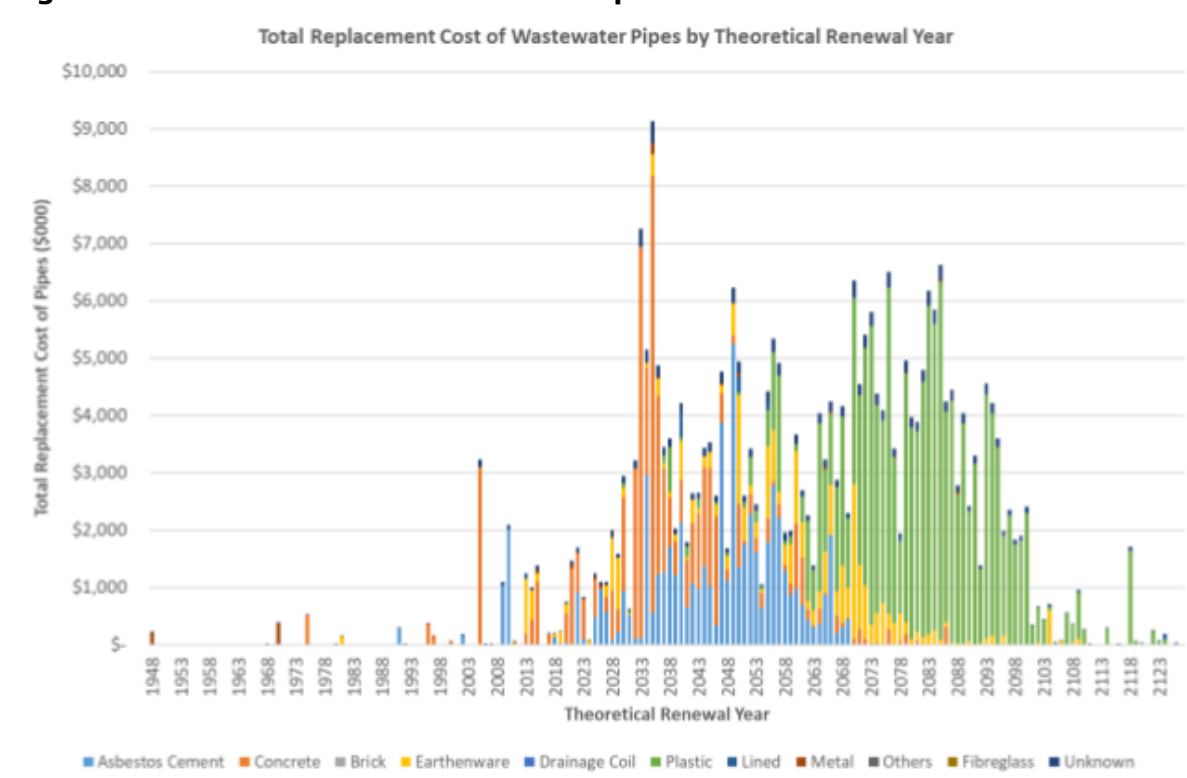
Council will use a variety of techniques for replacement of pipework ranging from traditional “dig and lay” techniques through to more innovative trenchless technologies, where appropriate.

Additionally, Council, in some situations, is rehabilitating existing pipework by installing PVC ‘sleeves’ (also commonly called relining). While this technique is quick and cost-effective and allows existing pipes to remain in place, it will not be suitable for all pipes and does not give the same asset life as a full replacement. Risks remain as the long-term outcomes of using this technique are not fully understood. When compared against the conventional approach of installing new pipes, the weaknesses (in addition to a shorter asset life) are that the sleeve is not able to bridge sections that have broken or been dislocated, and the sleeve reduces the capacity of the existing pipe.

The physical renewal work on the Atawhai Rising Main is expected to commence in 2026-27 and to extend into the early 2030s. An important consideration in relation to the Atawhai Rising Main is the future location of the NWWTP. At this stage it is assumed that the

NWWTP will remain in its current location or within the Nelson North area for the medium to long term.

Figure WW2: Theoretical Wastewater Pipe Renewal Year and Cost



Issue WW2: Planned levels of service for wastewater will not be met unless assets are maintained, renewed, and upgraded.

Desired Benefits/Investment Objectives

- Appropriate capacity in the network
- Pre-empt high levels of reactive maintenance with timely asset renewals.
- Solutions to network issues that decrease wastewater overflows
- Ability to cater for growth and intensification within the city
- Prioritised spend of budget with a focus on critical assets and considering remaining design life, current condition, and level of service assessments
- Council not being in a position of managing assets that are high risk because they have exceeded their design life and managing the consequences of failure (e.g. Wellington City)
- Use of network modelling and other data to inform good asset renewal decision making.

Table WW3: Principal options for improving the maintenance, renewal

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Proactive focus on gaining a better understanding of wastewater asset condition and on investing in data storage and management systems to support the renewal approach.	Increase the proportion of the network that has been assessed for condition, prioritising critical assets. This information is required to inform a renewal program. Condition assessment is generally an operational cost where this applies to regular assessment of critical assets.	x ✓	Investment in condition assessment of the wastewater network, prioritising critical pipes and assets. Investment in data management and storage systems required.
Preferred Option 2 Align wastewater asset renewals with growth and Level of Service upgrades to maximise economic benefit to ratepayers.	Growth and Level of Service upgrades often occur out of sync with the need to replace an asset. It is important to bear in mind the future potential for an upgrade when undertaking a renewal and vice versa. Additional lateral thought is required where relatively new assets are needing to be upgraded to ensure that maximum benefit is obtained from these assets.	✓	Ongoing. Low-cost work requires adequate staffing levels as requires iterative communication.
Alternative Option 3 Status quo — reactive response to service requests for wastewater improvements and like for like replacements.	Upgrades occur in the areas where the most complaints are made, which may not be the areas in most need of improvement.	x	Piecemeal expenditure does not represent value for money, nor does it target critical or poor condition assets.
Investigative work required/CAPEX decision <ul style="list-style-type: none"> · The condition assessments program needs to be enhanced to consider advances in technology that are occurring. Additionally, more work needs to be done on prioritising condition assessments to better target key/critical infrastructure given technological advances. · Structural condition assessments need to be undertaken on some key structures and an ongoing program and an ongoing program of condition assessment established. · Pressure pipe condition needs to be ascertained and an ongoing program of condition assessment established. 			
Key assumptions <ul style="list-style-type: none"> · A philosophy of smoothing out the renewal's "surge" will be employed. This will involve early replacement for some assets and later replacement for others · An increased spend on renewals will be feasible and these will not be cut to make up deficits elsewhere. · Investing in better condition assessments and data gathering will be key to making good decisions related to asset renewal. · Recruitment and retention of appropriately trained and experienced staff will be supported. · Use of modern technology to capture, store and manage large quantities of asset data will be supported and upgrade of wastewater assets. 			

Wastewater overflow reduction

Stormwater/wastewater issues

If households' stormwater pipes are connected to the Council's wastewater network not the stormwater network, rainwater from roofs and driveways flows into the wastewater system. These above-ground effects are called inflow.

Stormwater and natural sources of groundwater also enter the wastewater system if underground stormwater and wastewater pipes are broken. These underground effects are called infiltration.

This is a significant issue because inflow and infiltration can lead to wet weather wastewater flows which are several times greater than the flows the network was designed for. The increased flows into wastewater pipes put pressure on the capacity of the wastewater network as a whole and can result in wastewater overflows during wet weather in combination with other factors (such as dryness of soil, existing network blockages and debris levels within the network etc.).

Climate change and environmental standards

The height of the tide also influences groundwater levels, and therefore the amount of groundwater infiltration into the wastewater system. For example, daily flows of wastewater to the NWWTP increase by approximately 1,000 m³/day with a 4.4m tide compared to a 3.4m tide.

If infiltration is not addressed as an ongoing “business as usual” basis, wastewater overflows will become an even bigger problem in future, because of the predicted increase in sea level in combination with the increased frequency and intensity of future rainfall events. That means wastewater contamination of land or water would have ongoing impacts on cultural wellbeing, public health, and the environment, and make it difficult to achieve the outcomes required by the National Policy Statement for Freshwater Management (NPS-FM).

Council currently has a level of service regarding compliance with resource consents with respect to wastewater overflows. Council’s wastewater resource consent requires no dry weather overflows from pump stations by 2023 and a maximum of five wet weather overflows from pump stations per 12 months by 2032. The future reforms by central government are expected to set more challenging targets.

Levels of service are likely to increase because of changes to the National policy statement for freshwater management, the expected new National Environmental Standard for Wastewater Discharges and Overflows, and the probable new obligation on wastewater network operators to prepare a risk management plan, and/or to report annually on environmental performance measures. Further expenditure will be needed to meet the new requirements.

The ongoing updating and calibration/verification of the Council’s two hydraulic models is key to understanding network performance and where constraints exist and therefore to investing appropriately to reduce wastewater overflows.

Misconnections and broken pipes on private property are not always easy to resolve either through education or regulation. They tend to be extremely demanding on staff time and can become extremely challenging.

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).

Developing a holistic strategy and using the hydraulic model to predict where there is a higher likelihood of overflows is a key part of any solution to limiting wastewater overflows. It is probable that a solution will include upgrades to the system downstream (to carry flow away from areas prone to overflows) and/or provide storage to minimise overflows and/or include measures to reduce inflow and infiltration at source.

Issue WW3: Inflow and infiltration causes overflows from the wastewater network.

Desired Benefits/Investment Objectives:

Compliance with resource consents and legislative requirements.

Increased public knowledge of inflow and infiltration issues to decrease the incidence of cross connections, and an increased understanding of affordability.

Minimisation of risk to cultural wellbeing, public health, and environmental impacts due to overflows from the wastewater network.

Table WW4: Principal options to reduce overflows from the wastewater network

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
<p>Preferred Option 1</p> <p>Continue to progress with addressing I&I in priority catchments.</p> <p>Maintain the wastewater hydraulic models to current standards and use them to assist in confirming poorly performing catchments, allowing investigation work to be focused. Part of the solution is likely to be system improvements (such as pipe renewal/ upsizing, pump station upgrades and storage tanks) in locations at risk of overflow.</p> <p>Continue site investigations into high E. coli levels in receiving environments and undertake mitigation work as needed.</p> <p>Continue working with private property owners to limit I&I from this source. Grow NCC capability in this area (that requires strong non-infrastructure skill sets).</p>	<p>This is an important piece of work for the city, and it is expected that over time increased staff resources will be required to make a significant difference to the I&I issue,</p> <p>Detention tanks or network upgrades are 'end of pipe' solutions and do not treat the source of the problem. Instead, they work to remedy the consequences, but they are still an important part of the solution.</p>	✓	<p>Timing</p> <p>This is an ongoing piece of work that will never fully conclude. The strategy and program will need reviewing periodically and the hydraulic models will need to be maintained and upgraded on an ongoing basis (as will other tools and equipment).</p> <p>Costs</p> <p>Ongoing, consistent operational and corresponding capital budgets will be required.</p>
<p>Alternative Option 2</p> <p>Rely on pipeline renewal to reduce infiltration.</p>	<p>Wet weather overflows will not decrease at a significant rate into the foreseeable future.</p> <p>This is not a particularly strategic approach.</p> <p>This approach would be more effective if combined with financial and practical support to make changes on private property, and if used as part of a wider, comprehensive approach to tackling the issues of inflow & infiltration and wastewater overflows.</p>	<p>✗</p> <p>(On own)</p>	<p>Ongoing as the network ages and deteriorates.</p> <p>Significant costs. Actual quantum dictated by the timeframes over which the work is completed (noting that longer timeframes will likely mean overflow reduction will occur at a slower rate).</p>

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Alternative Option 3 Undertake a public education campaign to encourage appropriate disposal of stormwater.	Uncertainty regarding how much investment property owners would be willing to make in resolving cross connections and broken pipes on a voluntary basis. This approach would be partially effective if combined with financial and practical support to make changes on private property and if used as part of a wider, comprehensive approach to tackling the issues of inflow & infiltration and wastewater overflows.	✕ (On own)	This would need to be an ongoing program for a considerable time to ensure the messaging reached people and became a societal norm.
Alternative Option 4 Increase resources for investigating discharge of stormwater (by inflow and/or infiltration) to wastewater pipes on private properties, to avoid inflow of rainwater to the wastewater system.	Significant issues on private properties would require landowner support and possible funding to resolve. This approach would be more effective if combined with financial and practical support to make changes on private property and if used as part of a wider comprehensive approach to tackling the issues of inflow & infiltration and wastewater overflows.	✕ (On own)	The costs of fixing private stormwater/wastewater cross-connections have not yet been assessed. This is likely to be a slow process as it would involve dealing with landowners on an individual basis over several decades. It is also likely to require a significant level of staffing to ensure it is successful.
Investigative work required/CAPEX decision <ul style="list-style-type: none"> Investigations into which catchments require priority attention will continue being refined as data improves and regulatory standards are clarified. Additional resourcing to deal with private property inflow and infiltration is required. 			
Key assumptions <ul style="list-style-type: none"> Council will increase LOS to improve environmental outcomes in line with regulatory requirements. The community is generally in support of resolving the wastewater overflows issue but may be less supportive of remediating private property issues. Growth may be constrained where wet weather capacity is insufficient or requires alternative solutions to be developed. 			

Discharges to Nelson Haven from the Atawhai Rising Main

There is a large pipeline (approximately 1m in diameter) between Nelson and the NWWTP, which is located along Atawhai Drive. This rising main suffered significant damage from acid attack (from the gases emanating from the sewage being carried in the pipe) after approximately 30 years of service, and extensive repairs were carried out in the 1990s. However, further failures have since occurred, leading to low volumes of untreated wastewater discharging directly into Nelson Haven.

These 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.

It is assumed that the NWWTP will remain in its current location or within the Nelson North area for the medium to long term.

Issue WW4: Failures of the Atawhai Rising Main are occasionally causing untreated wastewater discharges directly into Nelson Haven.

Desired Benefit/Investment Objective:

Avoid wastewater discharges to Nelson Haven due to asset failures.

Table WW5: Principal options to address discharges to Nelson Haven due to asset failures

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Renewal of the Atawhai Rising Main pipeline.	Renewal of key lifeline asset is underway.	✓	The renewal of the pipeline is estimated to cost approximately \$53M.
Investigative work required/CAPEX decision			
<ul style="list-style-type: none"> Investigation of renewal options, including a duplicate pipeline which is located to minimise impacts of climate change, or relining/sleeving the existing pipeline. 			
Key assumptions			
<ul style="list-style-type: none"> The existing rising main is expected to have capacity for dry weather flows out to 2050–2060. Access for repairs and maintenance alongside the state highway will continue to be available although will be increasingly more difficult and costly. Periodic failures are expected to occur. Good contingency planning is required to manage these events. The NWWTP will remain in its current location or within the Nelson North area for the medium to long term. 			

Infrastructure Objective 3: Provide infrastructure to enable growth and development

Council is progressing implementation of the Future Development Strategy (FDS) which was adopted in August 2022. The FDS identifies intensification as a significant means to achieve its growth and development objectives. Wastewater services will be required to be responsive to new urban expansion and intensification areas.

Reducing inflow and infiltration and freeing up network capacity is supportive of growth and development (see Issue WW2). There are also some opportunities to increase the current pipe diameters when the network is renewed, the use of an up- to-date hydraulic model is critical to support these decisions.

Issue WW5: Nelson’s wastewater network has capacity constraints that impact on the city’s ability to accommodate growth and intensification.

Desired Benefit/Investment Objective:

Accommodate growth and intensification.

Table WW6: Principal options to accommodate growth and intensification acknowledging existing network constraints

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Preferred Option 1 Upgrades to the wastewater network occur in time to convey additional wastewater flows generated by development	This focuses on ensuring the network has adequate capacity to convey flows. The required network upgrades can occur ahead of growth/ intensification (lead) or can be undertaken in parallel (lag). The decision about whether upgrades would be lead or lag will depend on a number of factors including: <ul style="list-style-type: none"> · confidence in development availability of capital budget · severity of existing network constraints · need for pipe renewals in the relevant part of the network. 	× ✓	Timing will be led by the FDS/actual development. Costs will be dependent on several factors including length of network to be upgraded, depth of pipe and size of upgrade.
Alternative Option 2 Use on-site storage to detain flows to prevent overflows within the network.	This would involve providing storage either at an individual property or at development level to retain all wastewater flows (from the development) during a rainfall event. The downstream network would still need to be upgraded at some point in the future. This option could be implemented with the development and more quickly than most network upgrades.	✓ (future)	Timing will be led by the FDS/actual development. The long-term cost of this option is expected to be greater than focusing on network upgrades (as there will be storage installed and over time network upgrades will take place as well).
Investigative work required/CAPEX decision Use the wastewater hydraulic model to understand likely constraints within the network. Investigate potential options to deal with constraints within the network.			
Key assumptions <ul style="list-style-type: none"> · Development areas as identified in the FDS and IAP will be consistent and changes will not be too significant (i.e. number of properties may increase/decrease but the locations are consistent). · Funding is available and flexible to accommodate the relatively reactive nature of development responsive projects. 			

Infrastructure Objective 4: Maintain or improve public health and safety, and environmental outcomes

Everyday operations and long-term asset planning is focused on improving public health and safety, and environmental outcomes as a norm. Continual improvement in operational process, long-term planning and staff development is a norm. The Council has a dedicated team of staff, consultants and contractors who strive to excel in this area.

As noted previously, more work will be carried out to limit wastewater overflows. This work will have positive impacts on cultural wellbeing, public health and safety and environmental outcomes.

Additionally work related to Issue WW1 (and generally across the Wastewater Activity) will have a significant focus on carbon neutrality and the Zero Carbon Bill requirements.

Over time changes in legislation prompted by societal needs and expectations will lead to further improvements in this area.



Nelson Wastewater Treatment Plant

Stormwater

Stormwater: Asset description

Council's stormwater system consists of naturally formed channels, open drains, a piped network and secondary flow paths that capture and convey runoff within the serviced urban areas. During high rainfall events these may transport large volumes of water, debris, gravels, and sediment with levels of energy that can cause blockages and significant damage to property adjoining these drains and within the flood path.

The constructed stormwater network includes sumps, intakes, pipes, detention basins, stormwater treatment devices and constructed channels that convey stormwater to receiving watercourses or the sea. The stormwater system also incorporates 27 detention basins and 2 pumping stations. In many parts of the city a fully reticulated system is not provided and individual properties discharge stormwater to on-site soakage or to the road channel as part of the primary drainage system.

The inventory of stormwater assets owned by Nelson City Council and managed by the Infrastructure Group as of June 2023 is shown in Table SW1.

Table SW1: Summary of Stormwater Assets

Asset Category	Quantity	
	km	Units
Pipes ≤ 600mm dia.	206	
Pipes > 600mm dia.	48	
Constructed channels	3.4	
Culverts	2.5	
Rocks Road culvert	0.3	
Intake structures		134
Manholes		5,209
Outfalls		111
Sumps		369
Pump Stations		2
Tide Gates		28
Stormwater Detention basins		27
Stormwater Treatment / Low Impact devices		9

The capacity of open drains and piped networks is generally expressed in terms of a level of service, relating to the flood flow they are designed to contain. Under the Nelson Tasman Land Development Manual (Table 5-5, NTLDM 2020), new flood management assets (primary system such as pipes) should have sufficient capacity to carry a future 1 in 15-year (Q15 or 6.67% AEP event) stormwater flow, taking into account higher intensity rainfall predicted for 2090. The secondary system (including overland flow paths) should be capable of carrying a 1 in 100-year (Q100, or 1% AEP) flow without flooding habitable floors.

Some areas of the city have ongoing drainage issues which will be exacerbated by climate change, especially low-lying coastal areas, and hillslope gullies. Council is progressively working towards achieving a consistent basic standard of stormwater level of service across the city, with the final level of protection set through a risk-based approach. In some cases, a higher standard of stormwater design may be justified where stormwater overflows could contribute to land instability, wastewater infiltration, or damage to infrastructure and buildings.

In future, a warmer climate is expected to lead to more intense storm events, which would increase runoff and flows through the stormwater network, and over time this is likely to increase the frequency and volume of flows along secondary flow paths.

Secondary flow paths carry overland stormwater flow to streams and rivers where there is no stormwater network or when stormwater pipes are full. These flow paths are

progressively being mapped as part of work to develop stormwater strategies for various areas of the city. Draft maps of secondary flow path routes were produced in 2018/19 based on topographical survey done in 2015. These are currently being updated with more recent 2021 topographical survey, but these maps do not represent the diversion of stormwater into the piped network or show the predicted extent of the overland flow paths. A new version of secondary flow path mapping is in progress which uses stormwater network models and represents the capacity of the stormwater system.

It is important to recognise the limitations of this type of mapping generally in relation to the level of landform and structure detail that can be represented in the modelling, and the dynamic nature of stormwater catchments as well as urban development. Mapping of secondary flow path routes show there are many flow paths on private property that will carry stormwater during significant storm events. These need to be identified and landowners made aware of the importance of keeping them clear so as not to cause damage to their property. The NTLDM 2020 provides guidance and standards for developers of new subdivisions on the best means of managing these flows. Generally, roads are the preferred secondary flow paths in the city.

Climate change is expected to result in sea level rise that would cause increasing volumes of tidal backflow into the stormwater network and result in ponding within lower lying areas of the city. Council is looking into ways to minimise these inflows using tidal gates, but in the long term, tidal inflows may increasingly travel overland as sea level rises. Sea level rise is expected to increase rates of sediment and gravel where grades are insufficient to flush out this material in storm events. A higher sea level would likely reduce flow velocity, and sediment carrying capacity, within these parts of the network, and the manual removal of these accumulations will require an increasing level of operational expenditure in future years.

Issue SW1: The level of service provided by existing stormwater assets will progressively reduce over time due to more intense storms and sea level rise projected with climate change.

Desired Benefits/Investment Objectives:

- Properties in the city are protected from the effects of uncontrolled stormwater discharges in events up to a Q15 (6.67% AEP) event, as predicted to occur in the 2090s
- No habitable floors flooded up to a present day Q20 (5% AEP) flood event
- A resilient stormwater network that will continue to provide property protection during and after the action of natural hazards
- For areas of existing development, stormwater investment is targeted at where flood impacts are highest, following a risk-based approach
- New development does not increase exposure to flood risk up to a future Q100 (1% AEP) flood event

Table SW2: Principal options for adapting to higher intensity rainfall events and sea level rise

PRINCIPAL OPTIONS	EXPLANATION AND IMPLICATIONS	✓ or x	TIMING & COST ESTIMATE
<p>Preferred Option 1 - Stormwater</p> <p>The preferred approach is to progressively upgrade the public piped stormwater network to a 6.67% AEP (Q15) event based on predicted conditions in the 2090s.</p> <p>Events which exceed this threshold will utilise secondary flow paths (such as roads, open channels and natural gullies) to collect and convey stormwater to a safe discharge point.</p>	<p>Many parts of the existing stormwater network were installed prior to the recognition of climate change and will not cope with increasing flows into the future. For low lying areas, additional measures will be required to provide protection against tidal inundation as sea levels rise.</p> <p>Meeting the proposed level of service may also be achieved through providing additional stormwater detention and increasing infiltration, including allowing for more on-site soakage, permeable surfaces, and other green infrastructure.</p>	✓	<p>Ongoing for 30 years.</p> <p>The extent of the network which does not meet the 6.67% AEP (Q15) level of service is being assessed. A very rough cost estimate is in the order of \$200M over 30 years to meet the proposed level of service for the public network across the entire city.</p> <p>The cost of installing new detention capacity for existing development or for intensification areas will be assessed following stormwater network modelling.</p>
<p>Preferred Option 2 - Stormwater</p> <p>The preferred option is a risk-based approach to stormwater which means prioritising stormwater investment in areas where flood impacts are highest, and where a high level of benefit can be achieved through intervention at an affordable cost to the community.</p>	<p>Vulnerability to flooding is expected to increase due to climate change but raising sites and buildings in low-lying areas can also reduce risk over time. The risk profile can change annually as property valuations change and land use changes through redevelopment. Council expects the flood risk will need to be reviewed regularly to enable effective prioritisation of stormwater interventions.</p>	✓	<p>Ongoing for 30 years.</p> <p>The cost of implementing a risk-based approach will not be known until the analysis for the existing stormwater network capacity has been completed.</p>
<p>Alternative Option 3 - Stormwater</p> <p>An alternative approach is to progressively upgrade the public piped stormwater network to a 10% AEP (Q10) event, based on predicted conditions in the 2090s.</p> <p>Events which exceed this threshold will utilise secondary flow paths (such as roads, open channels, and natural gullies) to collect and convey stormwater to a safe discharge point.</p>	<p>Updates to NIWA's stormwater rainfall database (HIRDS) in 2018 resulted in increases to predicted future rainfall depths. The result is that a 10% AEP (Q10) event now exceeds the 6.67% (Q15) standard set under the previous LDM (2010).</p> <p>The most recent Water NZ survey for 2018/19 showed that most councils across New Zealand have adopted a 10% AEP level of service for urban stormwater design. Changing this level of service would require an amendment to the LDM 2020 which would align NCC's level of service with TDC.</p>	X No action at this stage.	<p>The cost of upgrading the public stormwater network to a Q10 (10% AEP) level of service has not been assessed but will be lower than for Option 1.</p>
<p>Key assumptions</p> <ul style="list-style-type: none"> It is assumed that strategies for areas vulnerable to future tidal inundation will be progressed in line with Policy 27 of the NZCPS (2010), and that clear parameters and timeframes are set in relation to protecting these areas from future flooding. Construction costs have escalated in recent years, and this has significantly affected the cost of achieving the levels of service set out in the table above. This provides further justification for adopting a risk-based approach. <p>Climate change will be monitored and both flood assessments and development controls will need to be updated on a regular basis to respond to the latest information.</p>			

Increase resilience to natural hazards

Council commissioned consultants to identify natural hazard risks for the three waters assets (the stormwater, wastewater, and water supply networks) and to assess how these could affect the critical assets within each network.

Earthquake damage because of ground shaking and liquefaction can cause significant and long-term disruption to the community, and loss of services to affected areas. Hillslope areas of Nelson are vulnerable to landslips that can be exacerbated by uncontrolled stormwater flows. Increases in rainfall intensity and sea level rise because of climate change will also impact on stormwater services, including increasing the likelihood of stormwater network blockages, silting up of pipes, or tidal inflows due to malfunctioning flood gates.

Assets are also increasingly being renewed as part of an upgrade to address inadequate capacity. The 2022 storm event highlighted issues with the size and debris control of many of the intake structures around the city. A program of upgrading key intakes is underway and is expected to be completed by 2027/28.

Issue SW2: Damage to the stormwater network from natural hazards and climate change.

Desired Benefit/Investment Objective:

A resilient stormwater network that will continue to provide property protection during and after the action of natural hazards and slow onset change that may not be considered as 'events' (e.g. sunny day flooding).

Table SW3: Principal options to manage risks to the stormwater network as a result of natural hazards

PRINCIPAL OPTIONS	EXPLANATION AND IMPLICATIONS	✓ or x	COST ESTIMATE & TIMING
Preferred Option 1 Identify and assess network risk and develop a resilient network to withstand moderate earthquake, liquefaction, landslips and other natural hazard events with minimal damage. Have insurance to assist with recovery costs.	To date, the risk assessment has focused on defining the areas potentially subject to natural hazards, and the criticality of the stormwater assets. This will lead to prioritisation of 'resilience works' with construction of network upgrades to follow investigation. The Tahunanui Hills Slump stormwater upgrade is an example of a stormwater resilience project, as it includes a higher level of service than required by the Land Development Manual as well as incorporation of flexible HDPE pipe across block boundaries.	✓	Accurate costs will not be known until the risk profile is better understood. Investigation cost of \$400k over 30 years has been included in operational budgets. A rough order cost of \$10M for works over 30 years has been included in capital budgets. Insurance costs are ongoing.
Preferred Option 2 Upgrade key stormwater intakes and culverts to reduce risks of debris blockage.	This work is currently in progress under the Flood Recovery Program and is expected to be completed by 2027/28.	✓	Funded through the Flood Recovery program for the August 2022 event.

Alternative Option 3 Identify and assess network risk (this investigation is underway) and rely on insurance to assist with recovery costs.	Significant damage to the network from major events, and slower recovery. This option includes an assessment of risks, but no remedial action to address them. Insurance withdrawal is increasingly likely in high-risk areas in the face of climate change.	X	Risk assessment of assets in years 1-5 and every 10 years thereafter. \$400k over 30 years (as per option 1).
Investigative work required/CAPEX decisions Complete investigation and risk analysis of key components of the network. Develop a response plan to inform priorities for network resilience upgrades.			
Key assumptions <ul style="list-style-type: none"> Existing information held about liquefaction areas and fault hazard areas of land instability is reliable. Note recent liquefaction hazard mapping shows significant parts of the city to be at risk. Renewal and upgrade of assets will be designed to minimise vulnerability to known natural hazards. Climate change will be monitored, and design standards and growth controls adjusted to respond to latest information. Sea level rise and increased storm intensity/frequency are two key considerations, but effects on groundwater including increased liquefaction risk are also likely to be important. Earthquake risk will be reviewed as and when any future investigations provide additional information. A risk-based approach will underpin the prioritisation of stormwater asset resilience projects over the lifespan of this strategy. 			

Infrastructure objective 2: Maintain, renew, and upgrade existing assets in a cost-effective way

Asset condition/data confidence

Effective management of stormwater assets relies on the availability of reliable asset data. Existing issues with asset data primarily relate to ownership, performance, condition, and structural attributes.

Ownership of the stormwater network is shared between several parties. According to data presented in the 2021 Asset Management Plan, the stormwater piped network is largely made up of concrete and PVC pipes with a smaller number of earthenware pipes collectively extending 510 km. Of this, approximately 48% are recorded as stormwater activity assets. The balance of the network is owned privately, or by Waka Kotahi, Nelson Airport, Port Nelson other Council departments including Roading and Parks as well as the Nelson Tasman Regional Landfill Business Unit. These other owners hold responsibility for the operation, maintenance, and renewal of pipes they own.

Stormwater pipe performance is generally measured in terms of the level of service provided, which relates to pipe capacity and reliability. It is useful to have a specific level of service (e.g., Q15 or Q10 flow capacity) to progressively work towards a consistent level of service across the city. As a result of a changing climate, and varying levels of service being provided when stormwater systems were constructed, Council doesn't have a good overview of the level of service being provided throughout the city, and how this will be affected in future by a warmer climate and rising sea levels.

Council is seeking to increase confidence in its data about stormwater levels of service through the creation of stormwater network models. These are hydraulic models into which Council can apply present day and predicted future storm rainfall and sea levels to

assess what level of service the network delivers. These models also identify where there are constrictions in the system, restricting the flow of stormwater, and the secondary flow paths resulting from the network overflows. They are therefore a useful tool to optimise the performance of the overall network (or to identify areas where performance may be severely compromised due to climate change).

Stormwater pipe condition surveys have historically been undertaken to support the investigation of new capital projects, prior to the laying of new pipes, and as a tool for assessing any stormwater issues which have been reported through service requests. The proportion of the network which has been surveyed for condition is estimated to be low (<5%). A significant amount of condition assessment has been completed in the first 2 years of the 2021 Long Term Plan, targeting older and higher criticality pipes. Stormwater condition assessment is being incorporated into a renewal strategy for assets approaching the end of their design life.

Structure details for stormwater assets are recorded in Council's asset system. Generally, pipe diameter and length is well documented, although there are data gaps for attributes such as surveyed levels of pipes, which means that assumptions often need to be made in relation to pipe grade (slope), based on other survey information. These data gaps may affect capacity assessments for stormwater pipes.

Development of stormwater strategies

A more strategic, risk-based approach is being followed to identify and prioritise stormwater issues across the city and develop appropriate responses, which will primarily be level of service upgrades. Stormwater network models are being progressed to inform this assessment. Once the network models are developed, Council will be able to take a more strategic approach to managing and improving the performance of these assets.

Four stormwater strategies are proposed, as follows:

- Stoke Stormwater Strategy (draft completed)
- Central Nelson Stormwater Strategy (initiated)
- Tahunanui / Port Hills Stormwater Strategy (initiated)
- Atawhai Stormwater Strategy

These will guide all the following elements of stormwater management:

- primary stormwater system capacity (pipes)
- secondary flow paths (roads and open drains)
- receiving environments (freshwater and coastal environments)
- growth areas and assessment of additional stormwater flows
- prioritisation of stormwater upgrades

Renewal of the stormwater network

Stormwater pipes are renewed when they fail to provide the required level of service, or where performance or reliability is compromised due to age and poor condition.

Stormwater pipes are not subject to the same water pressures or continuous use as the wastewater and water supply networks, so do not have the same pipe integrity requirements.

Expenditure on stormwater renewals is expected to be high over the first 3 years of the strategy (due to the renewal of the St Vincent Street box culvert)and then increase gradually over the 2nd and 3rd decades of the strategy Stormwater pipe renewals are expected to peak in the first 3 years of this strategy as shown in Figure SW1 below.

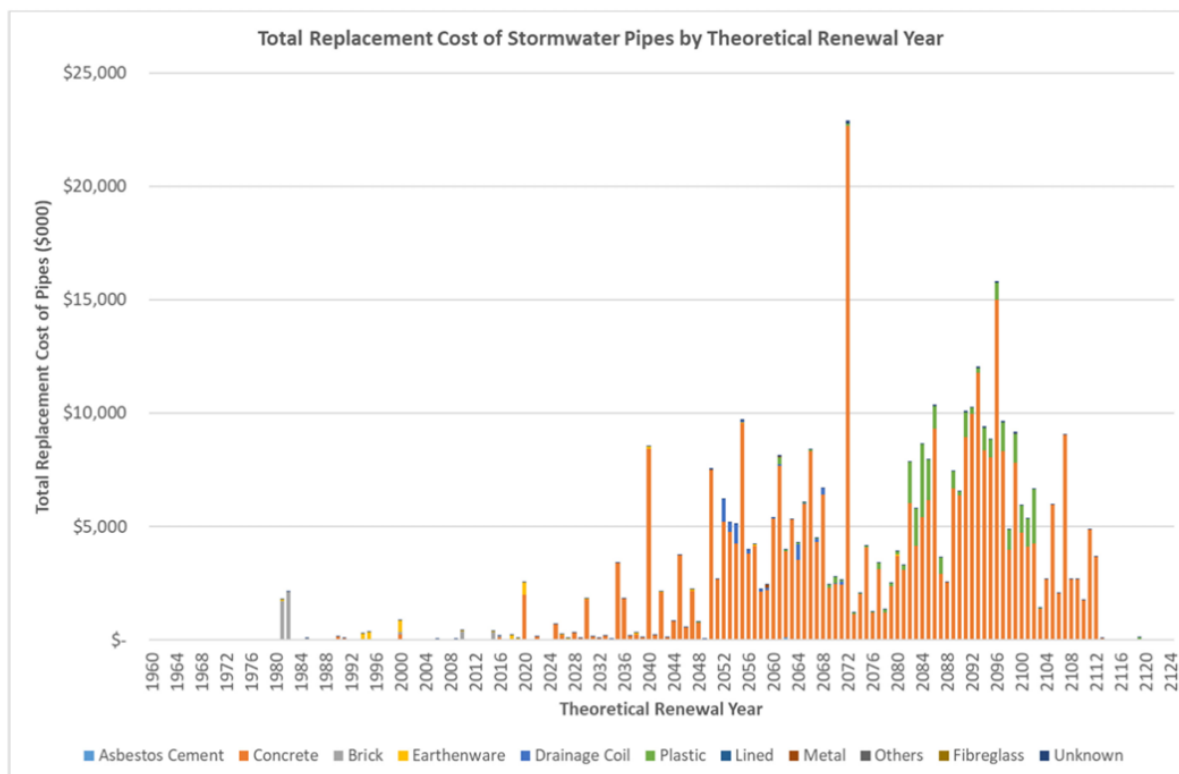


Figure SW1: Theoretical Stormwater Pipe Renewal Year and Cost

Council is working on a stormwater renewal strategy (see Option 1 in Table SW3) to address the increasing level of anticipated renewals required from the 2050s onwards, and to identify renewals required earlier due to poor condition. This will prioritise regular assessments of critical assets (including larger pipes and detention basins) and consideration of how to maintain low impact infrastructure.

Specific renewal budgets are in place for critical assets such as pump stations, tide gates and larger culverts. Other critical assets are being identified through the natural hazards' resilience assessment (discussed under Objective 1). A new funding line has been established for renewal of detention devices, as the number of these is increasing rapidly to service areas of urban growth. There are 23 existing facilities, and an additional 6 facilities have been planned or constructed but not yet vested in Council.

The other potentially vulnerable parts of the stormwater network are the remaining sections of brick culverts in the city. According to the 2018–28 Asset Management Plan, there are 2.2 km of brick culverts within the city. These are becoming difficult to repair due to an enhanced health and safety awareness of confined spaces. These are being

inspected by CCTV to confirm their condition and included in the renewal strategy referred to above.

Requests from property owners

Much of Nelson still uses a network of small open drains to channel stormwater from hillsides to public drains or streams. These channels are largely on private property but serve a wider public purpose. However, lack of maintenance of all the pipes and drains which are not owned or maintained by Council can result in ponding and flooding, causing property damage and land instability.

Council receives regular requests for assistance from property owners to maintain drains located on private land. Developers and Council officers need clarity on what Council can enforce and what it can maintain. The NTLDM 2020 provides guidance over what Council owns and what Council has responsibility to maintain. These define drain ownership for new drains as follows:

- Private drain – drain serving one property.
- Common private drain – drain serving two to five properties.
- Public drain – drain serving six properties or more and/or covered by easement in gross or is within road reserve.

This, together with legal advice, gives some direction that could be applied to update the asset ownership information for existing drains contained in Council records. Applying NTLDM 2020 standards to existing assets would be expected to increase the stormwater assets for Nelson under the Council's control and increase the percentage of pipe length managed by the stormwater activity. This would also increase operation, depreciation and maintenance costs, as well as long term renewal costs, but would have the benefits of clarifying responsibilities and delivering a higher level of service for the community. The implications of these changes would need to be carefully considered, but in light of existing funding constraints and uncertainty over future management arrangements, it is not anticipated that these changes will be implemented in the short-term.

Issue SW4: Planned levels of service for stormwater will not be met unless assets are maintained, renewed, and upgraded.

Desired Benefits/Investment Objectives

- Drainage ownership/maintenance policy to reduce risks of property damage because of stormwater pipes being in poor condition, and from non-maintained stormwater networks
- Stormwater strategies that support a risk-based approach, informed by stormwater network modelling and watercourse assessments, and which include prioritisation of upgrade projects
- Network renewal strategy which prioritises assets based on criticality, remaining design life, current condition, and level of service assessments

Table SW4: Principal options for improving the maintenance, renewal and upgrade of stormwater assets

PRINCIPAL OPTIONS	EXPLANATION & IMPLICATIONS	✓ or x	TIMING & COST ESTIMATE
Preferred Option 1 Proactive focus on gaining a better understanding of stormwater asset condition and developing a renewal strategy.	Increase the proportion of the network that has been assessed for condition, prioritising critical assets. This information is required to inform a renewal strategy. Condition assessment is generally an operational cost where this applies to regular assessment of critical assets.	✓	Condition assessment of the stormwater network, prioritising critical pipes and culverts, at a cost of \$1.0M over 30 years.
Preferred Option 2 Develop stormwater strategies that provide a consistent basis for prioritising upgrades of the stormwater network.	A better evidence base is required for improved prioritisation of stormwater projects. This includes an assessment of existing levels of service across the stormwater network and assessing the implications of growth areas on stormwater flows and receiving environments.	✓	Development of four separate strategies, supported by stormwater network modelling, to cover the city in the first 10 years. Implementation will follow each strategy. Strategies: \$800k Network modelling: \$800k
Preferred Option 3 Develop a drainage ownership/maintenance policy that will provide more clarity related to the responsibilities of operational staff and owners of private and common private drains.	Some risk of not being able to define every possible scenario, affecting Council's ability to provide timely responses to queries. Stormwater asset ownership can be complex and includes considerations such as whether there is a history of Council having installed or maintained a drain.	✓	Policy to be developed in-house over the duration of this Plan.
Alternative Option 4 Status quo — reactive response to service requests for stormwater improvements.	Upgrades occur in the areas where the most complaints are made, which may not be the areas in most need of improvement.	X	Piecemeal expenditure does not represent value for money.
Investigative work required/CAPEX decisions <ul style="list-style-type: none"> Stormwater strategies are required for the whole city. These strategies will assess current disposal provisions and set out appropriate disposal options for each area, taking into consideration growth areas identified in the Future Development Strategy and the impacts on receiving environments. The development of four Stormwater strategies for different areas of the city was provided for in the LTP 2021–31, but Central Nelson has now been included in the program. 			
Key Assumptions <ul style="list-style-type: none"> Current levels of service focus on the reliability of the network as measured by blockages and the response to issues as measured by contractor response times. There is a focus on maintaining the serviceability of the existing infrastructure and ensuring appropriate disposal options are available across the city. Future demand for stormwater services is primarily considered through subdivision consents and city growth planning. Renewal planning aims to match renewals to the rate at which assets reach the end of their service lives. Council only assumes full responsibility for public stormwater drains as defined under the NTLDM 2020 (a drain serving six or more properties, within road reserve, or covered by easement), where these drains are located on public land and not owned by a third party. Private drains (serving an individual lot) or common private drains (serving two to five properties) are generally the responsibility of the landowners, although Council may subsidise works on a prioritised basis. 			

Infrastructure objective 3: Provide infrastructure to enable growth and development

Council is progressing implementation of the Future Development Strategy (FDS) in line with the requirements of the NPS on Urban Development, which requires councils to plan for growth over the next 30 years. The FDS was originally adopted in June 2019 and an updated version of the FDS was produced to respond to national direction in the NPS: Urban Development 2020. The FDS 2022 was adopted by Joint Committee of Tasman District and Nelson City Councils in August 2022. The FDS identifies intensification as a key means to achieving its growth and development objectives for Nelson.

Providing for more housing and the infrastructure to support these new houses in intensification areas will require high levels of collaboration across Council. For example, low impact stormwater solutions will rely on use of road reserves, supportive planning rules which enable and encourage intensification (such as sharing driveways between different houses), and monitoring from the Science and Environment team to measure Council's progress towards meeting freshwater objectives.

Whilst the FDS encourages the intensification of existing urban areas, it also provides for urban expansion areas on greenfield sites. Increases in hard surfaces are inevitable as part of new greenfield development, due to the establishment of more roofs and driveways, which creates more stormwater run-off. The stormwater network generally lacks sufficient capacity to accommodate additional peak flows associated with additional hard surfaces. On-site ways to manage this additional stormwater include detention tanks, permeable constructed surfaces which enable water to be absorbed into the ground and rain gardens. This may be easier to achieve in greenfield development (as part of urban expansion) than in intensification projects. Innovative solutions will be needed in areas of intensification to mitigate the potential increase in run-off, which are likely to rely on more use of public land (such as road reserves and parks).

Issue SW5: Management of increased stormwater flows associated with urban intensification and growth.

Desired Benefits/Investment Objectives:

- The stormwater network has sufficient capacity for areas of urban intensification and expansion
- Stormwater levels of service can be achieved for new growth areas
- Stormwater quality from growth and intensification areas is maintained, or improved where necessary, to achieve freshwater quality targets

Table SW5: Principal options for managing increased stormwater flows associated with urban intensification and growth

PRINCIPAL OPTIONS	EXPLANATION AND IMPLICATIONS	✓ or x	TIMING & COST ESTIMATE
Preferred Option 1 New growth/intensification areas shall provide stormwater detention capacity to mitigate downstream effects where downstream stormwater network capacity is not sufficient to accommodate increased peak flows.	This is provided for in the NTLD 2020, but there may be insufficient land area to provide for detention in some areas where intensification is planned. Treatment of stormwater quality may also be required to enable Council to achieve water quality targets set under the NPS-FM 2020.	✓	Ongoing for 30 years The FDS identifies eight separate greenfield sites and 27 intensification areas for Nelson. Stormwater servicing of greenfield sites is generally developer led.
Alternative Option 2 Increased stormwater run-off from new growth and intensification areas to be provided for by upgrading the capacity of the downstream network.	This involves increasing pipe size to accommodate greater stormwater flow associated with urban development. Treatment of stormwater quality may also be required to enable Council to achieve targets set under the NPS-FM.	For some sites.	The cost of upgrading the stormwater network downstream of all growth areas will be assessed following completion of stormwater network models.
Investigative work required/CAPEX decision <ul style="list-style-type: none"> Assessment of additional storm run-off associated with growth and intensification areas to be assessed through stormwater network modelling. Stormwater quality objectives need to be established to achieve receiving environment freshwater targets 			
Key Assumptions <ul style="list-style-type: none"> All new developments within the Nelson Urban Area are required to provide appropriate stormwater disposal through connection to public services (where they have sufficient capacity) and disposal to ground or detention, as appropriate. Costs to Council for new growth areas will generally be up to the limit of development contributions. 			

Infrastructure objective 4: Maintain or improve public health and safety, and environmental outcomes

As outlined in Part One of the strategy, the Action for Healthy Waterways package includes several new initiatives, and the Nelson Plan will need to be updated to specify higher receiving environment water quality targets to meet, including sediment limits. Stricter controls over stormwater discharges are an expected outcome, as stormwater flows account for a significant proportion of overall flow in many urban streams.

Council will need to develop a clear picture of the extent of rivers, streams, and man-made stormwater channels affected by these policy changes as this may affect Council's range of options to deal with tidal inflows to the stormwater system. It is not expected that these will apply to all man-made drains, as not all of these are likely to support freshwater habitats.

As discussed under Objective 2, Council receives requests from landowners to pipe or cover over drains and open channels that run through their property. Landowners may view these as a safety hazard, a source of flooding, or consider that the amenity of their property could be improved by covering the drain. Council will need to develop a clear picture of the extent of channels affected by these policy changes and make this information available to the public.

The NTLDM 2020 includes specific standards for stormwater quality and treatment. Treatment is required for greenfield, infill and brownfield developments that exceed specific threshold criteria for high contaminant-generating surfaces. It is anticipated that measures to improve stormwater quality will also be required for existing development in future versions of the NTLDM. Implementation of these measures will need to be prioritised based on the risks that existing stormwater discharges present to receiving environment freshwater quality, and the targets set under the Nelson Plan.

Further investigation and monitoring will be required to establish the quality of existing stormwater discharges relative to receiving environment water quality, and the targets set. This will need to be done alongside ongoing investigations into wastewater overflows, and wastewater inflow to the stormwater network.

As discussed under Objective 2 above, the stormwater network has multiple owners, and currently the stormwater activity (under Utilities) directly manages only 48% of the network. This raises a question over responsibility for stormwater discharge quality from outlets owned by other parties, and where contaminants enter and pass through a network where multiple owners are involved.

Issue SW5: Meeting new freshwater quality objectives and standards set under future freshwater plans drafted to meet the National Policy Statement for Freshwater Management (NPS-FM), and the upcoming National Environmental Standard for Freshwater Management (NES-FM).

Desired Benefits/Investment Objectives:

- Stormwater discharges enable Council to achieve the freshwater quality objectives for receiving environments established under the NPS-FM 2020, as well as the quality targets set for specific watercourses in the Nelson Plan
- A clear overview of the quality of stormwater discharges across the network so that high priority catchments for intervention can be identified, and ongoing monitoring of these catchments is undertaken to assess the effectiveness of interventions
- Stormwater connections are available to landowners in areas where the wastewater network is subject to significant inflow/infiltration during storm events

Table SW6: Principal options for improving stormwater quality

PRINCIPAL OPTIONS	EXPLANATION AND IMPLICATIONS	✓ or x	TIMING & COST ESTIMATE
<p>Preferred Option 1</p> <p>Develop a stormwater quality improvement strategy prioritising high risk catchments and establish a monitoring network.</p> <p>This will also include a review of the existing Low Impact Devices identified in the Activity Management Plan to identify issues and develop best practice.</p>	<p>Existing information has provided a first pass assessment of high and medium priority catchments for intervention.</p> <p>Monitoring is required to understand stormwater quality variation spatially and temporally, the relationship between stormwater discharge and receiving environment water quality, and the gap between existing stormwater quality and that needed to achieve freshwater quality targets.</p>	✓	<p>Funded through the LTP 2021–31.</p> <p>Operational costs estimated for the first 10 years of this strategy are \$600k for strategy development and monitoring costs.</p>

Preferred Option 2 Provide or require a combination of stormwater treatment at source, and stormwater treatment at neighbourhood level, to deliver improved stormwater quality.	Treatment devices at neighbourhood level will require land to be allocated for green infrastructure in road reserves or public parks. Treatment devices on private property rely on maintenance by property owners.	✓	The level of treatment required to meet new targets for wastewater overflows under the NES-FM has yet to be established. Capital costs estimated at \$2.5M over the first 10 years for monitoring instrumentation and implementing high priority catchment upgrades
Preferred Option 3 Provide stormwater connections to properties located within high-risk catchments for inflow and infiltration to the wastewater network.	Responsibility for meeting freshwater targets primarily lies with Council. Reducing the volume of stormwater that enters the wastewater network is expected to reduce wastewater overflows.	✓	This cost will be built into network extensions and new stormwater projects servicing high risk catchments.
Alternative Option 4 Require stormwater treatment at source in all cases.	Treatment devices on private properties rely on maintenance by property owners. Policy and rules around stormwater discharges from private property to be consulted on through the Draft Nelson Plan.	-	May be required in some instances especially where permitted activity standards are not met. Costs lie with property owners.
Alternative Option 5 Implement treatment solutions within the stormwater network or at stormwater outlets to intercept stormwater prior to entering the receiving environment.	Public responsibility for meeting freshwater targets, primarily lies with Council. This approach may be required for treatment of stormwater from high contaminant generating surfaces such as busy roads and large car parks, where no land is available for green infrastructure.	-	Likely high CAPEX and OPEX costs. This will be estimated following development of the strategy referred to in Option 1.
Investigative work required/CAPEX decision <ul style="list-style-type: none"> Investigation required to verify priority areas and freshwater quality attributes requiring treatment, most appropriate treatment methods, and business case development to assess costs and benefits. Establish a stormwater quality monitoring network to track a range of attributes over time and ultimately trace the source of contaminants. 			
Key Assumptions <ul style="list-style-type: none"> The recent national direction on freshwater management will be reflected in the Nelson Plan. The Nelson Plan will include provisions relating to contaminants being released into, and from, the stormwater network. Wastewater activity will be able to identify priority wastewater overflow sites and catchments where concerted action is required to remedy overflows. Stormwater and wastewater upgrades will reduce potential for inflow and infiltration from the wastewater network, thereby reducing the frequency and severity of wastewater overflows. Inflow of wastewater to the stormwater network via leaks or cross connections should also be reduced. 			

Flood Protection

Flood Protection: Asset description

Council's flood protection system can be categorized into two parts — natural and constructed components. Natural consists of river and stream channels that play an important role in the support of aquatic ecosystems, recreation, and the conveyance of

flood flows in storm events. During high rainfall events the rivers and streams transport large volumes of water, debris, gravels, and sediment with levels of energy that can cause significant damage to property adjoining these areas and within the flood path.

The constructed flood protection network includes the larger stream culverts and constructed channels through which streams flow, grade control structures, flood gates, weirs, energy dissipators, channel bank retaining structures, fish passage assets and gravel traps. The inventory of public flood protection assets owned by Nelson City Council and managed by the Infrastructure Group as at June 2023 is shown in Table FP1.

Table FP1: Summary of Flood Protection Assets

Asset Category	Quantity	
	km	Units
Urban Streams/Rivers	42.0	
Stream Culverts	2.7	
Retaining walls: Concrete	5.5	
Retaining walls: Timber	3.0	
Retaining walls: Gabions	1.2	
Rock armouring	19	
Stopbanks (Earth)	4.5	
Flood walls	0.4	
Intakes		14
Manholes		12
Outfalls		9
Flood Gates		5
Stream Detention basins		4

Infrastructure Objective 1: Increase resilience to natural hazards and climate change

Definitions

% AEP: As with other natural hazard events, the likelihood of a flood event is often referred to in terms of its Annual Exceedance Probability (AEP)

e.g., a 1% AEP flood event has a 1% chance of occurring in any one year. This is sometimes referred to as a 1 in 100 year, or a 100-year ARI event. Climate change is expected to increase the flows associated with such events.

Urban Streams and rivers are Todd Valley Stream, Oldham Creek, York Stream, Brook Stream, Maitai River, Jenkins Creek, Poormans Valley Stream, Orchard Creek, Orphanage Stream and Saxton Creek.

Q15, Q20, Q50 and Q100: Open channel and stream culvert capacities are generally expressed in terms of the flood event they are designed to contain. Under the Nelson Tasman Land Development Manual (Table 5-5, NTLDM 2020), new flood management assets (streams and rivers) should have sufficient capacity to carry a future 1 in 100-year (Q100 or 1% AEP) flood flow, taking into account higher intensity rainfall predicted for 2090.

Adapting to climate change - increased rainfall and sea level rise

Nelson City's location on several flood plains, and close to the coast, means the community is vulnerable to the impacts of climate change that is expected to cause more intense storms, increased catchment flood flows, and coastal inundation resulting from sea level rise.

Some areas of the city already have ongoing drainage issues which will be exacerbated by climate change, especially low-lying coastal areas. Council is progressively working towards achieving a consistent basic standard of flood protection across the city, with the final level of protection set through a risk-based approach. In some cases, a higher standard of flood protection design may be justified where stream and river overflows could contribute to land instability, or damage lifelines infrastructure and buildings.

Detailed computer catchment flood models have been developed for 10 of the 11 urban streams in the city (Saxton Creek has not yet been modelled). These models show that significant areas of the city will be more regularly and severely impacted by stream and river flooding in future, particularly low-lying areas exposed to tidal inundation and sea level rise.

Coastal flood models show that higher sea levels will lead to more regular and extensive tidal inundation of low-lying coastal land during high tides and storm events and reduce the capacity of stream culverts and open channels to drain flood waters away to the sea.

The current levels of service in the 2024 –2034 Flood Protection Asset Management Plan focus on maintaining major flood protection and control works, with a view to protecting habitable floors from present day flood events. Council has historically committed to a program of works for urban rivers and streams for a primary capacity of present day Q50 (2% AEP flow), which is the peak flow arising from a rainfall event with a probability of happening once in 50 years. Ongoing concerns about climate change has led to a reappraisal of this approach. Where new land development and subdivision is proposed, the NTLDM 2020 has adopted a design standard of Q100 (1% AEP flow) in 2090 for streams and rivers, assuming an RCP 8.5 climate warming scenario.

Achieving a similarly high level of service for existing development is not straightforward for several reasons. The costs of channel widening or bunding to achieve a Q100 level of service is expected to be very high due to the proximity of existing properties, structures, and land of high natural, economic, and recreational value on the margins of these rivers and streams. For the tidally affected sections of these channels, additional challenges

apply, as sea level rise would require extensive bunding to contain both coastal storm surges as well as catchment flood flows. Even if it were feasible to prevent future stream overflows and tidal inflows, low lying coastal areas could still be vulnerable to local stormwater flooding due to impeded drainage, and elevated groundwater levels. Additional measures such as stormwater pumping would be required to prevent regular inundation of these areas in future.

Council recognises that the costs of meeting a 1% AEP design standard for the 2090 climate for all urban streams, rivers and the coast is likely to be unaffordable for the community within the term of this Infrastructure Strategy. In addition to this, the scale of works required within and along these watercourses as well as along the coast may not be acceptable to the community for amenity, environmental or cultural reasons.

A risk-based approach for existing development is expected to enable Council and the community to prioritise where and how interventions to manage river, stream and coastal flooding should be made. It is intended to enable the effective targeting of resources to higher risk areas where a high level of benefit can be achieved through intervention. This implies that some areas facing significant flood risk may not be prioritised due to other considerations outweighing the flood risk, until the flood risk increases to threshold levels. This approach is compatible with broader adaptive pathways planning which will consider a broad range of options including flood works, flood preparedness, urban design, and land use planning, including managed retreat.

A range of criteria such as environmental, economic, social, legislative, reputational, and cultural implications may be adopted when weighing up options to address flooding. The new flood models allow Council to better understand the probability (return periods) and the consequences (location, extent, and severity of flooding) to the community of flood events now, and in the future, under a range of response options. The consequences of flooding should guide the prioritisation of future actions.

Community perceptions of acceptable risk may evolve over time, particularly if climate change results in more regular and damaging flooding.

Issue FP1: Unless additional capacity is allowed for, the level of service provided by existing flood protection assets will progressively reduce over time due to more intense storms and sea level rise projected with climate change.

Desired Benefits/Investment Objectives:

- Flood Protection investment is considered as part of an adaptive pathways planning process, where long term protection is considered alongside other strategic response options.
- For areas of existing development, flood management interventions are targeted at where flood impacts are highest, following a risk-based approach
- New development involving subdivision and intensification does not increase exposure to flood risk up to a future Q100 (1% AEP) flood event (as predicted to occur in the year 2130)

Table FP2: Principal options for adapting to more intense storms, increased rainfall, and sea level rise

Principal Options	Explanation and Implications	✓ or x	Timing & Cost Estimates
Preferred Option 1 – Flood Protection The preferred option is a risk-based approach to flood protection which means focusing flood protection interventions on areas where flood impacts are highest, and where a high level of benefit can be achieved through intervention at an affordable cost to the community.	Vulnerability to flooding is expected to increase due to climate change but raising sites and buildings in low-lying areas can also reduce risk over time. The risk profiles can change annually as property valuations change and land use changes through redevelopment. Council expects the flood risk will need to be reviewed regularly to enable effective prioritisation of interventions.	✓	Ongoing for 30 years. The cost of implementing a risk-based approach will not be known until the analysis for low-lying coastal areas, as well as each stream and river has been completed. A very rough estimate is likely to be in the order of \$100M over 30 years. Climate change will be monitored and both flood assessments and development controls will need to be updated on a regular basis to respond to the latest information.
Preferred Option 2 – Flood Protection Adopt nature-based approaches to flood risk management where possible, such as 'making room for the river'	This performance target supplements the risk-based approach and includes providing for additional climate change flows by setting back stop banks in preference to raising them. This allows for a wider floodway and riparian corridor buffer area. Another example is off-line flood storage to reduce downstream peak flow.	✓	Ongoing for 30 years. The cost of implementing a nature-based approach will not be known until the analysis for low-lying coastal areas, as well as each stream and river has been completed. It is likely that setting back stop banks will involve land purchase, which may combine flood protection with managed retreat.
Alternative Option 3 – Flood Protection An alternative option is to upgrade all streams and rivers to provide a specific level of flood protection, for instance to ensure flows from a future 1% AEP event (in the 2090s) are contained within the channel.	The cost of upgrading channels to meet a 1% AEP event at 2090 would be expensive and in some areas the cost of upgrades may be found to outweigh the risks of damage from flood events. The environmental effects of achieving such a high level of protection may be unacceptable for the community.	x	Ongoing for 30 years. A very rough estimate of costs for the work would be in the order of \$250M over 30 years. This level of service may not be possible to achieve or sustain in the long term if the high-end climate change projections eventuate.
Alternative Option 4 – Sea Inundation Flood Protection Zone An alternative option is to put in place coastal defenses to provide a specific level of sea inundation and flood protection in the at risk coastal zones, for example to ensure tidal inundation from a future 1% AEP coastal storm event (in the 2090's) does not result in habitable floor damage within urban areas coastal sea surges.	The cost of installing coastal defenses to protect against a 1% AEP event at 2090 would be expensive and in some areas the cost of upgrades may be found to outweigh the risks of damage from tidal flooding events. The environmental effects of achieving such a high level of protection may be unacceptable for the community. It is possible that short-medium term protection could be provided for specific areas, especially if supported by an adaptive pathways plan.	x	Ongoing for 30 years. A very rough estimate of costs for the work would be in the order of \$200M over 30 years. This level of service may not be possible to achieve or sustain in the long term if the high-end climate change projections eventuate.
Investigative work required/CAPEX decisions <ul style="list-style-type: none"> Complete assessment of flood impacts for the largest 11 urban streams. Complete development of a risk-based framework for flood protection Complete risk exposure and vulnerability assessment for low-lying coastal areas. Investigations for the Maitai River, Brook Stream, York Stream, Jenkins Creek, and Poormans Valley Stream. Any subsequent construction works will be identified in future LTPs. 			

Principal Options	Explanation and Implications	✓ or x	Timing & Cost Estimates
Key assumptions <ul style="list-style-type: none"> · The flood protection activity is not implemented to address flooding from groundwater seepage. It is anticipated that stormwater pumping stations could provide some protection against elevated groundwater levels within their local catchments, however this would need to be part of future stormwater works. · It is assumed that strategies for areas vulnerable to future tidal inundation will be progressed in line with Policy 27 of the NZCPS (2010), and the proposed Climate Adaptation Act. Following on from that, clear parameters and timeframes are expected to be set in relation to protecting these areas from future flooding. · New legislation in the proposed Climate Adaptation Act is anticipated to be released by the end of 2023. Depending on the timing of release, this may inform the 2024 – 2034 Activity Management Plan. · A risk-based response to flood protection will underpin the flood protection activity for the life of this strategy. · Construction costs have escalated in recent years, and this has significantly affected the cost of achieving the levels of service set out in the table above. This provides further justification for adopting a risk-based approach. · Development in flood prone areas of the city will continue to be controlled by the Nelson Resource Management Plan, under the Resource Management Act, with design informed by the Inundation Practice Note. · Coastal inundation mapping and river and stream flood models are expected to support future controls for subdivision and land development that respond to new legislative requirements. 			

Increase resilience of flood protection assets to natural hazards

The principal natural hazards that can impact on flood protection assets are:

- High flood flow events that cause scour to the channel banks or bed that may undermine structures along the stream corridor, result in the deposition of large amounts of gravel and silt within the channel and the debris carried may cause blockages at stream culverts.
- Earthquakes and any associated liquefaction may result in subsidence of structures such as stop banks and floodwalls
- Landslips can inject a large amount of material to a single point within a channel which may cause the formation of a debris dam or result in debris blockages at downstream structures.

Increases in rainfall intensity and sea level rise because of climate change will impact on flood protection assets, including increasing the likelihood of stream culvert blockages, silting up tidal streams, undermining of in-stream structures due to channel bed scour, and tidal inflows due to blockages at flood gates.

The August 2022 flood extended over a three-day period and was characterized by three flood peaks which impacted catchments across the district in different ways. In a number of these catchments flood peaks approached or exceeded the 1% AEP event. Emergency works were initiated in the aftermath of the flood to reinstate channels.

The August 2022 flood event highlighted issues with the size and debris control of several stream culverts and intakes around the city, as well as gravel and channel bed level management generally. A program of reinstating and upgrading flood protection assets is underway and is expected to be completed by 2027/28.

Post flood stream and river channel inspections for all urban catchments detected a high number of channel bank scour issues, which have been ranked as high, medium, or low priority, based on proximity to assets at risk and channel bank height. There are

approximately 500 sites identified, of which approximately a third are high or medium priority to address.

An additional outcome of the August 2022 flood was the deposition of material along the beds of stream and river channels, particularly within estuarine reaches of these channels. In extreme cases such as Todd Valley Stream and Oldham Creek, the lower section of channel was completely infilled and needed to be re-instated. The Hillwood Streams were similarly affected, reflecting the high intensity rainfall that fell within these catchments which resulted in hillslope slips and stream bank scour.

Aside from the August 2022 event, the past ten years has included 4 other significant flood events:

- The December 2011 flood was a long duration event that generated higher stream flows than August 2022 in the Stoke catchments. As with August 2022, the duration of the event resulted in numerous slips on hillslope terrain.
- The April 2013 flash flood that affected the South Stoke catchments of the Orphanage Stream and Saxton Creek. High intensity rainfall over a 1 hour + period resulted in stream flows well in excess of a 1% AEP event.
- The June 2014 flash flood event affecting a localised area of the York Stream catchment including the Bishopdale, Victory and Toi Toi neighbourhoods.
- The February 2018 storm surge event (Ex-Tropical Cyclone Fehi) resulted in tidal inundation to low lying areas across the city, including the CBD, parts of Tahunanui and Monaco being particularly impacted.

Earthquake damage because of ground shaking and liquefaction can cause significant and long- term disruption to the community, and loss of services to affected areas. Flood protection assets along rivers and streams may be significantly damaged during an earthquake, and unless detected, this damage may result in subsequent structural failure during a flood event. The risks of this occurring can be mitigated through appropriate design and monitoring of structural condition.

Issue FP3: Damage to flood protection assets from natural hazards.

Desired Benefit/Investment Objectives:

A resilient network that will continue to provide property protection during and after the action of natural hazards, now and in the future.

Recovery from the August 2022 flood event will extend over the first several years of this Infrastructure Strategy and will include a significant program of works to repair, reinstate and upgrade assets.

Table FP3: Principal options to manage risks of damage to flood protection assets as a result of natural hazards.

Principal Options	Explanation and Implications	✓ or x	Timing & Cost Estimates
Preferred Option 1 Identify and assess network risk and develop a resilient network to withstand moderate earthquakes and other natural hazard events with minimal damage. Have insurance to assist with recovery costs.	A risk assessment of flood protection assets will be carried out between 2027 - 2030 and will be repeated every 10 years thereafter. To date, the assessment has focused on defining the areas potentially subject to natural hazards, Further work is required to assess the condition and criticality of flood protection assets. This will lead to prioritisation of 'resilience works' with construction of network upgrades to follow investigation.	✓	Accurate costs will not be known until this investigation is completed and the risk profile is better understood. Investigation cost of \$300K over 30 years has been included in operational budgets. A rough order cost of \$10M for resilience works over 30 years has been included in capital budgets. Insurance costs are ongoing.
Preferred Option 2 Upgrade key stream intakes and culverts to increase capacity and reduce risks of debris blockage	This work is currently in progress under the Flood Recovery Program and is expected to be completed by 2027/28.	✓	Scoping work in progress as part of the flood recovery.
Preferred Option 3 Install gravel traps in the upper catchments to enable better management of gravel loads, including during flood events.	This work is currently in progress under the Flood Recovery Program and is expected to be completed by 2027/28.	✓	Scoping work in progress as part of the flood recovery.
Alternative Option 4 Identify and assess network risk and rely on insurance as a means to assist with recovery costs.	Significant damage to the network from major events, and slower recovery. This option includes an assessment of risks, but no remedial action to address them. Insurance withdrawal is increasingly likely in high-risk areas in the face of climate change.	×	Risk assessment of assets in years 4-7 and every 10 years thereafter. \$300k over 30 years (as per option 1).
Investigative work required/CAPEX decisions Complete investigation and risk analysis of key components of the network. Develop a response plan to inform priorities for network upgrades.			
Key assumptions <ul style="list-style-type: none"> Existing information held about fault hazard, areas of land instability, and liquefaction risk are reliable. Renewal and upgrade of flood protection assets will be designed to minimise vulnerability to known natural hazards. The actual life expectancy of assets is on average not significantly less than the design life. Condition assessment is required to ascertain this. A risk-based approach will underpin the prioritisation of flood protection resilience projects over the lifespan of this strategy. 			

Infrastructure Objective 2: Maintain, renew, and upgrade existing assets in a cost-effective way

Reducing the Risk of Flood Protection Asset failures

Asset condition/data confidence

Effective management of flood protection assets relies on the availability of reliable asset data. Existing issues with asset data primarily relate to structural attributes, performance, condition, replacement value and expected remaining useful life.

In stream structure condition surveys have historically been undertaken to support the investigation of new capital projects, prior to establishing new weirs, grade control structures, channel lining, stop banks, or the laying of new stream culverts. The proportion of the flood protection network which has been surveyed for condition is estimated to be low for detailed condition assessments (<5%). However annual stream walks undertaken by the contractor identify issues which are visually evident. More comprehensive condition surveys should be undertaken on a more regular basis for critical flood protection assets, and this also needs to be incorporated in a renewal strategy for assets approaching the end of their design life.

Structure details for flood protection assets are recorded in Council's asset system. Generally, stream culvert diameter and length is well documented, although there are data gaps for attributes such as surveyed levels of pipes, which means that assumptions often need to be made in relation to pipe grade (slope), based on other survey information. These data gaps may affect capacity assessments for some stream culverts. Council relies on LIDAR and UAV (drone) surveys to identify areas and volumes of gravel build up. Reporting on Lower Maitai channel capacity is undertaken on a routine basis as this is a key performance indicator (KPI) under the Long-Term Plan.

The separation of the stormwater and flood protection assets recently undertaken has led to the identification of several data gaps for flood protection assets which will need to be addressed. For instance, it has been revealed that not all channel bed grade control structures, or bank retaining structures are adequately recorded. In addition, whilst checks are made through stream and river inspections, there is limited data about the condition of these structures.

Development of Flood Management Plans

A more strategic, risk-based approach is required to identify and prioritise flood protection issues across the city and develop appropriate responses, which will primarily be asset renewal and level of service upgrades. Catchment flood models have been developed to inform this assessment, which enables Council to take a more strategic approach to investigating, managing, and improving the performance of these assets. Flood Management planning will also need to consider flood mitigation through nature-based solutions that reduce flow in the lower catchment, including the implementation of measures that increase flood storage and detention further up the catchment.

Five Flood Management Plans are proposed, as follows:

- Maitai Flood Management Plan
- Brook Flood Management Plan
- York Stream Flood management Plan
- Jenkins Creek Flood management Plan
- Poormans Valley Stream Flood Management Plan

These will guide the following elements of flood management:

- Primary system capacity (open channels and stream culverts)
- Secondary flow paths and flood hazards
- Receiving environments (coastal environments)
- Nature-based solutions
- Flood Protection Structures and channel bank stability
- Gravel Management
- River / Stream bed grade control
- River and stream channel habitat
- prioritisation of flood protection upgrades

Requests from property owners

Council has collected a combined stormwater/flood protection rate to fund this activity in the 11 urban catchments South of the Gentle Annie Saddle. Areas North of this, and inland of the urban areas have been generally excluded from this rate. In the wake of large flood events, such as the August 2022, and December 2011 floods, Council receives multiple requests from landowners in these rural catchments for assistance.

Rural catchments and properties exceeding 15 ha have previously been excluded from the stormwater/flood protection rate on the basis that owners of large properties maintain sections of channel that run through their land. However, such maintenance has become increasingly difficult in recent years due to the evolution of freshwater policy and the requirement to obtain and comply with consents to undertake in-stream works. A decision is required on whether to extend the flood protection rate to rural catchments, and include larger properties within the rate.

Council proposes to extend the flood protection rate across the region to include the Nelson North communities and change the rating arrangements for the flood protection activities from a uniform charge to a general rate based on land value.

Issue FP3: The risk of flood protection asset failures will increase over time unless assets are maintained, renewed, and upgraded.

Desired Benefits/Investment Objectives

- Flood Management Plans are informed by a risk-based approach, consider risk exposure for existing development and constraints in relation to protection options.
- Flood Protection Network renewal strategy which prioritises asset renewal based on criticality, remaining design life, current condition, and level of service assessments
- Data gaps regarding the function, condition and effectiveness of the existing flood protection assets are addressed.

Table FP4: Principal options for improving the maintenance and renewal of flood protection assets

Principal Options	Explanation and Implications	✓ or x	Timing & Cost Estimates
Preferred Option 1 Develop flood management Plans that provide a consistent basis for prioritising upgrades of the stream and river networks.	A better evidence base is required for improved prioritisation of flood protection projects. This includes an assessment of existing levels of service across the river and stream network and assessing the implications of flood protection works on the aquatic environment.	✓	Development of five separate flood management plans, supported by catchment flood modelling, to cover the city in the first 15 years. Implementation will follow each plan. Flood Management Plans: \$750K Modelling: \$500K
Preferred Option 2 Proactive focus on gaining a better understanding of flood protection asset condition and developing a renewal strategy.	Increase the proportion of the network that has been assessed for condition, prioritising critical assets. This information is required to inform a renewal strategy. Condition assessment is generally an operational cost where this applies to regular assessment of critical assets.	✓	Condition assessment of the flood protection network, prioritising critical pipes and culverts, at a cost of \$500K over 30 years.
Preferred option 3 Extend the flood protection activity to rural catchments and include these properties in a new flood protection rate, including properties exceeding 15ha.	Rural catchments and properties exceeding 15 ha have previously been excluded from the stormwater rate on the basis that owners of large properties maintain sections of channel that run through their land. However, such maintenance has become increasingly difficult in recent years due to the evolution of freshwater policy and the requirement to obtain and comply with consents to undertake in-stream works. In addition, in the wake of large flood events, such as the August 2022, and December 2011 floods, Council receives multiple requests from landowners in these rural catchments for assistance	✓	It is anticipated that over time the cost of extending the flood protection activity into these areas would be off set by the rates collected. Additional operations staff would be required to implement the operation and maintenance of the network across the district.
Alternative Option 4 Reactive response to service requests for flood protection improvements.	Upgrades occur in the areas where the most complaints are made, which may not be the areas in most need of improvement.	x	Piecemeal expenditure does not represent best value for money.
Investigative work required/CAPEX decisions <p>Progress flood management plans for the urban streams on a prioritised basis. These will need to be supported by investigations into management options, including hydraulic modelling to assess the efficacy of a range of protect options to inform consultation with the community on adaptive planning.</p> <p>Condition and performance assessments will be required for instream structures where these have not been recently assessed. Replacement values for these assets will also need to be determined.</p> <p>Financial analysis is required to establish a new flood protection rate to cover rural areas as well as the existing urban drainage area.</p>			

Principal Options	Explanation and Implications	✓ or x	Timing & Cost Estimates
Key Assumptions <ul style="list-style-type: none"> Current levels of service focus on the reliability of the network as measured by blockages and the response to issues such as property flooding. There is a focus on maintaining the serviceability of the existing infrastructure and ensuring that structural failure of instream assets is avoided. Renewal planning aims to match renewals to the rate at which assets reach the end of their service lives. Responsibility for the overall management of rivers and streams will remain with Council for the foreseeable future. 			

Improving Freshwater Quality and the Health of Waterways

As outlined in Part One of the strategy, the Action for Healthy Waterways package includes several new initiatives, and the future changes to the Nelson Resource Management Plan may specify higher receiving environment water quality targets to meet, including sediment limits.

This is part of new national direction to protect and improve our rivers, streams, lakes, and wetlands. The package of measures aims to:

- stop further degradation of our freshwater
- start making immediate improvements so water quality improves within five years
- reverse past damage to bring our waterways and ecosystems to a healthy state within a generation.

The National Policy Statement for Freshwater Management 2020 (NPS-FM 2020) includes policies to avoid the loss of river extent and values, including limiting the reclamation of riverbeds.

There will be stricter controls over maintaining open waterways and ensuring fish passage is not obstructed by structures in the beds of rivers. New regulations are also proposed to avoid the impact of structures such as culverts, tide gates and tide flaps on freshwater species which need to swim between coastal and freshwater habitats to complete their life cycle. There are likely to be more regulations related to structures affecting fish passage such as culverts, dams, and tide gates. Piping, diversion or infilling of streams is not likely to be permitted.

Council will need to develop a clear picture of the extent of rivers, streams and culverted stream channels affected by these policy changes as this will affect Council's range of options to deal with tidal inflows from river and stream estuaries.

Actions to improve environmental outcomes:

Collaborative action by Council and the community is being taken to improve freshwater quality through the Nelson Nature and Healthy Streams programs.

Freshwater environments are being maintained or enhanced through best practice associated with:

- natural gravel management in beds where practicable
- protection of natural riverbanks

- Forest restoration to reduce peak flood flows and sediment yields
- riverbank shade through vegetation and protection of fish spawning areas
- protection of natural 'pool and riffle' stream bed forms
- maintaining or reinstating natural meanders where practicable
- moving away from using rock armouring for stream bank protection to using geotextile soil- filled bags which grow vegetation, and look like green walls

Issue FP5: Meeting new freshwater objectives and standards set under future freshwater plans drafted to meet the National Policy Statement for Freshwater Management (NPS-FM), and the National Environmental Standard for Freshwater Management (NES-FM)

Desired Benefits/Investment Objectives:

- Council's instream works positively contribute to achieving standards and policies under the NES-FM, and NPS-FM as well as the water quality targets set for specific watercourses in the Nelson Plan
- The short-term effects of implementing works within stream and rivers are appropriately mitigated.
- Implementation of gravel management, where required, to reduce the frequency of gravel and flood debris removal and associated disruption to aquatic habitat.
- Promotion and implementation of fish passage, where required, along stream and river channels, including at structures.

Table FP5: Principal options for improving freshwater quality in relation to the flood protection activity

Principal Options	Explanation and Implications	✓ or x	Timing & Cost Estimates
Preferred Option 1 Implementation of gravel management, including construction and operation of new gravel traps to reduce downstream effects associated with frequent gravel removal.	Gravel build within the bed of channels can compromise flood carrying capacity particularly in the estuarine reaches of channels. Installation of gravel traps is expected to reduce the frequency of Silt and gravel removal and the associated disruption to stream and river habitat.	✓	Planned to be undertaken as part of the flood recovery program, with a focus on catchments affected in the August 2022 flood Timing – First 3 years of this strategy. Cost will depend on the final number of sites agreed with landowners.
Preferred option 2 Improved management of river and stream channels to promote shading, optimise hydraulic performance and incorporate riffles, runs and pools for improved habitat	Improvement of river and stream channels will be considered to address existing issues. This may include stream re-alignment in some cases and reflect best practice standards in the NTLDM. NPS-FM policies and NES-FM standards will be reflected in future resource management plans which will frame this work.	✓	This is intended to be integrated in project methodology generally, and costs will be site specific.

Principal Options	Explanation and Implications	✓ or x	Timing & Cost Estimates
Preferred option 3 Extend fish passage along all stream and river channels, including along stream culverts and instream structures.	This relates to specific standards in the NES-FM to provide for fish passage and remove existing barriers.	✓	Long term costs and estimates will be on-going, as there is also a need to reinstate fish passage following large flood events. Fish passage works are planned under the recovery program
Alternative Option 4 Reactive response to service requests for stream channel modifications that provide flood protection.	There is often a strong demand for reactive works within watercourses to increase flood carrying capacity. This is particularly the case following a large flood event. This is not a preferred response as it does not generally allow for the same level of environmental improvements as a fully planned project.	x	Timing and costs would generally be in response to large flood events.
Investigative work required/CAPEX decision <ul style="list-style-type: none"> Investigation required to identify priority areas for improved gravel management and catchment gravel yields. Identification of channel reaches where additional shading is required to promote habitat Identification of barriers to fish passage across all catchments 			
Key Assumptions <ul style="list-style-type: none"> Proposed freshwater changes will be adopted in legislation and reflected in future freshwater plans that will include provisions relating to contaminants being released into the stormwater network. Responsibility for stormwater management, including stormwater discharges, will remain with Council. 			

Solid Waste

The Joint Waste Management and Minimisation Plan 2019 (JWMMP), currently under review, has a goal of reducing waste to landfill per capita by 10% by 2030. It includes the goals of avoiding the creation of waste, improving the efficiency of resource use, and reducing the harmful effects of waste. Through the draft Waste Assessment 2023, Council continues to have a strong focus on moving actions on waste further up the waste hierarchy. This is in alignment with Council’s commitment to action on climate change.



Figure SWA1: The Waste Hierarchy

Total waste volumes are expected to increase in direct proportion to population growth, however there is expected to be an increased demand for waste diversion services. These will increase in order both to reduce carbon emissions and to limit the pressure on landfill and other waste handling facilities.

Equally the government is introducing a significant work program with an updated New Zealand Waste Strategy and supporting legislation with the intention of reducing and avoiding waste while promoting a circular economy. Council will need to align its plans and strategies with the legislative changes. The legislative changes will also require extra reporting and potentially council monitoring of other waste providers.



The strategy of solid waste is twofold, to provide services which manage contemporary and historical waste in a manner that reflects the environmental, social, cultural, and economic values of Nelson council and to reduce the production of waste, and to maximise their reuse before providing options for low emission processing or disposal. This includes assisting individuals to manage their waste at a household level.

Solid waste activities are funded through a combination of gate fees at the Nelson Waste Recovery Centre, a share of the Local Disposal Levy from the joint Nelson City Council and Tasman District Council owned landfill, and the Nelson share of the central government Waste Disposal Levy.

The Waste Disposal Levy is funded from a per tonne charge for waste, at the time it is disposed to landfill. This fund is managed by central government to develop nationally important waste minimisation infrastructure. Approximately 50% of the amount collected is returned to the region to be used in waste minimisation activities. This in effect makes Solid Waste a 'closed account' and its activities do not burden residential rates.

In 2023 the waste disposal levy is \$ 50 per tonne and will increase to \$60 per tonne in 2024. This will provide a significant increase in locally available waste minimisation funds. This will assist in funding activities, such as a kerbside kitchen waste collection which is mandated to be started by 2030.

Solid waste supports rather than directs the York Valley landfill which will be reported separately through the Nelson Tasman Regional landfill Business Unit (NTRLBU) strategy.

Table SWA1: Summary of NCC assets (excluding land)

Asset Category	Units
Hoppers	2
Compacting mechanism and gantry crane	1
30 cubic metre haulage bins	7
Hopper building at Nelson Waste Recovery Centre	1
Barn building at Nelson Waste Recovery Centre (and attached sorting shed)	1
Kiosk Building at Nelson Waste Recovery Centre	1
Residential recycling bins	21,460
Unused Residential recycling bins	800
CBD street litter bins	203
Atawhai closed landfill	1
Wells at Atawhai Closed landfill	10
Bins in school recycling service	14

Asset Category	Location	Replacement Cost
Hoppers & Hopper Building	Nelson waste recovery centre	\$950k-\$1.2M
Barn in recycle yard	Nelson waste Recovery centre	TBD
Residential Recycling Bins		\$800k
CBD Street litter bins	CBD dairies and bus stops	\$400k
Atawhai Closed Landfill	Incurs cost without revenue so is considered a negative value asset.	

The activities of Solid Waste

It is anticipated that government legislation for activities such as product stewardship, standardizing recycling, diversion of organic waste, etc, will have an impact on activity delivery, which will be considered through the JWMMP and AMPs.

Residential and commercial refuse services in Nelson are supplied by private companies, independent of council. The Solid waste Strategy is one of cooperation and inclusion, it does not include competing with private companies or using the council position to disadvantage any company already actively reducing waste to landfill.

In the future, government legislation may require Councils to also provide a domestic kerbside refuse collection service.

Most other waste services are provided or managed by council. These include:

Nelson Waste Recovery Centre (NWRC), includes a free public drop off for recyclables, a user-pays transfer station operation (including green waste) and an NGO operated but leased from NCC re-use shop. This format has been proven effective and the NGO has expanded to include e-waste recycling. The strategy of the NWRC is to increase diversion, improve the disposal of hazardous waste, and to reduce the tonnes from the NWRC to landfill each year.

There is potential that following the introduction of a container return scheme that the NWRC could earn revenue from container return recycling.

The site, the Hoppers, most of the buildings, and the associated plant are NCC assets. Operation of the hoppers and the cartage of green waste to 'Green waste to zero' (composter) and refuse to York valley (landfill) are contracted to Fulton Hogan until 2029.

The NWRC also provides a disposal point for hazardous materials ensuring safe handling and disposal, protecting Nelson's stormwater and waterways. This includes the free disposal of batteries with the aim of limiting battery fires at landfill.

An area for the diversion of construction and deconstruction materials is being established in 2023 which will provide ongoing further NWRC diversion from landfill.

Residential Kerbside Recyclables Collection: NCC have provided over 21,000 households with a yellow lidded wheelie bin and households can purchase a blue glass bin for the glass collection service. The service for both is contracted to Nelmac until July 2025. Sorting and sale of commodities on behalf of Nelmac is by Smart Environmental Limited through the Regional Materials Recycling Facility (MRF) situated in Richmond, Tasman. Post 2025 recycling will be a collection contract with the collector and a separate sorting contract directly with NCC. The wheelie bins are an NCC asset, so replacement bins are provided by council.

Street litter: There are 54 leased solar compacting bins in the CBD, and 84 tilt bins at dairies and bus stops. The tilt bins are an NCC asset maintained at an average cost of \$40k per year. The collection contract for infrastructure street litter was awarded to Envirowaste until 2029.

Waste Minimisation: Solid waste activities also include programs to support our community to avoid or reduce waste, under the umbrella of Rethink Waste Whakaarohia – these are delivered both by NCC and collaboratively with Tasman District Council through the Joint Waste Management and Minimisation Plan and Activity Management Plans.

Infrastructure Objective 1: Increase resilience to natural hazards and climate change

The infrastructure strategy includes the closed landfill at Atawhai. This area primarily encompasses Miyazu Park, Whakatū Marae, The Nelmac nursery, Founders Park, Neale Park, and some surrounding residential properties.

There is an ongoing management plan for this landfill which includes annual testing for gas, leachate, and contaminants. The area is a HAIL site and as such has restrictions on excavations and constructions. While this management plan will continue, consideration will also be given to the potential effects of sea level rise and climate change.

Present NCC-utilised models for sea level rise place Atawhai landfill at risk of inundation during storms or weather events in the mid-2050s. Through the term of this strategy closer monitoring and discussion relating to mitigation options will be instigated to increase preparedness.

The annual closed landfill reports have identified increasing amounts of maintenance that will be required during the term of the plan which will take into consideration the initial climate change amelioration for the site.

The contracted collection services, and Solid Waste services which require vehicles, will be reviewed prior to the start of each new contractual term. Since 2022 low or zero emission vehicles were the preferred in all vehicular contracts. Since 2023 the street litter collection is being performed by an electric collection vehicle

An assessment of residential kitchen waste kerbside collection services and collection systems is underway. This includes geographical operational considerations, and processing options to ensure the process aligns with the council emissions policy.

Consideration is also being given to processing systems which may utilise a wider range of materials than the kitchen waste.

Green waste costs less to process than landfilling so will continue to be offered at a lower gate rate at the NWRC. In 2025 at the end of the contract term alternative processing options will be considered to ensure the efficacy of the process and to ensure that the process aligns with council policies.

A review will be conducted to ensure that the recyclables that produce emissions are processed and recycled in a manner consistent with councils' climate change and emissions policies.

The waste minimization activities of Solid waste will receive annual internal reviews to establish a baseline for diversion activities, from which mitigation and benefits of diversion can be calculated.

The review of the JWMMP 2019 will consider the need for infrastructure planning relating to the management of disaster waste, in line with the requirement under the Waste Management Act 2008 to protect public health, as well as managing the financial, social and cultural risks.

Infrastructure Objective 2: Maintain, renew, and upgrade existing assets in a cost-effective way

If solid waste 'owns' the waste stream they can control its methodology and manage its outcomes (this does not necessarily require assets). While ownership of the landfill is essential, (under the NTRLBU) control of a kerbside recycling service requires no more assets than the kerbside bins, and an economic basis for paying for the collection. This eliminates potential competition. The primary risk of competition is that the diversion of any waste stream from such a geographically constrained area as Nelson, would lead to multiple but inefficient or uneconomical options for the same service.

The asset strategy is to maintain assets which will ensure council control of the waste stream or the facility, and to phase out unnecessary assets at the end of their effective life.

Kerbside recycling bins are replaced as required with the present bins expected to be in use until 2028 and progressively replaced from that time as required.

Hoppers at Pascoe St are depreciated and replaced or maintained as required. By maintaining the hoppers NCC controls transfer station operations and sets the conditions of the contract.

Street litter tilt bins require regular replacement, (average \$40k/yr.). Solar bins are on a 5 year lease expiring in 2027. At that time the lease bins may be purchased or a new lease established.

The construction and deconstruction diversion at the NWRC includes a forklift and structural assets such as shipping containers, dome shelters, racking etc. NCC ownership of these assets maintains NCC control of the diversion process.

Many solid waste activities, particularly waste minimisation or reduction activities are developed in coordination with Tasman District Council (TDC) through the JWMMP.

Construction & Demolition Waste:

In 2023 the establishment of the NWRC C&D site will increase diversion of construction and demolition waste.

The diversion of building construction materials from landfill to secondary markets such as NGOs will be supplemented by the encouragement of 'deconstruction' of buildings rather than demolition. NGOs will recover and retail the deconstructed materials.

Volumes of diverted construction and demolition waste are likely to increase as landfill fees increase and new government legislation is enacted to introduce mandatory site waste diversion plans.

Improving resource recovery:

Following the introduction of product stewardship (for example container return schemes), the format of the recyclable collection service will need to be reviewed. Depending on the structure of the payment schedule there may be opportunities to reduce collection costs or provide a further revenue stream to the NWRC through the increased value of the commodities. Other product stewardship schemes (scheduled to start later in 2025) will also immediately divert most tyres waste in Nelson from landfill (600-700 tonnes per year).

Kitchen (Putrescible) waste:

Nelson City Council and Tasman District Council are exploring potential options to deliver a residential kitchenwaste collection service. This will also provide opportunities to encourage development of regional organic processing facilities.

Hazardous Waste:

There is an increased availability of recycling services for hazardous items such as chemicals and batteries with options to keep more residential hazardous materials from landfill being assessed. The NWRC management of hazardous waste is an environmentally required service and is not assessed by economic parameters.

Building Waste Diversion

Modifications to the NWRC will result in establishing an area for the diversion of building waste from late 2023. This will be staffed by NEC and be cost neutral to NCC. The aim of the service is to divert tonnes from landfill and maximise the reuse of materials.

Council will continue to focus on enabling community-led change to address our 'make, take, waste' culture and its associated greenhouses gas emissions through the Rethink Waste Whakaarohia program. Activities include grants, education, behaviour change programs, support for schools, event waste minimisation, Council walking the talk. These activities are sometimes delivered collaboratively with TDC under the Rethink Waste umbrella.

Following the introduction of product stewardship, the format of the recyclable collection service will need to be reviewed.

Issue SWA2: Solid waste will contribute to Council's obligations under the Climate Change Response (Zero Carbon) Bill by directing contractors to change to zero carbon vehicles, and through the diversion of materials which would otherwise be producing carbon emissions.

Table SWA2: Principal options to divert waste from landfill

Principal Options	Explanation and Implications	✓ or x	Cost Estimate & Timing
Option 1 Product stewardship	Government is proposing to regulate product stewardship for these priority products: tyres, electrical and electronic, containers, farm plastics, and packaging Adjustment to services, particularly tyres and containers, in line with the legislation this may provide economic benefit.	✓	Central government implementation by 2024-26
Option 2 Residential kitchen waste collection service	Nelson-wide residential service for collection and processing in line with climate declarations and NCC policies.	✓	Post 2027 costs estimated \$1M/yr
Option 3 Carbon neutral collection vehicles	Preference given to contractors with carbon neutral vehicles. (Started Dec 22)	✓	\$200k/yr. Post 2023
Option 4 Bio digester or in-vessel composting	Contracted service only. Not an NCC asset. Built and managed by contracted party	✓	\$700k/yr. Post 2023
Option 5 Joint waste Minimisation with Tasman District Council	The two councils will develop, implement, and promote activities that engage the community in waste reduction.	✓	Funded through the waste levy Present plan to 2028
Option 6 Green waste	Contracted to open windrow composter review alternate options as contract ends. Potential inclusion in food waste processing	✓	Post 2025
Option 7 Polystyrene	Few options for the diversion of polystyrene emphasis is on supporting government strategy to phase out its use.	?	Not estimated 2022
Option 8 Waste to incineration	Waste to Energy is not a preferred option as it does not align with council waste strategy. This is also a NTRLBU decision as it replaces landfilling but has minimal operational impact on collections.	x	Not estimated
Option 9 Small incinerator for non-recyclables plastics	A small incinerator will save landfill airspace (revenue) and unlike a waste to energy can be turned on and off	?	Not estimated 2025
Option 10 Atawhai closed landfill	Potential for extraction of waste from Atawhai landfill to place in alternate landfill	<	Not estimated 2040
Option 11 Deconstruction diversion to NGOs	NCC diverting deconstructed building materials to NGOs for re-sale	<	\$100k/ yr post 2023

Part Three: Financials

This section shows the estimated financial implications of the most likely scenario resulting from addressing the key issues and maintaining planned service provision over the next 30 years. This includes the estimated costs for the projects and initiatives identified in the previous section.

More detail about individual projects over the next 10 years is available in the various 2024 Activity Management Plans.

As described throughout this strategy the objective of core network infrastructure is to support achievement of the desired outcomes for the community. Each specific infrastructure objective aligns with the outcomes and will contribute to the city's success.

The anticipated impacts from climate change, recovery from severe weather events and central government direction will bring a degree of uncertainty in many areas but Council has shown the ability to remain flexible and adapt to change. While this strategy has identified the significant infrastructure issues over the next 30 years, it is based on existing information and thinking. It is understood that as new opportunities and challenges arise, future strategies will need to consider those changes.

The three waters flood protection and transport networks will continue to grow and be upgraded to meet user demand and the existing network will be upgraded/ renewed to provide the expected service levels.

Levels of service will likely change over time but the extent and direction is not always clear so ongoing monitoring of customer preferences and asset utilisation will continue. Regardless of what transpires, the focus remains on meeting the required levels of service in the most cost-effective manner.

Council is continually improving mechanisms to collect and analyse data on performance and condition. As this continues to improve, it will help ensure whole of life costs are fully understood, assets life is maximised, and funding requirements are based on sound evidence.

Key to success is not only maintaining and understanding current community needs and how our assets meet those corresponding service levels but to also keep an eye on the horizon for changes that may require a response, particularly with regards to the impacts from climate change.

The decision process needs to remain robust, so trade-off implications are understood when future changes require a re-allocation of funding.

The proceeding sections have shown our approach is to ensure that over the next 30 years Nelson's infrastructure assets are managed to continue to deliver expected levels of service. The networks will become more resilient from both natural hazards and climate change and more environmentally friendly.

They seek to provide accessible and safe transport options which allow efficient travel around the city and quality drinking water supply to households and businesses, wastewater disposal that remains in the network until treatment, and stormwater disposal options that are right sized to improve freshwater quality and protect properties from flooding.

These graphs show the financial estimates (each year is shown for the first 10 years, then spending in years 11-30 is shown in five-year increments as the average per year) for all infrastructure and by activity.

Depreciation graphs are also shown and compared against the total capital spend per year. Total capital spend has been presented as a significant amount of growth and level of service projects include a component of renewals, such as the intensification growth projects within the water, wastewater, and stormwater activities.

Furthermore, in the case of the stormwater activity, due to the impacts of climate change (increased rainfall intensity), the primary driver for replacing assets will typically be level of service, due to a reduction in pipe flow capacity. Therefore, resulting in a need to upsize the pipe, rather than a like for like renewal.

Estimates are adjusted for inflation using BERL forecasts.

Figure F1: Infrastructure Total Estimates

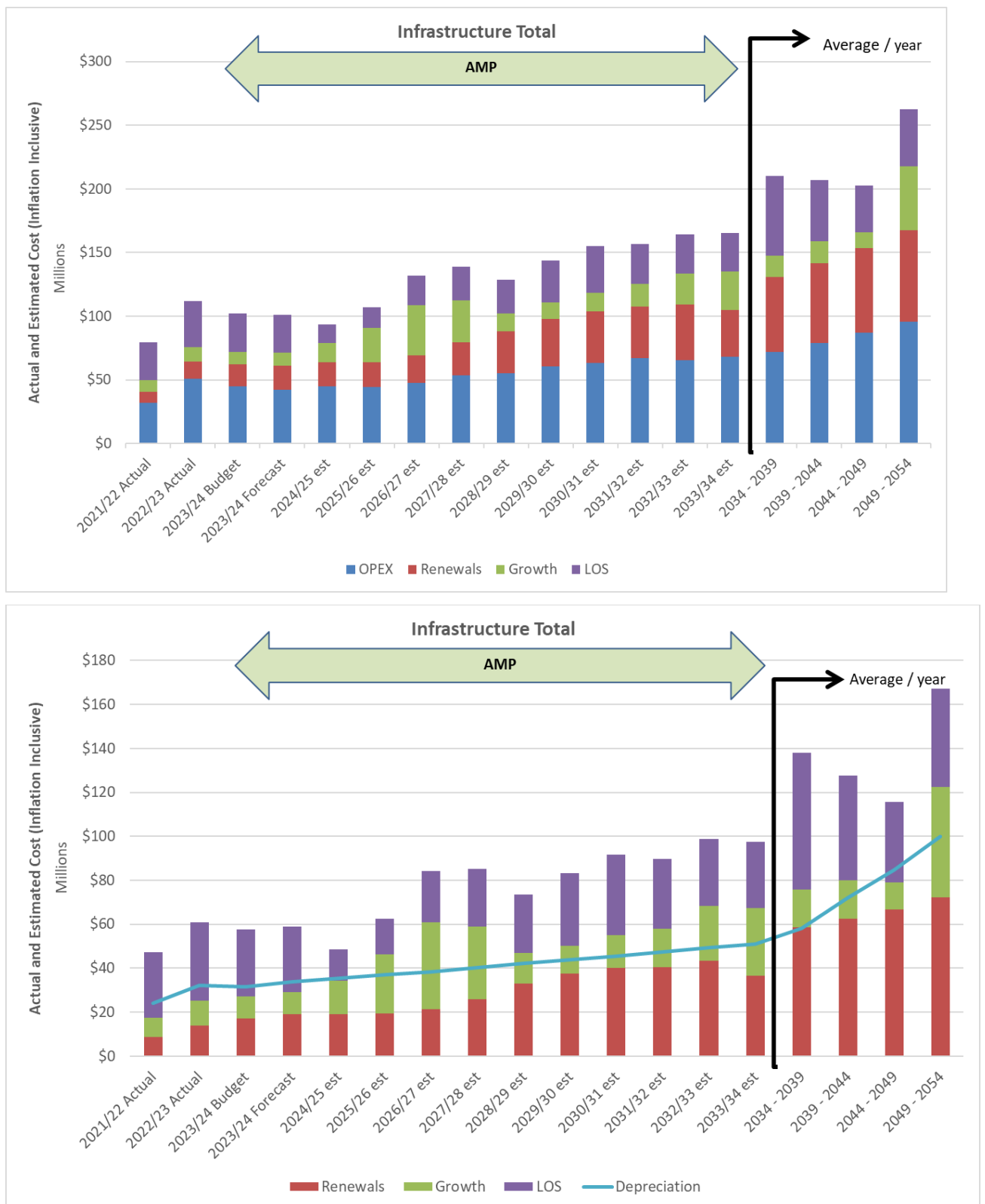


Table F1: Summary table of significant projects and programs

Activity	Project or Programme	CAPEX Cost Estimate*	Estimated	Issue Table Ref
			Timeframe	
Transport	Integration of the local network with transport solutions flowing from the Nelson Southern Link Investigation	\$164M	2023-53	T5
Transport	Footpath Renewals Programme	\$47.6M	2023-54	T2
Transport	Sealed Road Resurfacing	\$47.5M	2023-55	T2
Transport	Pavement Rehabilitation	\$41.1M	2023-56	T2
Transport	Retaining Wall replacement	\$27M	2023-57	T2
Wastewater	Atawhai Rising Main Renewal	\$57M	2024-33	WW4
Wastewater	Wastewater pipe renewals	\$300M	2024-54	WW2/3
Wastewater	Natural Hazards Risk Assessment	\$23.5M	2027-54	WW1
Wastewater	NWWTP Upgrade	\$149M	2025-54	WW1
Wastewater	Wet weather overflow mitigation programme	No direct capex programme – links to other programmes.	2024-54	WW3
Wastewater	Quarantine Rd Sewer PS/Catchment Upgrades	\$27.2M	2024-39	WW1/2/5
Wastewater	Emano/Murphy St Wastewater pipe Renewal & Upgrades	\$16.6M	2030-35	WW2/5
Wastewater	Awatea/Quarantine/Airport RM network - Renewal and Upgrade	\$19.6M	2033-38	WW1/2/5
Wastewater	City Centre RM network - renewal and upgrade	\$28M	2036-43	WW1/2/5
Wastewater	Vangaard PS (Upgrade/renewal)	\$23M	2032-37	WW1/2/5
Water	Primary Clarifier	\$22M	2035-40	WS5
Water	Water Pipe Renewal Programme	\$155M	2024-54	WS2/3/4
Water	WTP Membrane Renewals	\$23.7M	2030-54	WS3
Water	WTP Headworks Renewals/Upgrades	\$36.6M	2024-54	WS3
Water	WTP Renewals	\$18.3M	2024-54	WS3
Water	Maitai Raw Water Pipeline Renewal	\$38M	2027-41	WS1/2/3/4
Stormwater	Stormwater Renewals	\$56.7M	2024-54	SW3
Stormwater	Rutherford Stage 2 - Box Culvert Examiner to Hardy	\$12.0M	2033-40	SW1/2
Stormwater	Rutherford Stage 3 - Box Culvert Hardy to Saltwater Creek	\$14.3M	2040-47	SW1/2
Stormwater	Stoke STW Strategy Implementation	\$11.5M	2036-44	SW1/2
Stormwater	Port Hills STW Strategy Implementation	\$10.9M	2035-44	SW1/2
Stormwater	Atawhai SW Strategy Implementation	\$10.1M	2038-48	SW1/2
Stormwater	Freshwater Improvements Programme	\$7.5M	2024-54	SW5
Stormwater	Washington Valley Stormwater	\$8.4M	2025-34	SW1/2/3
Stormwater	Murphy/Emano Street Upgrade	\$10.5M	2024-34	SW1/2/3
Stormwater	The Wood Stormwater Upgrade	\$7.0M	2031-40	SW1/2
Stormwater	Tahunanui Catchment 9 - Moana Ave to Rocks Rd	\$8.1M	2024-31	SW1/2/3
Flood Protection	Maitai Flood Management	\$57.9M	2024-54	FP1/2
Flood Protection	York Stream Upgrade	\$9.5M	2031-41	FP1/2
Flood Protection	Jenkins Creek Upgrade	\$14.3M	2026-54	FP1/2
Flood Protection	Poomans Stream Upgrade	\$19.2M	2030-52	FP1/2
Flood Protection	Rural Rivers	\$9.8M	2027-52	FP1/2
Flood Protection	Coastal Response Strategy Implementation	\$9.6M	2028-49	FP1/2

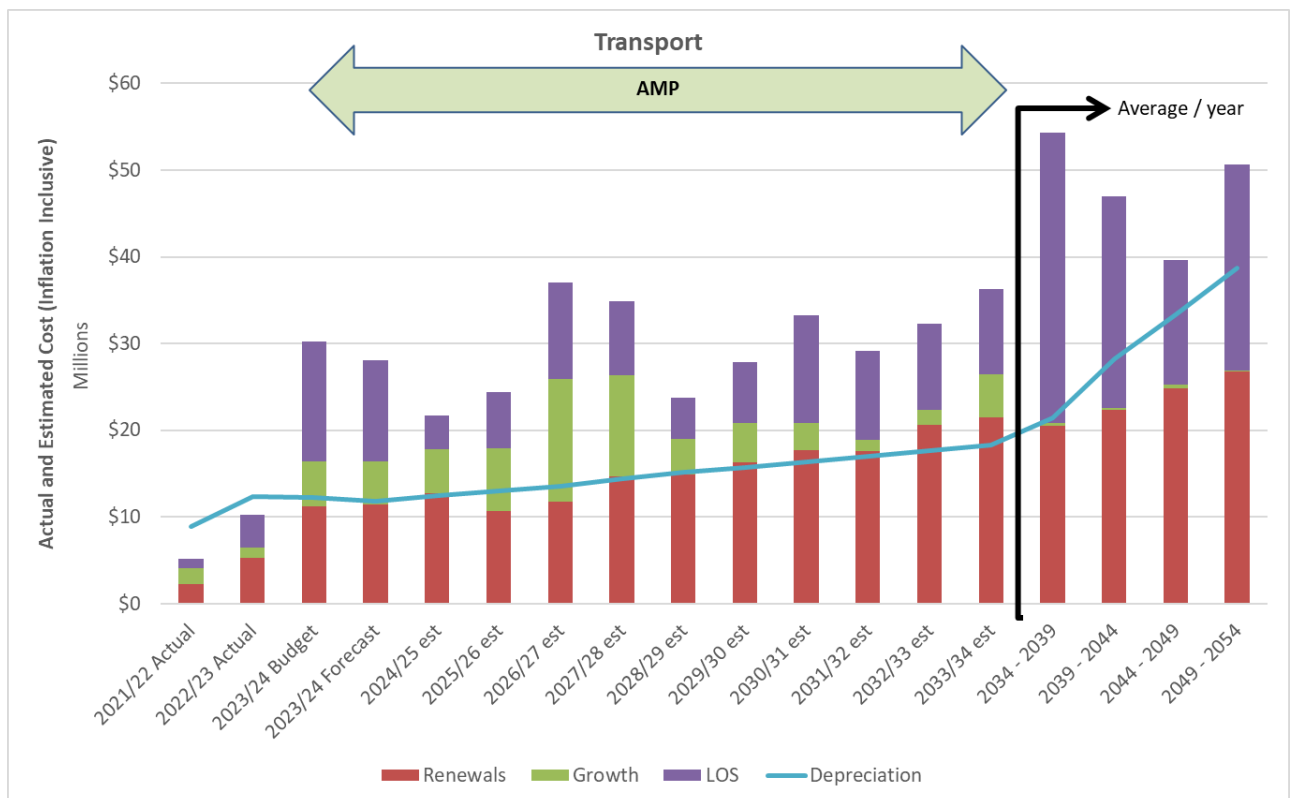
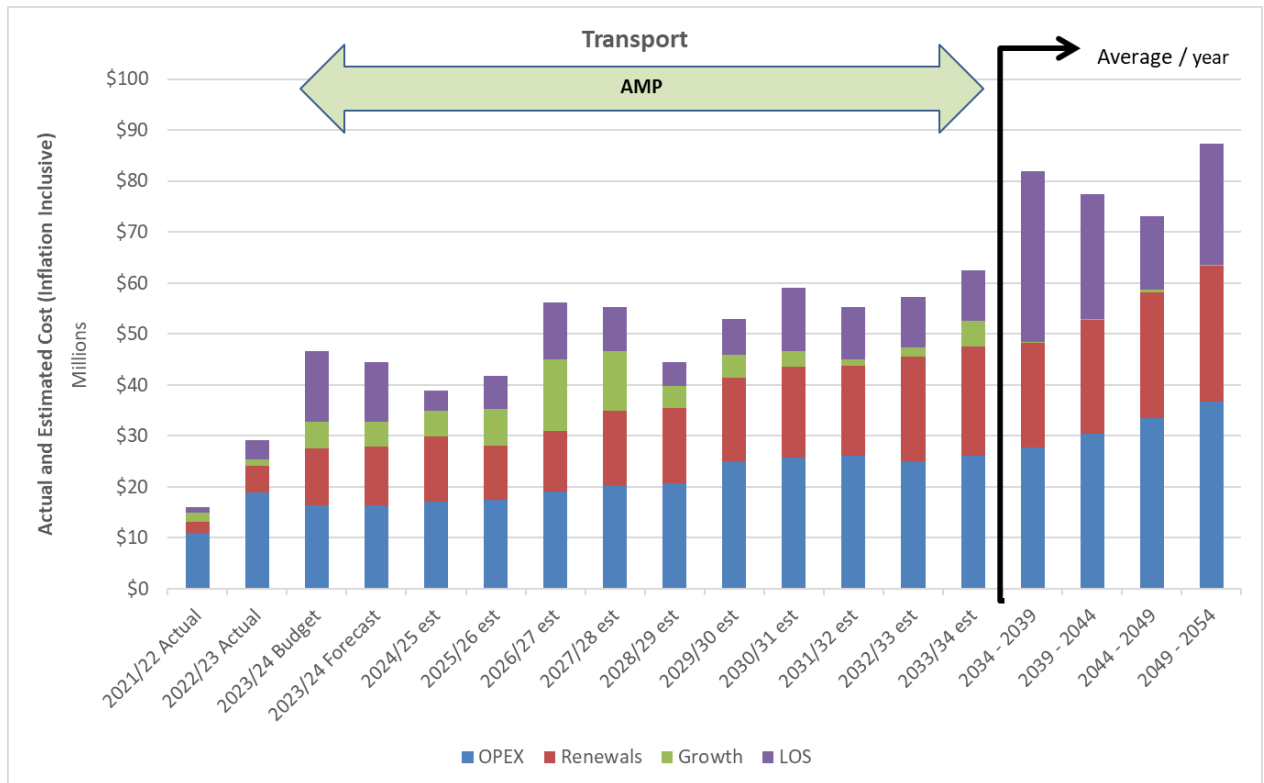
*All Capex Costs Inflated

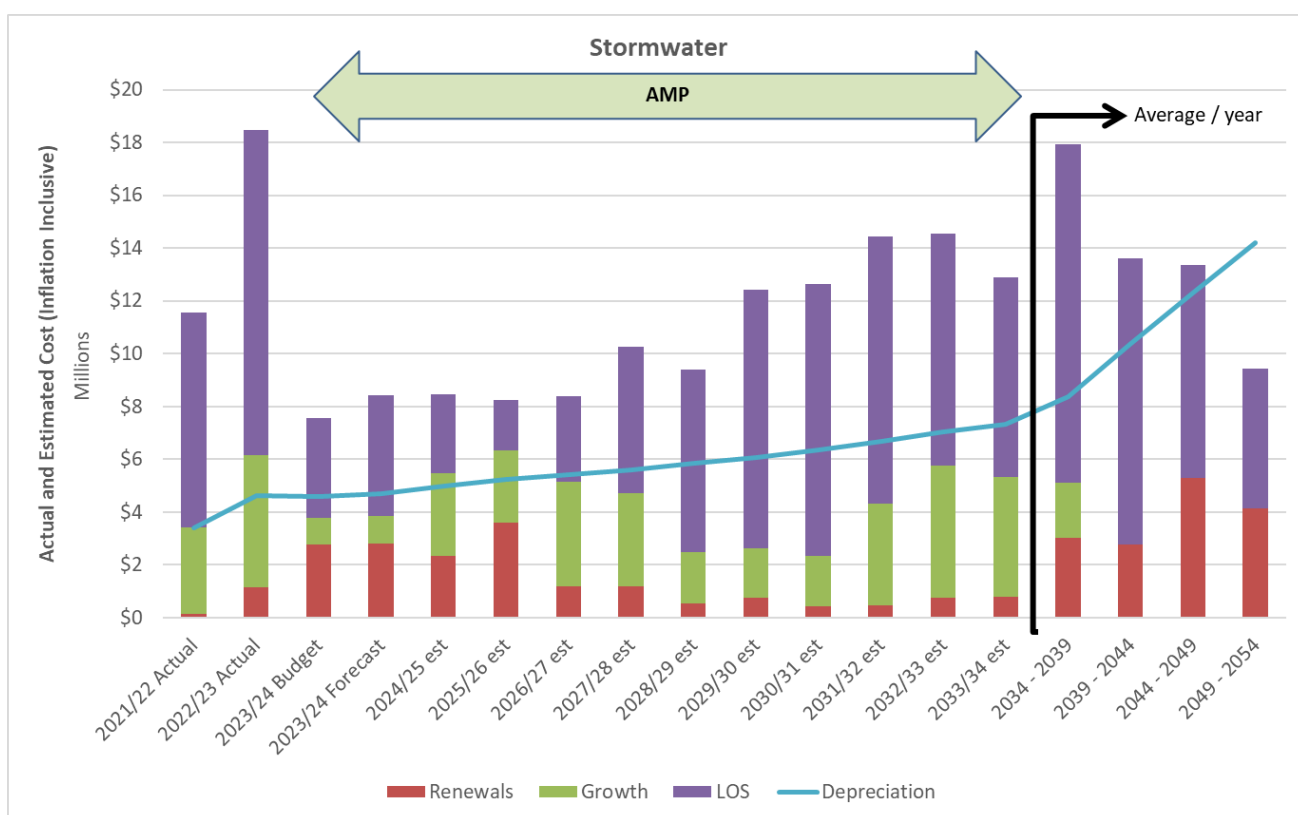
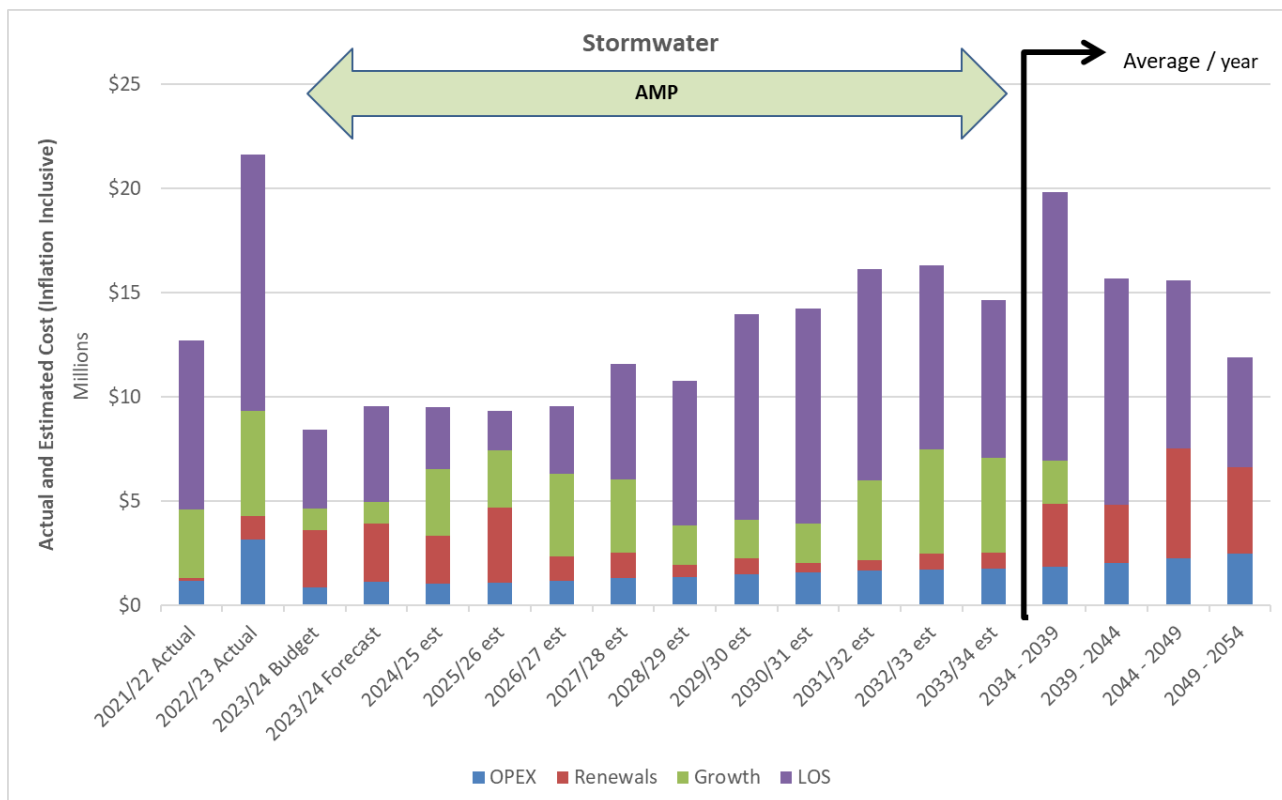
Table F2: Summary table of key growth projects

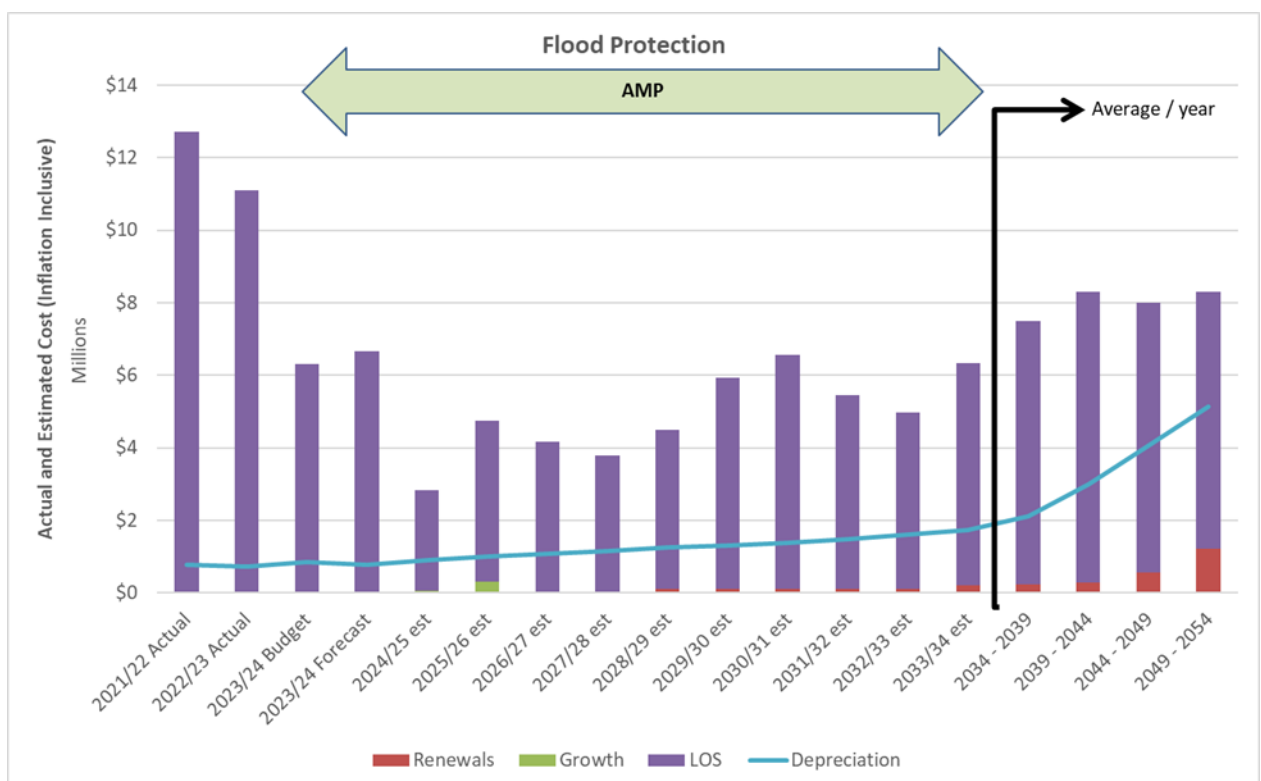
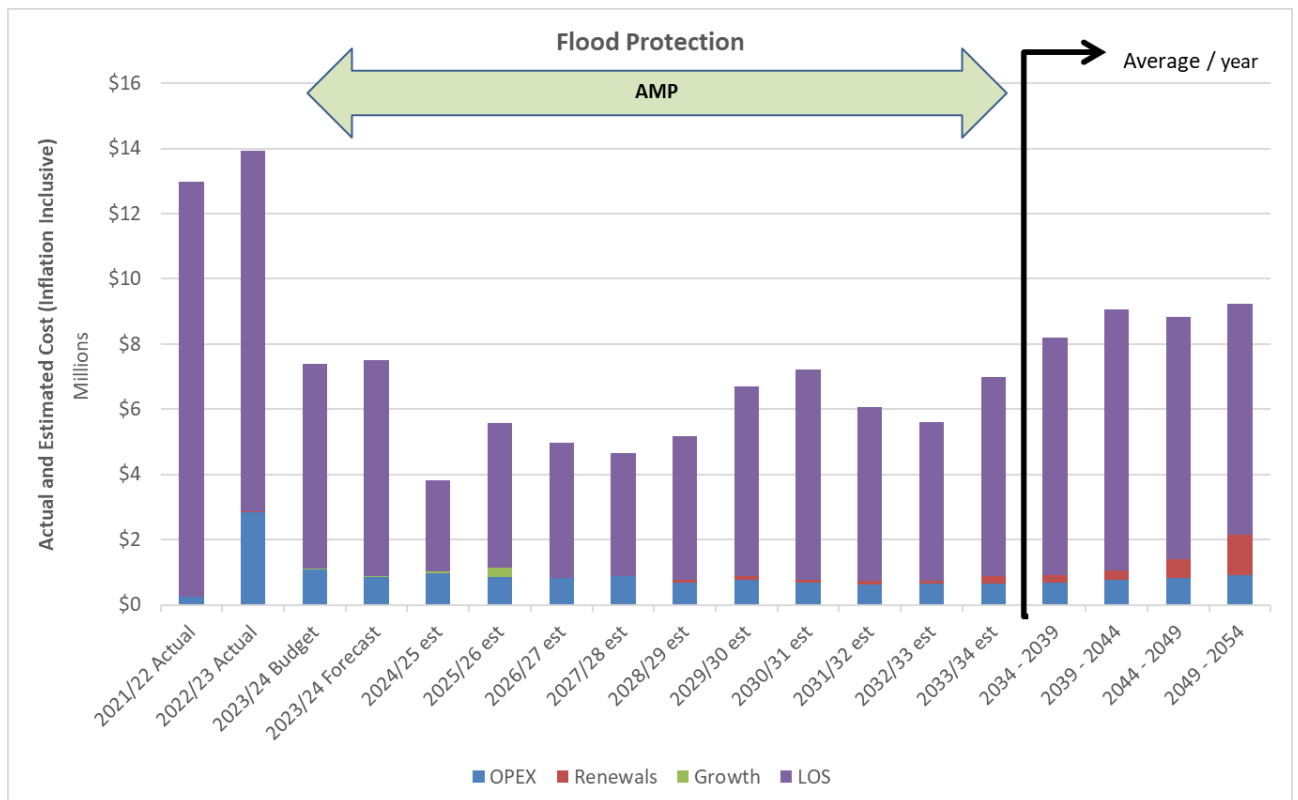
Activity	Project or Programme	CAPEX* Cost Estimate	Estimated Timeframe
Transport	Marsden Valley Ridgeway Upgrade	\$3.77M	2024-28
Transport	Main Road Stoke/Marsden Road	\$1.3M	2029-36
Transport	Montreal Princes Drive Intersection Upgrade	\$1.64M	2036-41
Transport	Polstead Suffolk Intersection Upgrade	\$2.75M	2031-46
Transport	Polstead Main Road Stoke Intersection Upgrade	\$1.12M	2024-27
Transport	Ngawhatu Suffolk Intersection Upgrade	\$3.17K	2028-31
Transport	Market Road Bishopdale Ave Intersection Improvements	\$483K	2046-51
Transport	Public Transport Facilities new and renewed	\$288K	2030-51
Transport	Integrated ticketing	\$111K	2025/26
Transport	CBD Interchange	3.6M	2021-27
Wastewater	Saxton Road Sewer Upgrade	\$7.69M	2031-34
Wastewater	Ngawhatu Valley Trunkmain – Stage 2	\$7.18M	2028-32
Wastewater	Central City Intensification Capacity Increases	\$4.56M	2032-42
Wastewater	Pump Station Upgrades	\$46M	2024-54
Wastewater	2034+ Growth projects	\$98M	2034-54
Wastewater	Mahitahi and Bayview development	\$12.48M	2024-32
Wastewater	IAF upgrades	\$26.81M	2024-28
Water	Mahitahi Development Growth project	\$5.5M	2024-31
Water	IAF upgrades	\$10M	2024-28
Water	NCC- TDC Link	\$3.3M	2029-33
Water	Ngawhatu Valley High Level Reservoir	\$2.6M	2027-31
Water	Bayview Storage	\$2.2M	2024-30
Water	Future growth and intensification	\$40M	2024-44
Water	Future growth Additional Storage	\$9.83M	2032-47
Stormwater	Intensification City Centre	\$8.65M	2028-38
Stormwater	Intensification City Wide	\$8.8M	2028-38
Stormwater	York Terrace	\$2.25M	2024-26
Stormwater	IAF Stormwater Pipeline Upgrade	\$5.34M	2024-29

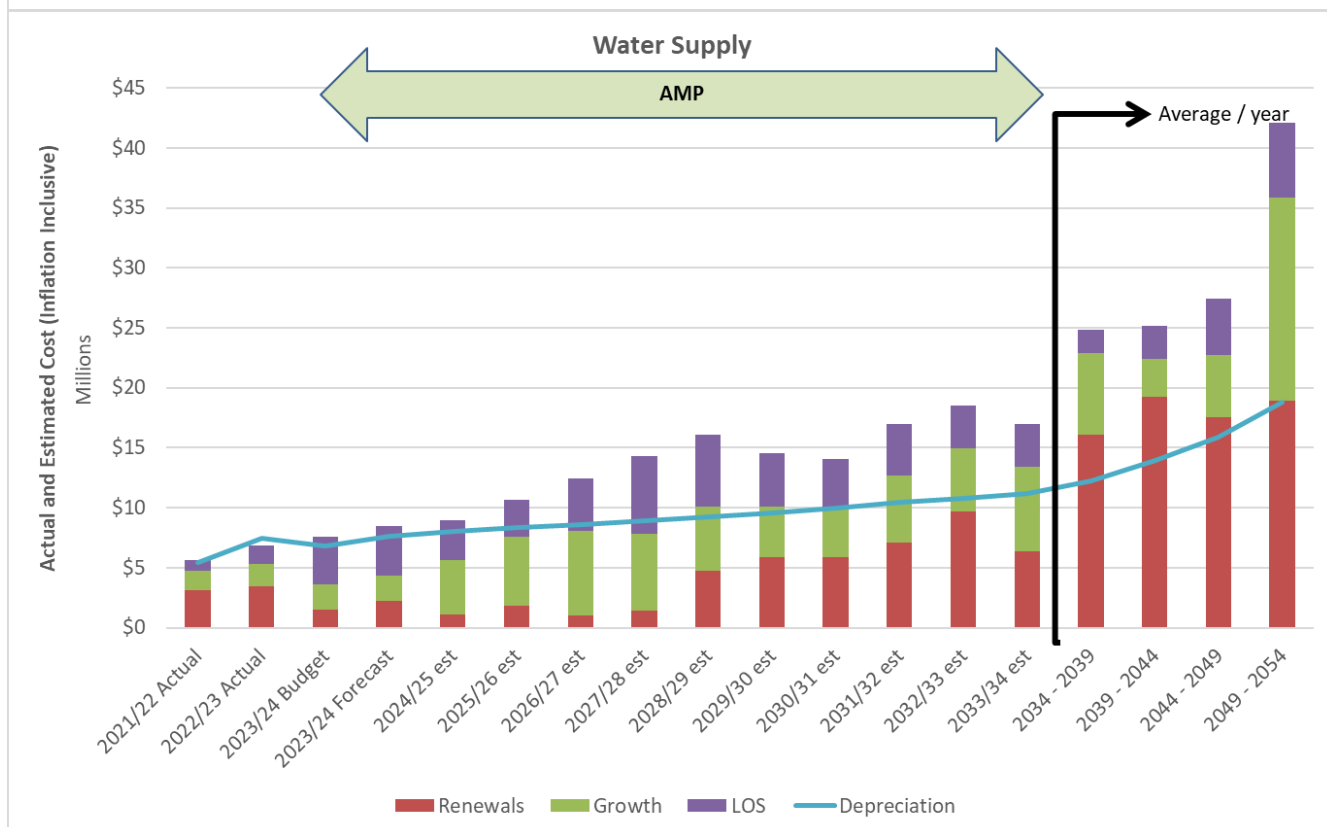
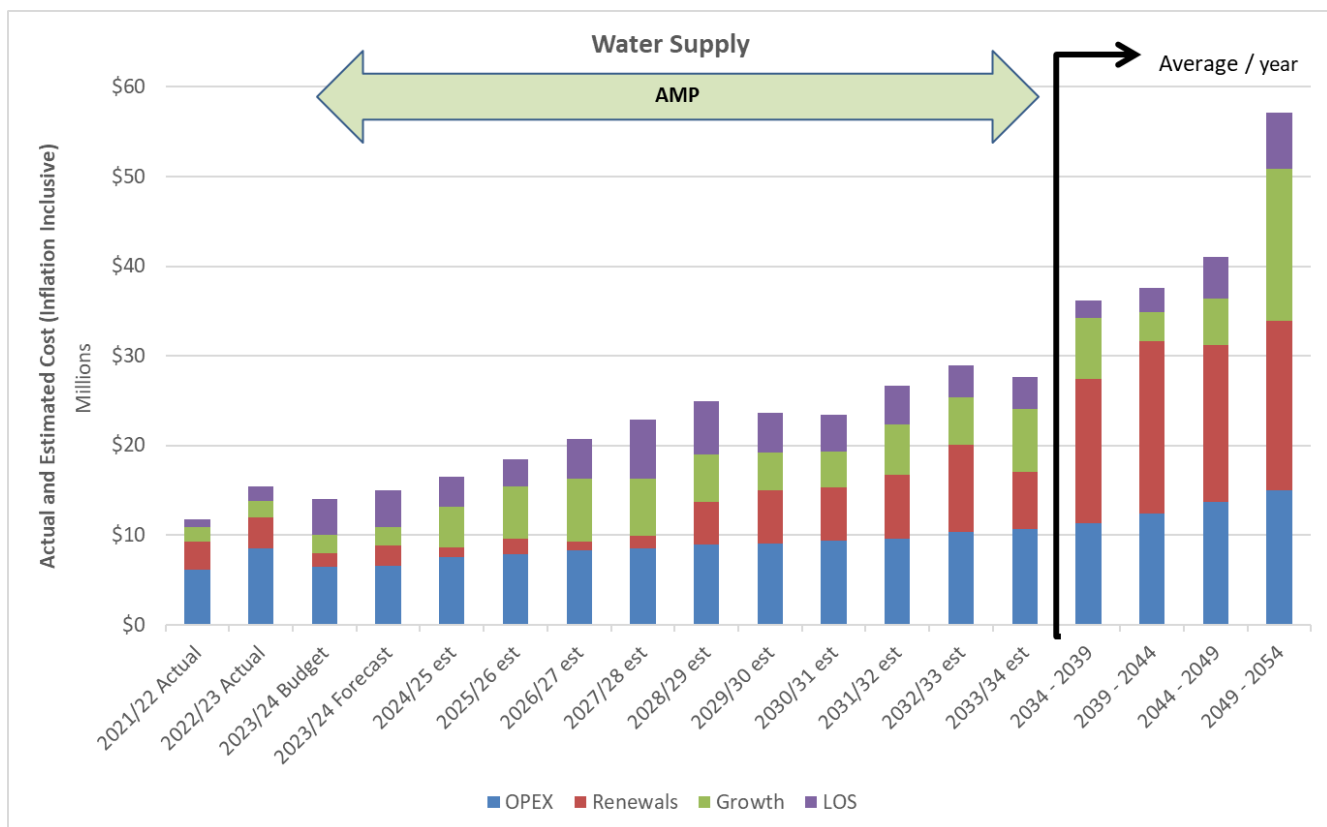
*All Capex Costs Inflated

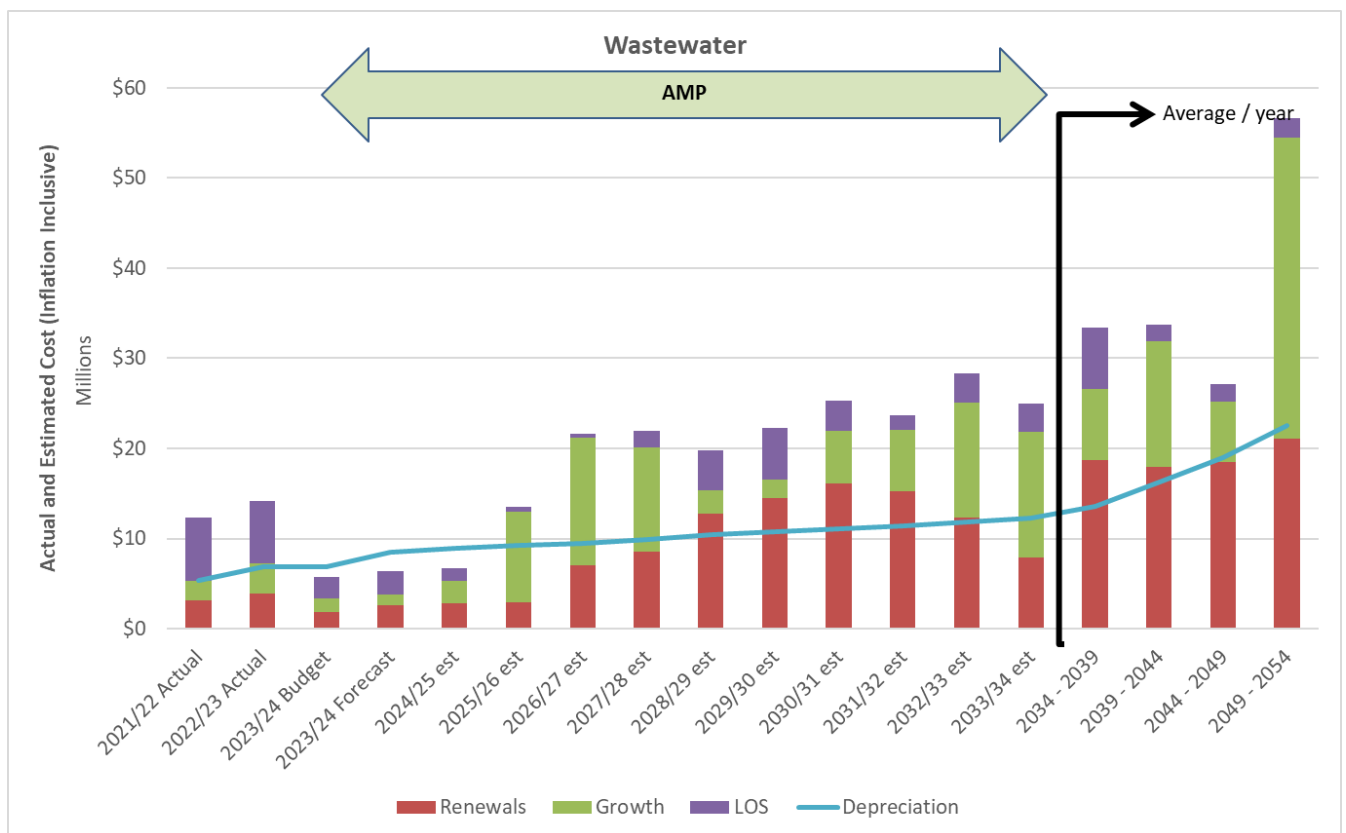
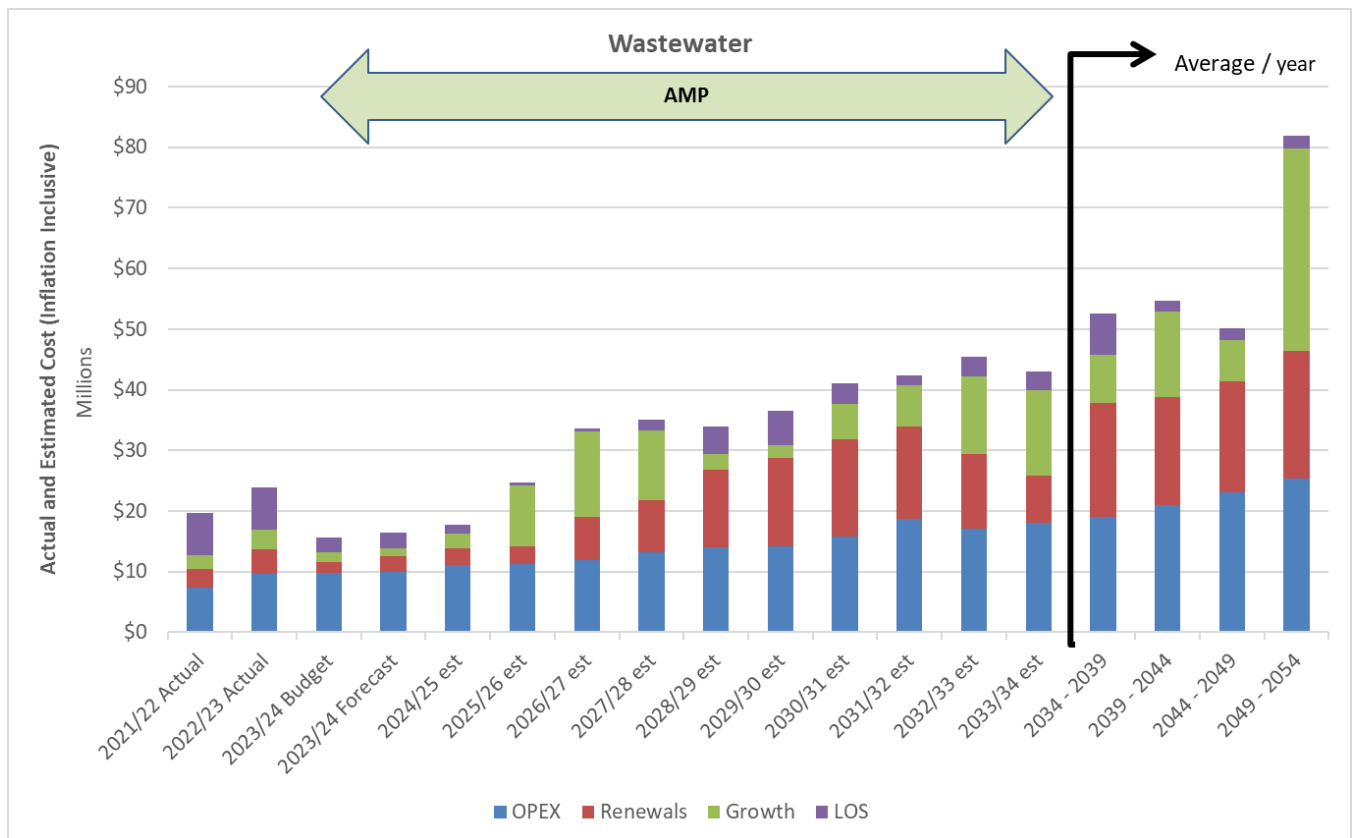
Activity Estimates

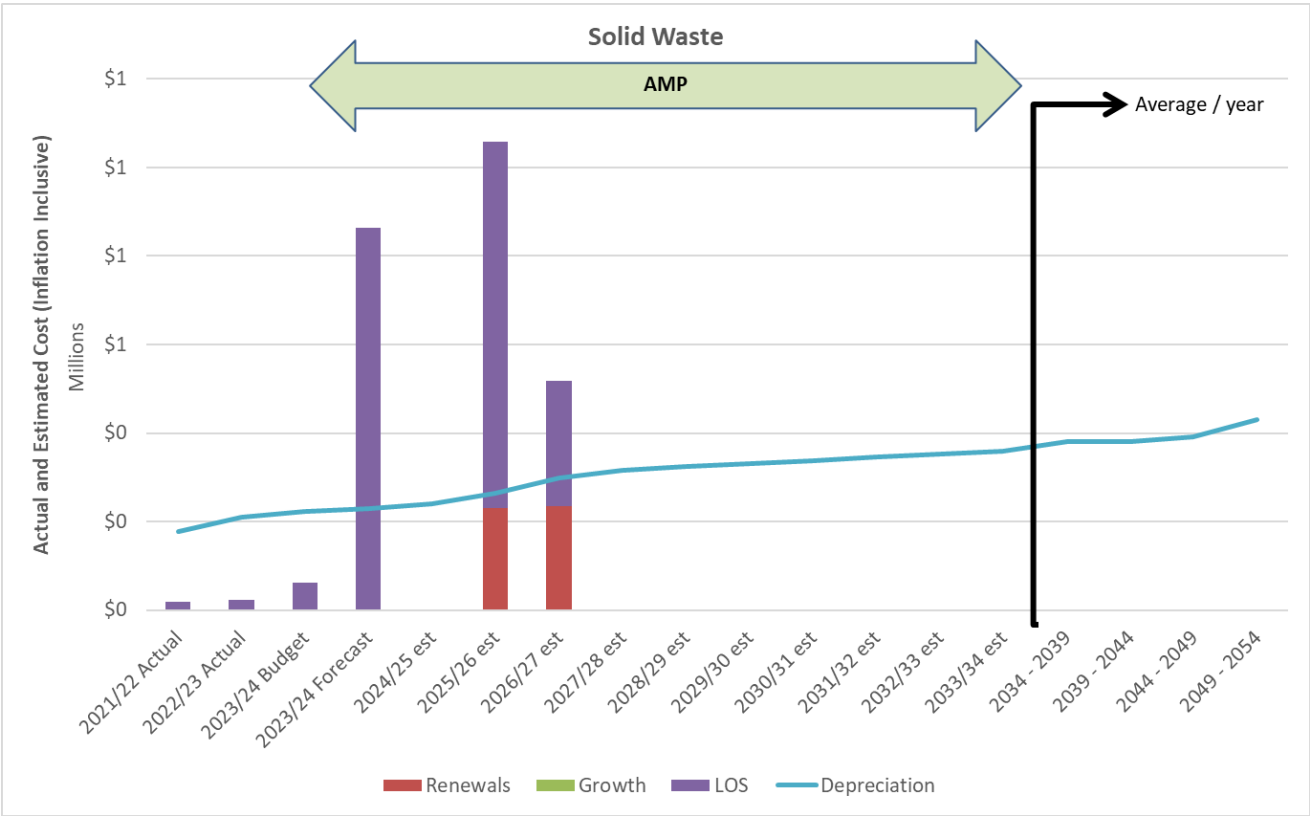
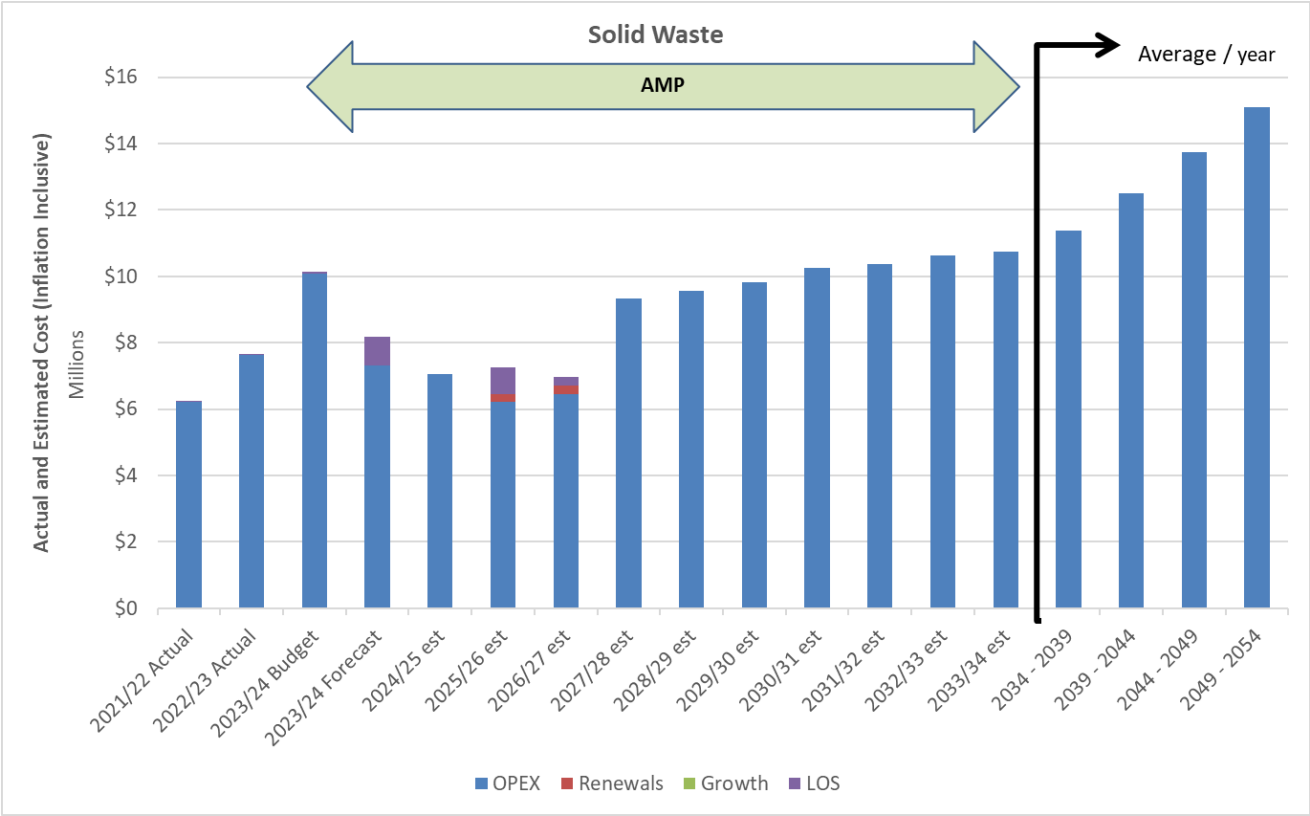












Glossary

AMP	Activity Management Plan
LoS	Level of Service
RAMM	Road assessment and maintenance management database – It is an asset management database to manage and maintain the networks assets.
ONF	One Network Framework - The One Network Framework is a tool to help establish transport network function, performance measures, operating gaps and potential interventions for each road and street type.
NGO	Non-Government Organisation
RENEW	Replace it with exactly the same type of asset
SATURN	A software program that calculates transport assignment on road networks. Saturn accurately reflects the effects of congestion on urban road networks by explicitly modelling the impact of queues that form at a particular junction on the capacity of those upstream ('blocking back') and the reducing flows able to travel downstream ('flow metering')
TE ARA Ô WHAKATŪ	The Nelson City Centre spatial plan
TRACKS	A suite of some sixty programs which have been developed by Gabites Porter Consultants to assist the analysis and interpretation of land use and transport planning problems
UPGRADE	Replace it with a bigger pipe, larger channel, or additional capacity
JWMMP	Joint Council Waste Management and Minimisation Plan shared with Tasman District Council