Transport Asset Management Plan 2024-34

June 2023

Christchurch City Council

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1 Executive Summary

1.1 Asset Management

Asset Management ensures that acceptable levels of service are provided in the most cost-effective manner to achieve the strategic objectives and community outcomes set by the Christchurch City Council (Council). Asset Management is 'knowing' about assets, what they are, where they are, what condition they are in, and what level of service is expected of them. From a planning perspective Council needs to know how they are performing such that works can be programmed and future budgets forecast.

This Transport Asset Management Plan (AMP), in support of Council's Long Term Plan (LTP) for the period 2024-34, is for Council's transport network assets as outlined in the **Table 1-1-: Transport Network Asset Portfolio Summary**. State Highways within the Council's territorial area are the responsibility of Waka Kotahi New Zealand Transport Agency (Waka Kotahi) and as such are not included in our Portfolio.

The investment horizon for the AMP is 30 years, which is consistent with Council's Infrastructure Strategy. This AMP has been prepared using industry guidance and contributes to the suite of advice for Councillors to make decisions that affect the community. It has also been prepared at a time when Christchurch and the rest of New Zealand and the world are recovering from the economic and social consequences of the COVID-19 pandemic. The aftermath of the pandemic is continuing to have a significant financial impact on Council; in particular in terms of ongoing supply chain issues and significantly increased inflation, so the demand for fiscal prudence continues to challenge our Asset Management planning and practices.

Asset Category	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Carriageways	2,178.8 km sealed 323.7 km unsealed	$1,949,440,700	$1,137,167,122	$24,789,938
Road Drainage	3,593 km kerb & channel 34,195 sumps & associated pipes	$779,938,985	$409,715,191	$8,944,987
Footpaths	2,581.7km	$559,346,581	$279,856,932	$12,030,333
Bridges & Structures	353 roads bridges & 116 footbridges 103 culverts,1 ford & 2 underpasses 1,611 retaining walls Guardrails, railings and gantries	$646,098,086	$238,840,328	$10,675,279
Road Lighting	38,145 lights & 20,327 poles	$125,171,204	$79,645,515	$3,796,076
Traffic Systems	348 signalised intersections 247 CCTV sites & X school speed zone sites	$57,664,831	$28,621,741	$2,478,263
Traffic Services	55,979 signs & city-wide marking	$23,838,391	$8,602,576	$1,211,373
Road Landscaping	65,720 trees	$410,373,102	$238,726,584	$5,099,786

	Berms and 9,592 landscaped sites			
Cycleways	225 km of on-road lanes 115 km of shared paths			
Bus	519 bus shelters, signs and furniture.	$2,849,765	$729,273	$99,825
Tram	4km of tram line	$36,826,953	$29,526,387	$551,475
Parking	1,200 on-street metered spaces 437 parking meters	$11,060,673	$2,889,890	$792,745
Other Street Furniture	Includes bollards, furniture, wheel stops & gas lamps	$273,849	$27,472	$10,260
Total		**$4,603,803,750**	**$2,454,442,622**	**$70,524,932**

Table 1-1-: Transport Network Asset Portfolio Summary (values as at 30 June 2022 from 2022 Valuation Report

Underpinning Council's Transport Asset Management approach are the three service outcome Pillars; all of which are underpinned by Affordability. These Pillars are outlined in **Table 1-2-: Transport service outcome Pillars**.

Safety	The network and our services are safe for all users and we actively seek to reduce deaths and serious injuries – to meet the challenging Vision Zero targets of a 40 % reduction in fatal and serious injuries for Christchurch roads in the next decade
Access	the network enables active and connected communities through providing transport choice for all
Environment	the environment is enhanced and projects proposed aim to meet the challenge of climate change – achieved through measures to reduce the need for motorised travel and to encourage more self-contained, sustainable and resilient communities
Affordability	solutions proposed that are affordable and sustainable

Table 1-2-: Transport service outcome Pillars

To assist with achieving the three outcome Pillars, a Tactical Asset Management Approach (Table 3) -sits at the heart of this AMP.

Approach	Details
Reduce	• Reduce overall need / demand for travel. • Plan and manage future growth projections in a sustainable way. • Improve integration of land use and transport assets / network. • Support increased integration, self-containment and resilience of our communities.
Manage	• Make the best use of existing transport assets and networks.

Invest	• Add or re-shape existing networks / assets only when Reduce / Manage options have been exhausted. • Use better business case approach. • Demonstrate the shift towards alternate modes (e.g. cycling, walking, public transport). • Demonstrate connection to improving Levels of Service.

Table 1-3-: Tactical Asset Management Approach

1.2 Key Issues

Council's Levels of Service for transport and roading services combine customer satisfaction and technical performance measures. These measures range from high-level outcomes directly associated with delivery of Council's community outcomes and strategic priorities to what is delivered on the ground. A gap analysis undertaken as part of preparing this document has identified which Levels of Service required additional investment for the target outcomes to be met. The four levels of service that have the greatest improvement required to achieve the target Level of Service are outlined in **Table 1-4-** with the details of what is required and how it will be achieved.

#	Issue	What's required	How it is to be achieved
1	Low Customer Satisfaction rating	Reduce backlog of maintenance and renewal issues `	Increase the quantity of maintenance and renewal work
2	Road safety Level of Service is not being met	Increase priority of road safety	Targeted road safety interventions
3	Insufficient opportunities and choice of non-car modes of travel	Improve the integration of land use and transport planning and services	Continue to invest in cycling and public transport infrastructure
4	Reduce car travel on our networks		

Table 1-4-: Levels of Service GAP Analysis identified that require additional investment to meet target outcomes

1.3 Financial Outlook

Below is a high-level summary of the proposed 30-year expenditure for the transport portfolio, including capital expenditure (Capex), operational expenditure (Opex) and depreciation. This has been prepared using the best available information to date, including historical trends back to 2008. This financial expenditure profile takes into account:

- the services we provide and the demand for those services; and
- the lifecycle of the asset and the proposed lifecycle management plan.

The financial forecast assumes growth predictions occur as per those outlined in this document, the smoothing of costs has not been undertaken and all budgets are in FY2022 dollars with no inflation allowance.

Figure 1--1: Transport Total Expenditure

1.4 COVID-19

New Zealand and the world are still coming to grips with managing COVID-19 and all that it impacts. The impacts are multi-faceted and far reaching and it is now very clear that the impact of this pandemic will continue to impact our communities and economy for many years to come. While we have a better understanding of COVID-19 impacts now compared to 12 months ago, there are still many gaps in our understanding that will require time for information to become available and questions to be answered.

Early forecasting advice from economic commentators (e.g. the Treasury, ChristchurchNZ, financial institutions) signalled significant economic impacts locally, nationally and internationally. This advice was updated regularly and changed over time (the Treasury's early economic scenarios released on 14 April 2020 cautioned that economic impacts are "*highly uncertain*"). That certainly proved to be the case. To date we know that due to COVID-19 there has been:

- a reduction in public transport patronage and a subsequent increase in people using private vehicles and other modes;
- an initial focus on infrastructure that supports COVID-19 economic recovery, delivers, and supports the remaining post-earthquakes central city anchor and regeneration projects;
- early priorities also include temporary re-allocation of road space to support physical distancing post-COVID;
- progress of 'shovel ready' infrastructure projects identified as part of central government stimulus package; and
- completion of committed projects citywide.

Looking forward there are a number of issues that Council will need to manage that may increase financial pressure on Council budgets. These include:

- in the short-term (now in 2021 and LTP years 1-3) :
    - possible delays in scheduled capital programme works;
    - potential issues with workforce availability / contractor viability following lifting of restrictions;
    - uncertainty about materials supply;
    - changing priorities for work programming and methodologies (e.g. accommodating the norm of physical distancing); and
    - opportunities for bringing forward 'shovel ready' work and potential changing travel patterns and demands (increased walking and cycling).
- in the medium term (LTP years 4-6):
    - possible re-prioritisation of capital works programme and changed programme priorities.
- in the longer term (LTP years 6 – onwards):
    - uncertain at this stage, but a potential bow-wave effect of deferred operational spend due to the above factors.

1.5 Risk Management

Council's corporate approach to managing risk is defined in its Risk Policy and assessment framework. The framework provides a means for consistently identifying, recording and assessing risks such that risk mitigations can be prioritised across Council. The 'Very High' and 'High' rated strategic risks identified in relation to this AMP include:

Risk	Description of Risk	Risk Rating
Asset Failure	Transport asset/s or core service could fail	Very High
Transport Safety	A death or serious injury occurs on the transport network	
Emissions	Council has declared a 'Climate Emergency' and set targets for Christchurch to become 100% Carbon neutral by 2045 and 50% interim reduction by 2030. The best approach to achieve those targets either through more tree planting or emission reduction by various sectors is being investigated. Achieving the aspirational targets is beyond the transport unit's level of influence and will require a coordination among a large number of influencing factors including but not limited to: • Central Government to practically encourage intensification, stop the import of fossil fuel cars, set high tax on fuel sales and invest heavily in alternative modes of transport; • Council to deprioritise car use through road capacity and speed reduction, parking limitation and aggressive pricing and meanwhile invest heavily in alternative modes of transport; • community to buy into the 'Climate Emergency' requirements and accept the fact that a considerable behaviour change is required which will include living in much denser residential areas and shifting to active, public or electric modes of transport. Lack of any of the above elements could end in failure to achieve the targets and considerable environmental costs for the current and future generations.	
Budget Overrun	Overspend on operational budgets will have an adverse impact on rates	High
Pandemics	COVID-19 showed that Council's revenues can become uncertain, at least in the short term. Similar incidences in the future could have implications for the funding of transport services and projects	
Poor Delivery	Projects not delivered to expected timeframes, quality or to budget	
Health and Safety	Staff, contractors and others working with the Council do not comply with the Health and Safety at Work Act to adequately (so far as reasonably practicable) protect their health and safety (including wellbeing)	
Natural Hazards	Earthquakes, storms, flooding, tsunamis, sea level rise and other natural hazards pose a risk to the transport network and to the service Council provides	

Table 1--5: Strategic Risks

1.6 Plan Improvement Programme

The Transport Unit has a strong commitment to the continual improvement of Asset Management. In November 2017 an Asset Management Maturity Assessment was completed by an independent consultant. The model utilised for the assessment aligned with the Asset Management Standard ISO55000/01:2015. This assessment was the basis for developing an Improvement Roadmap, a prioritised list of improvement projects to be completed between January 2018 and June 2020.

The consultant completed a re-assessment in March 2020 to determine what improvements had been achieved to date, a summary of these findings is presented in the Figure below.

Overall, the Unit achieved a maturity rating of **70**, putting it at the middle of the 'Enterprising' band in terms of Asset Management maturity. This represents an increase in overall maturity from 62 in 2017. An appropriate overall level of maturity for Transport would be around **85**, which would put the Transport Unit at the lower end of the excelling band.

Significant improvement was observed in the areas of strategic context, business process and financial management. For information systems, the gap in maturity has increased (current score regressed from 2017 review) mainly due to some issues identified with systems integration, and the continued reliance on off-line copies of data rather than real-time data integration.

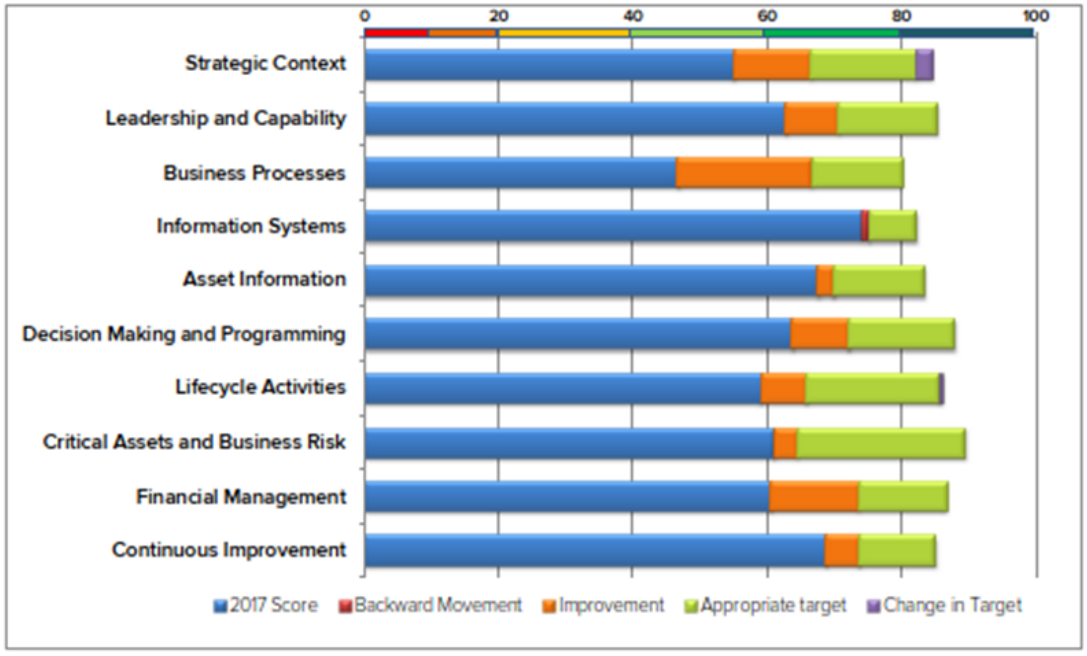


Figure 1-1: Asset Management Maturity re-assessment (March 2020) summary of findings

Moving forward the Transport Unit acknowledges the need to continue to focus efforts to further transform Asset Management practices until the next audit to an appropriate level of capability.

Future improvement projects are outlined in more detail in Section 10. The most significant are:

- alignment with 2021 Government Policy Statement on Land Transport;
- knowledge transfer from experienced Asset Management practitioners;
- One Network Framework implementation and alignment; and
- improvement in the understanding of transport asset risks.

2 Introduction

2.1 Background

This AMP is the basis for transport activity planning. The purpose of this Plan is to demonstrate responsive management of assets (and services provided from the assets), compliance with regulatory requirements, and to communicate funding needed to provide the required Levels of Service set by Council within its LTP for the coming plan period, but within a 30-year planning horizon.

The 10-year objective of Asset Management is to: *'Deliver the required level of service to existing and future customers in the most cost-effective way.'*

In this context the specific objectives for this AMP are to:

- define the services to be provided, the service standards that Council aims to achieve, and the measures used to monitor the performance of the activities undertaken by the Transport Unit and the Council as a whole;
- translate Council's Community Outcomes and Strategic Priorities into actions for the Transport Unit. The Plan identifies forward works programmes based on strategic outcomes sought around three new transport 'Pillars' of Safety, Access and Environment, with an underpinning foundation of Affordability. It also outlines financial forecasts required to meet agreed service levels and account for anticipated population growth;
- demonstrate responsible management of the transport infrastructure and services for which Council is responsible, ensuring that public funds deliver cost-effective services to meet customer expectations;
- document current Asset Management practices used by Council based on clear evidence as part of a sustainable and optimised lifecycle management strategy for transport infrastructure, and identify actions planned to enhance management performance;
- maximise alignment with Council, Regional and Government Strategies, Policies and Plans that effect the management of transport infrastructure and services; and
- comply with the requirements of relevant legislation.

The key outputs of this AMP are included in the 2024-2034 LTP process, which will be the subject of a public consultative process. The intention of this AMP is to set out how Council manages transport assets and services in a way that is appropriate for a readership including elected members of the Council, executive management, interest groups and key stakeholders, along with all members of the community.

This AMP covers a period of 30 years commencing 1 July 2024. Operational, maintenance and renewal programmes for the first 3 years are generally well defined with reasonable certainty of being implemented to budget as planned. Beyond this period, work programmes are generally based on projected trends and demands for the Long Term Plan period (to 2034), and where there is necessarily less certainty with respect to scope, timing and costs of the projects. All expenditure forecasts are based on unit costs as at 1 July 2023 with no allowance for inflation.

2.2 Scope of the Assets and Services Covered

In Scope	Out of Scope
All transport related assets	Public transport services
Operational activities including education and enforcement	Bus Interchange facility and suburban interchange facilities (off street) Off-street car parking facilities including the Lichfield Street Carpark building Tram Barn All included in Corporate Accommodation AMP

Table 2-1: Scope of AMP

2.3 Relationship with other plans

Many of the asset planning activities undertaken by Council are applied to all infrastructure assets. For this reason, Council has developed Asset Management Plans (AMPs) in two parts. A Strategic Asset Management Plan (SAMP) document, which provides an overview of Asset Management planning at the Council, and an AMP document for each asset group, which describes the assets and how the principles contained within the SAMP are applied to the management of the respective assets.

Figure 2-1 depicts the relationship between the various processes and levels of planning within the Council required to deliver on Council's vision and goals.

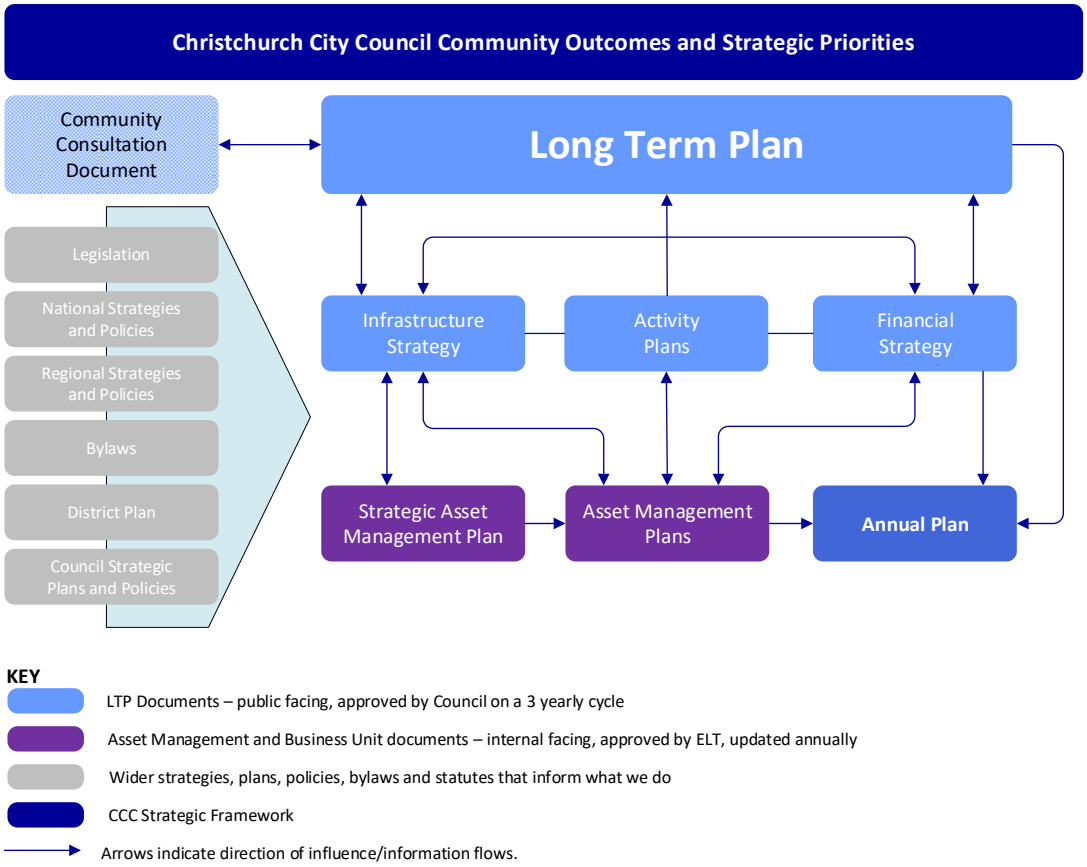


Figure 2-1: Council's Planning Framework

The SAMP provides an overview of the linkages between asset management planning and the other business processes of Council, such as strategic planning, risk management, financial management and compliance.

The SAMP also describes the linkages between each AMP and other corporate plans and documents. In addition to these corporate documents, the following documents are specifically relevant to this AMP:

- Government Policy Statement on Land Transport (2021);
- One Network Road Framework (Classification);
- Arataki, Waka Kotahi 10 year view;
- Canterbury Regional Land Transport Plan 2018 and National Land Transport Programme 2018;
- Christchurch Transport Strategic Plan (CTSP) 2012 (currently under review);
- Greater Christchurch Transport Statement (2012);
- An Accessible City (the transport chapter of the Christchurch Central Recovery Plan) (2013);
- Vision Zero (the national 10 year road safety strategy).

Alignment with these documents is explored in more detail in Section 3.1.

2.4 Context of transport in Greater Christchurch

Transport provides essential infrastructure and services that shape our urban form, affects our environmental, economic and social wellbeing and is a key determinant of the liveability of a city. While at its core our business is about moving people, goods and services by road, rail, bus, cycle or foot, it is important that we think about our transport network in broader terms, such as how it meets the needs of our communities, the impact on our environment and the economy of our immediate and wider region.

As the major urban centre of not only Canterbury but the entire South Island, Christchurch and its transport infrastructure is pivotal to the economic vitality and competitive advantage of the entire area. Our community, economy and environment are reliant on high quality, resilient and well-maintained transport infrastructure. The network also provides the access to New Zealand's second largest international airport connecting us all with international partners and markets.

Today's transport infrastructure needs to enable increased modal choice that supports community resilience and contributes to Council and national climate change goals over the coming critical decade. In residential and key activity centre settings, the place function of streets is increasingly recognised as a key determinant of liveability and vitality providing new challenges as to how to better balance both the movement and place functions of many streets. The aging population in Christchurch requires that we need to work harder to ensure our transport systems are future proofed to meet their needs and to maintain equity of access for all.

As well as supporting the community, Council has a role to play supporting the economy and local business. This includes providing for safe customer access, facilitating freight movements and future proofing travel opportunities. Further to this, utility operators have specific access rights to the transport corridor and the requirements which Council is obliged to meet. The proposed investment profile for the transport network aligns with Council's strategic framework and the Christchurch Strategic Transport Plan. In partnership with Waka Kotahi and Environment Canterbury (ECan), Council is also delivering the key actions of the post–earthquakes Greater Christchurch Transport Statement of 2012. Furthermore, it supports national policies such as the Government Policy Statement on Land Transport, the National and Regional Land Transport Plans, the One Network Road Framework (Classification) and Vision Zero, the Government's ambitious road safety strategy for the coming decade.

The newly derived key service Pillars for all our transport assets and services are outlined below, and underpin all the planning and work that is undertaken on the transport network.

Safety	The network and our services are safe for all users and we actively seek to reduce deaths and serious injuries – to at least meet the challenging Vision Zero targets of a 40 % reduction in fatal and serious injuries for Christchurch roads in the next decade
Access	The network enables active and connected communities through providing transport choice for all
Environment	The environment is enhanced and projects proposed aim to meet the challenge of climate change – achieved through measures to reduce the need for motorised travel and to encourage more self-contained, sustainable and resilient communities
Affordability	Solutions proposed that are affordable and sustainable

Table 2-1: Transport service outcome Pillars

2.5 Strategic Alignment

In developing this AMP, consideration has been given to aligning with a number of national, regional and local priorities for transport investment and network development. The Council was involved in the development of the One Network Road Classification (ONRC) system, now termed the One Network Framework (ONF), and its setting of nationally consistent functional criteria. These principles very closely align with Council's citywide Christchurch Transport Strategic Plan for the period to 2041, and An Accessible City – the transport chapter of the Christchurch Central Recovery Plan. These plans are already fundamentally re-shaping our priorities and programmes for the delivery of transport networks, around the principles of better linking land use and transport planning as well as investing in significant improvements to improve travel choice opportunities.

This new 'shape' of transport networks and services will have a fundamental effect on how we best manage and maintain our road and transport networks going forward - and with greater acknowledgement of the wide range of functions and services we expect our networks to support. For example, the Ministry of Transport outcomes framework places much more emphasis on transport's ability to directly influence better outcomes for community liveability and wellbeing. The increasing place or functionality of local roads, the need to deliver improved services for public transport, cycling and pedestrians and acknowledging the critical role in supporting resilience and economic prosperity, all heavily influence this new Transport AMP.

A review of relevant national and regional policy documents has demonstrated the strong strategic fit of the AMP in achieving the wider strategic outcomes and visions. Key themes repeated in each document include the need to better manage motorised travel demand on our networks, optimise the existing transport network assets to maximise their value, and to prioritise measures to improve safety, liveability and wellbeing. These can be found in Section 3.2.3.

2.6 Delivering on Council's Strategic Framework

2.6.1 Alignment of Outcomes, Priorities and Activity Objectives

Council's strategic framework of Community Outcomes and Strategic Priorities, and their general implications for activities are presented in Council's SAMP. The table below summarises key responses by transport activity to contribute to these community outcomes and strategic priorities.

	Community Outcomes	How the Activity affects the Community Outcome
Primary Outcome 1	A well-connected and accessible City promoting active and public transport	• Acting to reduce travel demands across the network, especially for single occupancy vehicles or trips. • Enabling a range of travel choices for everyone to access key destinations. • Delivering street improvements such as those delivered in the central city. • Integrating land use planning and transport improvement projects. • Enabling self-contained and more resilient communities, by ensuring a wider range of essential daily services are accessible by non-car modes.
Primary Outcome 2	Modern and robust city infrastructure and facilities network	• Providing/maintaining a network of infrastructure for all. • Journey times that are predictable for all, including freight. • Bus lanes and traffic signal priority helps make bus journey times more reliable. • Major Cycleway links to shops, workplaces, schools and essential daily services.
Primary Outcome 3	Safe and healthy communities	• Reducing the risk of injury by providing cycleways, safe crossings, reducing speeds, or operating traffic signals to protect all users. • Increasing priority towards our city-wide safety engineering and safe system programmes. • Maintaining the condition of our roads and making it clear which movement mode has priority through well-designed roads. • Providing safe access to schools and within residential neighbourhoods. • Journeys are safe for all road users is an important outcome for all trips. • Ensuring pedestrian facilities increasingly support access for people with mobility impairments. • Capturing pollutants before they enter waterways such as use of rain gardens.
Secondary Outcome	Sustainable use of resources	• Using recycled materials in our road construction. • Enabling new technology such as e-scooters and readily available electric vehicle charging for an evolving NZ fleet. • Minimising waste.
Secondary Outcome	A vibrant central city	• Prioritising delivery of transport projects and programmes that support the completion of remaining key anchor projects; notably the Metro Sports Facility, Canterbury Multi Use Arena, Performing Arts Precinct and Health Precinct. • Prioritising the completion of key cycleway connections between the central city and the city-wide Major Cycleways Network.
Secondary Outcome	Great place for people, business and investment	• Continuing to work closely with the Greater Christchurch Partnership and Waka Kotahi to complete the series of improvements to the strategic state highway network within the city. • Working closely with ECan and Waka Kotahi to develop a robust public transport futures business case for Greater Christchurch.

Table 2-2: Alignment of Outcomes, Priorities and Activity Objectives

2.6.2 Activity Responses to Strategic Priorities

Council has confirmed the following strategic priorities requiring specific focus for the next LTP. In response to these priorities, this AMP includes a number of responses as tabulated below. These are explored further in Sections 7 and 8.

Strategic Priorities	How this activity supports progress of each strategic priority
Enabling active citizenship and connected communities	▪ Transport connects us all and supports where people live, work and play. ▪ Transport provides access-for-all to key services and to take part in everyday life, through the provision of safe, accessible and affordable networks and services. ▪ Consultation is undertaken on all major projects as well as our transport policies, strategies and programmes, to understand local views and to help tailor projects to reflect local needs.
Meeting the challenge of climate change through every means available	▪ Reducing the need to travel, supporting local accessibility to essential daily needs and changing the way we travel away from a dominant reliance on the private car. ▪ Investing in initiatives to promote zero emission vehicles, to reduce reliance on fossil fuels, through programmes such as electric vehicle charging in Council buildings and support for shared fleets. ▪ Undertaking further analysis on the impact of rising groundwater and sea level rise to better understand the future impact on the transport network. ▪ Undertaking further analysis of transport's carbon footprint to inform future projects.
Ensuring a high quality drinking water supply that is safe and sustainable	▪ Run-off of pollutants from roads and vehicle brakes and tyres impacts the health of waterways. Further analysis is required to better understand the issues and develop sustainable solutions. ▪ Continue to prioritise sustainable solutions to urban drainage, including rain gardens, swales and the maintenance of these, along with changes in the way we travel to improve the quality of waterways.
Accelerating the momentum the city needs	▪ Continue to prioritise public transport, particularly on core and city-connector routes to provide equitable access to opportunities. ▪ Continue to prioritise transport projects in the central city that support the completion of key earthquake recovery anchor projects. ▪ Continue to invest in improving central city streets for all users, and especially those enabling seamless connections to citywide networks. ▪ Continue to develop and implement a new road classification system consistent with the national One Network Framework, to better balance both the movement and place functions of each section of road. ▪ Continue to develop a citywide network of cycleways, to make it easier, safer and fun to cycle.
Ensuring rates are affordable and sustainable	▪ Focus on works that are 'right place, right treatment, right time - best for all of Christchurch' approach. ▪ Continue to assess the impacts of COVID-19 on our programmes and resources going forward.

Table 2-3: Contribution of the Activity to the Strategic Priorities

2.7 AMP Development Process

This AMP review was carried out during 2022-24 by asset managers, led by the Asset Management Unit and covering all Council Asset Management Plans. The broad timeline is shown in the Figure below.

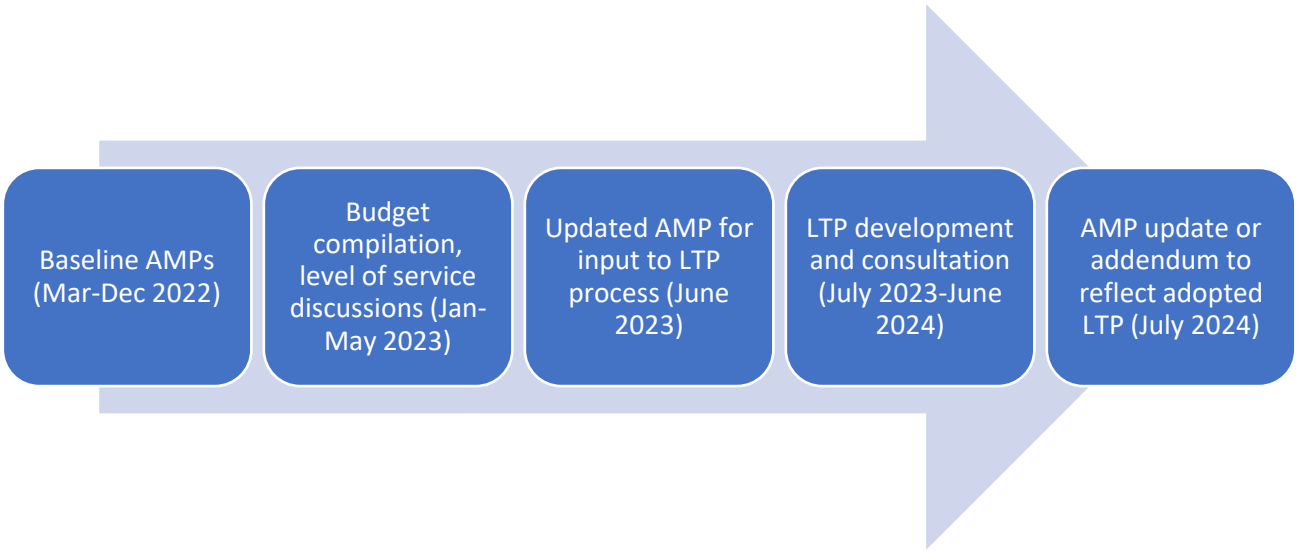


Figure 2-2: AMP Development Timeline

This AMP has been prepared as a team effort by staff dedicated to and trained in Asset Management planning. This team has been supervised and the AMP internally reviewed by professional Council staff having over ten years' experience in preparing Asset Management Plans (AMPs), with guidance from an external asset management specialist.

2.8 Navigating the AMP

The AMP follows the general format recommended in Section 4.2.6 of the International Infrastructure Management Manual. It comprises a series of logical steps that sequentially and collectively build the framework for sustainable Asset Management for the activity it serves.

Key elements of the AMP are:

- Levels of Service – specifies the services and levels of service to be provided by the organisation;
- Future demand – how this will impact on future service delivery and how this is to be met;
- Life cycle management – how Council will manage its existing and future assets to provide defined levels of service;
- Financial summary – what funds are required to provide the defined services;
- Asset Management improvement plan – the current and desired state of Asset Management practices and how the plan will be monitored to ensure it is meeting organisation's objectives.

3 The Services we provide

This section outlines the drivers for the level of service requirements, sets out the proposed levels of service and performance measures, provides information on how Council has been performing in recent years against those requirements and identifies projects and programmes aimed at addressing any Level of Service gaps*.

*Level of Service gaps are where performance results achieved are consistently different from performance targets.

3.1 Level of Service Drivers

3.1.1 Customers and Stakeholders

Understanding service expectations from customers and stakeholders helps to inform what is important to customers and therefore what aspects of performance should be measured.

Category	Customer Groups	Specific Needs / Wants
Governance	Elected Representatives, Councillors & Community Boards	Cooperation, information and compliance. Setting of Community Outcomes and Strategic Priorities that require responsive Levels of Service to meet
Transport network users	Residents Business / Commercial (incl. freight) Visitors Non-resident workers	Access to all properties at all times, including emergency vehicles Safe efficient and affordable network and network services, commensurate with a major metropolitan area Available transport choices that maximise access opportunities and equity Efficient goods to market, including from outside of Christchurch Polite & helpful customer service representatives Seamless transitions between neighbouring road controlling authorities
Key external stakeholder groups	Regulators – Canterbury Regional Council Waka Kotahi Ministry of Transport	Cooperation, information and compliance Safety, economic efficiency Sound long term planning Compliance with plans, policies, standards, and consents
	Central Government including Office of the Auditor General, Ministry of Health, Ministry for the Environment, Department of Conservation	Viable local authorities in the long term Asset planning which enables sustainable community outcomes Confidence in Council's management of the assets
	Greater Christchurch Partnership Selwyn District Council Waimakariri District Council Canterbury District Health Board Ōtākaro Ltd (the Crown's Development Agency) Christchurch International Airport Ltd Lyttelton Port of Christchurch Waka Kotahi (as state highway controlling authority)	Liaison Cooperation over mutually beneficial programmes, policies and strategies Clear and open lines of communication Consistent standards across boundaries Early warning of changes to needs and systems
Affected parties	Contractors and Professional Consultants	Clarity around standards of workmanship Fair and open competition for their services Consistent visibility of work pipeline for resource planning
	Land Developers	Capacity for new development. Fair and reasonable charges
	Planners	Clear, uniformly applied rules and procedures
	Tangata whenua	Recognition of special status. Consultation on issues with cultural aspects or environmental impacts. Sensitivity to concerns with overflows to rivers and discharge of wastewater to water bodies
	Community and Public Health (Canterbury District Health Board & ACC)	Protect public health Partnership over matters with public health outcomes – e.g. road safety and active travel programmes
	Special Interest Groups Community Groups	Inclusion in decision making – the need to be heard, set fair & reasonable charges, flexibility
	Environmental and recreational interest groups including Fish and Game	Appropriate inclusion in decision making – the need to be heard Cooperation, early warning of changes to needs and systems

Utilities	Emergency Services Three Waters Electricity Telecommunications Gas and fuel	Safe and ready access to all land uses, meeting emergency services' essential needs Cooperation and partnership over mutually shared outcomes – e.g. road safety campaigns, promotions and policy

Table 3-1: Customer Groups

3.1.2 Legislation/Regulation

Alongside customer expectations, we consider legislation, regulation and standards that impose Level of Service standards for Transport. These are summarised in the table below.

Legislation / Regulation	Impacts on Levels of Service
Local Government Act	Sets in place Level of Service framework.
Land Transport Act	Outlines basic requirement for transport network and users e.g. licensing.
Land Transport Management Act	More focused on the 'how' than the other Acts, so more directly related to Levels of Service.
Utilities Access Act	This defines rights of other parties.

Table 3-2: Legislative and Regulatory Level of Service Drivers

The Local Government Act sets out a framework by which Local Authorities are to govern. There are a number of sections that pertain to roads and transport, and these have been amended over the years (1974 to present) to reflect the views of society as to how they wish this process to work.

Council is responsible for the assets that they own and operate on behalf of the Community. Council is obligated to agree what Levels of Service will be delivered to ratepayers, and this discussion is undertaken via consultation with the community as part of the LTP process.

Land Transport Management Act 2013 (LTMA)

The LTMA establishes Waka Kotahi as the Crown's funding agency and as the manager of the state highway network; containing particular requirements for consulting on the Regional Land Transport Plan prior to its adoption by the Regional Land Transport Committee. The Council is an Approved Organisation under the terms of this Act.

In particular, to be eligible for financial assistance from Central Government for its transport network the Council needs to provide details of its programmes for inclusion in the Regional Land Transport Plan, and meet certain criteria. Note that the Council also carries-out activities on the network that do not receive financial assistance from the Crown and are therefore not subject to the LTMA.

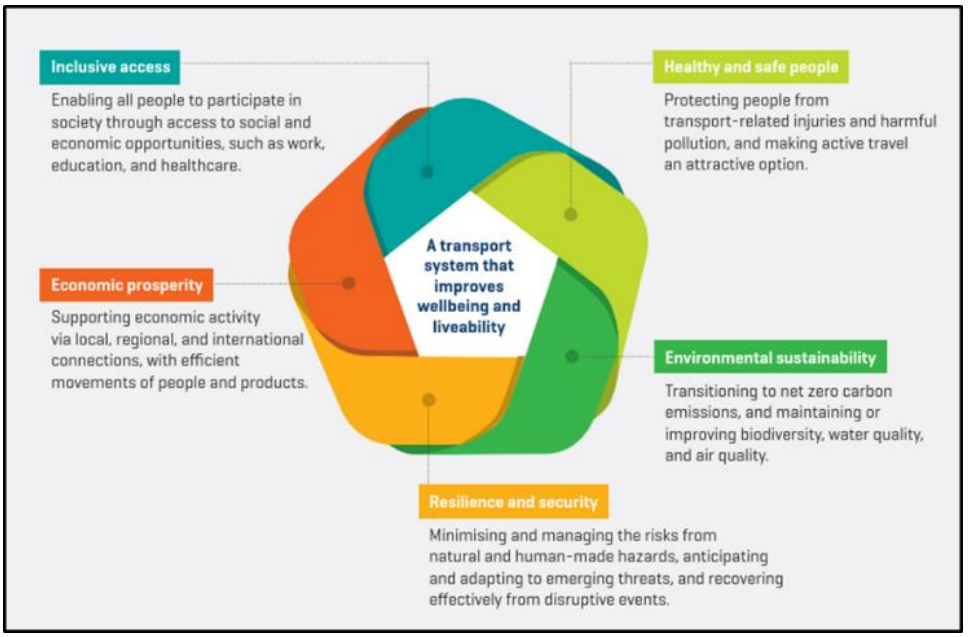
The LTMA repealed and replaced the Transit New Zealand Act 1989. The LTMA was amended in August 2008 altering the way the National Land Transport Programme is prepared, and changing the way direction is given to the Council on some transport matters.

The Land Transport Management Amendment Act came into effect on 13 June 2013, amending the 2003 LTMA, and repealing the Public Transport Management Act 2008, carrying over its relevant provisions. Three areas are covered by the amendment; simplifying the planning and funding framework of the LTMA; simplifying the process for approving toll road schemes and managing public-private partnerships; and establishing a new framework for planning and contracting public transport services, known as the Public Transport Operating Model. This allows long-term partnering arrangements to be built between regional councils and transport operators.

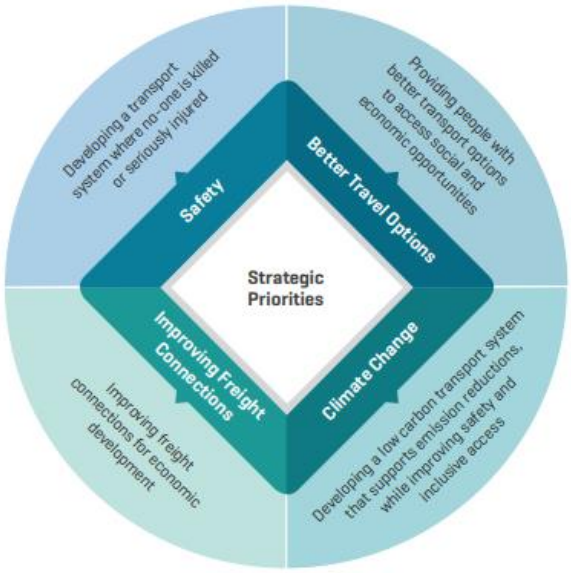
3.1.3 Government Policy

Government Policy Statement on Land Transport (GPS 2021)

The purpose of the transport system is to improve people's wellbeing, and the liveability of places. It does this by contributing to five key outcomes, identified in the Ministry of Transport's Transport Outcomes Framework.



The Government Policy Statement on Land Transport (GPS) 2021 sets out the government's priorities for expenditure from the National Land Transport Fund (NLTF) over the next 10 years.



The Government has identified four strategic priorities for land transport investment to best contribute to improving our communities' wellbeing and liveability. These include:

- safety;
- better travel options;
- improving freight connections; and
- climate change

These build on the strategic priorities set in the 2018 GPS.

Government's priorities include a land transport system that addresses current and future demand for access to economic and social opportunities and a land transport system that provides appropriate customer Levels of Service.

A key objective of this AMP is to enable ongoing sound investment in network maintenance, renewals and improvements, and to ensure it provides the appropriate customer levels of service. These were intended to improve the consistency effectiveness and therefore the value of investment in the maintenance, operations and renewal of roading assets nationwide. This AMP fully accords with those outcomes. Specifically, recent planning and investment decisions across greater Christchurch have been embedded in the Council's LTP, future public transport programme business case, and city-wide Transport Programme Business Case. These demonstrate very clearly Council's desire to transform public transport and active travel opportunities, and thus ensure best use of existing and any additional roading assets to maximise value-for-money from expenditure.

3.1.4 Waka Kotahi NZ Transport Agency

One Network Framework (Road Classification)

The One Network Road Classification (ONRC) was a national classification system dividing New Zealand's state highway and local roads networks into six nationally agreed categories of road, based on a series of factors including how busy they are, their strategic functionality, whether they connect important destinations, their importance in network resilience terms, and their primary mode(s) of usage. Classification of New Zealand's roads using the ONRC was initially completed in 2013. The ONRC was the primary tool developed through the national Roads Efficiency Group (REG) to enable operational and culture change in road activity management nationwide. It facilitated a customer-focused, business case approach to budget bids for the National Land Transport Programme (NLTP).

Most recently, Waka Kotahi has evolved the ONRC into the national One Network Framework (ONF). Through this ongoing development, it increasingly seeks to reflect both the movement and place-making functionality of streets in urban and rural settings. The ONF introduces a number of key changes including:

- a shift from a focus on the volume of vehicles on the network to the network's functional importance for moving people and goods, by any mode;
- considers adjacent land use, and the role the transport network plays as part of the wider public realm;
- when fully implemented, it will consider both the current and future movement and place function of the network. This will allow gaps to be identified and guide network changes and investment decisions seeking to close the identified gaps;
- it includes walking, cycling, freight, public transport, and general traffic networks, some of which include off-road routes.

Using the ONF, local authorities and Waka Kotahi can compare the state of roads across the country and then direct investment where it is needed most. Road users will in time see an increase in the quality of some classes of roads, and a decrease in others that may have been over-specified in the past. Overall, New Zealanders will increasingly get the right level of investment in road infrastructure where it is needed, determined by a robust, impartial, nationally consistent tool. Inconsistent changes of service levels of road networks across territorial and road controlling authority boundaries will therefore diminish in time.

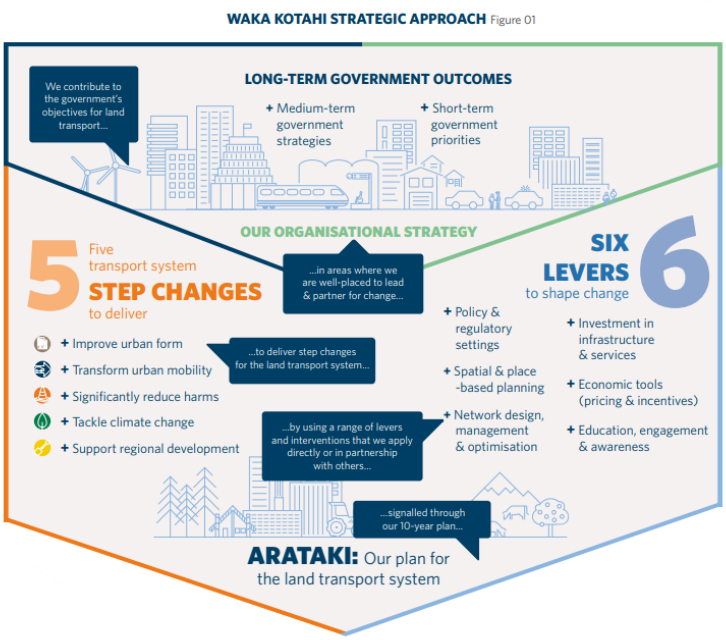
Council contributed through the Local Government Association, to the development of the ONF system and the resulting customer levels of service, and therefore we are confident its principles are fully reflected in the Christchurch Transport Strategic Plan, An Accessible City (the Central City Recovery Plan's transport chapter) and this AMP for 2024-34. The ONF is therefore the primary tool to enable operational and culture change in road activity management nationwide. It facilitates a customer-focused, consistent business case approach to investment decisions informing the NLTP. This AMP uses the ONF/ONRC classification system, (to which Council's functional classification via the District Plan is closely calibrated), in order to influence these investment decisions.

For further ONF details see Waka Kotahi guidance information

https://www.nzta.govt.nz/assets/Roads-and-Rail/onf/docs/ONF-detailed-design-document-november-2022.pdf

Arataki **(**Waka Kotahi NZ Transport Agency)

Arataki is a ten-year view from Waka Kotahi, of what is needed to deliver on the government's current priorities and long-term objectives for the land transport system.



Arataki Version 1 was released for feedback in December 2019.

Arataki Version 1.1 represents our best understanding of the land transport system and reflects publicly available material as at mid-March 2020. Furthermore it recognises the significant impact of the COVID-19 pandemic, but does not consider in detail the nature, scale and location of these impacts, or include details of potential economic stimulus packages to support New Zealand businesses and communities following the lock-downs.

This will be part of Arataki Version 2 which will be developed to assess the impacts of COVID-19 on the land transport system and identify the post-COVID-19 opportunities over the next ten years.

Arataki will continue to evolve over time to reflect changing circumstances, priorities and new information. The Government Policy Statement on Land Transport (GPS) continues to provide the strategic direction for the National Land Transport Programme (NLTP). The role of Arataki is to help meet today's priorities in a way that is informed by the objectives and needs of the system over the longer term. Both will therefore continue to influence the Council's Transport AMP.

3.1.5 Regional Priorities

Canterbury Regional Policy Statement (2013 – revised February 2017)

The Regional Policy Statement (RPS) states, "*An efficient transport system is vital to the economic prosperity of the Canterbury region, and to the well-being of its people and communities*". The RPS contains a range of relevant policies and directives, including:

- a safe, efficient and effective transport system to meet local, regional, inter-regional and national needs for transport which promotes the use of transport modes which have low adverse effects; and
- a transport system that avoids or mitigates adverse effects on the environment, including on sensitive activities and considers transport programmes under the Land Transport Management Act 2003 (LTMA) that promote better design and integration between land use and transport.

Canterbury Regional Land Transport Plan (RLTP)

The Canterbury RLTP (2015 and updated in 2018) is the statutory document under the Land Transport Management Act that sets out the region's challenges and priorities. The six key priority issues for the region are:

- travel time reliability;
- accessibility – travel choice;
- condition and suitability of assets;
- safety;
- resilience; and
- environmental impact.

While five of these priorities influence planning processes, those relating to condition and suitability of assets (themselves influenced by the One Network Framework / Classification System and customer Levels of Service), safety, environmental impact and resilience have the most significant influence over this Plan. A key outcome noted in the RLTP that is relevant, is to ensure all roads comply with One Network Road Classification (now One Network Framework) performance measures.

Canterbury Regional Public Transport Plan (RPTP)

The Canterbury RPTP (2018) is a statutory plan that sets out the region's public transport network and policies that Environment Canterbury, in partnership with local councils in Greater Christchurch and Timaru, propose to fund and operate. The plan, for the first time, sets a new long-term vision for public transport in Greater Christchurch. The top priorities, over the next ten years, are:

- improving our environment - increase the number of people using public transport and reduce the carbon footprint of public transport by shifting to zero emission vehicles;
- growing patronage - greater priority on high demand routes and a high-quality travel experience. As the population grows, rapid transit may be added to improve travel times along key corridors to and from the city;
- accessibility - provide more frequent public transport services so that more people can get to workplaces, shopping, education and recreation within 30 minutes;
- innovation - trial and introduce new transport and technology initiatives with lower environmental impacts, greater safety and lower costs; and
- affordability - expand the network at a rate the community can afford, with cost effective new services and infrastructure that is financially sustainable for ratepayers and funding agencies.

The RPTP proposes to add four new high frequency lines and to increase the services on five existing high frequency (Core Route) lines - the Orbiter, Orange, Blue, Yellow and Purple lines. A business case for mass rapid transit (including rail feasibility options) is also underway with the aim to enable urban revitalisation and support our future land use development pattern.

3.1.6 Council Strategies

As outlined in Section 2.3, Council has a suite of documents that encompass the Strategic Framework's Community Outcomes.

Further to the Strategic Framework outlined in Section 2.4 there are further key documents that directly influence Transport Levels of Service and these are outlined below.

Infrastructure Strategy (IS)

The IS is one of several key components of the LTP 2024 -34. As a statutory document, it describes the significant infrastructure issues for Christchurch over the next 30 year period, and identifies the principal options for managing these issues along with their implications.

The IS does not seek to replicate the detail in the AMPs, but it does provide direction for this planning, as well as for activity planning, capital prioritisation and financial planning. The IS frames and guides the approach taken to developing our transport capital programme and operational decisions about maintenance of assets.

The six significant issues identified and addressed through this IS are:

- looking after our assets;
- responding to community needs and expectations, as we grow;
- adapting to climate change;
- reducing emissions;
- responding to changing regulatory and commercial environments; and
- delivering within financial constraints.

A number of these significant issues have a very strong bearing on the shape and direction of this Transport AMP and on the associated Transport Activity Plan as they support the Council's Long Term Plan 2024-34.

Christchurch Transport Strategic Plan (CTSP)

This non-statutory Plan of 2012 was produced post-earthquakes and set the direction over 30 years for Christchurch's local transport policy in relation to relevant statutory plans; in particular the Canterbury Regional Land Transport Strategy, Regional Policy Statement, Greater Christchurch Urban Development Strategy, Regional Public Transport Plan and the Greater Christchurch Transport Strategy (of 2012). Currently under review, it places a strong emphasis on travel choice by establishing coherent and connected networks for all transport modes over the next 30 years in support of improved travel choice throughout the city. To achieve the vision and address these challenges, the current CTSP focuses on four goals:

- improve access and choice - delivering resilient transport networks with an emphasis on efficient road use, public transport, walking and making Christchurch a cycle city. Introducing a new road classification that recognises both the road function and the environments each road passes through. Working with our transport partners to manage our existing road network more efficiently and cost effectively by adopting a "one network" approach;
- create safe, healthy and liveable communities - adopting a safer systems approach. Transport actions which support the recovery of the Central City, suburban centres and new growth areas. Strengthening the integration of land use and transport planning through District Plan changes;
- support economic vitality - developing local freight routes to improve access to Christchurch airport, Lyttelton Port and freight hubs. Parking and congestion management to support the growth of commercial centres;
- create opportunities for environmental enhancements - building green infrastructure and adapting to climate change and peak oil by encouraging new technology and infrastructure enhancements.

To successfully deliver each of the four goals, the draft CTSP identified a range of actions. These were seen to be phased over the next 30 years, moving from recovery phase (ongoing at the time of plan publication), through transition to achieving the vision. Good progress has been made on implementing a number of the key actions and programmes promoted by the plan, and the current review explores the progress made and potential changes to activities and programmes going forward to reflect Council's new Strategic Framework, the IS and the increasing challenges of climate change.

3.2 Defining and Measuring Levels of Service

3.2.1 Measuring our Levels of Service

Based on the Activity objectives defined in Section 2, the following Levels of Service objectives were defined in the 2021 LTP:

Level of Service Objective	
Safety	Our networks and services are safe.
Access	Our networks and services support access for all, provide travel choices and improve liveability.
Environment	Our networks and services are environmentally sustainable and resilient.

Table 3-3: Alignment of (Level of Service) objectives and performance measures

A key objective of Asset Management is to match customer expectations with the level of service requirements specific to the asset. Levels of service drive the creation, acquisition, maintenance, renewal, and disposal programmes based on life-cycle management philosophies. Customer needs and preferences used for the writing of this AMP have been determined from the outcomes derived from the Annual Survey of Residents.

Table 3-5 on the following page is based on the information contained in the Transport Activity Management Plan (ActMP).

3.2.2 How we are / should we be performing?

In the past various methods have been utilised to assess customer expectations for transport assets. They include;

- outcomes derived from previous AMPs;
- Annual Residents opinion survey;
- Annual point of contact service satisfaction Residents survey;
- the Outputs and Standards Review;

- surveys of performance outcomes;
- surveys of levels of satisfaction for completed projects;
- an annual 'cycling' survey; and
- a price / quality and asset-focused telephone survey to assess preparedness to pay for specific Levels of Service.

Historically the Price Quality Survey of ratepayers was carried out by Council in 2002 and 2005. This sought to establish affordable Levels of Service through a process of presenting a range of priced Levels of Service from which customers could choose. This information is now out-of-date and the views of the Community needs to be resurveyed.

Further to this a survey of Residents was conducted biannually for some years, with a wider range of questions that covered all of Council's activities. The last of these was conducted in 2009.

In 2010 this survey was refined into the current Residents opinion survey, and has been conducted annually since that time. As the questions in this survey are predominantly general in their nature, additional 'point of contact' surveys have been conducted, focusing on specific services or user groups. However these are still high level questions that do not provide a direct link between Level of Service and Council spending.

Survey Question	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Satisfaction with the Condition of Christchurch Roads.	63	-	40	35	27	30	37	34	20	**27**
Satisfaction with the Condition of Christchurch Footpaths.	67	-	46	45	43	51	51	48	34	**41**
Level of Agreement – Christchurch is a Cycle-Friendly City.	-	-	-	42	26	37	53	56	51	**64**
Level of Agreement – Christchurch is a Walking-Friendly City.	-	-	-	81	77	82	84	81	76	**85**
Satisfaction with Ease of Use of Parking Meters.	56	-	65	62	50	54	51	48	39	**49**
Overall Satisfaction with Safety of Motor Vehicles in Parking Buildings.	81	-	-	-	-	-	47	51	48	**59**
Overall Satisfaction with Bus Stops and Bus Shelters.	70	-	60	67	54	60	72	73	70	**71**
Overall Satisfaction with Bus Exchange.	-	-	-	-	83	83	90	89	93	**91**

Table 3-4 Customer Survey Results

3.2.3 Performance Framework, 2024-2034

The Council's Level of Service measures enable us to monitor and report against our outcomes and service performance. Please see **Section 5 Specify Levels of Service in the Transport Activity Plan**. Performance of Community (C) Levels of Service will be reported to the Council Finance and Performance Committee each month.

The ActMPs adopted for LTP 2021-31 can be accessed from the following link:

Long Term Plan 2021-31 Activity Plans and Asset Management Plans: Christchurch City Council (ccc.govt.nz)

Table 3.5 below shows the strategic linkages to other documents.

Strategic Linkage

CCC						*Government*		*Ecan*		*NZTA*				*CCC*	
CCC Community Outcome Category (2020)	**CCC Community Outcome (2020)**	**CCC Strategic Framework (2020)**	**CTSP Outcome 2012**	**Draft CTP (2019) Outcome**	**Transport Unit Goals**	**GPS 2018**	**Draft GPS 2021**	**Regional Land Transport Plan 2015-25**	**Regional Public Transport Plan 2018-28**	**ONRC Customer Outcome**	**Draft ONF Customer Outcome 2019**	**Corresponding NZTA Arataki (2019) - Step Change**	**Corresponding NZTA Arataki (2019) - Draft Levels of Service**	**CCC 2018 LTP Transport Activities**	**Transport Service / Business Area**
Strong communities	Safe and healthy communities	Enabling active and connected communities to own their future	Create safe healthy and liveable communities	People	Safe, healthy communities	Safety	Safety	Supporting safe, healthy and connected communities	Innovation	Safety	Healthy and Safe	Significantly reduce harms	Safety – death and serious injuries Number of deaths and serious injuries	Journeys are safe	Operations Maintenance Improvements
Liveable city	A well connected and accessible city	Enabling active and connected communities to own their own future	Improve access and choice	Place	Access and choice	Access	Better Travel Options	Supporting safe, healthy and connected communities	Accessibility	Accessibility	Inclusive Access	Improve urban form	Access – access to key economic and social destinations (all modes) Proportion of population living within travel threshold (15, 30, 45 mins) of work, education, health care, supermarkets by different modes (walking, cycling, public transport, private motor vehicle)	Customers have choice	Operations Maintenance Renewals Improvements
	Vibrant thriving central city, suburban and rural centres	Accelerating the momentum the city needs		Prosperity	Efficient business		Improving Freight Connections	Enabling freight growth		Quality		Support regional development	Freight – throughput value Number of vehicles times average load per vehicle in NZD (data set in place around 2022)	Journeys are comfortable	
								Supporting economic development					Temporal availability: road Number and duration of resolved road closures: urban >= 2hrs, rural >=12 hours	Council is responsive to the needs of Customers	
Liveable city	Vibrant thriving central city, suburban and rural centres	Meeting the challenge of climate change through every means available	Improve access and choice	People	Access and choice	Environment	Climate Change	Supporting safe, healthy and connected communities	Growing patronage	Travel time certainty	Resilience and Security	Transform urban mobility	Spatial coverage: public transport resident population % of recently built residential dwellings with access to public transport services (subset of number of people living within 500m of a bus stop or 1km from a rail or bus rapid transit station)	Journey times are reliable	Operations Maintenance Renewals Improvements
	A well connected and accessible city												Traffic – mode share Number of pedestrians, cyclists and motor vehicles by vehicle class, expressed as percentages		
	21st century garden city we are proud to live in												People – mode share Average trip distance per person in urban areas		
	Healthy environment	Sustainable use of resources	Create opportunities for environmental enhancements	Planet	Environmental enhancement			Reducing environmental impact	Improving our environment			Tackle climate change	Pollution and greenhouse gases – CO2 emissions Tonnes of CO2 equivalents emitted		
								Improving resilience	Innovation	Resilience			Resilience – Level of service and risk Kilometres of road and rail infrastructure susceptible to coastal inundation with sea level rise		
													Availability of viable alternative routes Percentage of high-risk, high-impact routes with a viable alternative		
	Prosperous economy	Great place for people, business and investment	Ensuring rates are affordable and sustainable	Support economic vitality	Prosperity	Best use of every dollar spent	Value for money		Economic prosperity	Affordability		Economic Prosperity			Operations Maintenance Renewals Improvements
		Equitable economy with broad-based prosperity			People										
		Modern and robust city infrastructure & facilities													

Table 3-5 Strategic Linkages

4 Demand for our Services

This section provides details of growth and demand forecasts that affect the management, provision and utilisation of transport services and assets. New improvement works will also be based on the information outlined in this section.

4.1 Demand Drivers

4.1.1 Population growth

Christchurch's population was 380,200 in 2018[1] and is projected to grow rapidly to 459,100 by 2043[2] (**Figure 4-1**).

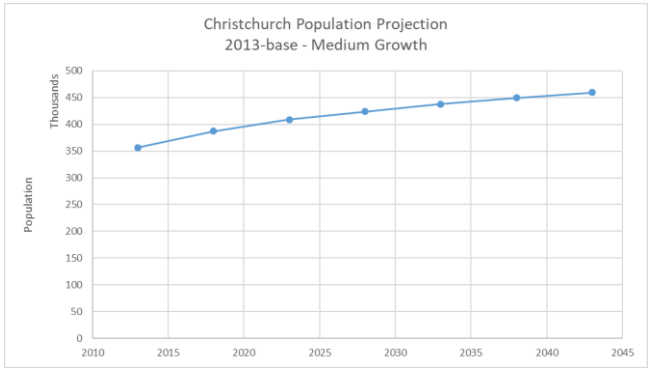


Figure 4-1. Christchurch City Population Projections

This is a projected 21% growth over the 25-year period within assumed medium growth assumptions. As a result, the Christchurch urban area[3] (larger than the city's boundary) is set to become New Zealand's second largest city by 2028[4].

4.1.2 Demographic Changes

The projected population growth is not equally distributed among age cohorts (**Figure 4-2**). While population of the under 40 years old cohort is expected to grow by only 5% and the 40 to 65 years old cohort by 14% over the period, the 65 years and over cohort is expected to grow by some 75%, which would comprise 23% of the entire population. The rapidly aging population will necessitate a different perspective on safety, and equitable access provisions for the city's future transport network infrastructure.

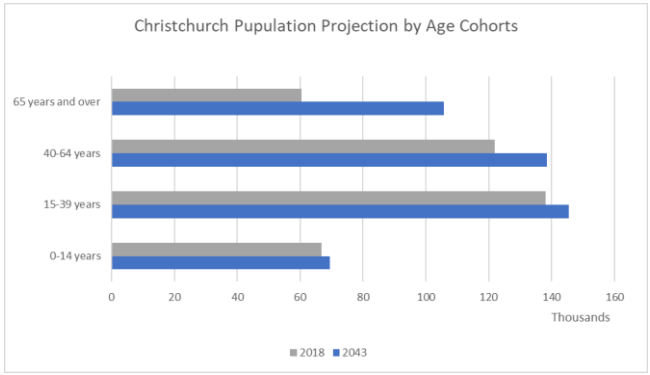


Figure 4-2. Christchurch City Population by Age Cohorts

[1] Stats NZ - Subnational population estimates, 2018(base) - accessed on 7/8/2020
[2] Stats NZ - Subnational population projections, 2013(base)-2043 update – accessed on 7/8/2020
[3] Urban commuter range covering Kaiapoi in north and Prebbleton and Port Hills in south
[4] Urban area population projections, 2013(base)-2043 update – accessed on 7/8/2020

4.1.3 Change in Land Use

Christchurch City's residential population growth is expected to mostly occur within the existing urban area. This is targeted to materialise mainly through intensification of the existing urban area and brownfield infill, including relatively high density central city residential developments. The intensification of central city residential development is as planned for through the post-earthquakes Christchurch Central Recovery Plan of 2012 and the transport chapter of that, 'An Accessible City' (2013).

In addition, there are further significant phases of residential greenfield development underway in the priority areas identified in the Land Use Recovery Plan (primarily to the South-west and North). Each of these is supported by the development of local neighbourhood and activity centre developments, increasing the range of essential daily services (food, health, education and employment) available to residents within a 15 minute or so journey from their home.

Urban intensification will have a mixed range of effects on transport access, safety and environment. It could, as intended, result in a welcome mode shift towards the active modes (primarily walking and cycling) and a reduced level of private car dependency to access the basic daily needs with positive safety and environmental effects. It may however also result in a higher number of conflicts between vehicles and vulnerable road users. Well planned transport networks supporting land use development and enabling improved, safe and ready access by non-car modes to local daily needs, often in low speed neighbourhood environments, is therefore an essential aspect of Council's transport access and neighbourhood planning for the coming decades. Such changes, in supporting in turn a reduced reliance on car travel for shorter journeys should bring added advantages of more resilient local communities able to better cope with system and network 'shocks', along with environmental improvements through reduced carbon emissions.

4.1.4 Economic trends

Transport costs make up a sizable proportion of a typical New Zealand household budget, comprising the third largest cost behind housing and food. The latest figures from Statistics NZ show that from 2016 to 2019, national household expenditure on transport increased by nearly 14%, to $216 a week and to $205 in Canterbury. National and Canterbury average household income grew by 12% during the same period to $2039 and $2012 a week, respectively. The increased transport burden on the typical Canterbury household budget comes largely from the increased amount of driving, compared with residents in other large centres, as the bulk of these costs are on vehicles and fuel purchases. Household incomes have not kept pace with rising transport costs, placing an increasing financial burden on residents.

Christchurch residents' reliance on private vehicle travel therefore puts residents at a financial disadvantage relative to those that have better ready access to alternative modes, or are locally well-placed for essential daily services. Christchurch City with over 6,000 urban vehicle kilometres travelled per resident per annum has one of the highest rates of urban vehicle use in New Zealand based on 2016 data from Waka Kotahi (**Figure 4-3**). An average Christchurch resident's annual kilometres travelled is 77% higher than that of a Wellington resident, where public transport trips are much more common.

Car reliance is driven by the need to access goods, services and basic needs, including employment, education, food, health care and recreation. Reducing the need to make many of those local trips with a car through better co-location of residential areas and neighbourhood services that are accessible by non-car modes in around 15 to 20 minutes, is the most effective way to help our community reduce their car dependence. By supporting and promoting residential intensification within the CBD and around the key activity and neighbourhood centres across the city, many short distance daily journeys could be conveniently made without a need for a car trip. The added advantages will be more resilient and sustainable neighbourhoods benefitting from reduced traffic levels and the consequential environmental and climate benefits of reduced fuel use. The approach also delivers more equitable neighbourhoods as individual households' budgets would benefit from reduced transport expenditure.

This concept has gained worldwide recognition in recent times as the '15 minute city', and to cater for remaining longer distance trips, co-investment can be directed towards improving public transport journey time reliability and attractiveness compared with the private car. The key objective for public transport services is for more business, employment, shopping, health and necessarily centralised services to be achievable within a 30 minute travel time from the city's major residential areas – existing and planned.

In summary, to make active and public transport more attractive and competitive it needs a step change in investment in services and infrastructure that need to happen in a meaningful way in this coming LTP period to 2034. Greater Wellington, for example, is spending nearly three times as much as Christchurch on Public Transport (**Figure 4-4**) and has an average annual boarding per resident of nearly three times as many people as that of Christchurch.

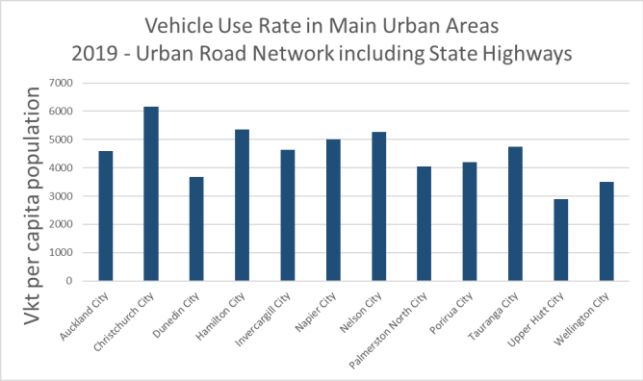


Figure 4-3. Vehicle rates in Main Urban Areas

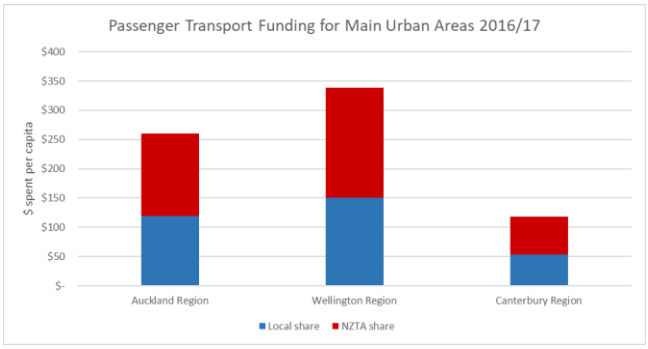
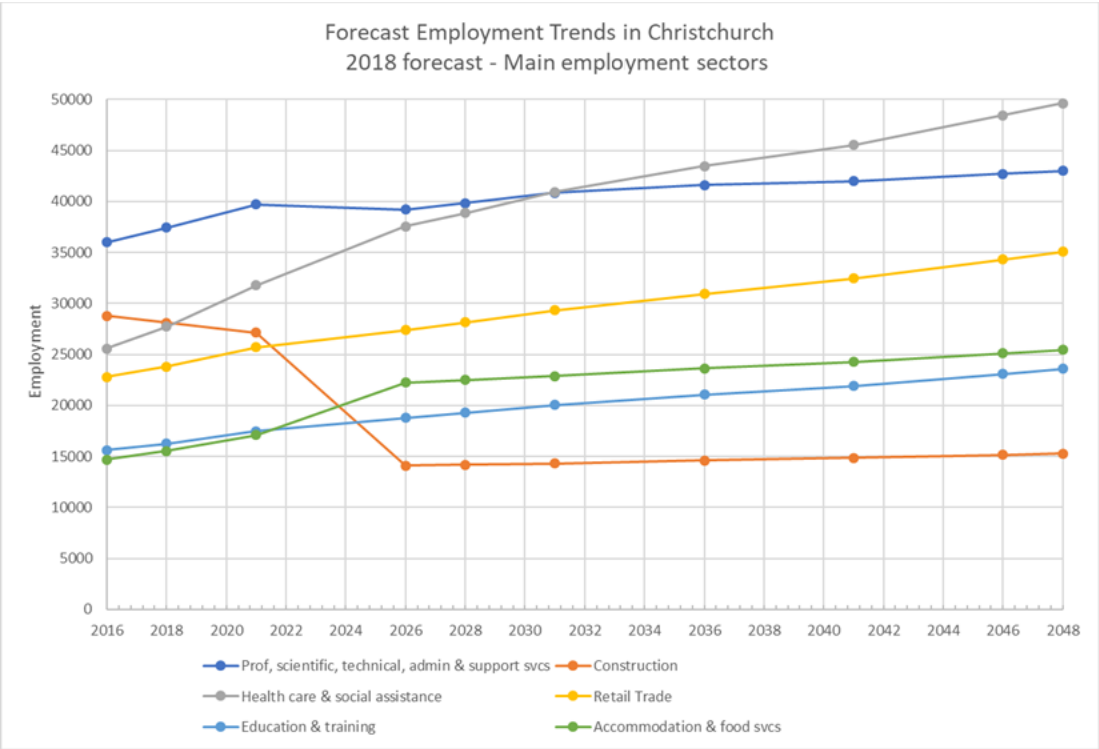


Figure 4-4. Passenger Transport Funding[5]

In the coming decades, the employment landscape will also continue to shift in New Zealand's urban areas. Total employment in Christchurch is forecast to grow by over 25% in the next 30 years to nearly 300,000 jobs. In terms of various employment types, as shown in **Figure 4-5**, employment in the construction sector, which is currently contributing to nearly 12% of the total employment, is forecast to decline by more than 45% with a net loss of nearly 13,000 jobs[6]. Meanwhile, in-line with the forecast aging population, health care and social assistance jobs are expected to substantially grow by nearly 80% with a net gain of nearly 22,000 jobs. Many of those jobs may well not be appropriate to adapt to remote or tele-working.



[5] https://www.nzta.govt.nz/assets/userfiles/transport-data/FundAllActivities.htm

[6] Market Economics - Greater Christchurch Urban Development Strategy Economic Futures Model

Figure 4-5. Forecast Employment Trends in Chtristchurch 2016-48

In early 2019, the Productivity Commission launched an inquiry into the impact of technological change and the future of work. Currently people are remaining in the workforce longer. Over the past 25 years, and prior to the COVID-19 pandemic, the share of the adult population employed in the labour market has continued to increase. The composition of the workforce is also continuing to change. Female participation in the labour market is at an all-time high with women making up nearly half of the workforce. The workforce is also becoming more highly qualified. The share of the workforce with no qualification has continued to decline while those with a degree or higher increasing to nearly 27%.

The nature of the work performed in industries is also likely to continue to shift. With the rise of a productive, knowledge-based economy, scientific, technical and professional services will increase. Conversely, the share of labourers and drivers within the mining, manufacturing and construction sectors will decline. This may result in a lesser need for a freight network expansion. The growing remote working and micro-mobility could also reduce the need for commuter trips leading to a general plateauing or even reduction in the number of daily car trips.

Considering the evolving labour market, it is likely that that the infrastructure needs to service the workforce of tomorrow is not going to resemble the current needs. As cities move from being hubs of manufacturing to clusters of service economies, transport infrastructure will need to focus on efficiently moving people in dense urban areas. This will also impact the way we measure economic productivity as a customer service metric, as it shifts from a product movement focus to the economic performance of the workforce. It is therefore imperative to focus on optimising our networks for economic performance towards the needs of future.

As in other areas of this AMP, at the time of writing it is highly uncertain what the short, medium and longer term effects of the COVID-19 pandemic and likely worldwide recession will be on the Christchurch employment picture. As a result, this Asset Management Plan will need to remain agile and adaptive to changes, but certainly have an increased focus on helping achieve more self- sustaining, resilient communities that have progressively reduced their dependency on daily car travel.

4.1.5 Modal Change

Today, car travel is still the predominant mode of transport in Christchurch, according to the Life in Christchurch Survey 2019, with 96% of people reporting travelling by car in the last 12 months. However, 27% of people report travelling less by car as compared to the 12 months previously. This is a substantive shift in a relatively short time period. This is despite the fact that 57% of residents reported it easy to travel by cars in 2019, an 11% increase from the previous year. Meanwhile 42%, 27% and 14% of respondents respectively reported more often cycling, using public transport and walking, as compared to the previous 12 months. More than 69% of respondents reported finding it overall easier to travel by these modes, which is an encouraging result given Council's enhanced emphasis on supporting the choice of these modes in recent years.

These trends show demonstrable progress is being made with the Council's accelerated investments in active transport and public transport infrastructure over the last decade. However, it is also very clear that much more needs to be done to attain a meaningful and permanent mode change and progress toward achieving local and national environmental targets. At the time of writing, it is also uncertain what the longer term effects of the COVID-19 emergency will have on the Christchurch community's travel behaviour.

4.1.6 Evolving Technology

The pace of technological change, along with the scale of private sector investment entering the transportation and mobility sector is unprecedented. Meanwhile with further advancement in communication services, a growing trend of working, shopping and accessing many 'day-to-day' goods and services remotely is emerging globally. This may have been accelerated recently by the worldwide implications of the COVID-19 pandemic, which remains ongoing at the time of writing. We have no clear idea at present what the longer term 'legacy' implications of this rapid change in increased tele and home working necessitated by the COVID-19 emergency will be.

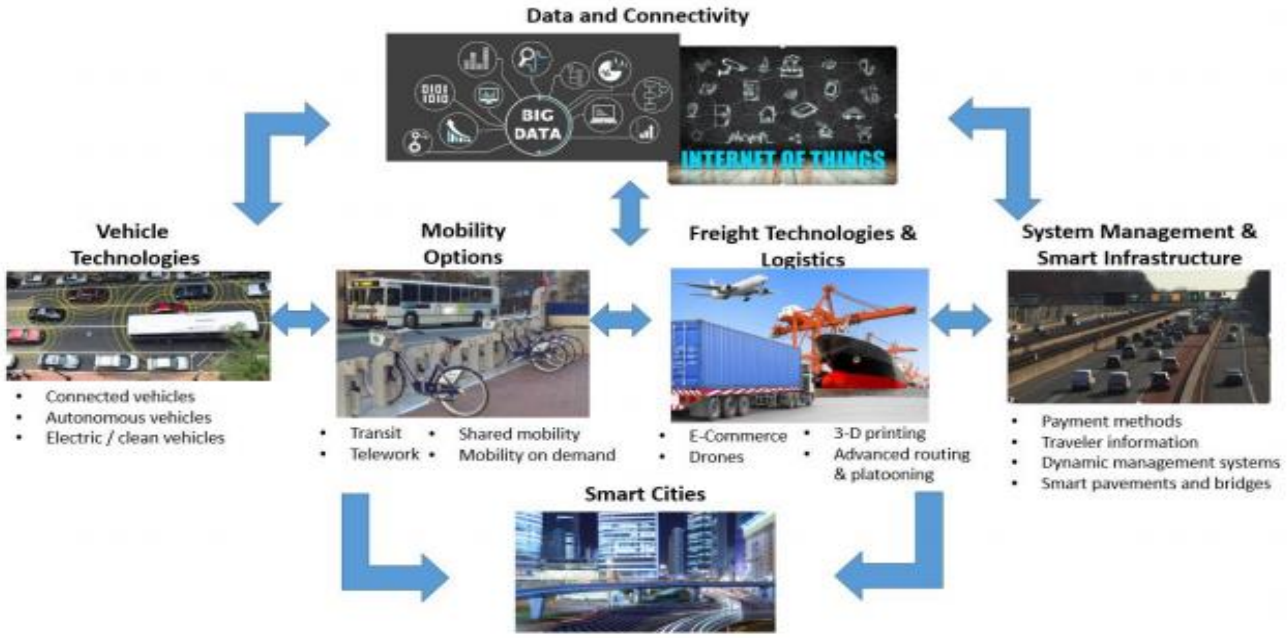
Christchurch as a city of opportunity, openly welcomes trials and new ways of doing things, including travelling. Changes in transport technology and new business models will continue to be encouraged and embraced in Christchurch and in turn, this will influence how the public interact with our transport assets. The Christchurch personal travel landscape has changed

appreciably in recent years, with the rapid arrival and adoption of e-scooters on the city's streets. In the period October 2018 to July 2020 more than 1.75 million trips made by e–scooters, a new mode of travel yet to be fully embraced in a number of the world's major cities.

Five overarching technology trends have been identified as being particularly important to this Transport AMP:

- increased widespread data and connectivity, and the further personalisation of travel choice, travel planning and mobility;
- advanced vehicle technologies, including connected vehicles (CVs), autonomous vehicles (AVs), electric vehicles (EVs) and alternative fuel vehicles (AFVs);
- adoption of new technology-enabled mobility options, including connections between public transport and shared mobility and vehicle fleets, and new forms of 'mobility as a service' (MaaS);
- developments in technologies affecting freight movement, logistics and tele-shopping, including new technologies for transporting consumer goods such as drones, as well as advancements in vehicle routing and efficiency;
- advances in transportation system management/operations, including mobile payment methods.

The pace of this change is rapid and exponential, to the extent that some of these technologies were not truly understood or even anticipated at the time of Council's publication of the CTSP in 2012. For example, in 2015 Council decided to install a limited number of electric vehicle charging points for a small number of spaces on the opening of its replacement Lichfield Street parking building, and committed to 'future proof' the building for later electrification throughout. This was a first for a central city parking building. Seven years later, a decision of this nature to embrace EV technology in a major new transport asset would hardly warrant debate.



4.1.7 Transport Safety

The Council shares the Government's vision of the Road to Zero national road strategy, with "*a New Zealand where no one is killed or seriously injured in road crashes. This means that no death or serious injury while travelling on our roads is acceptable.*" There is a primary duty of care for our local road network, to take all practical steps to prevent death and serious injuries. This entails Council looking at the implications of adopting a vision zero approach to targeting road casualty reduction on Christchurch's roads and transport networks over the coming decades.

Contrary to recent national trends, the number of deaths and serious injuries (DSI) on Christchurch local roads has remained relatively stable over the last twenty years, with approximately 140 deaths and serious injuries (DSI) per year (**Figure 4-6**). The last five years' (2015-19) totals are in fact below the average numbers, with around 130 DSI's per year. Crash rates across the region are relatively modest compared to most other regions and close to the national average (**Figure 4-7**).

Despite this position, these figures are still unacceptable considering the Vision Zero goal – which itself responds to the country's very poor overall record when compared with crash rates in other comparable OECD nations.

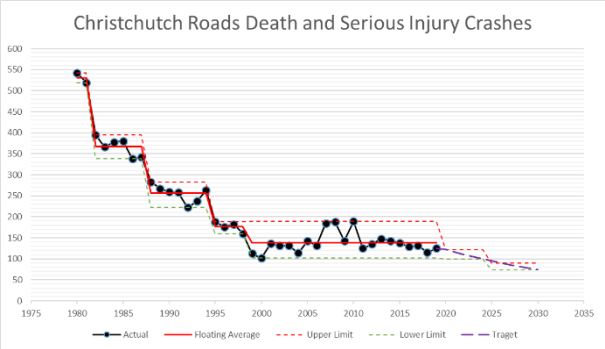


Figure 4-6. Christchurch DSI Crash History

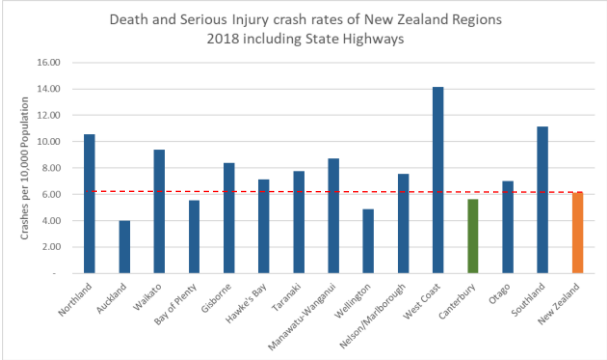


Figure 4-7. New Zealand Regions DSI Crash Rate

As **Figure 4-6** shows, during the 1980's and 1990's there were significant improvements in road safety achieved on Christchurch roads. The early 1980's typically had over 600 DSI's per year, but this dropped to 400 during that decade, then 250 in the early 1990's, and finally settled at around 150 per annum by the late 1990's. This was mainly due to progressive advancements in car manufacturing standards, better driver education and licencing and more forgiving roading infrastructure. It has however remained broadly static since, when other countries with safe system strategies similar to the Government's new Vision Zero approach have seen substantive improvements in fatal and serious crash numbers.

A further 40% reduction in DSI crashes on Christchurch roads over the coming decade in-line with that targeted by the Road to Zero government strategy, would see a drop in DSI's from the current annual average of 130 to around 80; a saving of around 50 deaths and serious injuries per annum. This is therefore the primary transport safety Level of Service outcome Council is setting for this coming LTP period. Towards that stretching but achievable goal, Council has been working collaboratively with Waka Kotahi, to identify, investigate and prioritise the most effective strategies to tackling the most unsafe parts of the Christchurch local road network, and deploying Waka Kotahi's Risk Assessment Programme (KiwiRAP) methodology and Safe Network Programme (SNP) recommendations.

The KiwiRAP methodology provides a network-wide approach to identify and rate unsafe infrastructure, including intersections and mid-block sections, considering the crash history and characteristics of the road network in the city's urban and rural environments. The risk rating of Christchurch intersections for the period of 2015-19 is presented in **Figure 4-8** provides a consistent framework for intervention selection based on the characteristics of the high risk locations and their identified risks through:

- safe system transformation;
- safer corridors;
- safety management; and
- safety maintenance.

The programme is currently funded and supported by a streamlined investment pathway to effectively mitigate the main causes of DSI crashes. The targeted reduction (which is one of the main transport safety targets in the Council's Activity Plan proposal for the LTP 2024-34), would drop the crash rate for the City from the current 3.2 DSI's per 10,000 population to 1.7, taking account of projected population growth. Achieving the target would require a progressive and intensive metropolitan safety programme to prioritise and address the existing and emerging infrastructure safety issues, supported by better driver education as well as a continued trend of improvement across New Zealand in vehicle qualities and safety features.

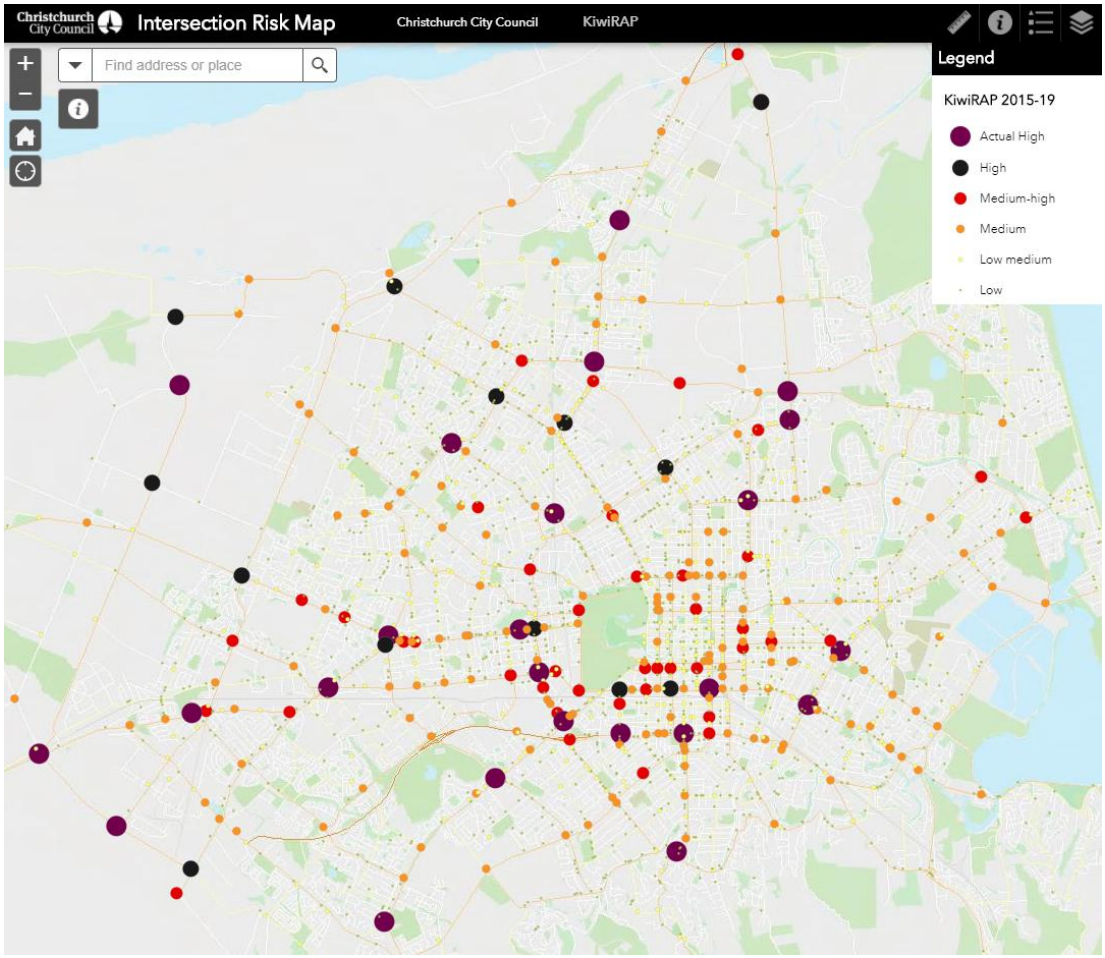


Figure 4-8. Christchurch Intersection Risk Ratings Map – KiwiRAP 2015-19

4.1.8 Access Requirements

Transport assets are essential to providing people with good access to employment, education, shopping, health services, recreation and entertainment. Some assets provide critical lifelines to health services, essential services and resilient alternative route options in times of emergency, plus help ensure primary goods can reach their market efficiently. At the same time, our transport assets provide the means by which different types of daily trips by different modes take place and goods and business services are brought to the international, national and local markets. The efficiency, quality and reliability of these assets in providing economic and social access and productivity is a key determinant of the customer levels of service we seek to achieve across our networks. Increasingly those desired customer levels of service are calibrated to meeting those of the national ONF (Road Classification) – both for existing and proposed networks.

Apart from the internal transport demand drivers, the forecast growth in both Lyttelton Port and Christchurch International Airport creates an external pressure on our combined transport assets shared with Waka Kotahi. The forecast external demand drivers' growth are listed below.

Transport Demand Driver	2018	2051	% increase
Airport passengers	6.3 million	11.6 million (2040)	84%
Port containers (TEU)[7] – (Lower)	370,000	782,000 (2041)	211%
Port containers (TEU) – (Upper)	370,000	1,500,000 (2041)	405%

Table 4-1. External Transport Demand Drivers

[7] https://greaterchristchurch.org.nz/assets/Documents/greaterchristchurch/FreightInfrastructureStatementV2.pdf

The One Network Framework (ONF) system is therefore the national 'yardstick' which Council now consistently deploys in determining what the appropriate Levels of Service might be for each link in our transport networks; today and into the future. The ONF system takes into account the range of transport modes competing for the often constrained available space and their relative priorities considering the movement and place functionality of each link and corridor. It also helps begin to define an appropriate level of investment when there is a clear service gap between a desired Level of Service (existing or planned) and the current status of an asset. It is therefore the key determinant as to how those assets are efficiently managed in a consistent manner with other Road Controlling Authorities nationwide.

By maintaining and delivering the transport and roading infrastructure that provides for essential access requirements, supporting and encouraging better mode choices and responding properly to different types of transport demand, we can achieve a more balanced and transparent approach to setting appropriate transport Levels of Service. We have a clear focus on meeting our three transport outcome 'Pillars' for the coming decade; that is of Safety, Environment and Access. We aim to achieve stretching but achievable targets over the next ten years in substantially reducing death and serious injuries on our roads, reducing single occupancy car dependency and resulting carbon emissions on the road network, and in so doing, support more resilient, self-sufficient communities with affordable transport options.

Identification of the need for new infrastructure and access provisions is achieved through close collaboration with Waka Kotahi, Environment Canterbury, the Greater Christchurch Partnership and other important local stakeholders. Significant investment decisions are guided by the development of sound business cases; again in partnership with those agencies. Major transport business cases include but are not limited to:

- the Public Transport Futures Business Case (Ongoing);
- the Major Cycleways Network and Connections Business Cases (Completed and Ongoing);
- an Accessible City Programme Business Case (Completed);
- the Christchurch Transport Business Case (Completed);
- Brougham-Moorhouse Business Case (Ongoing); and
- Travel Demand Management Business Case (Completed).

As an example of the benefits of developing sound, pragmatic business cases to support our largest investment decisions, before Council started to deliver a network of Major Cycle Routes, many people did not realise that cycling was a viable transport option for them. Today we are seeing cycling trip rates increase significantly on completed corridors, sometimes ahead of projections, by providing customers with an increasing range of access, a high quality experience and a level of service they have only previously been accustomed to with other transport facilities.

4.1.9 Rising Costs of Building and Maintaining Assets

The initial capital construction investment is only a small proportion of the asset life cycle costs. Operational expenditure is the cost incurred directly from operating and maintaining assets, and is usually funded directly through rates rather than borrowing. Transport infrastructure assets are long-lived and maintenance-intensive, especially in New Zealand because of our climate and geology and the way we have built our roads.

Managing operational expenditure requirements is not a new issue for Council nor for many other New Zealand councils. Ageing assets and renewals were an issue identified in the previous versions of our IS and it remains a significant challenge today. Deferral of renewals has the potential to create a bow wave of capital expenditure as the risk of ageing and/or Earthquake Prone infrastructure failing compounds. It also increases operational expenditure as ageing assets require more maintenance to keep them functioning at an acceptable Level of Service until they are renewed.

Our asset base is increasing as the City's population and employment base grows, both through planned construction and gifting of assets. The operational expenditure associated with an increasing asset base is becoming increasingly less affordable as we take on a larger liability for maintenance.

The need to meet and manage community expectations of a growing asset base has been highlighted as a significant issue in the Council's IS. Concerns have been raised by the community that the standard of transport Levels of Service are generally not meeting their expectations. We regularly gather information about satisfaction with the condition of our assets, and significantly, in the most recent survey only 24% of participants were satisfied or very satisfied with the condition of the roads. Inflation costs for infrastructure have been increasing much faster than wages, putting further pressure on

household rates. At the same time, there is a longstanding expectation from the community that rates increases should be minimised. Triangulating between these conflicting issues is therefore not simply a matter of affordability, as it is equally about demand management and the community's willingness to pay.

Changing demographics will also have an impact on infrastructure. Significant work is currently taking place in the city to address immediate housing shortages and cater to the needs of a diverse population. In order to accommodate forecast population growth, significant increases in affordable housing are required. There has been significant greenfield growth post-earthquakes and it can be expensive to service these areas with roading, public transport and other assets.

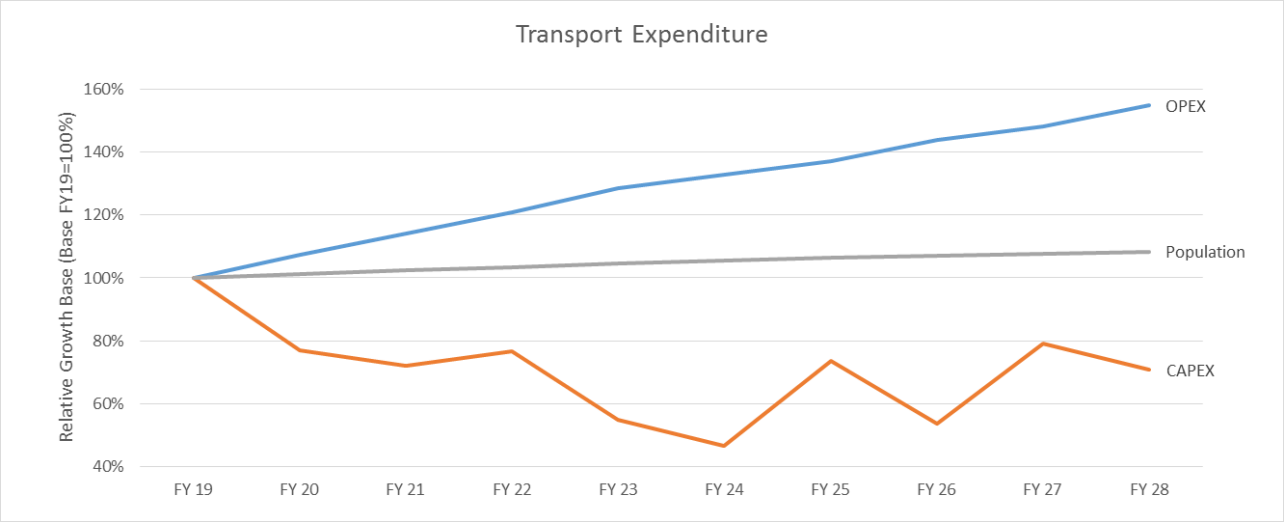


Figure 4-9. Relative growth in transport spending and population – LTP 2018-28

4.2 Demand Forecasts

The transport demand drivers outlined in Section 4.1 are expected to place unprecedented pressure in the coming decades on housing, employment and transport infrastructure across the city and sub-region. If the city continues to grow as expected and without addressing the need for much improved land use and transport integration across greater Christchurch, a failure to proactively tackle with our partners our current highly car-dependant travel behaviours, the inevitable travel growth and demand for road space will grow exponentially.

The Christchurch Transport Model (CTM), using the previously outlined population and employment growth scenario, combined with land use and network expansions and unchanged travel behaviour of high private vehicle usage, predicts that the traffic network particularly within and around the CBD would not be able to sustain the additional traffic volumes by 2038. This would mean more cars on the road, more economically debilitating network congestion spreading throughout typical weekdays, and an unsustainable level of demand on our roading and transport assets; all with their environmental, economic and quality of life consequences.

To tackle these issues and avoid these consequences, there are broadly two main options available:

Option	Objectives	Investment Focus	Outcome
Continue investing in general vehicle-led transport infrastructure improvements	- to provide more capacity for general vehicles - to tackle capacity bottlenecks for general traffic including additional road lanes and parking spaces	- new road infrastructure - multiple-laning of existing roads where demand projections support - widening/upgrading existing roads/intersections to maintain or enhance capacity	- continuing business as usual - high cost of implementation - increasing maintenance costs - urban sprawl - inability to meet environmental targets

Transition to more proactive travel demand management, through targeted urban intensification and linked investment in alternative transport choices	- to reduce the need for making car trips, especially for short distance trips - to provide active and public transport choices for longer distance trips as attractive alternatives to the car	- incentivisation of urban intensification around key activity centres - new and improved active and public transport infrastructure including cycleways, bus and HOV lanes - to optimise the use of the existing transport network capacity - supporting self-contained, more resilient neighbourhoods	- travel behaviour change required -more resilient local communities - lower comparative implementation costs - smaller increases in maintenance costs - reducing environmental impacts, especially CO_2 emissions and air quality (particulates)

Table 4-2. Demand Options

The high level strategic directions set out in the CTSP and the Council's Strategic Framework of community outcomes and strategic priorities, encourage active and public transport as the focus of Council's transportation, roading and land use investment direction.

4.2.1 Light Vehicle Demand

The graphs of **Figure 4-10** and **Figure 4-11** below show the historic and forecast annual light vehicle vehicle-kilometre travelled (VKT) based on Waka Kotahi surveys and the Christchurch Assignment and Simulation Transport (CAST) model v18 forecasts, respectively. There is a good consistency between the historic and forecast VKT's on the Christchurch network, despite some minor differences between the inclusions and exclusions and assumptions. In general the actual data are somewhat higher (by approximately 2%) given the actual data also includes local short distance trips whereas the model only focuses on the longer distance strategic trips. Hence, the growth trends look consistent and similar between the two.

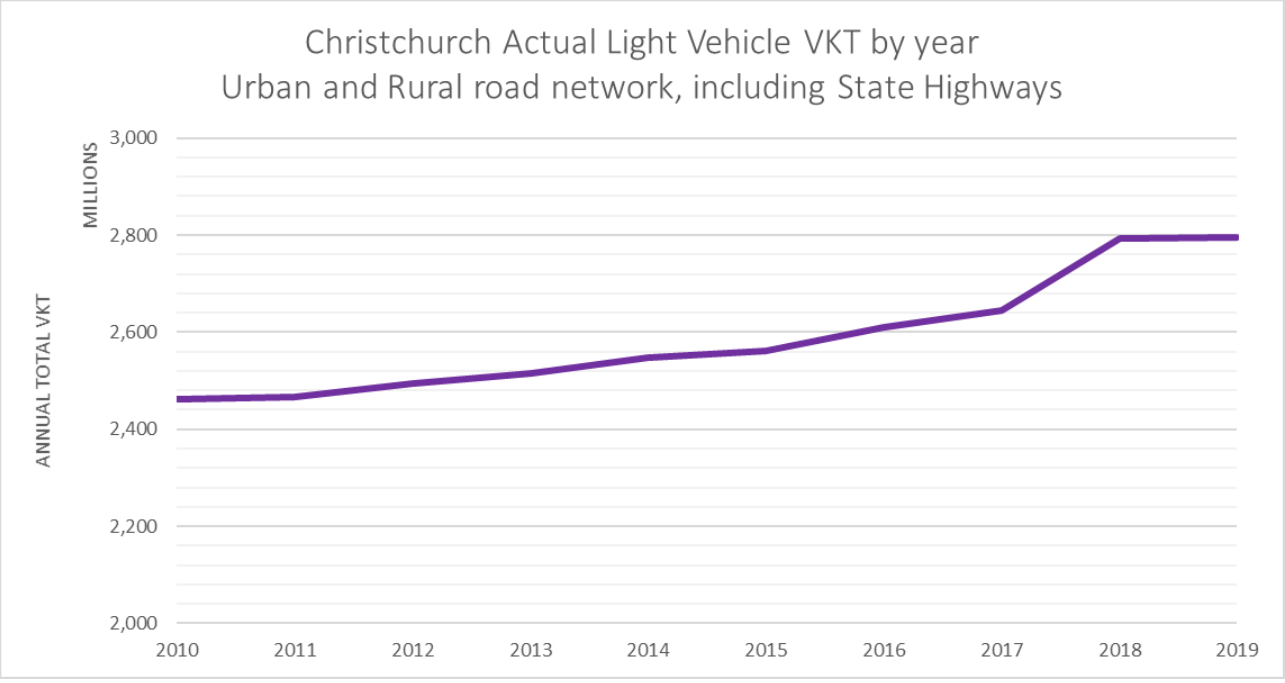


Figure 4-10. Historic Light Vehicle VKT's

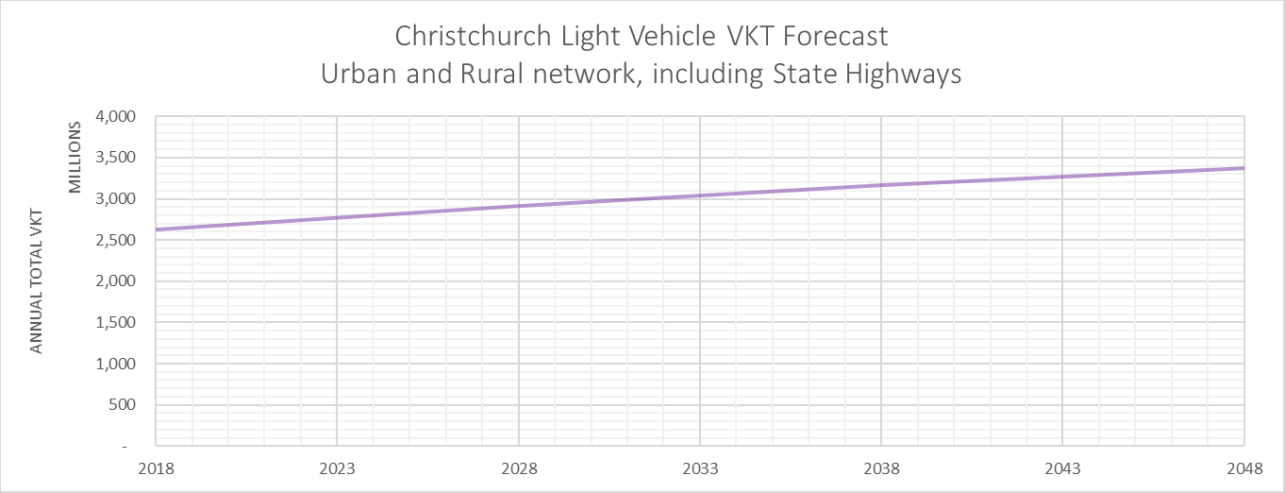


Figure 4-11. Forecast Light Vehicle VKT's

The historic data highlights an average 1.4% year on year growth in VKT's in the current decade. The model, based upon assuming little change in travel behaviour and mode choices along with the projected population / employment growth and materialisation of the planned land use and capital programme, predicts a similar 1.1% annual growth in VKT's in the next decade. The growth continues with a slight levelling out to 0.9% and 0.6% annual growth rates in the subsequent decades until 2048, adding up to nearly 30% cumulative growth over the 30 year period.

The decline in the forecast growth rates are in fact mostly influenced by the predicted growing congestion and the likely emergence of capacity shortage and bottlenecks across the network. If Business As Usual continues in providing for general traffic capacity, the forecast decline in growth in the following decades would not materialise which would entail further significant environmental impacts, safety issues and increased maintenance costs in the future. These costs are in addition to the capital investments required to deliver the needed extra capacity on the road network.

It is noted that, with the aftermath of the COVID-19 lock-down in early 2020 and the halt in international tourism and immigration numbers, a short-term decline in light VKT's occurred. The decline is evident by the plummeting fuel sales in the month after the easement of lock-down in May and June 2020 as shown in **Figure 4-12** below.

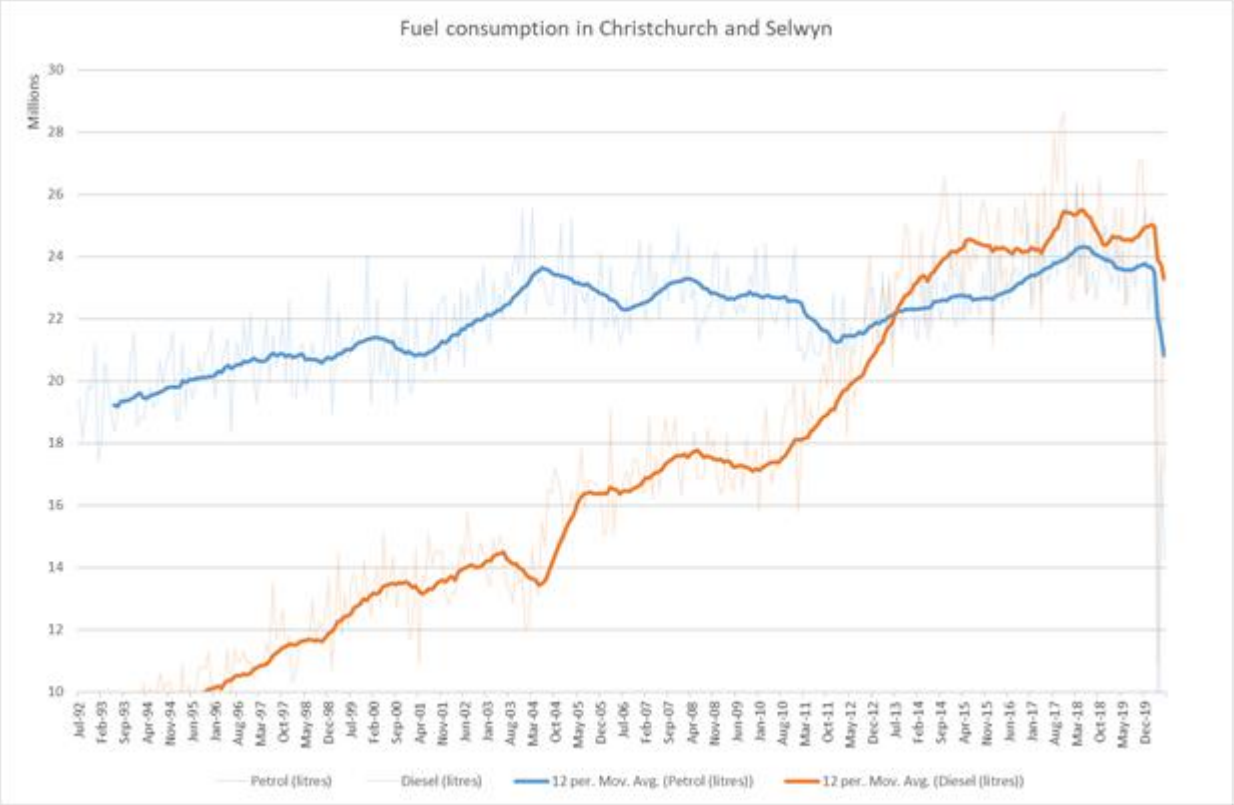


Figure 4-12. Historic fuel sales in Christchurch and Selwyn by type

The data suggests that:

- total fuel sales (Petrol + Diesel) in June 2020 was 31.3 million litres, 30% lower than June 2019 and the lowest it has been since 1997; and
- total fuel sales (Petrol + Diesel) for the year 2019/20 was 529.3 million litres, 8.3% lower than 2018/19 and the lowest since 2012/13.

As evidenced by traffic levels as Christchurch returned to Levels 3, 2 and 1 however, these reductions may well be short lived, as early evidence suggests traffic levels largely returning to similar pre-COVID levels. At the time of writing, it is unclear whether there will be any medium to longer term legacy effects of the pandemic on the community's travel behaviour and lifestyle choices.

4.2.2 Freight Demand

Major freight movements are carried by heavy freight vehicles and rail services throughout Christchurch. Rail services are governed by Kiwi Rail and Council has a limited role in the operation and function of those rail lines. However, functionality of the railway network and its interface with the roading network (state and local roads) will continue to be of considerable importance in terms of managing and delivering for the on-road freight transport demand and heavy vehicles.

The Greater Christchurch Transport Statement 2012 has forecast a two to four-fold increase in the freight volumes to/from Lyttelton Port between 2010 and 2041. The entire growth is not anticipated to be handled by on-road freight movements alone. The Lyttelton Port of Christchurch (LPC) desires to increase the proportion of freight by rail in future years, with a target of 40% by 2041 (from the current 20%). On this basis, the Greater Christchurch Freight Infrastructure Statement 2014 has projected the number of train movements around Christchurch to increase by over 50% over the same period.

The graph in **Figure 4-13** below shows the current and projected train movements around Christchurch based on Greater Christchurch Freight Infrastructure Statement 2014 and annual heavy vehicle trips based on the CAST model v18.

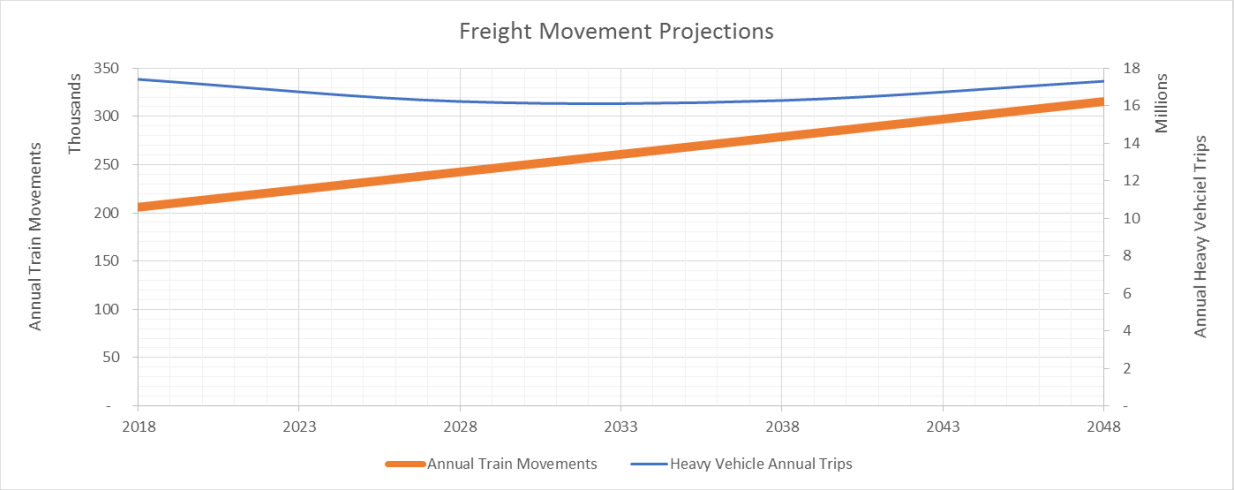


Figure 4-13. Current and Projected Freight Movements

The above graph indicates a relatively static projection for heavy vehicles trips for the period of 2018 to 2041, while train movements increase by more than 50% over the same period. The relatively static projection of the heavy vehicle trip number is mainly due to the combination of the projected higher capacities and more frequent train movements, gradually changing employment patterns and more direct land freight routes through the recently completed Christchurch Southern Motorway (CSM) and the Christchurch Northern Corridor (CNC).

It should be noted however that the above projections are based on the lower projection for the Lyttelton Port container volumes. If the upper growth forecast for port volumes materialises, then there would be an additional pressure on the road network to cater for the extra heavy freight vehicles. The selection of the lower projection in the transport model is based on the historic performance and growth in the freight volumes at the port.

The graphs of **Figure 4-14** and **Figure 4-15** below show the historic and forecast annual heavy vehicle vehicle-kilometre travelled based on the Waka Kotahi surveys and CAST model v18 forecast respectively.

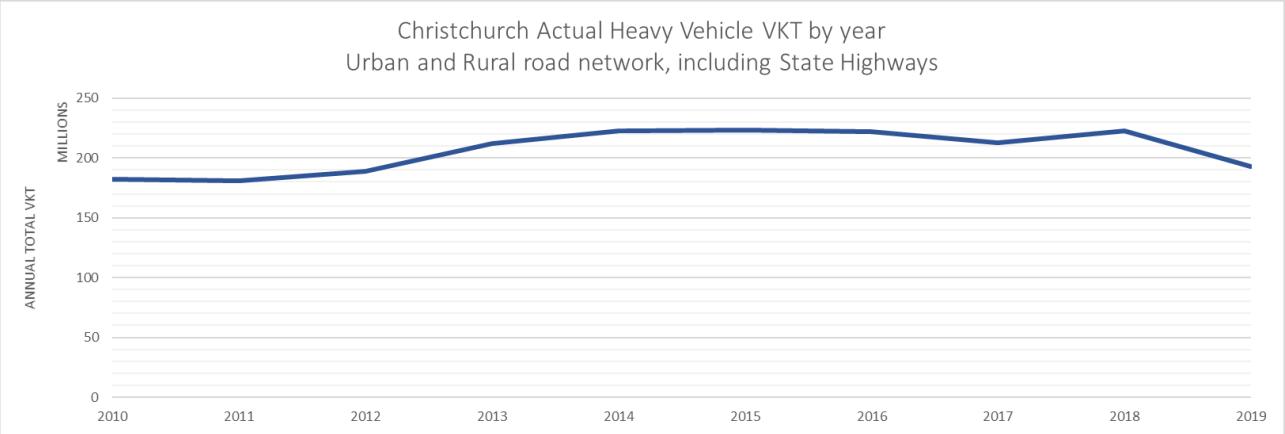


Figure 4-14. Historic Heavy VKT's

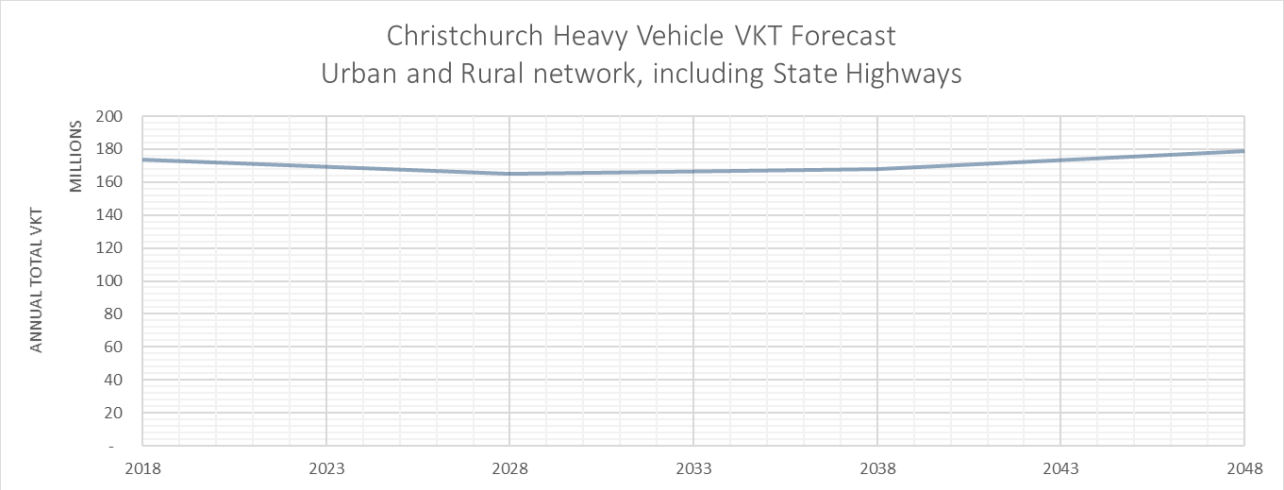


Figure 4-15. Forecast Heavy VKT's

Again there is an acceptable consistency between the historic and forecast VKT's on Christchurch's network. The last decade's heavy VKT trends were largely static with only 5% growth over the entire period. The VKT's grew during the period of recovery following the earthquakes but have generally declined since 2016.

The forecast heavy VKT's indicate a similar declining pattern to continue until 2028 followed by a modest growth beyond then until 2048. The 2048 VKT's are however nearly the same as those of 2018. The trend suggests that demand for on-road freight is not likely to grow considerably if the aspired rail freight growth to the port materialises. The increased rail freight would however have some implications for level crossing interfaces across the city with both the state highway and local road networks, which should be taken into account.

4.2.3 Active Transport Demand

After the earthquakes and the subsequent publication of the Christchurch Transport Strategic Plan (CCC, 2012) and An Accessible City (CERA, 2013), Council in partnership with the Crown and Waka Kotahi has increasingly invested in active transport infrastructure including new Major Cycle Routes (MCR's) and shared paths city-wide as well as similar networks and shared streets in the central city and through suburban master plans. As at June 2020, Council owned approximately 521 kilometres of formal active transport assets as presented in the table below.

Asset Type	Urban (kilometre)	Rural (kilometre)	Grand Total (kilometre)
Cycle Path	23		23
Shared Path	173	7	180
Cycle lane	294	8	302
Quiet Street	16		16
Grand Total	**506**	**15**	**521**

Table 4-2. Formal Active Transport Horizontal Assets – June 2020

These have been the first significant investments in non–car modes for many decades, and as global experience shows, making real and lasting changes to people's travel behaviour requires substantial and sustained investment over many decades. Although the limited investment has itself slowed down due to budget constraints in recent years, a considerable uptake beyond the initial forecasts has been observed for both walking and cycling demand, both in the central city and associated with a number of critical Major Cycle Route connections. The graphs of **Figure 4-16** and **Figure 4-17** below show the growth trends over the last few years for the new cycling and walking infrastructure respectively.

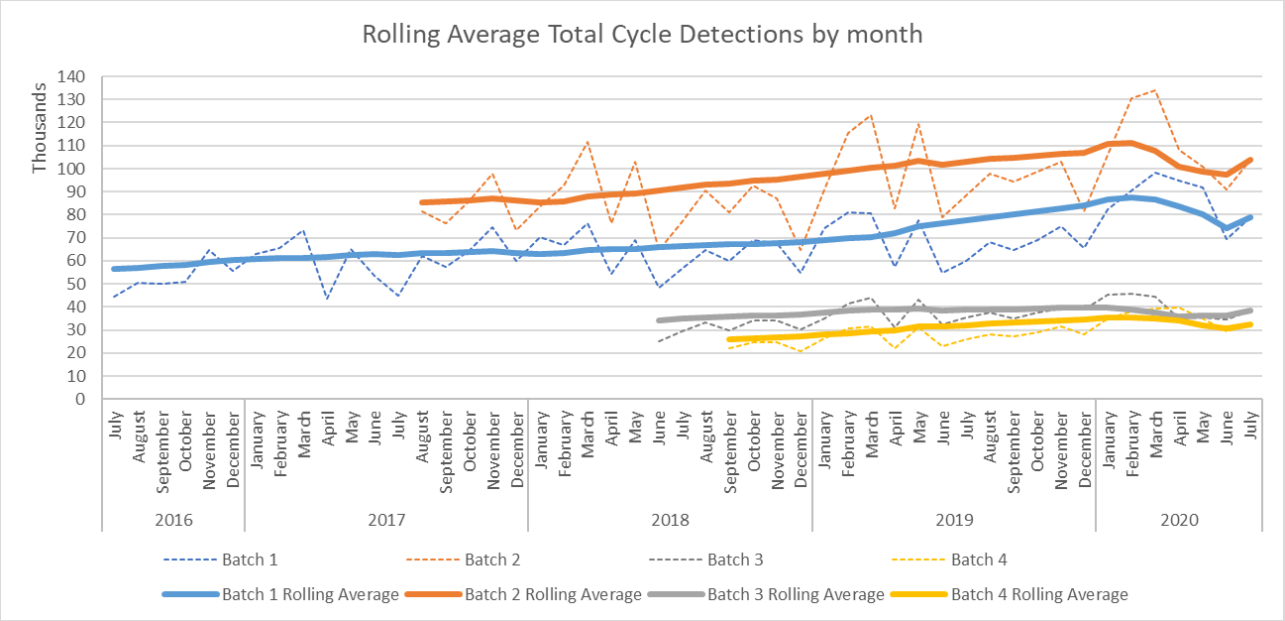


Figure 4-16. Cycling Growth Trends on Major Cycle Routes at 25 detection sites

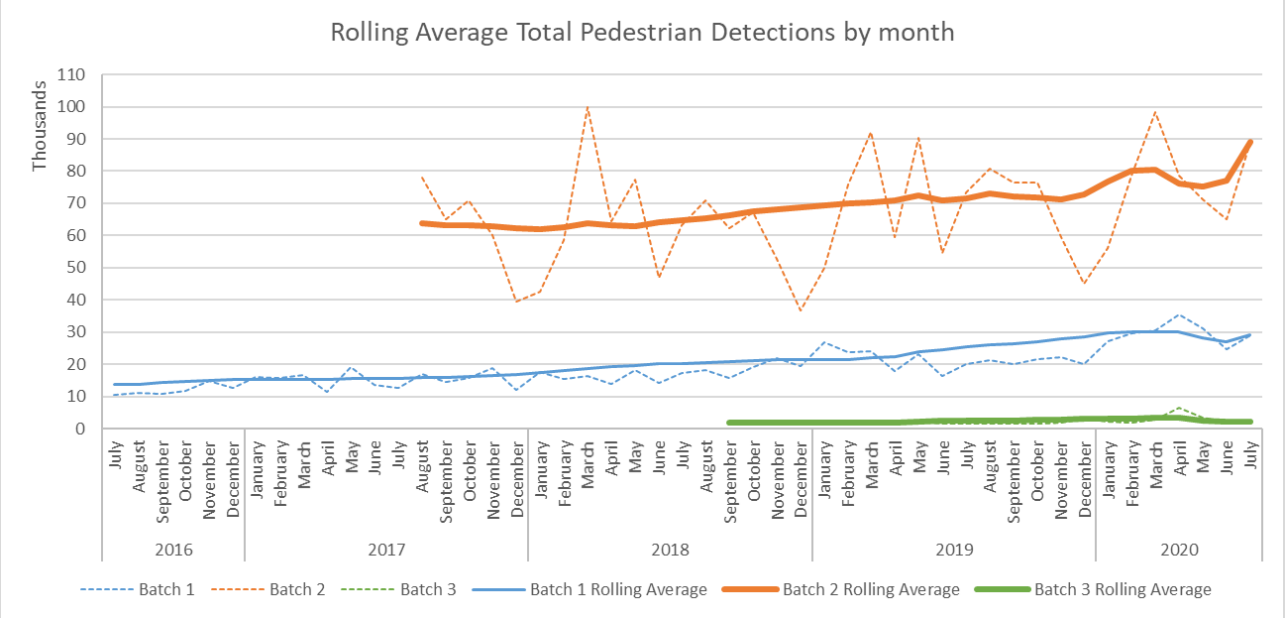


Figure 4-17. Walking Growth Trends on Major Cycle Routes (shared paths) at 8 detection sites

The two above Figures suggest that regardless of seasonal variabilities, both cycling and walking demands on the new infrastructure grew by nearly 15% in Financial Year 2020 (July to June), despite the lock-down effects. The total annual detections on the monitoring locations are listed in the Table below.

Financial Year	Total Cycle detections	Total Pedestrian detections
2016/17	1,938,000	921,000
2017/18	2,299,000	972,000
2018/19	2,620,000	1,041,000
2019/20	3,013,000	1,195,000

Table 4-3. Total annual detections on the walking/cycling monitoring locations

This highlights an early success story of an effective investment in active transport. This growth is on top of the increasing number of cyclists detected on the 'base network' of on-road cycling facilities. The Council's traffic counting programme indicates a growing number of cyclists at major intersections throughout the city, accounting for approximately 10% annual growth since 2016.

The 2018 census indicates that 11,160 people stated cycling as their mode of transport to work on the census day. This accounts for 5.6% of all daily trips. The share has remained largely unchanged compared to the 2013 census, despite the fact that the absolute number of cyclists grew by nearly 14% over the period. This is due to the fact that cycling mode share is starting from a very low base and it requires more time to shift the overall mode share in the favour of active transport. Considering the significant difference between the rate of cycling and walking growth with vehicle use, a meaningful increase in the mode share would be quite likely if the trends continue to grow with similar rates. It also demonstrates what many other cities internationally have learnt; which is that we need to remain consistent in progressively continuing to invest in increasing and improving our alternative active travel networks and the quality of facilities if this welcome early trend is to continue.

4.2.4 Public Transport Demand

In the beginning of the century, as exhibited in **Figure 4-18** below, public transport boardings in Greater Christchurch experienced average growth of 5-6% per annum, peaking at 17.2 million trips per year in 2010. In the aftermath of the earthquakes which led to significant disruptions in the services and the effective closure of the CBD and dispersal of key employment zones across the city, the number of boardings plummeted by over 40% to nearly 11 million passengers losing nearly 6 million passengers in 2012, the year following the earthquakes. This drop was mainly due to the post-earthquake shift of almost all of activity away from the central city - the traditional focus of the bus network. Patterns of travel demand also changed in Greater Christchurch, as many people moved homes or work places, presenting a huge challenge for the public transport system to respond to and meet these new demands. Short-term changes were made to the system immediately after the earthquakes, including some service level reductions which followed a review of the public transport network in 2011-12, resulting in the current much changed network.[8]

The total number of boardings started recovering again and reached 14 million by 2013, but since then the overall growth has effectively plateaued with individual growth or decline occurring on particular routes. This stabilisation has occurred at a level well below the pre-earthquake peak of 17.2 million trips per year. Furthermore, in terms of mode share, public transport continues to decline, as the stabilisation of trip numbers has occurred while our population has been growing.

COVID-19 and the lock-downs in 2020 and 2021 has again had a detrimental impact on the number of bus boardings, and caused a 2.5 million reduction in annual boardings to a level similar to 2011. The number of boardings at the time of drafting this section (when Christchurch is in Covid-19 Level 1) have recovered to nearly 80% of the same months of the last year (2019), suggesting a longer recovery period and lower total boarding numbers for the year to the end of June 2021.

[8] Canterbury Regional Public Transport Plan (RPTP) 2018-28

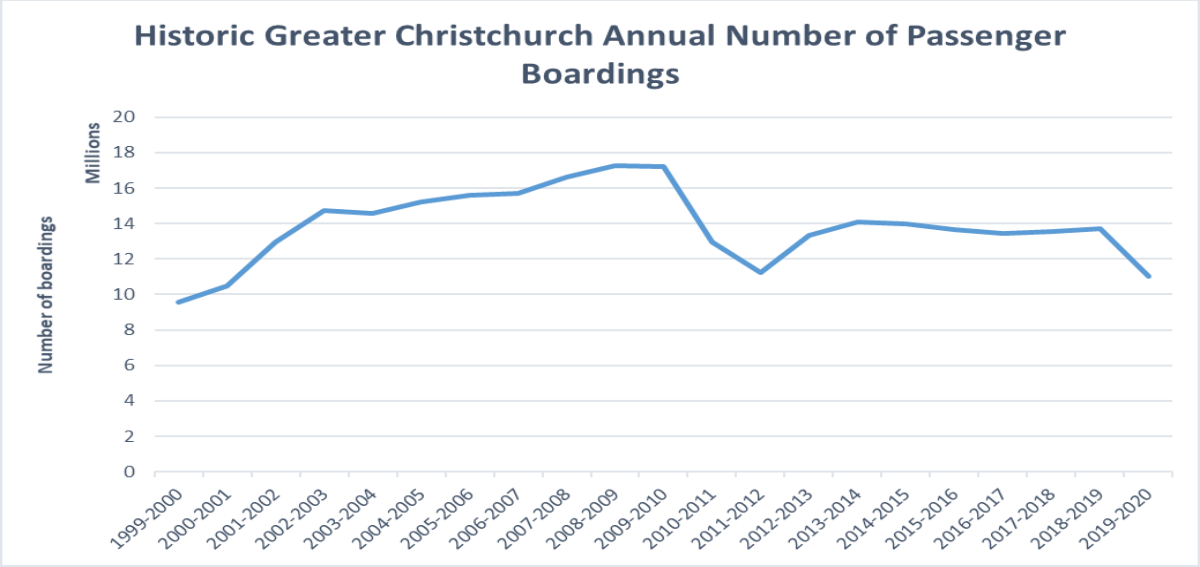
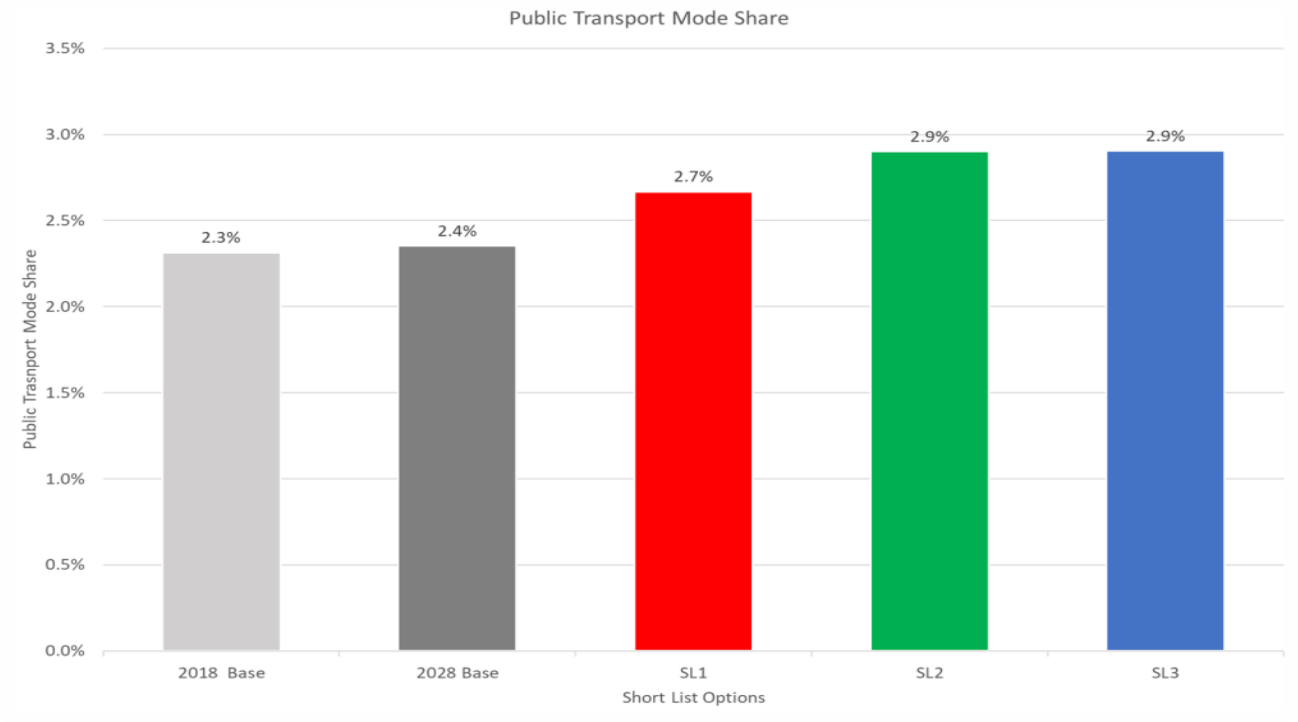


Figure 4-18. Public Transport Boardings Historic Trends

With regards to the future projections, the Public Transport Futures Business Case forecasts a 13% growth by 2028 in the Base model (no changes to the existing public transport provisions). The preferred scenario increases the 2028 forecast by another 13% (overall 28% growth compared to 2018 base to nearly 20 million trips a year). The scenario includes supply interventions for five core routes which includes enhanced frequencies in the higher density range, express services to Rangiora, Kaiapoi, Rolleston and Lincoln, and improved bus stop infrastructure and customer information.

Despite the forecast growth in demand and use by various scenarios until 2028, the public transport modes share is not expected to grow rapidly (**Figure 4-19**). The base 2028 scenario forecasts a 0.1% increase in mode shares from the current 2.3%, while the preferred scenario envisages a further 0.3% increase to 2.7%. This is mostly due to the forecast overall growth in the number of trips by other modes (particularly cars).



- SL1 Increases Total PT Trip by 7000 trips per day compared to 2028 Base, resulting in a 2.7% PT Mode Share
- SL2 Increases Total PT Trip by a further 5000 per day compared to SL1, resulting in a 2.9% PT Mode Share
- SL3 does not provide any further shift in number of public transport trips nor mode share than SL2

Figure 4-19. Public Transport Mode Share Forecast – PT Futures Business Case – June 2020

The main issues and opportunities with the public transport network as listed in the RPTP 2018-28 are as below:

- **The current public transport system can be unreliable and many journey times are not competitive with the private car.**

Current public transport journey times and reliability limit the attractiveness of public transport for customers. Comparative travel times within Greater Christchurch generally show that car travel is much faster than public transport. **Figure 4-20** below exhibits Bus Stop Time Point Arrival Reliability [9] over the 12-month period ending in July 2020.

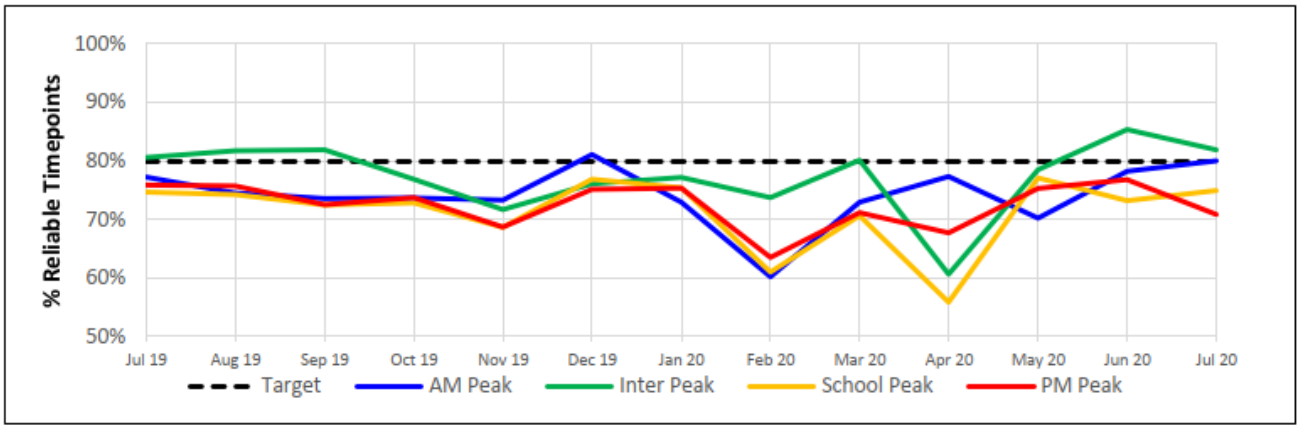


Figure 4-20. Bus Stop Time Point Arrival Reliability – Public Transport Dashboard – August 2020

[9] Adherence to the time points as set out in the service schedules measured by GPS technology

In summary, nearly all of the average morning, evening and school peak hour bus services fail to meet the 80% reliability targets. The majority of the length of the public transport network is currently shared with general traffic and therefore buses are exposed to the same levels of congestion and delay as per general traffic. Bus travel times on corresponding route sections are, however, on average 20% to 40% (average 30%) longer than those of general traffic, due to the requirement for boarding / alighting manoeuvres. This is additional to the walking time to a bus stop, waiting time at the bus stop, travel time difference if buses are not taking the shortest path to the destination and walking time after the bus trip to the final destination. On some routes, passengers transfer between suburban and core services through suburban interchanges, adding further delays to some longer journeys. While not all of these travel time elements can be controlled by Council, the Levels of Service can be influenced by improving bus frequencies, travel times and reliabilities; some of which can be assisted by improved bus priority infrastructure.

Public transport priority measures, combined with frequent or rapid services, would help to improve journey time reliability on many key routes, so that public transport can become a viable transport option which provides access to opportunities for all. Key outcomes identified by the business case, are to increase the number of households able to access key activity centres, employment areas and the central city within a 30-minute pubic transport journey. Making public transport more competitive also contributes to managing traffic growth and reducing our reliance on single occupancy vehicles, particularly for longer journeys outside the local neighbourhood. The challenge is to improve the reliability of the current public transport system so that journey times are more competitive with the private car.

- **The current public transport system is not always well integrated with existing and planned land use in Greater Christchurch.**

Currently, Greater Christchurch is relatively low density, compared with other cities such as Auckland, Wellington, and Hamilton. Low density means that there are fewer people within walking distance of a public transport stop, thus reducing the patronage catchment of each stop, making it more difficult to operate an efficient public transport system. Since 2011, the majority of growth in the city and in greater Christchurch has been located in greenfield areas. These areas of new development are on the fringes of the city and serving them with public transport is difficult, as it takes time for new areas to be developed and have sufficient population to make public transport viable. Over the next 30 years, Greater Christchurch's population is expected to grow by about 150,000 people to 640,000. This growth means more people will be making more trips across our transport network to where they want to go. Designing a public transport system which better connects key activity centres will improve access and provide genuine transport choice, in turn creating a more liveable and inclusive city. The integration of public transport and land use planning is key to creating communities and a more liveable city. In particular, there may be an opportunity for rapid transit to support more compact urban growth and improve access to opportunities like employment, education and recreation. The challenge is to better integrate public transport with existing and planned land use in Greater Christchurch.

- **There is a poor perception of the experience of using public transport in Greater Christchurch.**

The most prominent issue that deters the use of public transport, identified by current and potential customers, is that it does not get to places on time and that it is not a convenient use of commuting time. The challenge in partnership with Environment Canterbury and Waka Kotahi, is to better understand existing and projected public transport customers' needs, and improve the overall experience of public transport in order to retain those existing users and attract new users.

- **Transport contributes at least 19% to national greenhouse gas (GHG) emissions. In Christchurch, transport contributes more than half (53%) of emissions and is a significant contributor to poor local air quality. The majority of transport emissions are a result of road transport and this represents a significant opportunity for reduction.**

Local and central government are committed to reducing the adverse effects of transport on the climate, local environment and public health. The New Zealand government has committed to the 2015 Paris Agreement target of reducing GHG emissions to 30 percent below 2005 levels by 2030, and has introduced legislation proposing to make New Zealand net carbon neutral by 2050. The challenge is to better recognise the role of public transport, alongside active travel and better integrated land use and transport networks, in achieving these outcomes and targets by growing patronage, therefore helping reduce single occupancy vehicle use, and by transitioning to a PT fleet which comprises zero emission vehicles.

- **Public transport affects all aspects of life that keep us well and healthy.**

Access to public transport services enables individuals to participate in employment, study, recreation and their community and helps provide access to food, services, friends and family. The use of public transport is also considered an active form of transport because it typically involves walking to and from bus stops. Being physically active reduces the risk of a number of health conditions. The challenge is to improve the overall health outcomes of our communities by enabling more people to access opportunities by using public transport.

4.2.5 Micro-mobility Demand

Publicly accessible micro-mobility in Christchurch is mainly represented by rental e-scooters. Rental e-scooters are a relatively new feature to Christchurch, introduced in October 2018. **Figure 4-21** below shows the total monthly ridership data for the applicable period.

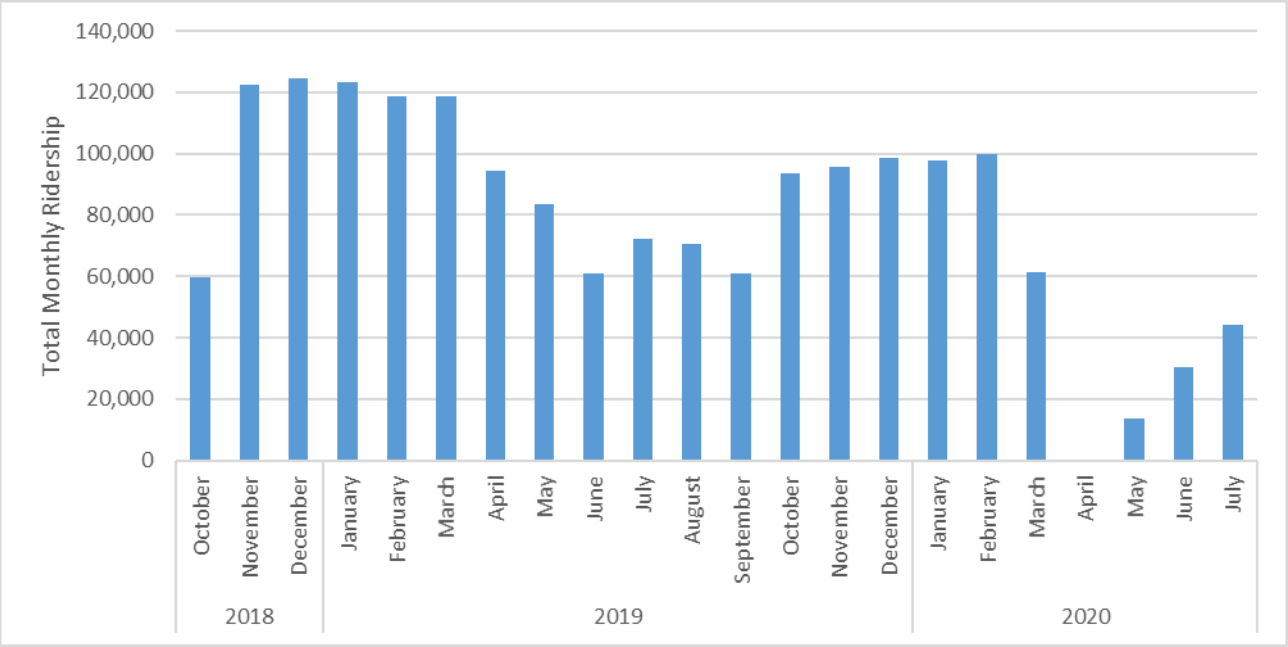


Figure 4-21. E-Scooter Monthly ridership data – August 2020

The existing data indicates that the available 700 e-scooters during the period of October 2018 to March 2019 catered for an average monthly ridership of approximately 120,000 rides (5.7 rides per vehicle per day). The ridership, however, declined by a sharp 50% drop over the following winter season of 2019 even though the available number of e-scooters increased to average 1,300 vehicles (out of 1,600 citywide cap). Demand recovered again in the next warm season but not to the same levels of the first year. Vanishing novelty and the growing market for privately owned e-scooters can be counted as the likely main contributing factors for the 20% drop. COVID-19 lock-down and subsequent border closure again had a substantial impact on the demand for rental e-scooters; hence the numbers seem to be recovering by a fast rate to those of the previous cold season.

In terms of their function in the larger transport network, rental e-scooters can enhance connectivity to the public transport network by offering an alternative for walking in the 'last mile/first mile' or extend the catchments of public transport journeys to farther afield. They may also increase the range of walking trips and reduce car reliance for mid-length trips. It should, however, be noted that the highest average number of e-scooter rides for the entire city is circa 4,000 which is nearly 10% of daily public transport trips.

Hourly ridership patterns, as illustrated in **Figure 4-22**, and in particular the relatively low numbers of morning peak rides suggest that commuting to work/education purposes is only contributing to a fraction of the e-scooter demand.

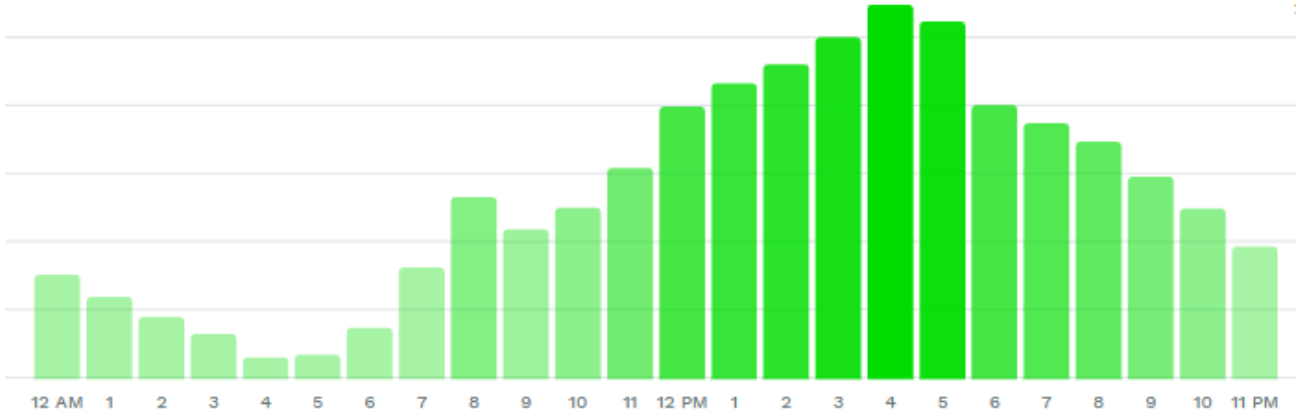


Figure 4-22. E-Scooter Hourly ridership data – August 2020

The hourly trends indicate that afternoon ridership is noticeably higher than that of morning. The average trip duration and distance are approximately 12 minutes and 1.5 km respectively, which indicates a tendency towards usage for shorter trips. The geographical distribution of trips indicate a high concentration mainly within the boundaries of the CBD or to / from the educational centres e.g. the university.

The usage data suggests that the rental e-scooters are not competing with other modes to cater for commuter trips. However, there has been a considerable uptake in the use of personal e-scooters as a commuting vehicle since the introduction of the rental e-scooters. Considering the convenience of making a trip with the e-scooters, the cost of every day hiring of the rental e-scooters soon justifies an investment into buying one if used for every day commuting purposes. Currently, very limited data is available on the trends of the number of privately owned e-scooters or their trip purposes. The trend, in general transport terms is a positive sign with more real trips being transitioned into urban micro mobility vehicles.

Urban micro mobility, being a new feature to urban public spaces world-wide, does not have an extensive policy background. Government is currently preparing the 'Accessible Streets' rules package which proposes a number of new rules to respond to the rise of micro-mobility devices like e-scooters as well as rule changes to improve the safety and efficiency of active transport modes and buses. The aim of the regulation package is to increase the safety and accessibility of our footpaths and streets, and encourage active modes of transport.

The consulted version of the Accessible Streets package proposes new rules that would require anyone riding a device on the footpath to give way to pedestrians, to not exceed a speed limit of 15km/h, and for the device to be no wider than 75cm. Other proposed changes include:

- allowing e-scooters to use cycle lanes and cycle paths;
- giving buses priority when existing bus stops on roads with a speed limit of 60km/h or less;
- clarifying road controlling authority powers in relation to parking on berms;
- categorising vehicles to reflect changes in technology; and,
- improving the safety of people walking, cycling and using micro mobility devices by making several Give Way rule changes.

Public consultation for the Accessible Streets rules package was hosted by Waka Kotahi and closed on 20 May 2020.

Clarifications around rules and regulations associated with urban micro mobility vehicle is likely to encourage a wider extension nationwide. The proposed more permissive regulations to use footpath, cycleways and cycle lanes would also encourage less confident users and extension of the user catchment. It will also result in a higher utilisation of the Council's active transport assets.

4.3 Impact of Changing Demand on Existing Assets

As described above, in the medium to longer term, the utilisation of our transport network and roading assets is likely to change as a result of increasing demands, especially if they remain unchecked. The challenges of responding to community concerns about diminishing transport Levels of Service targets and performance, will be coupled with inevitably increased maintenance and renewal costs if those demands rise unchecked. These issues and the huge challenge of meeting the Council's (and the nation's) stretching climate change targets for the coming decades, will continue to be a defining issue in the coming plan period.

In the short term, the national and global economic impacts of the COVID-19 pandemic has seen a decline in employment, tourism and GDP, potentially leading to a lower demand for people and freight movement. This may cause a period of stable or even opposite trends in the utilisation measures. The real impacts and the length of the COVID-19 recovery is still unknown but past experience with global economic downturns suggest a recovery to levels similar to pre-event. The rate of recovery is the greatest unknown at this time.

The need for an asset Demand Management Plan is therefore essential. At the same time, asset utilisation will need to be monitored more effectively so that emerging trends, issues and solutions can be identified to both respond to and influence demand changes.

4.4 Demand Management Plan

The Council's strategic priorities (i.e. for the next three years) of increasing active, public and shared transport opportunities and use; climate change leadership; maximising opportunities to develop a vibrant, prosperous and sustainable 21st Century city; and safe and sustainable water supply and improved waterways, can each help to guide how we influence the demands on and management of our transport assets.

The key outcomes we are setting out to achieve in setting our Asset Management planning outputs are therefore:

- reducing the need to travel and levels of car dependency through better integrated land use, transport and asset planning;
- moving more people in fewer vehicles;
- supporting more self-sufficient, resilient neighbourhoods where the need to travel by car for the daily essentials of food shopping, health, employment, education and recreation is much reduced;
- reducing the harm caused by vehicles in terms of road safety and impact on the environment;
- emphasising and supporting shared travel options and investing in comprehensive travel demand management services;
- seeking more sustainable and lower operating cost infrastructure (such as the switch to LED street lighting);
- utilising smart technology for travel choice management and asset planning and operations; and
- improving the equity of the travel market by considering smarter revenue and demand management measures that deliver better outcomes for the community.

To incorporate the community outcomes and the above objectives into the Council's Transport Capital programme, the three transport Pillars have been identified as:

The three transport Pillars are gauged based on the foundation of Affordability (across all three) in order to maximise the benefit with the limited available budget. The entire Transport Capital programme, including various business cases, is therefore scored against the Pillars and ranked according to their level of affordability.

To assist with achieving these goals, the following management approach to AMP delivery is being developed:

REDUCE – the need for travel (i.e. reducing the underlying demand on transport assets), and ensuring future expected growth projections are planned for and managed in a sustainable way.

MANAGE – our existing assets to best effect, i.e. in terms of supporting mode shift, making best use of the existing transport assets and networks (e.g. guided by ONF, Network Management Plan etc.)

INVEST – in adding to or significantly reshaping our existing networks of transport assets ONLY where we have explored Reduce and Manage responses, and have concluded that fresh capital investment is fully justified (i.e. the business case process). This should also outline how the nature of future capital investment should shift away (*rapidly*) from new road building (i.e. beyond existing commitments) to enhanced capital investment in the alternative modes, i.e. public transport, cycling, walking, and streetscape enhancements. Again, this investment can be influenced by Level of Service gap analyses driven by the ONF system.

Opportunities identified to date for transport demand management are shown in the following Table.

Table 4-4: Demand Management Initiatives and Impacts

Current initiatives			
Initiative that influences demand	**Effect of initiative on demand (↑, ↓, ↔)**	**Can this effect be quantified – what assumptions have we made about the effect of the initiative**	**Potential impact on asset planning (operation / maintenance / revenue / renewal / Capex)**
Car Parking – Policies, Pricing and Supply **Parking policies that seek to restrict long stay (commuter) parking in favour of short-stay shopper / visitor parking – and overall seeks to manage the supply of parking to off street purpose-built facilities**	↔ to↑ car demand, if pricing and supply is not deployed to restrict demand Potentially (if parking demand is not checked): ↓ PT patronage, cycling	Forecast parking demand (from model) – this already assumes mode splits (3x PT, cycling, walking for central city by 2041) to which we may not be currently tracking.	Is linked to predicted general traffic flow projections city–wide out to 2031 / 2041. Well recognised that parking availability and pricing can influence general traffic demand- and so Council's parking policies and pricing structures can be used to help manage down future general traffic growth. Affordable (low cost in comparison with other CBDs) public parking and some free on-street parking within 500m of the central city and around commercial centres.
Public transport priority lanes (e.g. current examples of Riccarton and Lincoln Road)	↓ car demand	Citywide PT corridors seek to support greater Christchurch wide PT patronage growth of 4x by 2050 – and 3x growth in central city by 2041 (from pre EQ levels).	Helps manage future general traffic growth pressures across network, but adds to PT infrastructure assets to be delivered, managed and maintained by Council.
Major cycleways	↓ car demand	Citywide major cycleways corridors seek to support city-wide uptake of cycling – and 3x growth in central city with connected networks by 2041 (from pre-earthquake levels).	Helps manage future general traffic growth pressures across network, but adds to cycle route infrastructure assets to be delivered, managed and maintained by Council.
Central city transport improvements, public realm improvements and 30km/hr zone	↓ car demand Improvements makes walking and cycling feel safer and reduces car demand. Improved liveability of central city for increased residential population and density	Improvements have already reduced serious crashes on network and contributed to increases in walking and cycling activity. Helps achieve targeted increases in central city living (of 20,000+ residents in next decade or so) – in turn reducing citywide transport growth pressures, by reducing travel demands.	Helps manage future general traffic growth pressures across network, by making central city more attractive to non-car modes. However, some streetscapes across central city require increased asset funding to maintain higher quality assets including features such as raingardens.
Central City workplace travel plan programme	↓ car demand	Early programmes with major central city employers are showing significant gains in non-car mode choices (i.e. PT and cycling especially).	Helps manage future general traffic growth pressures across network and does not directly add to asset management Opex programme costs.
Network Management Plan (National Operating Framework)	↔ manages existing demand	Ensures both network Opex and Capex programmes are more accurately targeted at identified levels of genuine service gaps, and can be tuned to ensuring non-car based modes are prioritised where appropriate.	Helps manage future general traffic growth pressures across network, and ensures scarce Opex and Capex asset management budgets are better directed to closing identified customer Levels of Service gaps, consistent with our strategies and plans.
Network management and corridor plans taking account of the one network approach	↔	Ensures both network Opex and Capex programmes are more accurately targeted at identified levels of genuine service gaps – and can be tuned to ensuring non-car based modes are prioritised where appropriate.	Helps manage future general traffic growth pressures across network, and ensures scarce Opex and Capex asset management budgets are better directed to closing identified customer Levels of Service gaps, consistent with our strategies and plans.
Public realm and walking improvements (wider footpaths, crossings) integrated into other transport improvements	↓ car demand ↑ cycle usage and walking ↑ assists demographic changes of ageing population	Helps achieve targeted increases in central city living (of 20,000+ residents in next decade or so), in turn reducing city wide transport growth pressures, by reducing travel demands.	Capex and Opex costs overall likely to be neutral in long run, instead that they are increasingly directed towards transport outcomes that better reflect Council's transport priorities and desired community outcomes. Opex costs of improved streetscapes may be higher initially while limited number of applications restrict abilities to achieve economies of scale in Opex programmes from the different 'shape' of transport assets.

Future planned initiatives			
Initiative that influences demand	**Effect of initiative on demand (↑, ↓, ↔)**	**Can this effect be quantified – what assumptions have we made about the effect of the initiative**	**Potential impact on asset planning (operation / maintenance / revenue / renewal / Capex) etc.**
Increase on street parking management zones in the central city **Increase paid parking areas around central city and key activity centres to better reflect the true cost of providing parking** **Prioritise shared parking, short stay parking and dis-incentivise commuter parking**	↓ car demand	Existing Council policies can be deployed in these areas to help achieve desired mode shares into central city (of 3x PT, cycling, walking from pre-earthquake levels by 2041).	Is linked to predicted general traffic flow projections city–wide out to 2031 / 2041. Well recognised that parking availability and pricing can influence general traffic demand- and so Council's parking policies and pricing structures can be used to help manage down future general traffic growth. Removal of on street paid parking and adding extra will have both negative and positive effects on Council's parking revenue.
Reduce number of Council-owned parking assets	↔ car demand	Externalises the cost of providing parking – costs of parking are market led and therefore not subsidised by Council.	Potentially reduces ongoing Opex and Capex costs to Council associated with delivering and managing on and off-street parking infrastructure. Reducing the Council parking asset however does result in a long term reduction in Council parking revenues.
Rapid transit to north and south-west with supporting land use zoning changes	↓ car demand	Effect of rapid transit (as opposed to other bus-based solutions) to be assessed through future phases of Greater Christchurch Public Transport Business Case.	Potential costs in Capex and Opex terms are significant. Only further business case analyses will determine if they are economically viable, as 'above line' costs to Council and strategic partners could be very high indeed.
High occupancy vehicle lanes	↓ reduce single occupancy vehicles	When carefully designed for key corridors and balanced with other infrastructure and network operational outcomes have been shown to achieve positive effects on mode choice and reductions in single occupancy vehicles	If full infrastructure Capex and Opex costs are accounted for at installation, remaining Opex costs are associated with enforcement mechanisms. These can be offset / reduced by enforcement technology solutions at implementation.
Bus Priority lanes on core routes with high quality stops	↓ car demand ↑ PT patronage	Plenty of positive examples worldwide where quality public transport priority corridors act to reduce car commuting including single vehicle trips.	If full infrastructure Capex and Opex costs are accounted for at installation, remaining Opex costs are associated with enforcement mechanisms. These can be offset by enforcement technology solutions (e.g. on-board enforcement cameras) at implementation.
Traffic / emission charging zones	↓ car demand ↑ PT patronage ↑ cycle usage and walking	International evidence that congestion and emission charging zones can be effective in both reducing vehicle numbers (incl. SOV), plus reducing resulting emissions.	If full infrastructure Capex and Opex costs are accounted for at installation, remaining Opex costs are associated with enforcement mechanisms. These are typically automated technology solutions. 'User pays' principles can be deployed to design and manage systems.
Citywide travel behaviour change programme with focus on central city, northern corridor and south west corridor (where most residential and traffic growth is expected)	↓ car demand ↑ PT patronage ↑ cycle usage and walking	Early programmes with major central city employers are showing significant gains in non- car mode choices (i.e. PT and cycling especially).	Helps manage future general traffic growth pressures across network and does not directly add to asset management Opex programme costs.
Speed management citywide (focus on schools, central city, key suburbs and residential neighbourhoods)	↔ car demand overall ↓ car demand associated with school travel – and if coupled with improved local neighbourhood accessibility ↑ cycle usage and walking	Considerable international and growing NZ evidence of the benefits in mode shift terms of prioritising comprehensive speed management programmes – in both Capex and Opex (incl. enforcement) terms. Can be used to support self – contained neighbourhoods and '15 minute city' principles.	Capex and Opex costs overall likely to be neutral – providing speed management is fully accounted for on Capex and Opex programming.
Smart networks and technology influence management of network including traffic signals, road condition, parking enforcement, road pricing to reduce Opex	↔car travel demand overall	Ensures both network Opex and Capex programmes are more accurately targeted through technology solutions, at identified levels of genuine service gaps – and can be tuned to ensuring non-car based modes are prioritised.	Ensures both network Opex and Capex programmes are more accurately targeted at identified levels of genuine service gaps – and can be tuned to ensuring non-car based modes are prioritised where appropriate. Helps manage future general traffic growth pressures across network – and ensures scarce Opex and Capex asset management budgets are better directed to closing identified customer Levels of Service gaps, consistent with our strategies and plans.
Micro-mobility and shared transport encouraged	↓ car demand ↑ walking ↑PT if well integrated as first / last mile	Emerging international evidence that micro-mobility and personalised journey planning can make positive contributions to reducing single vehicle occupancy – and enhancing non-motorised travel in city centres.	Capex and Opex costs overall likely to be neutral in long run.

4.5 Demand Related Projects and Programmes

Infrastructure provides the foundation for achieving the vision and community outcomes. The proportion of funding out of the entire Transport Capital Programme which has been allocated to achieve each of the Community Outcomes and Levels of Service over the period of the Long Term Plan 2024-34 is illustrated in the Table below.

LOS Pillar	Funding Source	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	Total
Safety	Core	$17,317,962	$18,401,371	$15,250,168	$14,416,887	$18,834,531	$16,166,331	$15,950,613	$9,305,000	$9,722,786	$11,394,039	$146,759,687
	CRAF	$2,443,793	$955,540	$-	$-	$-	$-	$-	$-	$-	$-	$3,399,333
	Shovel Ready	$-	$334,737	$-	$-	$-	$-	$-	$-	$-	$-	$334,737
Environment	Core	$8,893,199	$8,663,331	$9,667,059	$25,174,837	$33,884,085	$39,864,923	$35,224,659	$20,167,833	$19,669,468	$28,692,349	$229,901,743
	Shovel Ready	$24,847,078	$27,036,385	$28,622,795	$2,791,761	$-	$-	$-	$-	$-	$-	$83,298,019
Access	Core	$71,567,825	$67,260,801	$69,895,785	$83,928,399	$72,288,630	$69,030,913	$73,199,446	$94,171,506	$95,642,592	$84,969,513	$781,955,410
	CRAF	$10,167,254	$6,375,028	$6,283,173	$6,174,153	$5,000,000	$-	$-	$-	$-	$-	$33,999,608
	Global Settlement	$370,000	$2,832,977	$2,000,000	$1,507,694	$-	$-	$-	$-	$-	$-	$6,710,671
	Shovel Ready	$56,292	$5,665,955	$-	$-	$-	$-	$-	$-	$-	$-	$5,722,247
Grand Total		**$ 135,663,403**	**$ 137,526,124**	**$ 131,718,980**	**$ 133,993,730**	**$ 130,007,245**	**$ 125,062,167**	**$ 124,374,719**	**$ 123,644,339**	**$ 125,034,846**	**$ 125,055,901**	**$1,292,081,454**

Table 4.5 – Transport Capital Budget Allocation

Targeted Plans and Strategies – the Council has adopted a range of activity or outcome focused plans and strategies that provide the detailed link between the high level community outcomes and strategic priorities and the work programmes the Council undertakes to deliver on these.

The new assets required to meet growth will be acquired free of cost from land developments and constructed/acquired by the Council. New assets constructed/acquired by the Council are discussed in Sections 7 and 8.

Acquiring these new assets will commit the Council to fund ongoing operations, maintenance and renewal costs for the period that the service provided from the assets is required. These future costs are identified and considered in developing forecasts of future operations, maintenance and renewal costs in Sections 7 and 8.

5 Managing Risk and Investing in Resilience

This section outlines Council's approach to managing risk and investing in resilience. It includes responses by the activity to build resilience across a number of identified 'disruptors'. A risk register and schedule of proposed risk mitigation actions are also included.

5.1 Council's Approach

Investing in Resilience

The Resilience Greater Christchurch Plan (RGCP) provides a framework and multi-agency actions towards a more resilient City. All Council's activities play a role in contributing to this RGCP by becoming more resilient to 'disruptors'.

To build resilience in our asset networks, we need to firstly understand the potential disruptors and the impacts on our assets and services. These are outlined in Section 5.2.1.

Key projects or activities to improve resilience, that we have identified and defined sufficiently to be included in this AMP programme, are included in Section 5.2.2.

Where further investigation is required to understand the impacts of disruptors and ways to be more resilient, opportunities are identified in Section 5.2.3.

Risk Management

Council's corporate approach to managing risk is defined in its Risk Policy and assessment framework. The framework provides a means for consistently identifying, recording and assessing risks such that risk mitigations can be prioritised across Council. The risk management framework and application to the AMP is summarised in Section 4.3.3 of the SAMP.

Whilst the resilience programme focusses on the big, strategic challenges such as natural hazards and globalisation, Council's risk register (recorded in Promapp) is also intended to be used to manage higher frequency, lower probability events. For example, while another major earthquake would have very high consequences for many of Council assets, lower consequence risks such as third-party damage may be so frequent as to also warrant attention.

In Section 5.3.1 we provide a snapshot of the highest risks recorded for this activity and in Section 5.3.2 summarise the major mitigation actions that have been included in this AMP.

Resilience Definitions

Acute Shocks: Sudden, sharp events that threaten us e.g. the Canterbury earthquakes represent one of the most significant types of shock any place can endure.

Chronic stresses: Activity that weakens the fabric and functioning of a city on a day-to-day or cyclical basis.

Resilience is the capacity of individuals, communities, businesses, and systems to survive, adapt and grow, no matter what chronic stresses and acute shocks they experience. (*100 Resilient Cities*)

The Resilience Dividend: The practice of designing projects and policies to address multiple challenges at one time, improving services and/or saving resources i.e. the net social, economic and physical benefits achieved when designing initiatives and projects. (*100 Resilient Cities)*.

Multiple Dividends accrue from investment in disaster risk reduction and can: (1) Avoid or minimise losses when disasters strike. (2) Stimulate economic activity in a zone as a result of reduced disaster risk; and (3) develop co-benefits, or uses, of a specific investment.

Absorption is the ability to absorb shocks or stresses without triggering non-linear, abrupt environmental change (in the wider sense of 'environment' not just the natural environment). *New Zealand Treasury Resilience and Future Wellbeing 2018.*

Adaptation changing something in order to make it suitable for a new use or situation. In a climate change context, the UN Development Program calls it a process by which strategies to moderate, cope with and take advantage of the consequences of climatic events are enhanced, developed, and implemented. *(Oxford Dictionary).*

Mitigation is the action of reducing or minimising the severity and seriousness of any harmful impact *(Oxford Dictionary).*

Resilient Qualities are the characteristics of resilient projects and systems. The 100 Resilient Cities define these characteristics as reflective, resourceful, robust, redundant, flexible, inclusive, and integrated.

5.2 Investing in Resilience

5.2.1 Understanding our Resilience Challenges

Section 4.3 of the SAMP detailed the 'shocks and stresses' (disruptors) that provide resilience challenges for Christchurch. The table below summarises how each of these has the potential to negatively impact our assets and services:

	Disruptors	Potential Impacts on our Assets and Services
Chronic Stressors	Climate Change	This will have a significant impact on the City, particularly the coastal areas, with likely effects being more regular inundation or accelerated erosion A key decision will be on adapting vs retreating for our coastal communities. For the transport network the routes and assets on the coast will need a strategy to either protect them from storm surges, or a decreased Level of Service before a managed retreat. Either way there will be a cost that ratepayers need to cover. To illustrate, for a 1.0m sea level rise scenario, approximately 110km of the road network is at risk of inundation with these assets valued at $65.6 million. Council has started to assess the risks involved. From a contribution perspective 53% of carbon emissions in Christchurch are from the transport sector; 36% from road transport. How we manage our assets can influence the level of emissions. For example, the investment in LED lighting upgrade has brought about a significant reduction in carbon emissions as well as reducing Opex costs. Also, network management and prioritising movement by other modes, shared transport, public and active transport all reduce carbon emissions.
	Globalisation	Globalisation has an impact on transport. As goods and services are moved it will affect which parts of the city are busy. Council has already shared its network view via the Network Management Plan Model, which indicates the primary road network, which streets are suited for heavy vehicles, buses etc.
	Demographic Changes	Increasing population and demand for services with a reliance on private vehicle use. Increasing demand on the assets reduces the life of the asset resulting in unreliable journey time. Mitigation measures include shifting demand for services away from the Single Occupancy Vehicle (SOV), meeting a need for integrated land use and transport planning through zoning and investment in sustainable modes of transport.
	Population Health	Shifting demand for services to have more benefit on health, wellbeing and liveability outcomes. For example, Public health issues related to levels of inactivity and poor air quality because of NO^2 and PM10 emissions (noting that transport is not the main contributor, but it is a significant one). Asset Management to support Central city regeneration and increasing residential living.
	Housing and Social Inequity	The way fuel is taxed can be considered regressive as it will disproportionately impact low-income households who tend to have older, less fuel-efficient cars. However, as car technology improves these costs will likely be reduced.
Acute Shocks	Seismicity	The 2010 and 2011 earthquakes showed that while road pavements may be resilient, bridges and retaining walls are the key lifelines for both people and utilities to cross rivers and access hill areas respectively. Such was the scale of the impact, a number of structures across the city and region are still vulnerable to damage in future earthquakes and could be damaged such that they are no longer useable. Going forward there will need to be a focus on ensuring that structures are appropriately resilient.
	Tsunami	Christchurch's coastal community is susceptible to tsunami impact, however, the primary role of the transport network in this instance is to provide evacuation routes.

	Flooding	Parts of the Transport network are susceptible to flooding, particularly around the Avon and Heathcote Rivers.

Table 5-1: Potential Impacts of Resilience Disruptors

5.2.2 What transport actions are needed to reach zero net emissions?

Advocate for change:

- Increase carbon price and fully reflect this in fossil fuel costs (transparent market signals).
- Minimum emissions standards for all imported vehicles.
- Differential pricing for more polluting vehicles (rebate scheme to lower cost of more efficient and zero emission vehicles).
- Regional fuel tax to cross subsidise public transport, walking and cycling.
- Lower the age of fleet – vehicle retirement / recycling programme (promoting safer cars will do this).
- Waka Kotahi to prioritise public and active transport investments.
- Incentives for zero emission vehicles and charging infrastructure.
- Nationwide behaviour change programme.
- Sustainable bio-fuel content in fuels (made from agricultural by-products and bio-wastes).

Reduce the need for travel

- Design neighbourhoods with local services and amenities ('15-minute neighbourhoods').
- Design neighbourhoods and activity centres to promote public transport, walking and cycling.
- Focus new development within existing neighbourhoods, near amenities, around key activity centres and public transport routes.
- Encourage homes to have no car parking, for central city and activity centres.
- Digital connectivity - enable and encourage working from home and remote attendance of meetings / conferences, with improving quality of internet connections and online services etc.
- Encourage local / regional activities and holidays (limit long-haul flights).
- Measure to manage your personal, household, organisation travel including apps to help people understand their footprint.
- Tax incentives for company cars applied to cycles and bus travel (incentivise business).

Change the way we travel

Change behaviours:

- Travel demand management plans in all schools, large businesses and for all major events.
- Role model and showcase needed behaviours e.g. normalise public transport (away from 'loser cruiser', option of last resort) and normalise one car and no car households.
- Encourage climate smart driver behaviours – slow and smooth travel.
- Fly less – especially long-haul flights.
- Mobility as a service – seamless access to all modes and information.

Vehicle efficiency:

- Properly maintain vehicles and tyre pressure – eg prompts needed at petrol stations.
- Fleet management – green fleet approaches.
- Choose more efficient and safe vehicles (right choice app).
- Encourage dual occupancy and multiple tasks with each trip.

Zero emission transport:

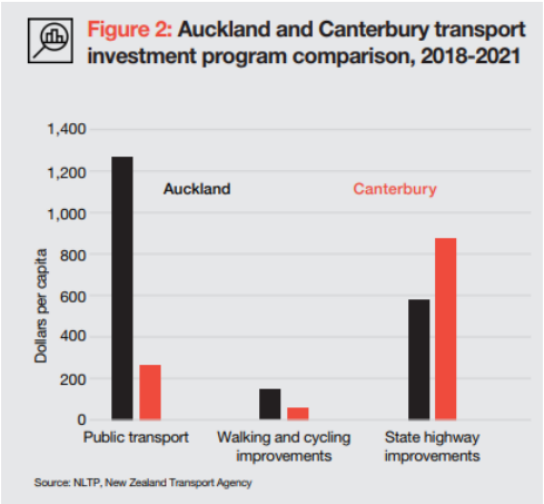
- Encourage cycle commuting – eg Bikewise Challenge, Biketober etc.
- Encourage uptake of zero emission vehicles – eg Take Charge Christchurch.
- Wide deployment of vehicle charging infrastructure.

Low carbon transport system:

- Measure to manage - understand whole-of-life GHG emissions (e.g. REGGE, plus other tools).
- Include cost of carbon within business case and decision making (e.g. ISCA or Green Roads).
- Encourage low carbon lifecycle - smart design, sustainable procurement, efficient construction and maintenance, recycling etc.
- Full deployment of LED street lighting.
- Moratorium on motorways (no new motorways unless they improve public transport and active travel).
- Actually prioritise walking, cycling and public transport – service and network enhancements.
- Free public transport - create a step change uptake of service (covered by regional fuel tax).
- Discourage vehicle use – parking charges, parking spaces, road layout, speed, road charges.
- Adopt 'Streets for People' criteria / principles in the design and function of the network.
- Design standards require low carbon products, designs, construction and operations.
- Ability to innovate and adopt continual improvement.
- Extensive roadside tree planting.

What actions would make it worse?

- Build more motorways and wider roads to speed up traffic and allow more distant living and travel.
- Encourage housing in remote locations and daily commuting to Christchurch.
- Design new neighbourhoods with no local shops or services.
- Design all homes and development around vehicle parking.
- Offer free parking everywhere (central Christchurch parking cost estimate $185m per annum).
- Build more car parking – on-street, parking buildings and retail parking spaces.
- Encourage many short vehicle trips like school drop-offs and work commuting (already 70% of trips are less than 2km and 60% are less than 5km).



Source: PwC Spotlight on Christchurch

- Make it dangerous to walk and cycle around the city (Christchurch 4th highest accidents in New Zealand, 120 people per year, 40% cyclists yet only 4% of trips).
- Ignore emissions and climate change in decision making.
- Build shopping centres in remote locations with poor bus, walking and cycling options.
- Increase the cost of public transport (Christchurch lowest level of public funding in New Zealand).
- Limit public transport routes and times (Christchurch underinvestment in public transport).
- Reduce fuel costs.
- Allow cheap and polluting imported cars (reject rebate schemes, no emissions testing or standards).
- Make SUVs our most popular cars.
- Increase household expenditure on travel (increased 57% over the last decade).
- Normalise vehicle ownership (New Zealand third highest car ownership per capita in world).
- Don't let people know the true cost or impact of private vehicles or climate change.
- Teach youth how to drive, but not how to cycle safely.
- Hold major events without travel planning.

5.2.3 Resilient Projects or Activities in this Plan

The following projects and programmes to build the resilience of our assets are already underway and/or are included in Council's AMP programme. These projects will position Christchurch to be better prepared for, and more resilient to, the disruptions identified in the Resilient Greater Christchurch Plan as most likely to impact community wellbeing.

Table 5-2: An Accessible City

Project Description	The Recovery Plan supports the re-establishment of central Christchurch's function as the primary activity centre for greater Christchurch following the earthquakes. Ensuring central Christchurch has reliable, safe, effective and efficient connections to the rest of Christchurch and Canterbury is vital for the recovery of the central city and of the wider region. It also responds to shocks and stressors including population health, demographic change and post-earthquake recovery.
Scope and Expected Impact	The Canterbury Earthquake Recovery Act (CER Act) required Council to develop a draft Recovery Plan (Central City Plan) for the CBD which was presented to the Minister for Canterbury Earthquake Recovery within nine months of the legislation being enacted. The Share an Idea initiative generated 106,000 ideas from the community for the redevelopment of the Central City following the earthquakes. These ideas are reflected in the draft Central City Plan. The final draft Central City Plan documents developed by the Council informed and shaped the Central City Development Unit (CCDU) Christchurch Central Recovery Plan.
The Case for Change	Christchurch Central City Recovery Plan https://www.ccc.govt.nz/the-council/plans-strategies-policies-and-bylaws/plans/central-city-recovery-plan/
The Resilience Dividend	The central city transport system will provide a range of travel options that are flexible and resilient, able to accommodate projected population growth as well as supporting growth in travel by public transport, walking and cycling.
Further Opportunities	Opportunities to future proof the system through using new and smart technologies will be explored.

Table 5-3: LED Street Lighting Upgrade

Project Description	Council are responsible for the management/operation of 39,500 Council-owned street lights as part of the Christchurch street lighting network. Of these, 38,000 lights are associated with the road network. Council has almost completed the process of converting the remaining Waka Kotahi subsidised non-LED lights (approximately 28,000) to LED lights.
Scope and Expected Impact	The principles used in delivery of the LED conversion is to minimise whole-of-life cost (including network connection costs) while achieving appropriate lighting levels and minimising impact on the environment and adjacent residents.
The Case for Change	The conversion of the existing street lighting network to LEDs provides an opportunity to make a significant reduction in energy consumption and CO_2 emissions as well as the financial benefits due to reduced energy consumption and maintenance. This has significant economic, social and environmental consequences. As an example, street lighting is the second largest business activity in the Council in terms of energy use. The LED conversion project is strongly aligned to Council policy documents, schemes and plans.
The Resilience Dividend	The project will deliver the following benefits annually? - 71% energy saving and 1,489 tonnes of CO_2 saved.
Further Opportunities	A new maintenance contract has been let which started on 1 November 2018. This contract includes a planned maintenance programme where lights are cleaned and lamps replaced when they reach the end of their life. It also includes the delivery of the accelerated conversion to LED and renewals. This allows the maintenance and installation to be coordinated to maximise efficient use of resources.

Table 53: Trial the use of emulsion stabilised basecourse

Project Description	When groundwater rises or floodwaters inundate a road, not only can the surface seal be damaged but also the supporting pavement layers (termed formation) can rapidly lose strength. Conventional strengthening of basecourse material is often achieved through the mixing of lime or cement into the basecourse material before compaction. A problem occurs if the water table rises or floodwaters surround the road formation. When the water recedes the lime or cement is often 'leached' from the formation meaning that the supporting material which remains is damaged with the fine particles removed, possessing little or no strength. In this situation the entire road formation needs to be rebuilt at significant expense and often with extended disruption to road users. Our contractors have experience in the use of emulsion stabilised basecourse having already used it in Australia and specific locations in New Zealand. They have provided us with details of the outcome of this work and based on that information, it appears that good results could be achieved for a relatively small additional construction cost.
Scope and Expected Impact	In recent floods in Queensland Australia, there was significant damage to road surfacing and formation, even when the basecouse had been stabilised with lime and/or cement. However, it was noted that sections of pavement that had been stabilised with emulsion (a bituminous product) had effectively repelled the floodwaters with the aggregate still bound and intact and with the formation strength substantially remaining. The distinct advantage of emulsion is that the bitumen drops are incredibly small so that all of the aggregate, including even the very fine particles, are fully coated in bitumen and so tightly bound together in a matrix structure.
The Case for Change	We can see the possibilities for the use of emulsion stabilised basecourse in selected locations across the city and so we are planning to carry-out trials of short lengths of roads which require reconstruction in a number of specific locations such as • roads in flood-prone areas; such as Cumnor Terrace, Riverlaw Terrace, Aynsley Terrace and • roads which are being increasingly threatened by high tides; such as in Charteris Bay and Teddington.
The Resilience Dividend	With the increasing frequency of flood events and rising sea level, we can proactively provide greater resilience to threatened pavements, thus potentially avoiding the cost and disruption of seal and/or pavement failures. If successful, this will avoid the need for the entire road formation needs to be rebuilt at significant expense and usually often with associated extended disruption to road users.
Further Opportunities	Our current maintenance contractors have already carried-out the production of emulsion stabilised basecourse and it's use in construction of pavements in New Zealand. They therefore have the capability to partner Council in a series of trials

5.2.4 Building the case for Resilience Investment - 2021 LTP and beyond

Often, we will need to do further work to build a case for future investment in resilience e.g. information/data, policy directions, guidelines, modelling, etc. These opportunities are the basis for a potential investigatory programme of work to inform the 2024 and 2027 LTP's and are summarised in the Table below.

Disruptor	Opportunities	Timeframe	Resources
Effects of Climate Change	As discussed in Section 5.2.1 approximately 110km of the road network is at risk of inundation for a 1.0m sea level rise scenario. To take this into account all assets that have useful lives greater than 20 years will have their intervention processes amended to incorporate specific site analysis e.g. for a bridge renewal the levels will need to be checked and future proofed. This is explored in further detail in Sections 7 and 8.	This will require further planning and will be incorporated into the 2024 LTP.	Opex for planning works, and Capex for design and construction
Major seismic event e.g. the Alpine Fault 8 rupture scenario	Christchurch can prepare for this by putting in place a targeted strengthening programme for key bridges and retaining walls. This will add value by extending the life the structures and ensuring that they are more capable of handling earthquakes up to magnitude 8.	This work is being prepared as part of the 2024 Asset Management Plan. It will effectively be an option for acceleration of works.	Opex for planning works, and Capex for design and construction
Continuing demographic change	As our population ages their travel choices will change and the services which Council offers will need to adapt.	2024	Opex
Societal habit change due to technology such as smart phones and the availability of information	Embracing this technology will help to reduce our operations costs around asset maintenance. However, the way in which these technologies evolve and how individuals use and adopt them is extremely unpredictable – and so our planning needs to be agile to continued change, rather than based upon the step-wise extension of current practices for example.	2027	Opex and Capex
Micro-mobility as a service-type offering such as rental e-scooters	Emerging international evidence that micro-mobility and personalised journey planning can make positive contributions to reducing SVO – and enhancing non-motorised travel in city centres.	2024	Opex
Electric & Autonomous vehicles	As technology shifts there will be a need to move to centralised control of general traffic, public transport and parking systems.	2030	Opex and Capex

Table 5-4: Opportunities to Improve Resilience

5.3 Managing Risks

Council's approach to managing risk is detailed in its Risk Management Policy (including a risk assessment framework), which is summarised in Section 4.3 of the SAMP as a background to the content of this Section.

5.3.1 Strategic Risks

Business unit leads have the responsibility for identifying, recording and monitoring business risks using Promapp that are rated as high or very high. The reporting within Promapp ensures that there is visibility of the risks Council is managing. The Council risk framework sets out the levels at which residual risks are escalated, reported and governed.

The strategic risks identified in Promapp in relation to the Transport activity include:

ID#	Description of Risk	Residual Risk Rating
R00558	Major infrastructure fails and causes network failure of core services.	Very High
R00222	Serious injury or fatality on the transport network.	Very High
Ref no?	Post COVID-19 Council's revenue is uncertain, and this has implications for Transport services and projects. At the time of writing this document staff don't yet understand the full impacts of this. Hence it has been added as a Very High risk rating.	Very High
Ref no?	Staff, Contractors and others working with the Council do not comply with the Health and Safety at Work Act to adequately (so far as reasonably practicable) protect their health and safety including wellbeing.	High
R00550	Project cost over-runs, non-delivery of capital projects and network inconsistency as a result of engagement with the Kiwi Rail network and organisation.	High
Ref no?	Operational budgets will be overspent with an impact on rates.	High
Ref no?	Council fails to deliver specific high profile capital projects within an acceptable margin of agreed/approved time, budget and scope.	High
R00272	Transport Programme is not delivered to the expected timeframes, quality and cost.	High
R00599	Project decisions are/or will be made with incomplete and insufficient asset condition information.	Medium
R00567	Council activities fail to comply with District Plan and/or conditions of approvals, licenses and consents (from regulatory bodies).	Medium
R00391	Third party funding for transport is not realised.	Low

Table 5-5: Business Risks included in Promapp

The full detail of these strategic risks can be found in Promapp, along with further explanation of the cause, consequence, treatments and signoffs. Here is the link to the register in Promapp https://go.promapp.com/ccc/Risk/Register#

5.3.2 Activity specific risks

ID #	Risk Area	Risk Description – cause and result	Inherent rating	Treatments in place	Residual rating
	Planning	Problems / issues / defects are not identified via Council processes e.g. routine condition inspections. Therefore they are responded to reactively at a later date.	High	Audits	Low
		Budget or time constraints do not allow for most appropriate intervention.	High	Prioritisation policy and process	Low
		Procurement process not understood	Medium	Specific support provided by Council Procurement Team	Low
	Management	Breach of consent	Medium	Active monitoring	Low
		Data management deficiency	Medium	Audits	Low
		Resourcing	Medium	Monthly management meeting	Low
		Decision making	Medium	Monthly management meeting	Low
	Delivery	Each project has a specific risk register. These are stored in TRIM and High and Very High risks are raised with the Transport Management Team.	Medium	Active monitoring	Low
		Works not delivered on time	Medium	Monthly monitoring	Low
		Project not completed within budget	Medium	Monthly monitoring	Low
		Contractual dispute	Medium	Escalation processes	Low
	Physical	Member(s) of the public are harmed due to failure of the transport network e.g. a bridge collapses due to insufficient live load capacity, traffic signals fail.	Medium	Planning work incorporates condition and risk	Low
		Crash occurs	Medium	Safety programme	Low
		Sabotage or terrorism	Low	Security measures as appropriate	Low
		Natural hazards – earthquake, storm, flooding, tsunami, sea level rise etc.	High	Operational response	Low

Table 5-6: Activity specific risks and treatments

5.3.3 Risk Mitigation Strategies

Risk management is inherent in all of Council's Asset Management processes. Significant risk management strategies for this activity include:

- **Management escalation and review**

The Transport unit holds a monthly management meeting to review progress on operational activities, and intervene where required. In support of this a Transport Steering Group (TSG) has been set-up to provide governance on capital projects and they meet fortnightly.

- **Asset Design and Delivery**

For Council delivered projects, all elements are designed and delivered in accordance with Council's Infrastructure Design Standards (IDS) and Construction Standard Specification (CSS). These two suites of documents set in place the expectations of fit for purpose design and construction practices. For example, these include elements such as pavement design life, bridge importance level, and Crime Prevention through Environmental Design (CPTED) requirements.

During construction, quality assurance processes are in place to confirm that the works are built in accordance with expectations and are fit for purpose.

Furthermore assets designed and constructed by other parties that are intended to be vested to Council (e.g. subdivisions) are also required to comply with Council standards.

- **Business cases**

Programmes and projects are well planned and supported through robust business cases. This will allow clarity of decision making.

- **Asset acceptance processes**

Council has processes that cover the handover of assets from third party construction including TSG sign-off of as-built and safety audit data.

- **Insurance**

Funding for transport activities is sourced from rates, developer contributions (for growth projects), borrowing and (for qualifying expenditure) financial assistance from the National Land Transport Fund (NLTF) managed by Waka Kotahi. On this basis only the major bridges are insured.

- **Business Continuity Plan**

Business Continuity Plan (BCP) documents cover the roles, responsibilities, and procedures developed to enable the City to keep operating should key risks to the City's transport network eventuate. The BCPs are designed to enable the transport system to recover quickly after a disaster or a major incident, and enable the restoration of essential services to ratepayers in the City as quickly as possible.

6 How we Deliver our Services

6.1 Historical Context

A fundamental role of local authorities is to supply core services that meet the needs of their communities. The specific services that are provided, and how they are provided, depend on the Level of Service required by the community.

Transportation services enable people to move beyond their property boundaries to access essential services and to interact with other people, as well as for the distribution of freight, goods and services. It is therefore generally regarded as one of the most essential services, and Council's role is to manage transport assets to provide safe, easy and comfortable use of the network. The road network corridor also provides access internally and enables utility companies to carry-out their power, telecommunications, water supply and waste disposal activities.

The rationale for Council ownership of roads includes statutory requirements to engage in roading activities contained in the Local Government Act 1974, the Resource Management Act 1991, the Local Government Act 2002, and the Land Transport Management Act 2003 and subsequent amendments.

The Christchurch City Council was established in 1862. Road boards, borough councils, county councils and district councils existed in the Greater Christchurch area since this time. Many of these entities amalgamated with the City in 1903 and others in 1989. Banks Peninsula District Council was the last Council to be amalgamated becoming part of Christchurch City in 2006.

The Council Archive holds records created by a number of these superseded entities.

https://www.ccc.govt.nz/the-council/how-the-council-works/council-history/council-archives

As mentioned above, the Banks Peninsula District Council and Christchurch City Council merged in 2006 to become one council. For services apart from those delivered from service centres, the Council agreed to the Levels of Service being ring-fenced for five years from the date of amalgamation. In the interests of consistency and efficiency, the Council's intention was to align services with those it provides for city residents over time. The Council appreciated that situations would arise where exact mirroring of existing city services may be impractical or inefficient and in such cases the intention was to work with Banks Peninsula communities to develop mutually acceptable and practical outcomes.

6.2 Business Structure

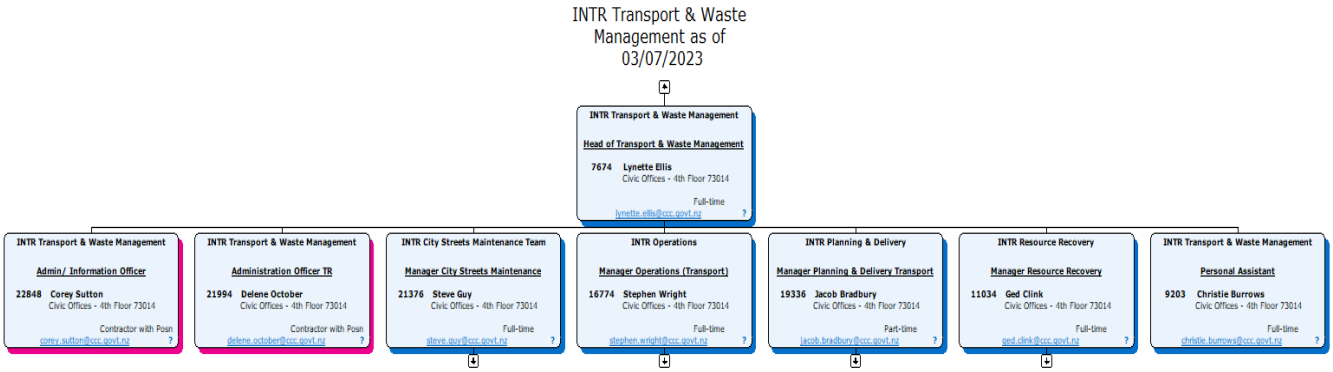


Figure 6-1: Transport Unit business structure

- **Funding**

Funding for transport activities comes primarily from three distinct sources:

- Council rates;
- NLTF administered by Waka Kotahi; and
- Development Contributions.

Environment Canterbury (ECan) is funded through its own rating framework and the NLTF. In addition, parking revenue is provided through user fees and there are a number of minor revenue streams; for example advertising, commercial rent and fees for work such as trench openings.

- **Governance**

Governance of all transport activities currently resides with Council through its management structure. This is split into Strategic Planning that is the responsibility of the Strategy and Transformation Group and planning, operations, maintenance, project delivery and funding that are the responsibility of the City Services Group through the Transport Unit.

The only exceptions to this governance framework are:

- provision of Passenger Transport services that is the responsibility of ECan and co-ordinated through the Greater Christchurch Public Transport Joint Committee of which Council is a member.

- **Operations and Service delivery**

Operations and Service Delivery are a combination of in-house units and tendered contracts with private organisations:

- organisational management, asset management, asset planning, traffic planning and management, public space management, education and communications activities are all delivered internally;
- street space enforcement activities are delivered internally; and
- maintenance and construction activities are all delivered by contract with external private organisations.

6.3 Key Service Delivery Partners

Waka Kotahi NZ Transport Agency

As the agency for government funding of transport Waka Kotahi manage and distribute the NLTF in accordance with the GPS on a three-yearly cycle. Note that the National Land Transport Act outlines obligations for using National Land Transport funds

Further to this, Waka Kotahi is the road controlling authority responsible for the State Highway network and they manage the development of standards to be used by the transport industry in the delivery of transport services and management of roading networks.

The Waka Kotahi Planning and Investment Knowledge Base is a web-based manual providing a framework along with relevant policies and procedures.

Environment Canterbury

ECan is responsible for co-ordination of transport planning at a regional level and management of the RLTP. They are also responsible for delivery and operation of bus services; excluding the supporting infrastructure such as bus stops, bus lanes etc which are a Council responsibility. ECan are funded from the NLTF and Regional rates.

Road Efficiency Group

The Road Efficiency Group (REG) is a collaborative initiative between Waka Kotahi, Local Government New Zealand (LGNZ) and the Road Controlling Authorities (RCAs) of New Zealand. It was formed in 2012 as the entity to implement the recommendations of the broader Road Maintenance Task Force.

The REG partnership is focused on delivering change that will transform the transport sector as the New Zealand transport network transitions from private-vehicle/freight centric to a modern integrated system that includes all modes and available technologies and aligns the objectives of local, regional and central government.

More recently REG has been responsible for the development and implementation of the ONRC system. ONRC specifies performance metrics and Levels of Service for each road classification to be utilised and managed by roading authorities across the country to bring national consistency.

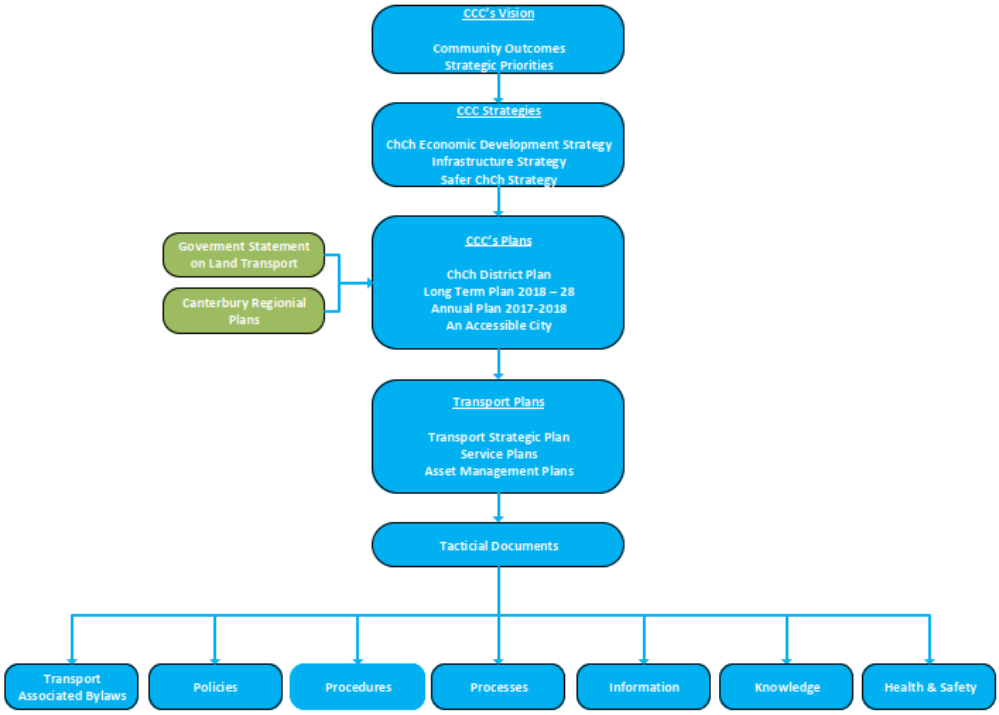
Council are an active participant in the REG Excellence Programme which is an initiative focused on providing local authorities with a pathway towards excellence in transport asset management, identifying and prioritising opportunities for improvement and benchmarking performance against peer organisations. Included in this Programme are periodic structured reviews of each local authority's AMP and a structured scoring of achievement. In the most recent Review in June 2022, Council was assessed as having made good progress and is now achieving a level significantly above both the national and regional average, ranked in the top performing nine local authorities in New Zealand.

Public Transport Joint Committee

The Greater Christchurch Public Transport Joint Committee was set up in 2016 to support increased collaboration and integrated decision making between Council, ECan, Selwyn District Council and Waimakariri District Council. It aims to provide clear and decisive leadership with respect to the provision of public transport services and infrastructure in Greater Christchurch.

6.4 Business Strategies

The Transport Unit has a number of strategies that guide the work undertaken by staff. Further to these strategies there are a number of key tactics documents, which outline how these strategies will be implemented and managed. Below is a diagram outlining the relationship between these documents.



Included below is a summary of the most significant documents within this framework.

Policy	Advertising on Bus shelters policy (2000) Bus Stop Location (1999) Bus Passenger Shelters and Seats (1993) Footpath Battens Policy Footpath Berms Policy Footpath extensions to expand cafes onto the roadway Policy Heavy Vehicle Parking in a Residential Area (2008) Intersection Design for Persons with Disabilities	Kerb Parking Limit Lines (2010) Living Streets Charter Policy Maintenance of private Rights of Way Policy (2002) Pedestrian accessways closure Policy Procurement Policy Public streets enclosures Policy and Fees charges	Road Stopping Policy Street Lighting Policy Structure on roads Policy Surburban Car Parking Policy (DRAFT) Traffic management and road level classifications Policy Tree Planting in Streets Policy Vehicle entrances and footpaths Policy
Strategy	Christchurch Economic Development	Infrastructure Strategy	Safer Christchurch Strategy 2016-2021 Sustainable Energy Strategy 2008-2018 Transport Strategic Plan 2012-2042
Plans	Service Plan for Active Travel Service Plan for Parking Service Plan for Public Transport Infrastructure Service Plan for Traffic Safety and Efficiency Service Plan Roads and Footpaths	Christchurch City Council Christchurch Central Parking Plan (2015) Christchurch City Road Safety Action Plan 2017/18 (Plan) 2018 Transport Asset Management Plan Regional Land Transport Plan (DRAFT)	Retaining Wall Repair and Replacement Programme (Plan) Footpath Resurfacing Programme 2017/18 (Plan) LED Replacement Programme (Plan) Travel Demand Management & Road Safety Education Team Plan FY19

Figure 6-2: Transport Unit business framework and strategies

6.5 Business Reviews Undertaken

A service delivery review was undertaken in August 2017, to fulfil the requirements of Section 17A of the Local Government Act 2002.

The detailed analysis has concluded that the status quo remains the most effective way forward at this stage. Although the performance analysis outlines areas for improvement, changes in governance, funding or service delivery were seen as not being the best way forward. There are a number of key reasons which impact any potential scale savings through joining with other local authorities, including Waka Kotahi restrictions and the large scale / urban fabric within which we operate.

Recommended Option from Section 17A Review

Activity	Governance	Funding	Service Delivery
Management	CCC	CCC	CCC
Deliver subsidised roading	CCC	CCC	Other (Tendered contract)
Deliver non-subsidised roading	CCC	CCC	Other (Tendered contract)
Operations - Safety	CCC	CCC	CCC
Operations – Active Travel	CCC	CCC	CCC
Operations - Parking	CCC	CCC	CCC

Table 6-1: Transport Unit business review

6.6 Significant changes planned for the activity

There are no major changes planned at this stage

7 Portfolio Lifecycle Management Plan

The lifecycle management plans detail how the Council plans to manage the network of assets at the agreed Levels of Service (defined in Section 3) while optimising lifecycle costs.

Section 7 provides the lifecycle management information and strategies at a portfolio level. Section 8 provides this information at an asset class level.

7.1 Asset Lifecycle Approach

Council has established a lifecycle management framework, aligned to the International Infrastructure Management Manual (IIMM) as illustrated in Figure 7-1. Section 7 and 8 are structured to align to the lifecycle stages.

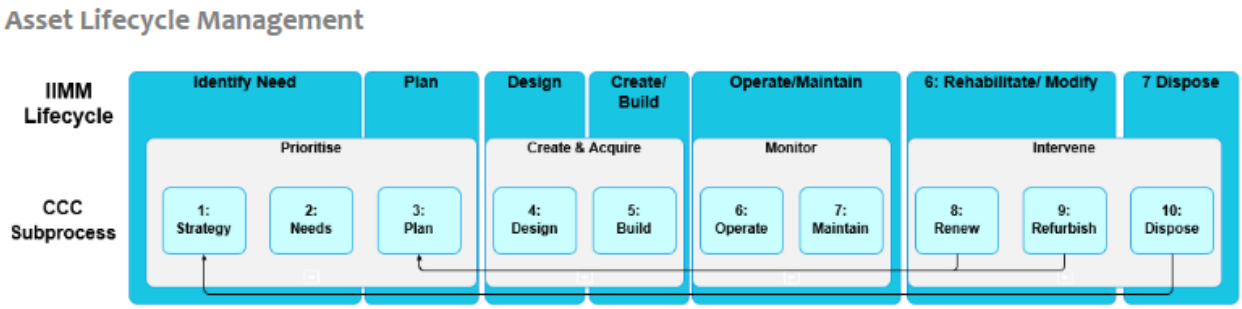
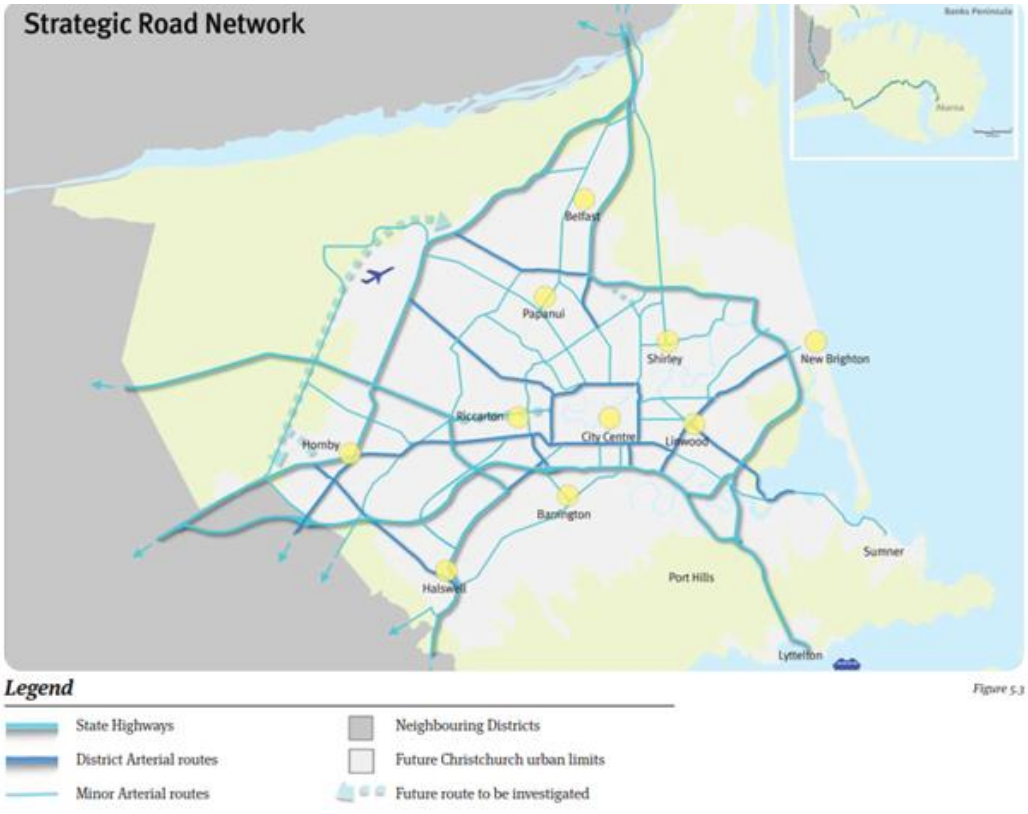


Figure 7-1: Asset Lifecycle Categories

7.2 Our Asset Portfolio

7.2.1 Location and Value

Council owns, plans and manages the more than 2,500 km local roading network that supports all transport activities. The assets covered by this AMP are outlined in the following table along with quantity and value



Asset Category	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Carriageways	2,178.8 km sealed 323.7 km unsealed	$1,949,440,700	$1,137,167,122	$24,789,938
Road Drainage	3,593 km kerb & channel 34,195 sumps & associated pipes	$779,938,985	$409,715,191	$8,944,987
Footpaths	2,581.7km	$559,346,581	$279,856,932	$12,030,333
Bridges & Structures	353 roads bridges & 116 footbridges 103 culverts,1 ford & 2 underpasses 1,611 retaining walls Guardrails, railings and gantries	$646,098,086	$238,840,328	$10,675,279
Road Lighting	38,145 lights & 20,327 poles	$125,171,204	$79,645,515	$3,796,076
Traffic Systems	348 signalised intersections 247 CCTV sites & X school speed zone sites	$57,664,831	$28,621,741	$2,478,263
Traffic Services	55,979 signs & city-wide marking	$23,838,391	$8,602,576	$1,211,373
Road Landscaping	65,720 trees Berms and 9,592 landscaped sites	$410,373,102	$238,726,584	$5,099,786
Cycleways	225 km of on-road lanes 115 km of shared paths			
Bus	519 bus shelters, signs and furniture.	$2,849,765	$729,273	$99,825
Tram	4km of tram line	$36,826,953	$29,526,387	$551,475
Parking	1,200 on-street metered spaces 437 parking meters	$11,060,673	$2,889,890	$792,745
Other Street Furniture	Includes bollards, furniture, wheel stops & gas lamps	$273,849	$27,472	$10,260
Total		**$4,603,803,750**	**$2,454,442,622**	**$70,524,932**

Table 7-1: Transport Network Asset Portfolio (values as at 30 June 2022, from 2022 Valuation Report)

7.2.2 Critical Assets

Critical assets are those whose failure would likely result in a significant disruption in service and financial, environmental and/or social cost, and therefore warrant a higher level of asset management. The criteria used for assessing criticality for transport assets are as follows.

Risk evaluates events without focusing on the specific systems leading to the event. Analysing risk is important in order to prepare for, mitigate, or reduce the likelihood or impacts of events on a broader scale. Risk deals with both the probability of a failure (Likelihood) and the severity of its effects (Consequences). Criticality evaluates failure of a specific item within a larger system. It is a measure of how important an asset is to your Level of Service. It is rated against a number of weight categories in order to establish a criticality score. The more critical the asset, the more of an impact it will have if it fails. Establishing criticality allows attention and resources to be proactively allocated to the reliability and fault detection of critical systems or components. A critical asset may not be high risk if it's not likely to fail, and an asset that's highly likely to fail may not necessarily be critical.

- **Score of 5 - Critical**

A vital asset or route whose failure would have significant economic, and social impact or complete degradation of Levels of Service. This could be to the city as a whole or to a significant lifeline route with no alternative, ensuring access or continuity of supply of essential services throughout the city during an unforeseen event.

- **Score of 4 - Essential**

A major asset or route whose failure would have a serious economic or social impact or complete degradation of Levels of Service to more than one ward, or is an alternative access path to significant lifeline facilities, ensuring access or continuity of supply of essential services to more than one ward during an unforeseen event.

- **Score of 3 - Important**

An important asset or route whose failure would have a major economic or social impact or serious degradation of Levels of Service to a ward, with degraded access or continuity of supply of essential services during an unforeseen event.

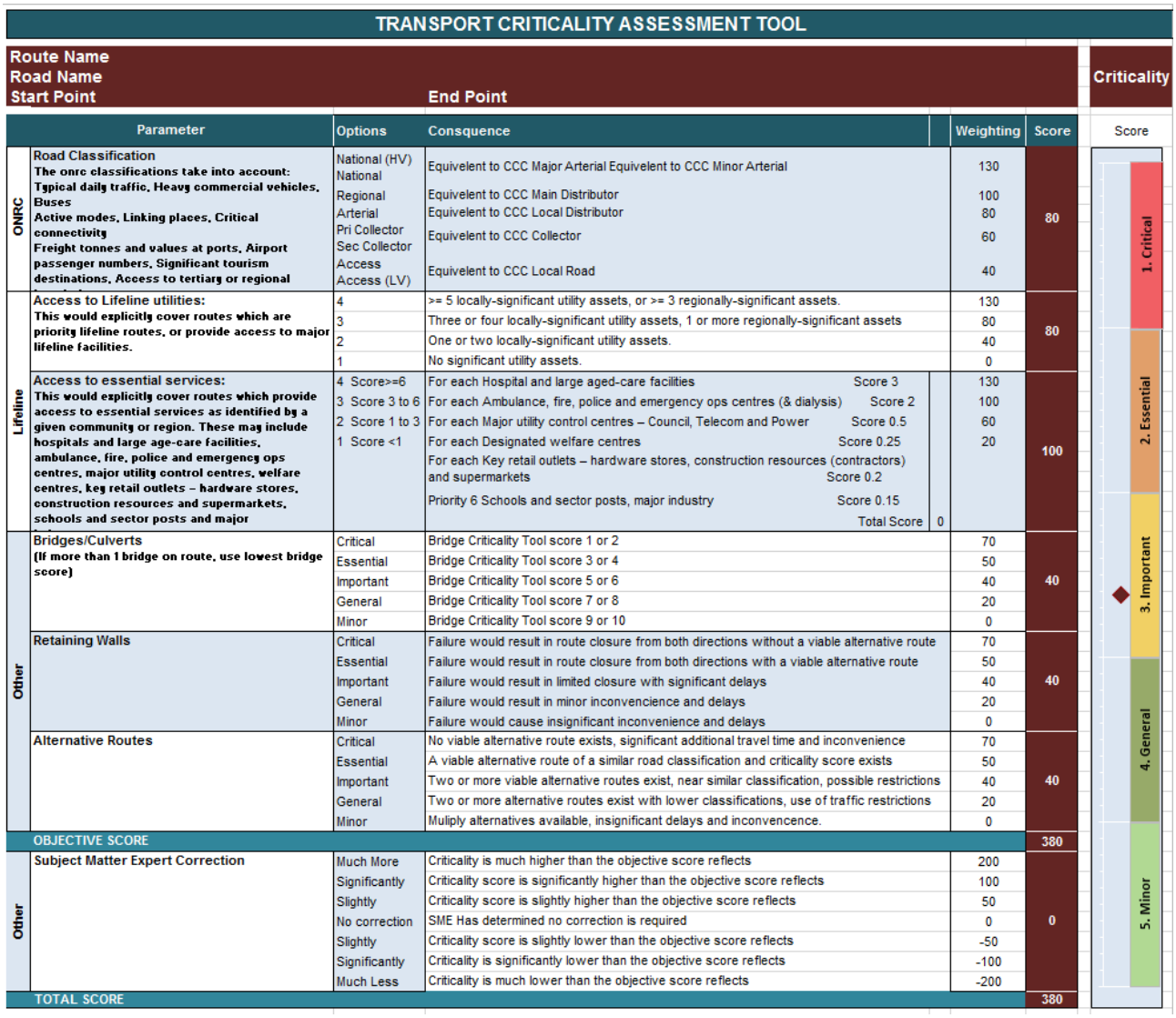
- **Score of 2 - General**

An asset or route whose failure would have some local economic or social impact, and some degradation of Levels of Service to a limited area, with no locally important lifeline facilities, and sufficient alternative routes to ensure access or continuity of supply of essential services during an unforeseen event.

- **Score of 1 - Minor**

An asset or route whose failure would have virtually no impact on local economic or social activity, and only minor degradation of Levels of Service if any, restricted to a single street or two. With no need for alternative routes to ensure access or continuity of supply of essential services during an unforeseen event.

Definitions mainly based on those in the Waka Kotahi Criticality Review 20160923 RevB.



TRANSPORT CRITICALITY ASSESSMENT TOOL

Route Name
Road Name
Start Point — End Point

Criticality

	Parameter	Options	Consquence	Weighting	Score
ONRC	Road Classification The onrc classifications take into account: Typical daily traffic, Heavy commercial vehicles, Buses Active modes, Linking places, Critical connectivity Freight tonnes and values at ports, Airport passenger numbers, Significant tourism destinations, Access to tertiary or regional	National (HV) National Regional Arterial Pri Collector Sec Collector Access Access (LV)	Equivelent to CCC Major Arterial Equivelent to CCC Minor Arterial Equivelent to CCC Main Distributor Equivelent to CCC Local Distributor Equivelent to CCC Collector Equivelent to CCC Local Road	130 100 80 60 40	80
Lifeline	Access to Lifeline utilities: This would explicitly cover routes which are priority lifeline routes, or provide access to major lifeline facilities.	4 3 2 1	>= 5 locally-significant utility assets, or >= 3 regionally-significant assets. Three or four locally-significant utility assets, 1 or more regionally-significant assets One or two locally-significant utility assets. No significant utility assets.	130 80 40 0	80
Lifeline	Access to essential services: This would explicitly cover routes which provide access to essential services as identified by a given community or region. These may include hospitals and large age-care facilities, ambulance, fire, police and emergency ops centres, major utility control centres, welfare centres, key retail outlets – hardware stores, construction resources and supermarkets, schools and sector posts and major	4 Score>=6 3 Score 3 to 6 2 Score 1 to 3 1 Score <1	For each Hospital and large aged-care facilities Score 3 For each Ambulance, fire, police and emergency ops centres (& dialysis) Score 2 For each Major utility control centres – Council, Telecom and Power Score 0.5 For each Designated welfare centres Score 0.25 For each Key retail outlets – hardware stores, construction resources (contractors) and supermarkets Score 0.2 Priority 6 Schools and sector posts, major industry Score 0.15 Total Score 0	130 100 60 20	100
Other	Bridges/Culverts (If more than 1 bridge on route, use lowest bridge score)	Critical Essential Important General Minor	Bridge Criticality Tool score 1 or 2 Bridge Criticality Tool score 3 or 4 Bridge Criticality Tool score 5 or 6 Bridge Criticality Tool score 7 or 8 Bridge Criticality Tool score 9 or 10	70 50 40 20 0	40
Other	Retaining Walls	Critical Essential Important General Minor	Failure would result in route closure from both directions without a viable alternative route Failure would result in route closure from both directions with a viable alternative route Failure would result in limited closure with significant delays Failure would result in minor inconvencience and delays Failure would cause insignificant inconvenience and delays	70 50 40 20 0	40
Other	Alternative Routes	Critical Essential Important General Minor	No viable alternative route exists, significant additional travel time and inconvenience A viable alternative route of a similar road classification and criticality score exists Two or more viable alternative routes exist, near similar classification, possible restrictions Two or more alternative routes exist with lower classifications, use of traffic restrictions Muliply alternatives available, insignificant delays and inconvencence.	70 50 40 20 0	40
	OBJECTIVE SCORE				380
Other	Subject Matter Expert Correction	Much More Significantly Slightly No correction Slightly Significantly Much Less	Criticality is much higher than the objective score reflects Criticality score is significantly higher than the objective score reflects Criticality score is slightly higher than the objective score reflects SME Has determined no correction is required Criticality score is slightly lower than the objective score reflects Criticality is significantly lower than the objective score reflects Criticality is much lower than the objective score reflects	200 100 50 0 -50 -100 -200	0
	TOTAL SCORE				380

Score

1. Critical
2. Essential
3. Important
4. General
5. Minor

Figure 7-2: Transport Criticality Assessment Tool

7.2.3 Asset Data Confidence

Table 7-3 summarises the asset information available for transport assets both in terms of completeness (% of assets for which that data type is stored) and reliability (using the A-E grading below). Asset data is held in RAMM.

Confidence Grading				
Asset	Quantity	Unit Cost	Age/Life	Overall
Pavement Formation	B	B	B	B
Pavement Basecourse	B	B	B	B
Pavement Sub-base	B	B	B	B
Pavement Surface	A	B	B	B
Berms and Landscaping	B	C	D	C
Bridges and Bridge Culverts	B	B	C	B
Bus Furniture	C	C	B	C
Cameras	D	B	D-E	C
Drainage	C	C	D	C
Footpath	A-B	B	A	A-B
Litter Bins	D	D	E	D
Markings	B	B	D	B-C
Other Street Furniture	D	B	B	C
Other Transport Amenities	B	A	A	A-B
Parking Meters and Other Minor Structures	C	C	D-E	C-D
Railing	C	B	D	C
Retaining Wall	B	B	B	B
SW Channel	B	C	B	B
Sign	C	C	D	C
Street Light	C	C	D	C
Street Trees	B	C	D	C
Tram Assets	B	B	D	C
Traffic Signals	C	B	D	C

Table 7-2: Asset Data Confidence from 2019 Valuation

REG data confidence view

The ONRC was designed to standardise the performance of our roads throughout New Zealand, aiming to address historical inconsistencies, and promote economic growth.

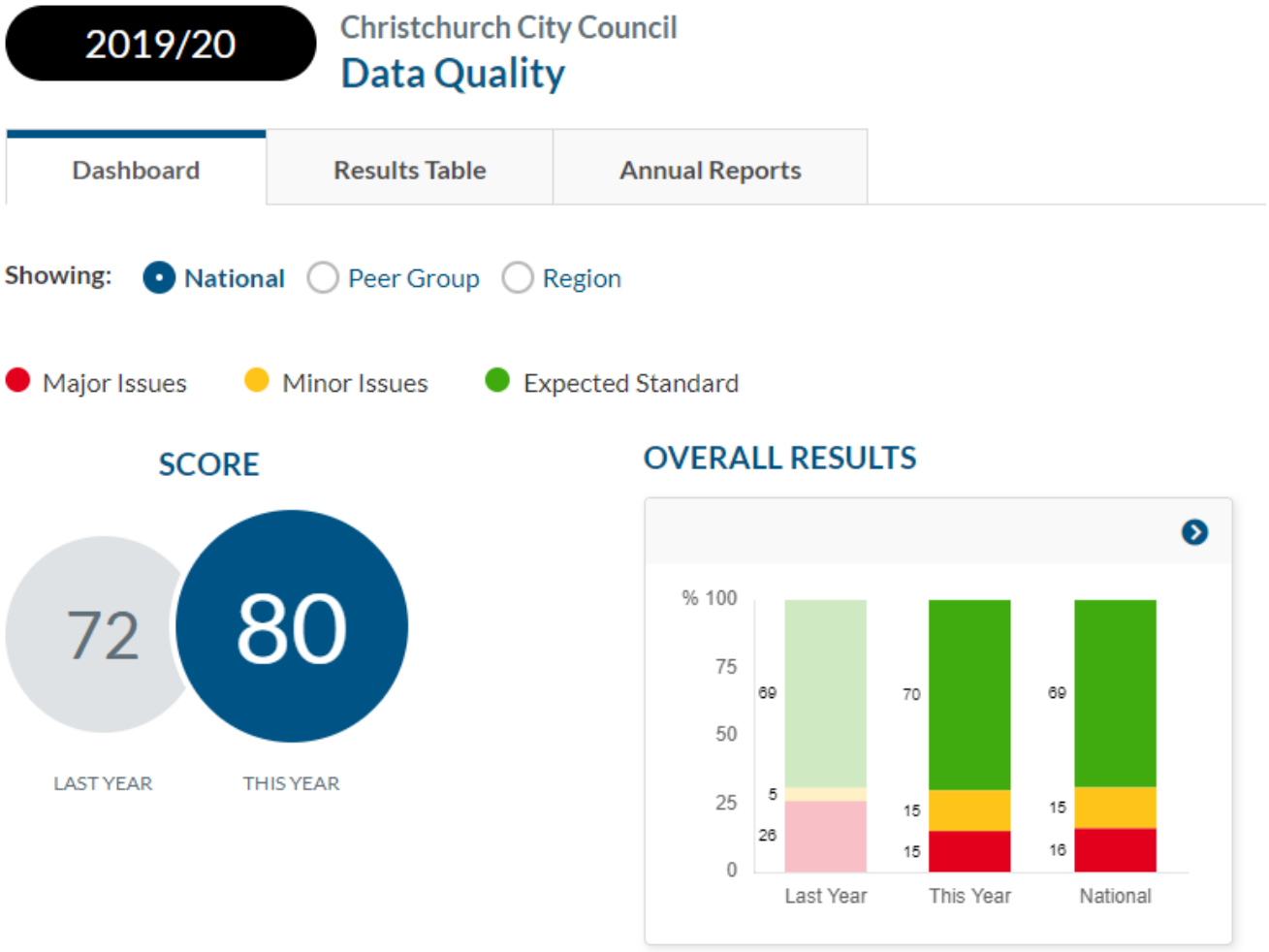
This can only be achieved if all RCAs are monitoring and measuring their roads with the same tools and standards consistently over time.

These performance measures support that consistency. They have been developed by subject experts from the REG – a collaboration between LGNZ and Waka Kotahi (described in more detail in Section 6.3). When used with the ONRC Performance Measures Reporting Tool (ONRC PMRT), they are a significant resource to help asset managers better understand their network and tell their investment story.

Data is imported into the ONRC PMRT from RAMM by RCA administrators. Crash Analysis System must be updated before an import from RAMM. After an import administrators check for data validation messages and fix any issues in RAMM. Asset managers use the performance measures when developing their business cases for the RLTP. Regional Champions and experts from REG are available for support.

Asset managers also use the ONRC Performance Measures General Guide, which provides strategic overview and context. Further guidance in the form of case studies are provided for operational use of the ONRC, specific to the field operations and data management. When using the performance measures, it is important to remember that while there is an element of compliance, they are intended to form the backbone of a thinking process.

The measures complement and interact with each other – enabling the development of an investment story by considering the data across the network and in the national context, rather than focusing on individual performance measures in isolation.



7.3 Asset and Network Planning

7.3.1 Asset planning strategies

- Planning for the transport networks current and future state to 2048 with CTM and CAST transport models and recognising the Greater Christchurch transport area impact as well with Selwyn and Waimakariri District Councils;
- Developing business cases for all modes, general traffic, active modes walking and cycling and public transport under the umbrella of the Case for Change Business Case City Wide priority areas for general traffic safety and journey time reliability;
- Under the Christchurch Transport Strategic Plan and District Plan, planning for future land use growth and population in the city. Investigating and working with developers to service the needs of new neighbourhoods, along with planning for the downstream effects of new roads and major motorways of national significance and the impact effects on communities;
- Providing resource consent advice for new developments both land subdivision and other high trip generation developments, monitoring the network through the network management plan and models;
- Safety and corridor improvements planning within existing road spaces for all modes, to feed into the improvements capital programme for the LTP. Initiating capital projects through briefs based on planning and investigations, and support for schemes development;
- Plans and business cases for public transport infrastructure improvements including bus priority measures;
- Plans and business cases for cycle network routes to feed destination locations across the city. Manage traffic count data and economic appraisal of projects to support business cases for Waka Kotahi funding;
- Providing policy advice for policies and bylaws including road stopping and structures on roads approvals.

Plan, Strategy, Model	Content	Next review
Christchurch Transport Strategic Plan	Strategic direction for all transport modes.	2020
Regional Land Transport Plan		December 2020
An Accessible City	Central city transport plan all modes	
Government Policy Statement on Land Transport	Guides the investment in transport	2020

Table 7-3: Asset Planning Strategies

7.4 Asset Creation (Design and Build) and Acquisition

7.4.1 Identifying and recording capital projects

New works are those works that create a new asset that did not previously exist or works which upgrade or improve an existing asset beyond its existing capacity. Assets may be developed by Council, by other agencies (for example Ōtākaro or Waka Kotahi), or by developers and then handed over to Council on completion of the development. In this AMP, a number of projects have been identified through consideration of:

- Level of Service requirements (Section 3);
- growth and demand requirements (Section 4);
- investment in network resilience (Section 5); and
- other asset planning initiatives described in Section 7.2.

7.4.2 Selection criteria

The asset creation plan covers new carriageway assets, or additional assets created through projects which upgrade or improve an existing road asset beyond its existing capacity or performance in response to changes in transport patterns, safety issues, or customer expectations. This includes additional capacity required as a result of changes to Levels of Service and changes to meet new demand (growth).

The types of projects which result in additional carriageway capacity include:

- road network improvements (designated and intersection widening and new major roads);
- new road construction; and
- bus priority.

Other projects which result in enhancements to the network and provide other benefits to road users, but do not necessarily increase capacity, include:

- safety works;
- neighbourhood improvement works;
- major amenity improvements;
- seal extensions; and
- seal widening.

Developers are also responsible for providing new assets through subdivisions (which do have a partial Council funding component to them).

7.4.3 Asset Design

The design phase is where a lot of value can be added to the project. The aim is to report whole-of life costing (Capex + Opex) for the whole project when considering design options. We use the equivalent value expressed in ‘todays’ dollars’ to report, for the purposes of simplicity.

Council’s IDS governs the standards to which assets are to be designed. The suite of IDS documentation is available on the Council’s external website.

7.4.4 Capital Investment Programme

The asset creation plan includes three main streams of asset procurement:

- Council-funded development of the road network is undertaken using funding streams associated with the project types as listed above. Major projects are often indicated in the City Plan where designations exist for land purchase for road widening and new construction;
- privately-funded new roads are those constructed as a result of sub-divisional development and are vested with Council and added to the network upon satisfactory completion. Enhancements to the existing road network directly connecting to new subdivisions can also occur where additional capacity is required; and
- Waka Kotahi funded works – typically enhancements to the Council controlled road network intersecting with the state highway system which can occur where the Waka Kotahi (State Highway Division) initiates a project to improve the state highway. To illustrate by example, after completion of the Northern Bypass, CNC, Christchurch Southern Motorway Stage 2 (CSM2), existing Waka Kotahi roads that are no longer required for the State Highway network have been handed to Council as local authority roads.

New Project Prioritisation

Capital projects are prioritised using a multi criteria analysis (MCA). The highest ranking is given to projects necessary to provide legislative compliance and to maintain the agreed Level of Service delivered by infrastructural assets. Projects that provide for improved Level of Service or respond to growth are evaluated for their contribution to Council's Community Outcomes and the triple bottom line of economic, social and environmental factors. Applying weightings to the factors results in a ranking score.

The current funding system for road network improvements, safety works, and some neighbourhood improvement works is generally dependent on financial assistance from Waka Kotahi and funding criteria and prioritisation thresholds.

Management of Vested Assets

Developers are required to comply with Council design and construction standards. Both the IDS and CSS are available on the Council external website. These set in place the requirements for design, materials and quality. Furthermore, they outline what As-built information is required by Council for handover.

This is administered by Council's Resource Consent team who represent Council as the asset owner to ensure that a subdivision complies with Council Standards and the resource and building consent processes.

7.5 Operations and Maintenance

Council is responsible for delivering safe, sustainable and integrated traffic operations and systems in line with traffic standards and bylaws, to achieve a safer and optimised transport network. This is achieved through a wide range of projects including those related to minor safety improvements, intersection improvements, parking restrictions, public transport infrastructure, speed management road markings and signage. The teams within the Transport Unit also provide technical advice to other staff and business units, management, elected members and external partners and stakeholders. In addition, the teams respond to customer queries and requests for service for a range of transport-related concerns, and frequently assist in the development and review of policies and bylaws which are directly and indirectly related to the operation of Council's transport network.

Further to the items above there are a number of specialist operational functions that Council is required to manage and deliver. These have generally been divided into the following teams to better manage resources:

Asset Protection – the key legal function is to act as Road Corridor Manager, which is a Council delegation. The duties are outlined below:

- ensure the Council complies with its statutory requirements around the Utilities Access Act 2010 and Local Government Act while working in the Legal Road;
- manage the protection of road assets in relation to road openings, vehicle crossings and other operations affecting the asset;
- manage the recovery of costs from damage to Council assets in legal road e.g. street lights hit by vehicles, road assets damaged by contractors; and
- receive and process notifications of proposed works in the road corridor e.g. Corridor Access Requests (CARs).

Parking and Enforcement - to enforce all parking offences and road safety breaches

Travel Education - develop and deliver road safety education, behaviour change programmes and promotions for road safety, active travel and travel planning, cycle safety education

Real Time Operations – responsible for the day-to-day operation of the Council's signalised intersections

Temporary Traffic Management – responsible for reviewing and approving temporary traffic management plans

7.5.1 Maintenance

Road maintenance is now delivered through four area contracts, (3 awarded in 2017, North, South and Central across the City, and 1 for Banks Peninsula, awarded in 2015).

Operational Performance Measures for the Routine works are in-place, with an at-risk payment mechanism, coupled with bespoke Key Performance Indicators (KPIs) and/or Key Result Areas (KRAs) that link to a Performance Bonus and/or extension of the contract term. These are to encourage the performance expected and the value gained. This assists with benchmarking of contractors and will also continue to assist in gaining a greater understanding of potential focus areas for future contracts.

Council's own contract and field staff focus on proactive management of the network, and prioritising jobs according to the ONRC hierarchy. Customer and asset needs are balanced and addressed on a hierarchy and urgency basis. Make Safe/safety issues are attended to as soon as practicable, as are incidents that affect journey time efficiency.

The area contractors prepare monthly, quarterly and annual programmes of work which are reviewed and approved by the Council's Pavement Engineers. The quality of each service, both lump sum and measure and value are audited/inspected using RAMM tools; including Pocket RAMM, as well as Data Warehouse reports where applicable. Global Positioning System (GPS) tracking of all elements of cyclic work, including inspections, is a contract requirement. Re-work is programmed as are faults which are identified through the inspection of cyclic items. For example a failed pothole in an inspection will trigger the creation of a work request (known as a Dispatch) to repair it. Claims are sampled through the month and auto claims rules ensure maintenance costs flow automatically into the RAMM asset database. Rules which prevent incomplete work, duplicate work and specification/checklist are part of the overall system to ensure work is only paid for when the full service has been delivered.

7.5.2 Road Maintenance Strategy

A comprehensive road maintenance strategy is critical to ensuring that roads remain safe, functional, and cost-effective. The strategy for the maintenance of the Council's road assets involves regular condition inspections, and both planned and unplanned maintenance activities.

Regular Condition Inspections

Council undertakes two planned annual condition surveys on the road network:

- *RAMM condition rating*: it is a visual rating to measure defects on the road surface, cracks (various types) and kerb & channel condition. This survey is done annually for 50% of the entire road network and is subsidised by Waka Kotahi.
- *Road Roughness Survey*: it is a survey done by specific trucks that measure the roughness of road surfaces as a function of the number of recorded vibrations, namely NAASRA. This survey is done annually for 100% of arterial roads and 50% of the rest of the network and is subsidised by Waka Kotahi.

Planned Maintenance

Repairs and renewals are programmed for the identified defects and condition ratings during inspections and annual condition surveys. The main prioritisation criteria considers those defects that have an effect on public safety, accelerated deterioration of the pavement, convenience for road users, traffic volumes, types of traffic and the adjacent land use.

Planned maintenance and renewals are funded via Capex and programmed for every Long Term Plan. Opportunities for programme optimisation and collaboration between different parts of Council (e.g. capital improvement projects or 3 Waters projects) or third party organisations (e.g. utility providers such as Orion or Chorus) are investigated through the programming process. The funding for planned renewals/maintenance is subsidised by Waka Kotahi, subject to approval in the National Land Transport Funding process.

Unplanned/Reactive Maintenance

In addition to the planned annual condition surveys, Council collects road condition information on an ongoing basis via two other sources:

- *The City Street Maintenance Contracts*: the contracts include a cyclic inspection schedule with different inspection frequencies for various road classes. The identified road defects are categorised according to their impact on public safety and convenience and prioritised for attention;
- *Public interactions*: reports of roadway faults are received through Council's Contact Centre, and website ('Snap, Send, Solve' initiative). The work requests (termed tickets) are further investigated by the contract engineers and categorised according to their impact on public safety and convenience and prioritised for fixing.

Repairs are carried out immediately where there is an issue of public safety (i.e. potholes) or where significant problems exist. If the repair is not urgent the fault is added to the defects list for planned maintenance or renewal works.

Unplanned/Reactive Maintenance work is funded mainly through Opex and can fluctuate year-on-year. The funding for the unplanned/reactive maintenance is subsidised by Waka Kotahi subject to approval in the National Land Transport Funding process.

7.6 Renewals

7.6.1 Portfolio Renewal Strategies

Renewal expenditure describes items of major work which do not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing asset to its original or lesser required service potential. Renewals are carried-out to modern equivalent standards. Work over and above restoring an asset to original service potential is defined as upgrade/expansion or new works expenditure.

Renewal expenditure is major work which restores an existing asset to its original capacity and/or condition. Renewals can entail either surfacing renewals alone, or full carriageway renewal including the pavement layers. In the Christchurch context carriageway renewals on local roads may entail a reduction in the carriageway width to allow the opportunity and space for better facilities for users other than motorised vehicles. Conversely, in order to cater for cyclist's needs, many carriageways on major routes may be widened to allow on-road cycle lanes to be included.

The renewal strategy objectives are:

- to allow sustainability of the asset in an efficient and cost-effective manner; and
- to attain nominated levels of improvements including better traffic management, optimisation of carriageway strength and carriageway smoothing.

7.7 Asset Disposal

Disposal includes any activity associated with the disposal of a decommissioned asset including sale, demolition or relocation. Any revenue gained from asset disposals is accommodated in the Council's LTP process.

The Council is not free to dispose of roading assets as it wishes. In most situations road stopping occurs after a land owner has requested that a section of unformed and unmaintained legal road be stopped. When the process is completed the resulting title/s are usually legally amalgamated with the title of the adjoining property.

Disposal Strategy – Uneconomic Roads

Waka Kotahi has made a formal policy determination on provision of financial support for 'uneconomic roading facilities'. This is detailed in its Planning, Programme and Funding Manual. The determination defines an uneconomic roading facility as one where the total cost of the proposed works per Annual Average Daily Traffic (AADT) is greater than or equal to $8,000.

The Council has no expressed intentions or programme to dispose of low traffic volume roads or unformed and unmaintained legal roads (also called 'paper roads') unless requested to do so.

Unformed legal roads are not maintained by the Council for roading purposes. Some of these roads have been classified as limited maintenance roads, and receive only sufficient maintenance to keep them in a basic state given their low use. Others are used as walking tracks or cycle trails and are maintained as Parks assets.

Surplus Land

Land is usually declared surplus when land designated as legal road is not required for roading purposes now or in the future. This usually affects unformed legal roads.

The Council may consider a road's closure and disposal, where requested by an adjacent property owner who wishes to incorporate the road into their adjacent land title.

In some places there are land parcels that were intended to be roads when they were originally surveyed in the early days of European settlement, but were never formally declared to be roads or vested in the Council or the Crown as roads.

In these situations the Council may hold titles to these parcels as ordinary freehold (fee simple) land. Experience has shown that there can be significant problems and public concern with the status of these parcels of land which are often perceived as legal roads. This can affect land use planning and property access on the basis if there is potentially no legal road frontage available, for instance when a new residential subdivision is planned, or it serves a 'point of interest'. It can also complicate disposal procedures. The net effect is that extensive consultation is required; the results of which cannot always be assumed.

Leasing and 'Occupation' of Roads

Roads cannot be leased, however, the space under or above the road area can be – where the road area is defined as being the land from property boundary to property boundary. Although strictly not a disposal, this matter is discussed here because it does not logically fit anywhere else in this AMP. Often unformed legal roads in rural areas will be grazed and managed as part of the adjacent property, and few of these roads are subject to formal arrangements as to this use. Other areas of road reserve land are occupied by private persons or organisations under formal 'licence to occupy' agreements. The Council has a formal policy on licences to occupy roads which is termed 'Policy on Structures on Roads'.

7.8 Mitigation and adaptation to the effects of climate change

As mentioned earlier, tackling climate change is a strategic priority for Council. Further to this, staff are developing a climate change strategy (which is in Draft at the time of writing this section of the Plan).

From a Transport portfolio perspective there are a number of issues, as have been explored in Section 5 Managing Risk and Investing in Resilience.

With regard to the lifecycle of the assets in the Transport portfolio there are a number of activities that Council will need to continue. These are required to meet Levels of Service, and keep the city operating. These include:

- operations;
- maintenance; and
- renewal of shorter life assets.

It is the staff view that assets with short lives (<20 years) will see their renewal processes less influenced by climate change than those with long lives (>20 years). For example: the average pavement surface life is 15 years, so on that basis the longer term impacts of climate change do not significantly influence 1-5 year renewals planning. Streets that are currently failing their Level of Service targets are all considered for inclusion in maintenance and renewal programmes.

Conversely the average life of a bridge is 75-100 years, which is well within the timescale that climate change impacts will have a significant effect. As such the planning of this type of work needs to take into account the physical location and the foreseeable risks that the asset will encounter over its life. If these risks cannot be managed adequately then the future of the project should be reconsidered.

In addition to this there are a number of activities that Council will need to carefully consider including:

- renewal of longer life assets;
- asset creation e.g. building new roads; and
- Carbon impact of projects.

Lastly there are a number of activities that Council should consider having a greater focus including:

- reusing materials; and
- reducing the need to travel e.g. working from home.

Section 8 explores these concepts in more detail on an asset-by-asset basis

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8 Lifecycle Management Plans

8.1 Carriageway

8.1.1 Asset Inventory

Carriageways are built to provide for the effective and efficient movement of vehicles and people. Carriageways need to have a suitable all weather surface that is appropriate to its location, function and have a structure suitable for legal traffic loading requirements.

Council is responsible for managing Christchurch's local road network, which includes 2,179 kilometres of sealed roads and 324 kilometres of unsealed roads. Carriageways in the city and Banks Peninsula vary from very old, lightly constructed carriageways, to more recent examples where pavement designs take account of present and future loadings from traffic.

Carriageway condition is related to the pavement structure of an individual street and its suitability for the loadings applied. The condition of the carriageway is rated on an annual basis, with physical faults recorded over a fixed, statistically representative portion of the carriageway. Capturing a snapshot of condition is complex because of the constant wearing of carriageway surfaces.

The current condition of carriageways is assessed by a range of measures in conjunction with the RAMM system. These measures are categorised in two ways:

- surface condition – including skid resistance, scabbing, potholes, linear cracking, edge break, and drainage factors; and
- structural condition – including roughness, deflection, pavement depth, sub-grade type and strength, rutting & shoving and alligator cracking.

Historical pavement thickness data for the pavement layers is held as test-pit and bore-log information in RAMM. Reasonably reliable surfacing data from the 1960's onwards has been loaded into RAMM after verification and review.

There are known material quality and thickness issues with carriageways constructed prior to the mid-1950's and a significant length of (mainly pre-1950's) carriageways are considered to be under-strength. A significant proportion of the Council's network was constructed before 1950.

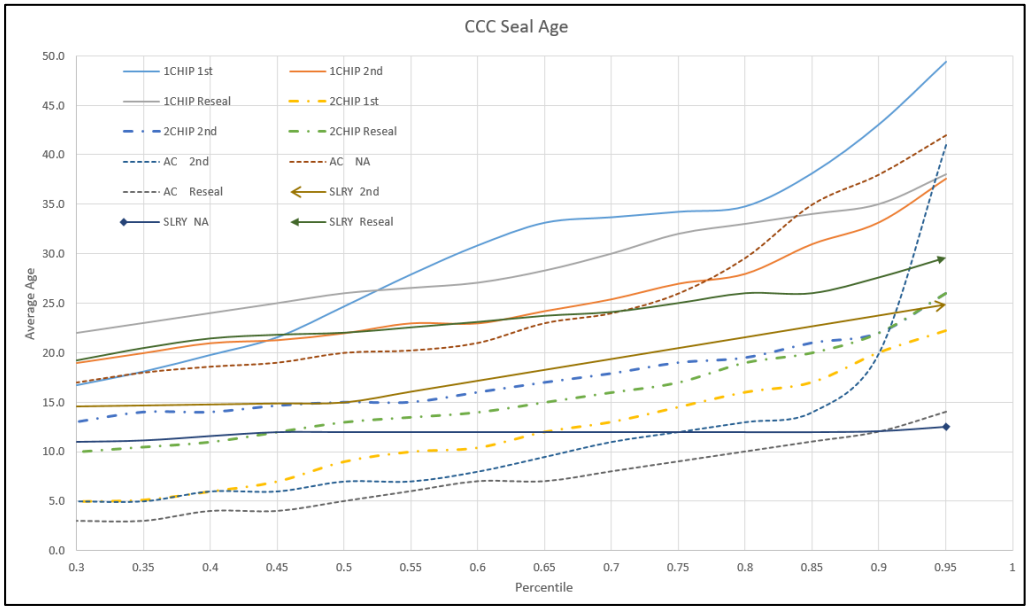
The carriageway structure can be separated into four main parts; the carriageway formation, the construction layers (sub-base and base course) and the surfacing layer.

An overview of carriageway assets is provided in the table below (as at February 2021). The type of surfacing used on the carriageway is generally dependent on the traffic volume and mix of traffic using the road. The table below outlines the distribution of surfacing types across the sealed road network.

Surfacing Type	Totals		Expected life	Quantity older than expected life
	Km	%	Years	Km
Chipseal (1st coat) Chipseal (2nd coat and reseal)	93 1,416	4 57	5 18	56 827
Asphaltic Concrete	581	23	15	110
Unsealed	324	13	3	NA
Slurry Seal	41	2	12	0
Concrete and Pavers	14	1	56	1
Emulsion Mix	2	<1		
Total	**2,471**			**1,273.2**

Table 8-1: Summary of Surfacing Type across portfolio

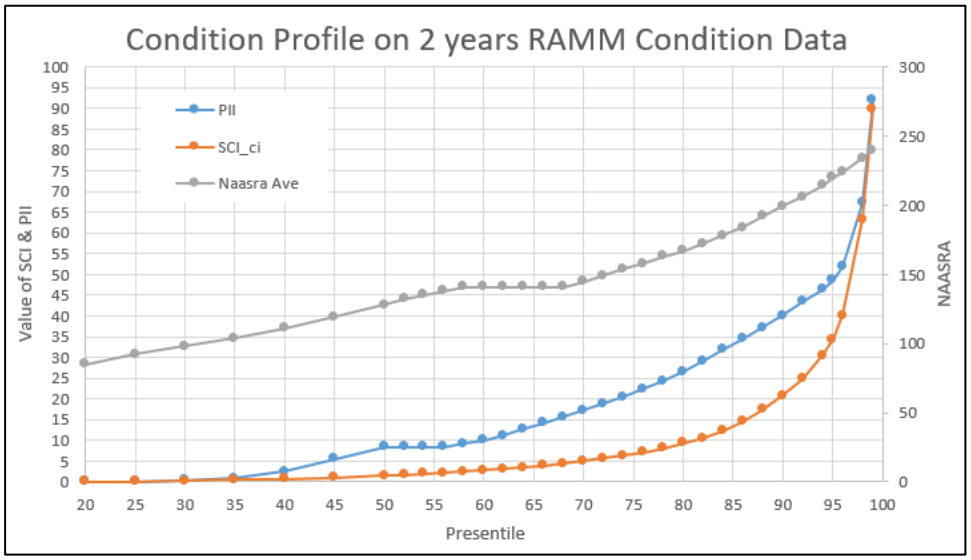
8.1.2 Asset Age



The graph to the left demonstrates the variability across the network by using a percentile view.

Figure 8-1: Variability of surfacing type by age

8.1.3 Asset Condition



The standard measure of road roughness was developed in 1969 by the National Association of Australian State Road Authorities and is known as the NAASRA count. Further to this, Council also considers surface and pavement condition indices, with 0 being a new pavement, and 100 being a failed one.

Figure 8-2: Roughness condition profile

8.1.4 Valuation Data

Asset valuations are established at 3-yearly intervals, and this was last undertaken in June 2019. For valuation purposes the carriageway is split into four sub categories – pavement formation, subbase, basecourse and pavement surfacing.

Assets	Optimised Replacement Cost (ORC)	Optimised Depreciated Replacement Cost (ODRC)	Annual Depreciation (AD)
Pavement Formation	$467,654,165	$352,540,299	$1,446,295
Pavement Subbase	$298,535,772	$233,554,877	$823,952
Pavement Basecourse	$664,510,569	$303,463,513	$8,022,087
Pavement Surface	$247,003,582	$96,800,696	$11,227,463

Table 8-2: Asset valuation breakdown by pavement structural layer

8.1.5 Problems/Issues

There are a number of significant problems or issues relating to carriageways in Christchurch which have been identified:

- following the earthquakes, a number of carriageways in Christchurch were resurfaced. However, there is still a backlog of renewals (approximately 300km), and this deficiency has been exacerbated by an increase in pipe repairs and trenching;
- growth and new subdivisions are resulting in increased traffic volumes and heavy vehicle use in specific locations, which is impacting the useful life of the carriageway and increasing maintenance costs in those areas;
- coal tar is still being discovered in old pavements which requires remediation works to mitigate environmental impacts;
- ongoing uncertainty determining and planning for the effects of climate change; and
- under-strength pavements which need upgrading to improve resilience.

8.1.6 Benefits

Addressing these problems or issues will help achieve Council's strategic outcomes as shown in the table below.

Journeys are safe	Journeys are reliable	Customers have choice	Journeys are comfortable	Council is responsive to the needs of customers
Improved safety outcomes due to reduction in loss-of-control crashes, particularly on wet roads, and improved safety for vulnerable road users.	Improved travel time reliability due to reduced maintenance and temporary speed reductions.	Improved carriageway smoothness could encourage increased cycling uptake and improve public transport ride experience	Maintain road condition to an appropriate (national) standard and improve resident satisfaction.	Improved carriageway condition will improve the perception that Christchurch is a cycle friendly city and reduce complaints.

Table 8-3: Alignment with strategic outcomes

8.1.7 Consequences of Not Addressing the Problems

Increased safety risk can be caused by a number of issues including faults in the road carriageway, poor response to growth requirements, low customer satisfaction, deteriorating network that is below national peer group condition, and high maintenance and renewal costs over the expected life of the road carriageway.

8.1.8 Levels of Service

Carriageway condition contributes to a number of the ONRC performance measures and Council measures, the most relevant of these measures are listed below:

- 16.0.3, Improve resident satisfaction with road condition, measured via annual resident satisfaction survey;
- 16.0.1, Maintain roadway condition, to an appropriate national standard. The percentage of the sealed local road network that is resurfaced per year. *Note this is a Mandatory measure as per the 2010 amendment to the Local Government Act and the Department of Internal Affairs Non-Financial Performance Measures Rules 2013;*
- 16.0.2, Maintain roadway condition, to an appropriate national standard. Calculate the average quality of the sealed local road network, measured by smooth travel exposure (STE). *Note this is a mandatory measure as per the 2010 amendment to the Local Government Act and the Department of Internal Affairs Non-Financial Performance Measures Rules 2013;* and
- 16.0.19, Maintain roadway condition, to an appropriate national standard. The average roughness of the sealed road network measured (NAASRA roughness).

8.1.9 Gap Analysis

This section outlines how Council's carriageway assets are currently performing against the key Levels of Service measures detailed above.

Customer satisfaction

As shown in Section 3.2.2, customer satisfaction with the state of Christchurch roads is still very low, and this has been declining following the earthquakes.

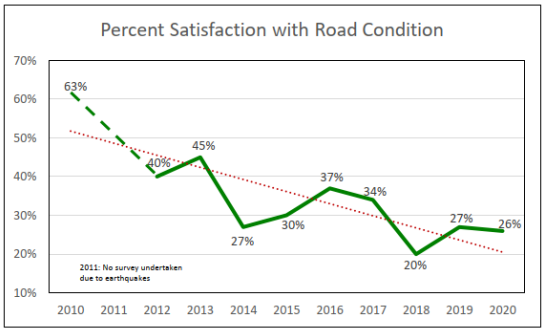


Figure 8-3: Customer satisfaction with road condition

Smooth travel exposure

While Christchurch has been making improvements, as shown in the first graph, the current results are still poor when compared to the rest of the peer group. This suggests that further work is required, particularly in the arterial, collector and access classifications.

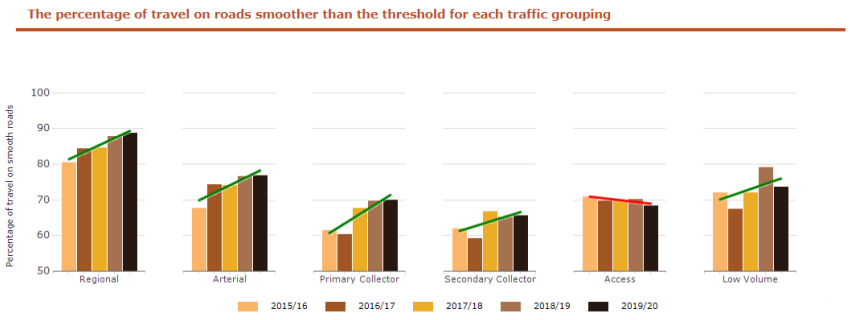


Figure 8-4: Proportion of travel over smooth threshold

Roughness

Current condition indicators and trends show earthquake effects are most noticeable in roughness and smooth travel exposure measures. The cause(s) of the other condition trends is less clear – rutting, shoving, potholes and patching are symptoms of deferred resurfacing due to asset age, but these trends may have been accelerated by the earthquakes and subsequent trenching for buried services repair.

Figure 8-5: Roughness (85th percentile) by road type

The adjacent graph shows peak roughness percentage of network – metro peer group from ONRC reporting tool.

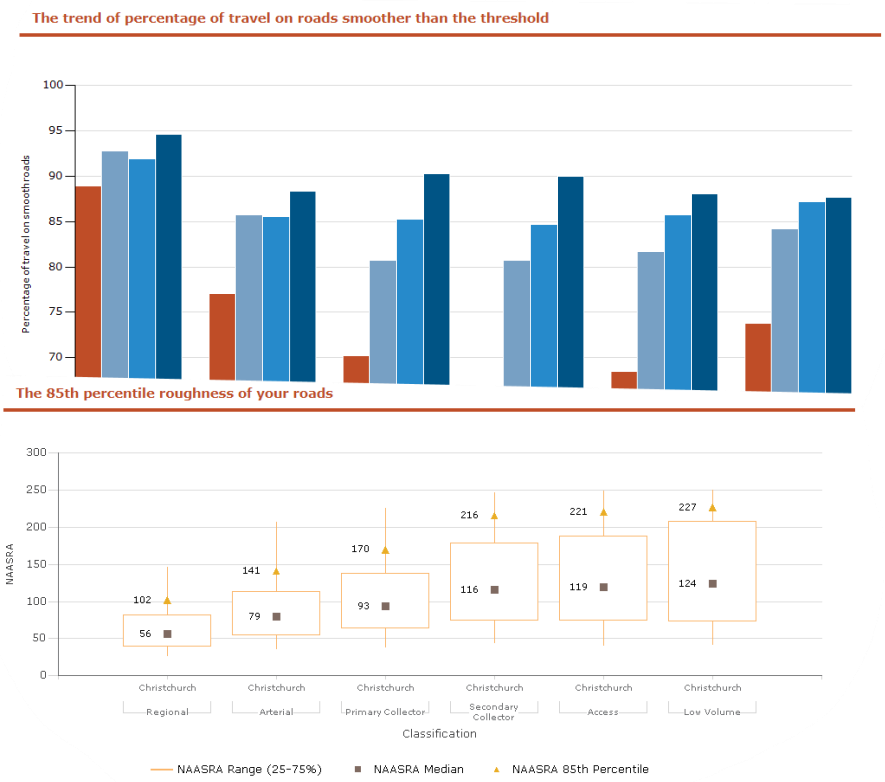
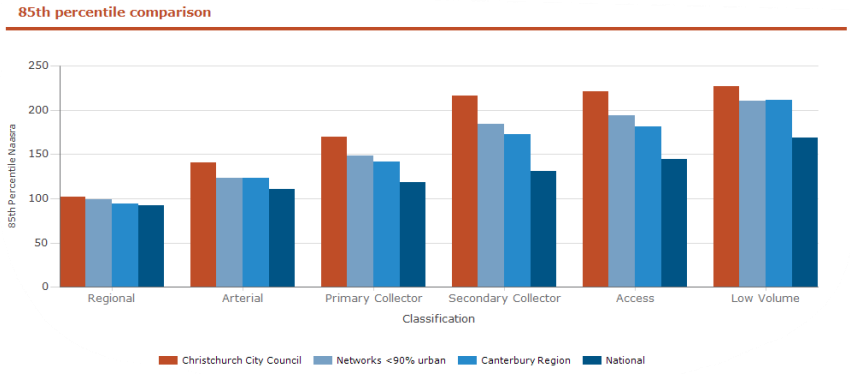


Figure 8-6: Peak Roughness by road type

This shows that Christchurch has the highest percentage of its network exceeding the 95 per cent threshold for roughness, when compared to its metro peer groups. This is true for both the rural and urban network, across most ONRC categories.

Figure 8-7: Roughness (85th percentile) by road type compared to other locations



8.1.10 Options to Address Gaps

Council has developed the following options to address the identified gaps in the network for its carriageway assets.

Options	Output	Benefit / Consequence
Maintain current level of investment Keep the quantity of work static.	Approximately 50-60km of works per year.	Not achieve any improvements to network condition. Likely reduction in customer satisfaction and higher costs in medium to long term as assets deteriorate, and the backlog will increase.
Increase investment over time Incrementally increase spending over a 5 year period.	Increase the programme over 5 years to achieve 120km per year.	Sustainable increase in quantity of work. Return network to appropriate state over 10 – 20 year period.
Increase investment now Increase investment for the next 3 financial years.	Increase the programme over 3 years to achieve 120km per year.	Concentrated effort to get assets back to appropriate standard. High level of capital outlay, and likely disruption to users/residents due to increased scale of works.
Run to failure Don't plan to remediate assets until they have clearly broken.	Don't plan for a stable quantity per year, wait for assets to break and respond accordingly.	Uncertainly of workload, and likely higher costs due to reactive nature of work.

Table 8-4: Option development

8.1.11 Recommended Option

There is still a significant backlog of work, and Council is consistently failing on its Level of Service measures. The only way to address this is to increase the quantity of work in the short term, and this will take increased budget.

On this basis Council recommends adopting the '**Increase investment now**' option for the maintenance, operation and renewal of its carriageway assets, as it considers this the best option to deliver the strategic outcomes. This option aims to deliver ONRC fit-for-purpose Levels of Service, and plans to renew assets before they fail.

- **How is this option optimised and does it address the issues?**

Value for Money – Sealing is about preservation of the existing asset. Council and all RCAs want to achieve a full economic life and this task protects the pavement and replenishes the usefulness of existing seal layers, reducing required maintenance. Providing a new surface is aligned to painting a house; it protects the current asset in an economical way to prevent deterioration rates and to secure an asset that is not 'new' but is still fully functioning.

Whole of Life Costs – Sealing is thought to be an economical solution when combined with preseal repairs to ensure the pavement is expected to retain its strength. Whole-of-life was assessed against a target age of 14.5 years in Council's prioritisation process and maintenance costs by area were a factor. A full economic analysis is not undertaken prior to sealing every site but is considered when asphalt is used to replace chip seal.

Life Cycle Management – In an ideal situation a carriageway will have a consistent pavement and will result in at least four seal lives. Given how Council's network has changed over the last 10 years this is no longer the case and each site needs to be considered independently.

8.1.12 Operations and Maintenance Plan

Routine maintenance involves reactive repairs carried out as a result of inspections or customer notification, or planned work (including preparation for reseals). As part of the contract and services that Council procures, routine services such as sweeping, drainage maintenance, litter collection, incident response, footpath and cycleway maintenance also fall under this activity.

Routine / general maintenance of roads includes the following work activities:

- repair of potholes, dig-out repairs, surface defects, edge break, surface openings (trenches) and minor surface levelling;
- adjusting surface covers;
- maintenance of unsealed shoulders and metalling and grading of unsealed roads;
- frost and ice gritting / gritting for excess bitumen; and
- emergency works (including snow clearing and ice gritting).

Network change in recent years has been affected by the earthquakes, which aside from the significant quantity of utility repairs in the streets, have resulted in altered traffic patterns as pre-earthquake business and housing centres were relocated. A number of Red Zone roads are now closed by physical barriers, the remainder are open and being maintained at a minimal Level of Service.

Unsealed roads are graded to redistribute the wearing course and maintain a water-shedding gradient on the surface. Grading is carried out on a scheduled basis directed by the maintenance contract. The grading schedule is reviewed on a 5 yearly basis, and the most recent review was undertaken as part of retendering the Banks Peninsula area wide maintenance contract.

- **Roading Standards, Specifications and Materials**

To achieve consistency and quality of work, maintenance and renewal works comply with the following technical standards where appropriate:

- Waka Kotahi approved specifications and Austroads - The Guide to the Structural Design of Road Pavements – New Zealand Supplement; and Sealed Local Roads Manual; and
- Council's Civil Engineering CSS - Parts 1, 2, 6, & 7: (General/materials, Earthworks, Roads, and Landscapes); and IDS.

Standards have been developed for planned and unplanned activity, detailing response times and surface level tolerances. For unplanned and / or emergency work requiring immediate response, agreed Levels of Service have been agreed covering sump lid replacement, spillages, grit spreading, and similar safety-related works. Pothole repairs have a response time of 24 hours; with most other tasks able to be programmed over a longer period.

Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	30.5	32.5	34.9	38.2	39.9	43.3	46.4	49.7	52.3	54.8
Operations	12.1	12.2	12.2	12.2	12.3	12.3	12.3	12.3	12.3	12.3
Maintenance	10.7	11.0	11.1	11.2	11.3	11.3	11.3	11.4	11.4	11.5
Total	53.3	55.7	58.2	61.7	63.4	67.0	70.1	73.4	76.0	78.6

Table 8-5: Maintenance expenditure (Opex) by work type

8.1.13 Renewals Plan

As outlined in Section 7 renewal expenditure is major work which restores an existing asset to its original capacity and/or condition. For the carriageway this can entail either surfacing renewals alone, or full carriageway renewal including the pavement layers. In the Christchurch context carriageway renewals on local roads may entail a reduction in the carriageway width to allow the opportunity and space for better facilities for users other than motorised vehicles. Conversely, in order to cater for cyclist's needs many carriageways on major routes may be widened to allow on-road cycle lanes to be included. Pavement strengthening of under-strength carriageways is also included as part of the renewals programme in order to allow optimisation of the carriageway asset.

The renewal strategy objectives are:

- to allow sustainability of the asset in an efficient and cost effective manner; and
- to attain nominated levels of improvements including better traffic management, optimisation of carriageway strength, and carriageway smoothing.

Most full street renewal projects within the city are aligned with and selected as part of the kerb and channel renewal programme requirements. Some renewals work also occurs in conjunction with Road Network Improvements, Safety Works, and Neighbourhood Improvement Works.

Kerb and channel renewal projects are focused on existing streets with kerbs and dished channels, and expenditure on carriageway renewals varies relative to the condition, strength, and geometry (particularly vertical) of existing carriageways adjacent to kerbs and channels being renewed. Road shoulder reconstruction, not full-width renewal, is considered as the first option and is the method used where all asset and user needs can be met using this technique.

- **Earthquake Legacy**

While much of the earthquake damage has been repaired under the Crown-Council Cost Share Agreement, condition modelling indicates that even with increased levels of Opex and Renewals funding, it will take approximately 10 - 20 years to return the assets to a condition that is on-par with the national average. This will mean a serviceable network but with much lower Levels of Service within the timeframe of the 2024-2034 LTP.

A high proportion of the irregularities on the carriageway are related to trenching (both lateral and transverse), and there has been a focus in recent years on better control of utility installations. Trenching throughout the city causes both surfacing and structural distress – particularly where there are older pavements. This leads to surfacing and pavements not reaching their expected lives as the trenching activities effectively contribute to a 'loss in expected life'.

- **Climate change / adaption considerations**

It is the staff view that assets with short lives (<20 years) will see their renewal processes less influenced in the near future by climate change compared to those with long lives (>20 years).

The average surface life is 15 years, so on that basis the longer term impacts of climate change do not significantly influence 1-5 year renewals planning. Streets that are currently failing their Level of Service targets are all considered for inclusion in maintenance and renewal programmes.

Note that if Council does choose to retreat from areas, it is likely that roads will be the last asset to be removed as access will need to be maintained to facilitate clearance works.

- **Second coat sealing**

New chipseals require second coat seals to maximise and achieve their useful and economic lives. A second coat seal is generally carried out in the year after the initial repair / rebuild. Further to this there is a significant need and quantity of second coat sealing work created by the earthquake repair and trenching works.

- **Surfacing Renewals**

The objective of resurfacing is to restore pavement water-proofing and skid resistance. Resurfacing techniques used are chip sealing, surfacing with thin asphaltic concrete, and slurry sealing. Surfacing material selection is dependent upon user needs as well as carriageway structural factors.

Surfacing renewals can avoid or delay more expensive pavement renewals or increasing maintenance costs.

- **Treatment selection**

There are three primary types of surfacing renewal:

- re-sealing – direct replacement of surfacing;
- re-metalling – restoration of wearing course for unsealed roads through addition of material; and
- smoothing – alleviating roughness via additional surfacing.

- **Prioritisation of works**

Prioritisation of surfaces for renewal focuses on five elements relating to the road surface that can be readily obtained from asset data such as:

- Condition Index (Index of surface defects);
- maintenance spend (maintenance $ / km);
- seal requiring a 2nd coat;
- roughness; and
- age.

- **Pavement Layer Renewals**

The need for renewal of pavement layers is dependent upon the existing structural condition of the carriageway.

Methods of pavement renewal include:

- renew / rebuild / reconstruction – remove the existing basecourse, sub-base and deepen the formation into the subgrade and replace with new metal-course layers;
- structural strengthening – removal of surfacing and basecourse and reinstate with deeper layer of asphaltic concrete; and

- area-wide treatment – involves removing the existing surface and pavement layer. Stabilisation can be used to increase the strength of existing basecourse / sub-base materials by adding a stabiliser (hydrated lime, bitumen, or cement) and re-compacting. Other options include smaller scale excavation and replacement, granular overlay and asphaltic concrete strengthening overlay.

- **Coordination with other Projects, Programmes and Activities**

As carriageway renewal is a long term decision, the timing of works need to be coordinated with other construction activities to avoid rework and minimise the disruption to residents.

Council undertakes coordination discussions with the following work programmes:

- Transport;
- 3 Waters; and
- Other Utilities external to Council.

- **Renewal Recommendation**

The current rate of sealed surfacing renewal is approximately 60-80km per year, which has fluctuated since the earthquakes. It is recommended to increase the quantity resurfaced over the next 3 years to achieve 120km per year. This needs to be maintained over the medium term (15 years), by which time the network will be in a stable position.

The rate of pavement rehabilitation (or pavement layer renewal) has also fluctuated since the earthquakes. It is recommended to maintain the renewal rate at close to 15km per year for the next 10 years.

The two Tables below outline the recommended quantities of work by year, along with the corresponding capital expenditure required. The graphics on the next page project the impact of this over the longer term (20 years), along with the predicted impact on Opex budgets and the resulting network condition.

Surface Type	**Quantity (Km)**									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Chipseal	73.1	30.9	39.1	44.1	49.5	63.1	66.5	79.0	84.5	97.8
Asphalt	17.2	26.1	24.9	25.8	26.3	26.1	27.2	24.9	21.7	16.7
Rehabilitation	14.2	13.7	13.6	14.6	15.4	14.2	13.9	15.5	13.9	10.8
Unsealed										
Total	**104.4**	**70.7**	**77.6**	**84.4**	**91.2**	**103.4**	**107.6**	**119.4**	**120.2**	**125.3**

Table 8-6: Recommended work quantity by surface type

Work Type	**Capex Budget ($M)**									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	33.72	31.89	28.51	30.76	33.37	26.38	26.12	27.31	28.18	27.46

Table 8-7: Capex budget for renewal work programme

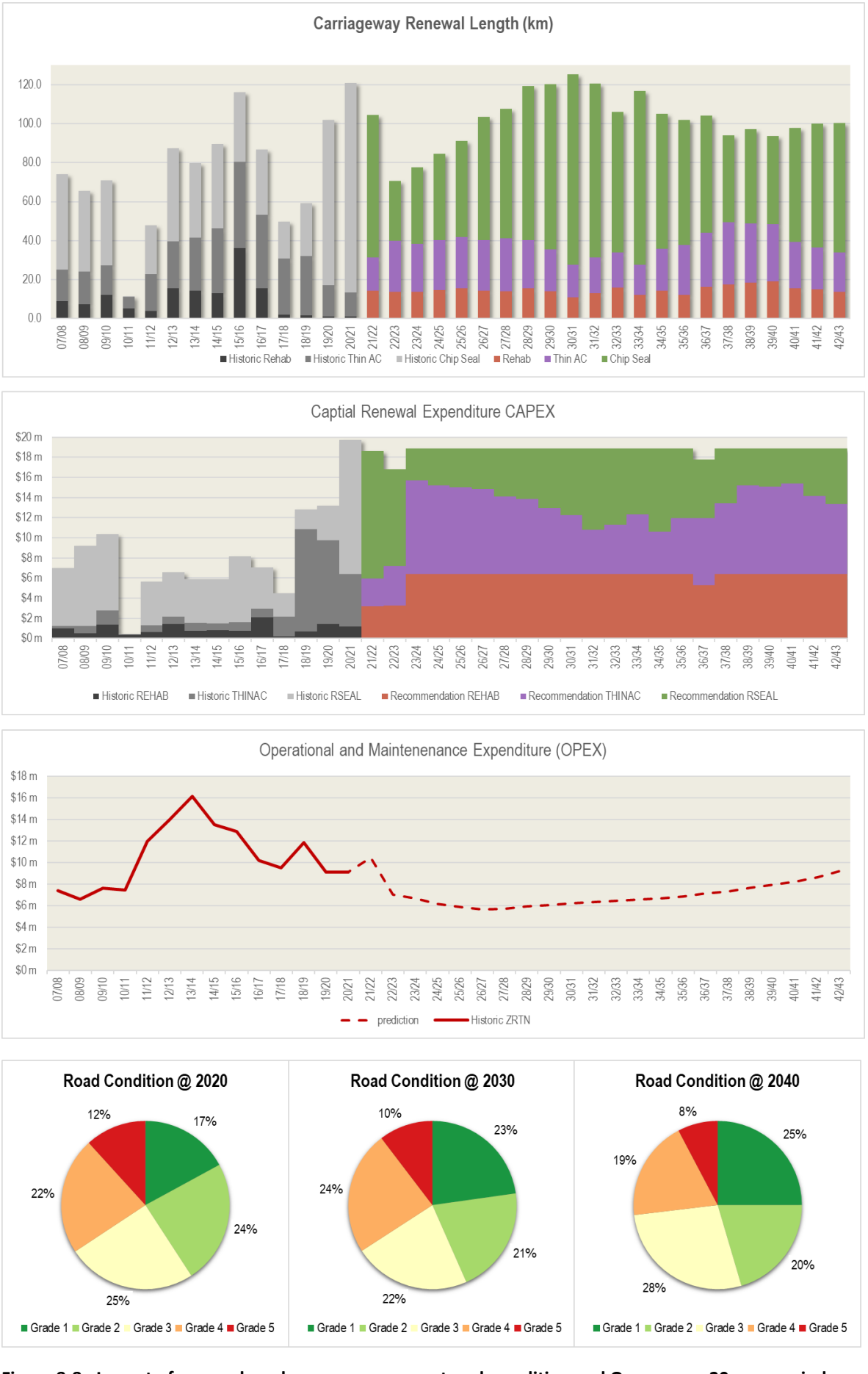


Figure 8-8: Impact of renewal work programme on network condition and Opex - over 20 year period

8.1.14 Capital development plan

Capital development planning is explained in detail in Section 7.

The budgets allowed in the capital programme are summarised in Section 9.

8.1.15 Disposal Plan

Disposal of transport-related land is explained in detail in Section 7.

8.2 Drainage

8.2.1 Asset Inventory

Council is responsible for 3,593 kilometres of kerb and channel and 34,195 sumps and associated pipes. The purpose of drainage infrastructure is to provide sufficient carrying capacity for normal (i.e. 5 year recurrence interval) surface storm-water runoff from the carriageway, footpaths, berms and adjacent properties to an outfall point and to delineate the road edge for road users.

Kerb and channel assets form the bulk of the assets in the road drainage area, which also includes sumps and pipes/culverts with a diameter of less than 600 mm (note pipes/culverts with diameters over 600 mm are dealt with under the following Road Structures section). The lengths of the main kerb and channel types are held in the RAMM database (along with other drainage assets) on a street-by-street basis. A summary of road drainage assets is outlined in Table 8-8.

Type	Totals	Expected life	Quantity older than expected life
	Km	Years	Km
Kerb and flat channel	2,412	80	21
Kerb and deep dish channel	385	80	108
Mountable kerb	107	80	-
Kerb only	94	80	3
Other concrete / stone	194	80	-
Sumps	26,803 no	80	-
Small culverts (dia <600mm)	3,858 no	50	102 no

Table 8-8: Summary of road drainage assets

The current design philosophy which is applied allows for a 5 year return period rainfall event for stormwater design, meaning that any storm with rainfall intensities expected during a normal 5 year interval should create no more than minimal ponding into the road shoulders, and should not create any traffic safety issues. Due to Christchurch's flat topography, storms of greater intensity and duration will result in greater areas of roadway ponding, and the need for greater road-user care during and immediately following these storm events.

8.2.2 Asset Age

The general life expectancy of a concrete kerb is 80 years. Below is a table outlining the average age for the different types of kerb on the network.

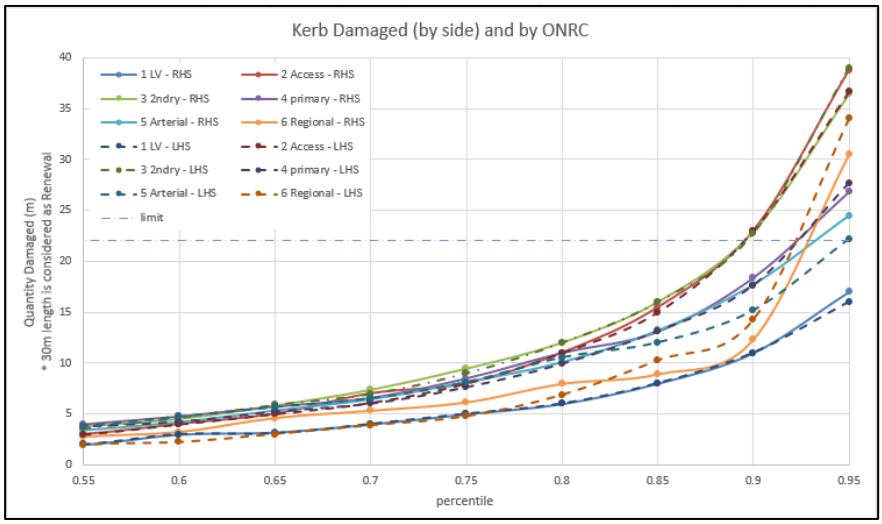
Row Labels	swc_type	Sum of length_m	Average of age	Max of age
CO	Channel Only	293	3.91	5
DA	Dished Channel (Asphalt)	1,370	3.00	3
DC	Dished Channel (Concrete)	75,889	27.03	110
DCH	Dish Channel (Concrete Hand Poured)	425		
DS	Dished Channel (Sealed)	8,086	58.62	89
KC	Kerb Only (Concrete)	75,352	28.11	99
KCC	Kerb & Channel (Concrete)	2,464,806	32.06	110
KCF	Edge Kerb (Conc) - Flush with road	18,390	16.53	23
KCS	Kerb & Channel (Stone)	2,190	85.79	139
KDC	Kerb & Dished Channel (Concrete)	287,699	72.40	119
KDCC	Covered Kerb & Dish (Concrete)	9,444	76.41	89
KS	Kerb Only (Stone)	3,069	8.26	109
MKC	Mountable Kerb Only (Concrete)	116,365	20.96	84
MKCC	Mountable Kerb & Channel (Concrete)	2,003	9.26	38
OTHER	Other Type	185,354	52.50	119
SLTC	Slot Channel (Concrete)	1,409	25.92	90
SWCD	SWC (Deep, >200 Below Seal Edge)	71,357	17.85	50
SWCS	SWC (Shallow, <200 Below Seal Edge)	118,325	16.04	19
VC	V Channel	1,346	8.39	49
Grand Total		3,443,172	33.13	139

As at October 2019 approximately 135km of kerb and dish channel is beyond its expected life of 80 years. This is predominantly reflecting the remaining kerb and deep dish channel in older suburbs of the city.

Prior to the earthquakes these older kerbs were deemed obsolete due to safety and usability concerns and a street renewal programme was in place that focused on replacing these assets with new slip formed kerb and flat channel, along with renewing the other carriageway elements. This was an efficient way of renewing drainage features, footpaths, carriageway surfacing and pavement layers at one time.

Table 8-9: Life expectancy of range of kerb assets

8.2.3 Asset Condition



Damage is directly related to a typical condition and it was the priority focus for site selection historically. It has frequently been focused on assessing the percentage damaged and was associated to damage on a whole street, not individual kerb sections.

The condition of the total length of both kerb and channels and rural surface water channel assets are assessed on a yearly basis during the RAMM condition survey, with the number and length of faults being recorded.

Figure 8-9: Kerb damage profile

Replacing kerb and flat channel can be undertaken in a targeted manner, however replacing older sections of deep dish channel is more problematic. To achieve appropriate falls the road crossfall may need to be re-graded or the piping for the street replaced.

8.2.4 Asset Valuation

Asset valuations are established at 3-yearly intervals and this was last undertaken in June 2019. For valuation purposes road drainage is split into two sub categories; kerb and channel and drainage as shown in the following table.

Assets	Optimised Replacement Cost (ORC)	Optimised Depreciated Replacement Cost (ODRC)	Annual Depreciation (AD)
Drainage	$253,872,205	$151,005,517	$2,504,892
Kerb and Channel	$427,777,635	$220,371,628	$5,315,450

Table 8-10: Road drainage asset valuations

8.2.5 Problems

The following problems have been identified relating to road drainage in Christchurch:

- Christchurch has areas of deep dish channel which are approaching the end-of-life and needs replacing before it deteriorates further and fails. There is currently a backlog of work, which will rise as the assets constructed after World War 2 approach (their) end-of-life;
- transport functionality and safety are compromised when carriageways and pavements are adversely affected by stormwater run-off; and
- if peak stormwater flows increase in the future (for instance due to increased rainfall events as a result of climate change) then the capacity of the stormwater reticulation network would need to be addressed.

8.2.6 Benefits

Addressing these issues will help achieve Council's strategic outcomes as shown in Table 8-11.

Safety	Access	Environment	Affordability
Improve road safety, particularly during wet weather events	More people choose to travel by cycle in wet weather events	Minimises risk of road closures and delays due to flooding	Reduces the number of customer service requests relating to kerb, channel and drainage flooding

Table 8-11: Alignment with pillars

8.2.7 Consequences of Not Addressing the Problems

The specification applicable to kerb and channel construction and maintenance is the 'CSS - Part 6: Roads'. The consequences and risk of lowering material quality requirements and/or design standards are:

- reduced safety - broken sections of kerb and channel create safety issues for road users;
- reduced reliability/lower Level of Service - additional surface flooding from changed design parameters related to storm recurrence intervals; risk of water ingress into carriageway layers; and
- loss of asset life - accelerated deterioration/reduced kerb and channel life from reduced concrete strength or reduced foundation strength requirements at the time of construction; or reduced maintenance.

8.2.8 Levels of Service

Road drainage contributes to a number of the Council's Levels of Service, the most relevant of these measures are listed below:

- 10.5.1, Reduce deaths and serious injuries per capita for cyclists/pedestrians;

- 16.0.3, Resident satisfaction with road condition;
- 16.0.9, Resident satisfaction with footpath condition; and
- 16.0.10, Perception that Christchurch is a walking friendly city.

8.2.9 Gap Analysis

This section outlines how Council's road drainage assets are currently performing against the key Levels of Service measures detailed above.

- **Safety**

While there is no direct correlation between the state of the kerb and accident statistics, kerbs can be a source of slips, trips and falls, particularly around high use areas such as malls, schools and retirement homes. On this basis the function of the street is taken into account when prioritising which streets to remediate. This is discussed further is Section 8.2.10.

- **Customer satisfaction**

As shown in Section 3.2.2 customer satisfaction with the state of Christchurch's road network is still very low, and has been declining following the earthquakes.

As the kerb and channel element is a prominent part of the road corridor it likely has an influencing factor on this result. Similarly the resident satisfaction with footpath condition is also low at 40% in the 2020 survey. Conversely 84% of surveyed residents feel that Christchurch is a walking friendly city.

So from a customer level of service perspective Council's road drainage assets are performing adequately.

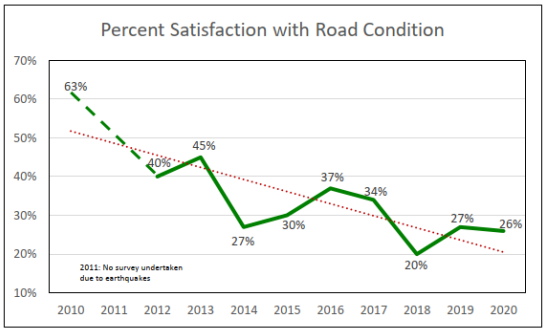


Figure 8-10: Customer satisfaction with condition

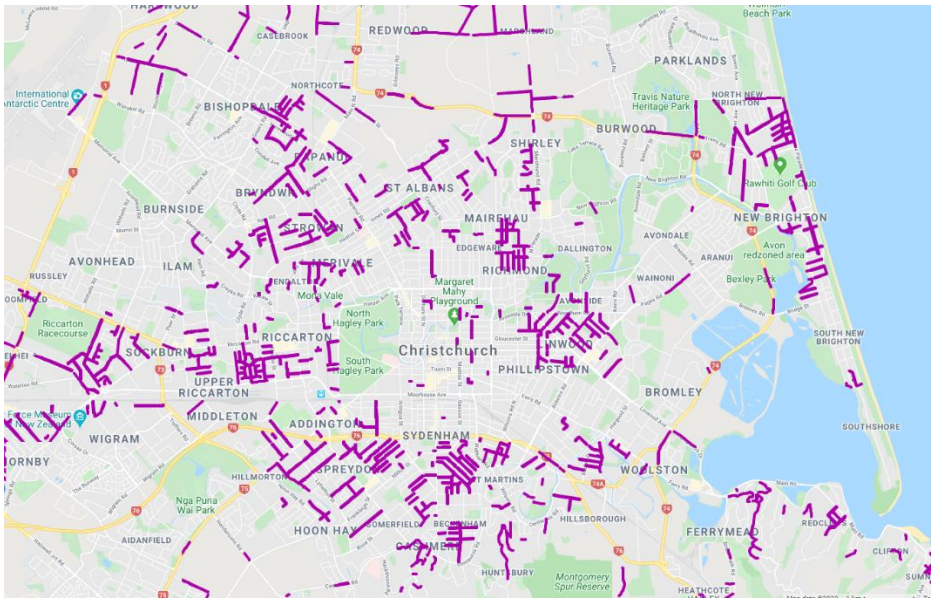


Figure 8-11: City streets with deep dish channel

8.2.10 Options to Address Gaps

Council has developed the following options to address the identified gaps in the network for its drainage and stormwater assets.

Options	Output	Benefit / Consequence
Maintain current level of investment Keep the quantity of work static.	Approximately 10km of works per year.	Not achieve any improvements to network condition. Likely reduction in customer satisfaction and higher costs in medium to long term as assets deteriorate.
Increase investment over time Incrementally increase spending over a 5 year period.	Ramp up the programme over 5 years to achieve 30km per year.	Sustainable increase in quantity of work. Return network to appropriate state over 10 – 20 year period.
Increase Investment now Increase investment for the next 3 financial years.	Deliver on the backlog of works over the next 3 years.	Concentrated effort to get assets back to appropriate standard. High level of capital outlay, and likely disruption to users/residents due to increased scale of works.
Run to failure Don't plan to remediate assets until they have clearly broken.	Don't plan for a stable quantity per year, wait for assets to break and respond accordingly.	Uncertainly of workload, and likely higher costs due to mostly reactive nature of work required.

Table 8-12: Drainage and stormwater option development

8.2.11 Recommended Option

Council recommends adopting the **Increase investment over time** option for the maintenance, operation and renewal of its drainage and stormwater assets, as it considers this the best option to deliver the strategic outcomes.

This option aims to deliver ONRC fit-for-purpose Levels of Service, and plans to renew assets before they fail.

- **How is this option optimised and does it address the issues?**

Value-for-Money – Council remains focused on renewing assets due to condition rather than age. That is why many of the older channels are still in place as they are still adequately performing their intended function.

Whole of Life Costs – this is assessed against the expected life of 80 years.

Life Cycle Management – while there are no immediate gaps in Levels of Service, a portion of these assets are at or past their useful lives. Council needs to spread this work over an appropriate period such that it is manageable.

8.2.12 Operations and Maintenance Plan

Operations and maintenance of the drainage assets includes:

- general kerb and channel repairs;
- side drain (water table) maintenance;

- street and sump cleaning;
- small diameter pipe repairs (including repair of stormwater pipes serving private properties); and
- emergency response works.

- **Standards and specifications**

The specification applicable to kerb and channel construction and maintenance is the 'Council's Civil Engineering CSS - Part 6: Roads'. The consequences and risk of lowering material quality requirements and/or design standards are:

- reduced safety - broken sections of kerb and channel create safety issues for road users;
- reduced reliability/lower Level of Service - additional surface flooding from changed design parameters related to storm recurrence intervals; risk of water ingress into carriageway layers; and
- loss of asset life - accelerated deterioration/reduced kerb and channel life from reduced concrete strength or reduced foundation strength requirements at the time of construction; or reduced maintenance.

- **Maintenance Strategy**

The strategy for the maintenance of the Council's road drainage assets involves regular condition inspections, and both planned and unplanned maintenance activities.

- **Condition Inspections**

The maintenance contractor is required to report any defects observed in day-to-day road maintenance activity. Formal condition assessments are undertaken on the whole network annually in association with the RAMM condition rating survey. Operational activities such as street cleaning are audited to provide contract and Level of Service compliance.

- **Unplanned Maintenance**

Many defects related to road drainage assets are notified by the public, and a 24 hour call-out service is provided to attend to complaints. Repairs are carried-out immediately where there is an issue of public safety (i.e. broken kerb) or where significant flooding problems exist. If the repair is not urgent the fault is added to the defects list for planned maintenance or renewal works.

- **Planned Maintenance**

Repairs are programmed for defects identified during inspections and annual condition surveys where the defect has an effect on public safety, accelerated deterioration of the pavement, the flow of stormwater, and convenience for road users, pedestrians and / or property owners.

Routine maintenance includes sweeping / cleaning kerb and channel and ensuring the entranceways, exits and barrels of culverts are clear and free of obstructions.

All urban kerb and channel is swept regularly to keep it free of debris and reduce the probability of blockages during rain. The interval between sweeps varies, roughly in accordance with the road hierarchy, but also depending on the traffic volumes, types of traffic and the adjacent land use.

As the historic focus of renewals has been to reduce the overall length of kerb and deep dished channels, the previous maintenance strategy was to target maintenance expenditure at flat channels which are showing signs of premature failure. Maintenance activities include concrete repairs and side-drain maintenance.

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	9.1	9.4	9.8	10.1	10.7	11.1	11.5	11.9	12.1	12.5
Operations	2.7	2.8	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Maintenance	9.8	10.1	10.1	10.2	10.2	10.2	10.4	10.4	10.4	10.4
Total	21.7	22.2	22.7	23.1	23.6	24.1	24.6	25.1	25.3	25.7

Table 8-13: Opex including maintenance

8.2.13 Renewals Plan

In 2003 Council policy was established concerning the renewal of kerb and channel within a structured street renewal programme. Asset condition and function was a prime driver of this and as a result, older deep dish channel around the city was targeted.

Prior to the earthquakes, the average renewal rate was 35km per year for kerb and dish channel.

Following the earthquakes the street renewal programme has been refocused, and the kerb and deep dish channel elements are no longer considered obsolescent meaning all drainage assets will be treated based on condition.

Condition survey of the kerb and channel assets is undertaken on an annual basis, as discussed previously. Historically the trends were reasonably linear, however following a change of consultants, recent survey results have varied significantly (which has highlighted some of the limitations with visual condition grading).

Kerb and channel renewal in Christchurch is typically carried-out by way of street renewal projects. There are a number of reasons for this; primarily that in order to achieve alignments that conform to current standards, the changes typically require reconstruction of adjacent pavement and footways. These assets are often in need of renewal on their own merit, so street renewal is efficient from an asset management perspective.

Standalone kerb and channel renewal also occurs; however this typically involves shorter lengths as this work can be generally tied-in more easily with existing assets. Due to the shorter lengths involved, much of this work is carried-out as maintenance

The renewal plan for kerb and channel has been developed by creating a prioritized list of candidates and determining the schedule for when they can be delivered based on the available budgets. The budgets are defined as part of Council's Annual Plan and LTP processes.

- **Prioritisation Process**

The available data on street assets and condition is compiled and weighted alongside other non-condition factors such as traffic, earthquake damage, earthquake repairs, % dish channel and whether previous design work has been completed.

The highest scoring streets and those with known issues highlighted by staff or residents are further assessed and prioritised for inclusion in a draft 10 year renewal programme. There are approximately 65km of streets with scores that deem further investigation, and a budget for approximately 20km of street renewal work in the next 10 years.

- **Renewals Recommendation**

The rate of kerb and channel replacement has been very low since the earthquakes.

It is recommended that the programme be incrementally increased over the next 10 years to achieve 30km of renewal per year, and then sustain this for the medium term (years 10-20).

Further to this, Council's street renewal programme has similarly been low since 2010. It is recommended to incrementally increase this to 5km per year in the medium term.

Work Type	Quantity (Km)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Kerb and channel	10	15	20	25	25	30	30	30	30	30
Street renewal	1	1	1	1	1	1	1	1	1	1
Total	**13**	**16**	**21**	**26**	**11**	**31**	**31**	**31**	**31**	**31**

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	6.29	5.60	3.07	4.41	5.60	7.96	9.21	4.92	7.66	4.70

Table 8-14: Proposed kerb and channel work programme and budget

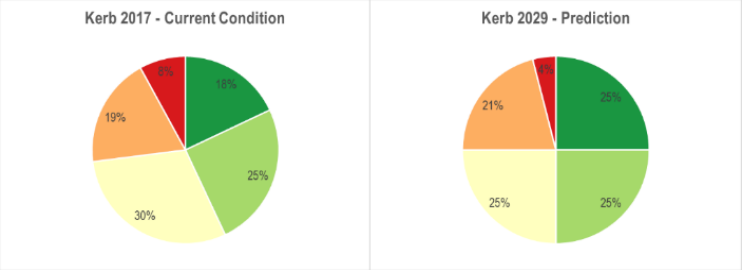


Figure 8-12: Comparison of kerb condition over time

8.2.14 Capital Development Plan

Kerb and channel assets may be added to the network to improve amenity, safety or enhance the Level of Service in streets which do not currently have them. Aside from new assets added in association with new carriageways, the provision of additional capacity is not currently a specific consideration.

New sections of kerb and channel are acquired as a result of:

- Council-funded extensions to the network where no kerb and channel previously existed; and extensions or additions to the network where the project is not renewal-related;
- Council construction of new kerb and channel in conjunction with road network extensions e.g. Road Network Improvements; in conjunction with Safety Works, Neighbourhood Improvement Works; and as New Construction – mostly on the urban fringe to link housing developments with the rest of the network; and
- new kerb and channel construction with subdivision development (constructed at the developer's expense or with a part contribution from Council), and vested to the Council.

It is rare for these new assets to replace old ones due to condition.

The budgets allowed in the capital programme are summarised in Section 9.

8.2.15 Disposal Plan

Realignment of carriageways can create lengths of kerb and channel surplus to current needs. While the kerb and channel may be removed and disposed of, the available space provides opportunities for other users of the road reserve e.g. for landscaping; and passive, cycle and pedestrian use. The RAMM database and asset register are updated to remove the redundant kerb and channel data.

Costs of disposal are included within the funding provided for the development of a new use, and therefore there is no budget allowed or required for the disposal of road drainage assets.

8.3 Footpaths

8.3.1 Asset Inventory

Council is responsible for managing 2,582 kilometres of footpath. Footpath assets include the sealed network providing pedestrian access to residential properties, industrial, commercial and recreational areas, and alongside state highways where applicable. The main physical parameters are width, alignment and material.

The width of footpaths is highly variable across the city. Generally they are 1.65m wide in industrial areas, 1.8m wide in residential areas and 3.0m wide in the city centre and other urban areas. Traditionally footpaths were constructed against the kerb to ease access to parked vehicles and buses, with grass or grit in the area between the footpath and property boundary. There are more than 400 km of street with this configuration of footpath in Christchurch; many in conjunction with the older kerb and deep dished channels.

A footpath is made up of its construction layers and a surfacing material. The standard footpath construction includes a 75 mm thick layer of metal course, which is increased at vehicle entrances. This construction layer has an expected life of 80 years, however in reality unless damaged by vehicles will achieve a near infinite life. Other than concrete (with an expected life of 80 years), a footpath's surface has an expected life of 25 years. Table 8-15 provides a summary of footpath assets by surface type.

Surface Type	Length (km)	Expected life	Quantity older than expected life
Asphaltic Concrete	2,627	25	300
Chipseal	30	10	30
Slurry Seal	1	10	1.2
Concrete	65	80	-
Interlocking Block (concrete pavers)	14	35	-
Metal (unsealed)	7	-	7
TOTAL	2,744		

Table 8-15: Summary of footpath assets by surface type (as at February 2021)

8.3.2 Asset Age

Asset age has a direct relation to condition, with assets older than their expected lives more likely to be in poor condition triggering maintenance or renewal works.

8.3.3 Asset Condition

The last full condition survey of the network was undertaken in 2017, the details are summarised in the Figure below.

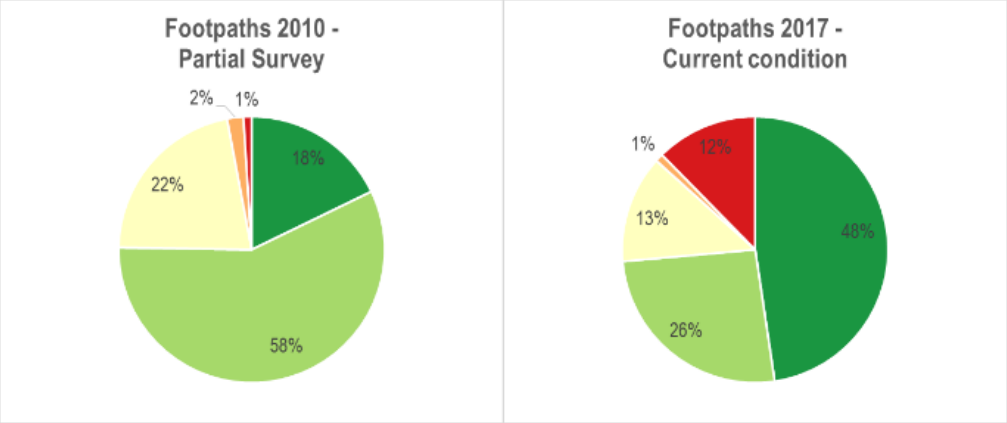


Figure 8-13: Comparison of footpath condition over time

Footpath condition data was loaded on August 2017 and provides a condition based on major and minor fault lengths. The data has been assessed using percentiles and has also been considered when aligned against maintenance dispatch records. Given the quantity of completed renewals and the change in condition it provides only a quick guide as to where sections of path may be requiring attention.

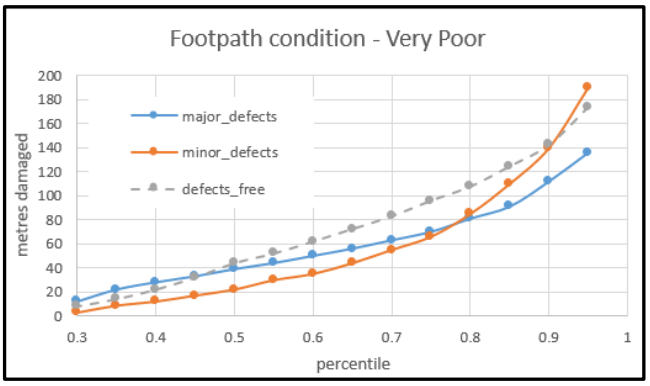


Figure 8-14: Analysis of footpath condition by defect

8.3.4 Asset Valuation

Asset valuations are established at 3-yearly intervals and this was last undertaken in September? October? 2022.

Assets	**Optimised Replacement Cost** (ORC)	**Optimised Depreciated Replacement Cost** (ODRC)	**Annual Depreciation** (AD)
Footpath[†]	$456,083,629	$255,515,689	$9,616,184

Table 8-16: Footpath asset valuation data (from 2019 Valuation Report)

8.3.5 Problems

The following problems have been identified relating to footpaths in Christchurch:

- the risk of tripping, and wheelchairs tipping due to surface irregularities (such as potholes, puddles, tree roots, cracks and depressions) is often too high. Also poor visibility due to overgrown foliage often results in conflicts between pedestrians and vehicles at driveways;
- ease of use is seen as unsatisfactory due to surface irregularities and the existence of significant lengths of older surfaces, including chip seal surfacing;
- generally substandard appearance because of patching, trenching, deterioration, cracking, and other defects;
- footpaths are too narrow in some locations, which reduces the uptake of walking; and
- coal tar is still found in some areas of older footpaths. This requires remediation works to mitigate adverse environmental impact.

8.3.6 Benefits

Addressing these issues will help achieve Council's strategic outcomes as shown in Table 8-17 below.

Safety	Access	Affordability
Improve road safety, particularly for vulnerable users such as pedestrians and wheeled modes	Increase in trips by active modes and a decrease in private vehicle trips	Improved customer experience and resident satisfaction with footpath condition

Table 8-17: Alignment with strategic outcomes

8.3.7 Consequences of Not Addressing the Problems

Footpath and cycleway use will not increase and there will be an increasing risk of incidents causing serious injuries or deaths, linked to infrastructure deterioration.

8.3.8 Levels of Service

Footpaths contribute to a number of the Council measures, the most relevant of these measures are listed below:

- 16.0.9, Resident satisfaction with footpath condition; and
- 16.0.10, Perception that Christchurch is a walking friendly city.

8.3.9 Gap Analysis

This section outlines how Council's footpath assets are currently performing against the key Levels of Service measures detailed above.

- **Customer satisfaction**

Resident satisfaction with the condition of footpaths has been low following the earthquakes. It has fluctuated between 34% and 51%, and is currently at 40% from the 2020 survey. Conversely the perception that Christchurch is a walking friendly city has remained high over this same period, and Council achieved 84% in the most recent survey.

Staff interpret this to mean that there are specific issues on the network that residents would like to see remediated, however these issues do not stop them using the footpath.

8.3.10 Options to Address Gaps

Council has developed the following options to address the identified gaps in the network for its footpath assets.

Options	Output	Benefit / Consequence
Maintain current level of investment Keep the quantity of work static.	Approximately 25km of works per year.	Not achieve any improvements to network condition. Likely reduction in customer satisfaction and higher costs in medium to long term as assets deteriorate.
Increase investment over time Incrementally increase spending over a 5 year period.	Ramp up the programme over 5 years to achieve 50km per year.	Sustainable increase in quantity of work. Return network to appropriate state over 10 – 20 year period.
Increase Investment now Increase investment for the next 3 financial years.	Deliver on the backlog of works over the next 3 years.	Concentrated effort to get assets back to appropriate standard. High level of capital outlay, and likely disruption to users/residents due to increased scale of works.
Run to failure Don't plan to remediate assets until they have clearly broken.	Don't plan for a stable quantity per year, wait for assets to break and respond accordingly.	Uncertainly of workload, and likely higher costs due to reactive nature of work.

Table 8-18: Footpath investment option development

8.3.11 Recommended Option

Council recommends adopting the **Increase investment over time** option for the maintenance, operation and renewal of its footpath assets, as it considers this the best option to deliver the strategic outcomes.

This option aims to deliver ONRC fit-for-purpose Levels of Service, and plans to renew assets before they fail.

- **How is this option optimised and does it address the issues?**

Value-for-Money - sealing footpaths in urban areas results in a durable asset that will last for many years. It solves a number of safety issues that arise when footpaths are not provided, and contributes significantly to Council's Community Outcomes.

Whole-of-Life Costs - this is assessed against an expected life of 25 years for asphalt footpaths, which form the majority of this asset group. As maintenance costs increase this is the right time to intervene and construct a new surface along a major section of the footpath.

Life Cycle Management - footpaths are renewed based on condition, and are prioritised based on their classification and function e.g. high use areas such as schools are prioritised ahead of small culs de sac.

8.3.12 Operations and Maintenance Plan

Historically footpath maintenance has been a reactive, 'unplanned' activity, which has generally proved to be the most cost effective maintenance method.

Most footpath defects are notified by the public, and the contract documents specify that a 24 hour call-out service is provided to attend to safety-related problems. Maintenance needs are also identified from inspection surveys and observations made by staff in the course of their duties.

Typical work undertaken includes pothole repair, removal of tree roots, surface levelling/ smoothing, edge drainage improvements, seal edge alignment and trimming of vegetation.

There is no cyclic planned maintenance work carried out on a block-by-block basis, and no provision for maintenance contractor inspection and / or scheduling footpath maintenance work when scheduling other work on a road section.

All footpath activities must comply with Council's CSS - Part 6: Roads.

The recommended funding allocation for the next 10 year period is shown in the Table below. Note this recommendation is based on the following assumptions:

- 1% growth in the overall size of the asset per year;
- strategies to control third party damage, especially trenching damage, are effective; and
- there will be no significant changes in contract rates (above the rate of inflation) for maintenance work.

Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	15.2	15.8	16.3	16.9	17.5	17.8	18.0	18.3	15.7	11.1
Operations	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Maintenance	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Total	19.3	19.9	20.4	21.1	21.7	22.0	22.2	22.5	19.9	15.3

Table 8-19: Opex including maintenance

8.3.13 Renewals Plan

Footpath renewal works include;

- surface renewals to provide a safe, smooth, waterproof surface; and
- full footpath reconstruction including layers - in association with street upgrading and / or kerb and channel renewal (footpath condition is not a significant driver in assessing these work priorities).

Renewal programmes are developed by initially inspecting footpaths prioritised by age, and assessing the footpath condition. Customer complaints also highlight footpaths with user issues and these areas are inspected.

Surfacing renewal programmes are developed based on performance, using the area of defects per kilometre of footpath as a measure. Defects are logged to record depressions, tripping hazards, potholes, failed areas and cracking and the total area of repairs required is calculated and the net present value (NPV) of repair is compared with the NPV of renewal.

Construction layer renewals are usually based on the condition of the adjacent kerb and channel or carriageway rather than the overall footpath condition. The footpaths reconstructed are typically some of the oldest in terms of original layer construction date. An exception might be where substandard 1950's and 1960's construction requires basecourse replacement rather than just resurfacing.

Renewal Quantities and Expenditure

Work Type	Quantity (Km)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Renewal	25	30	35	40	45	50	50	50	50	50
Total	25	30	35	40	45	50	50	50	50	50

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	2.52	6.00	5.69	8.04	6.82	6.90	6.61	7.97	7.97	7.97

Table 8-20: Proposed footpath renewal work programme and budget

8.3.14 Capital Development Plan

This is outlined in detail in Section 7.

Footpaths are created and acquired as a result of:

- extensions constructed by the Council and prioritised through the CTSP, where no footpath previously existed;
- extensions constructed by Council as part of the road network improvements, safety works, and neighbourhood improvement works budget categories;
- new footpaths constructed in conjunction with subdivision development (at the developer's expense) then vested in the Council; and
- upgrading work to improve the Level of Service to meet the requirements of the CTSP to provide high quality walking networks around the central city and suburban centres.

Opportunities for new footpaths have generally been identified from requests from the public, Community Boards, or in conjunction with subdivision developments. The CTSP will provide a way of prioritising these requests to implement the plan for 'walkable centres'.

Projected growth for the 10 year period is expected to add 200 km of new footpaths (average 0.8% annual growth), based on costs of $100 per lineal metre for Council-funded (brownfields) works, and $60 per lineal metre for developer-funded (green fields) works.

It is assumed that the length of footpath lost through residential red zone clearance will roughly balance the new footpath created in the additional subdivisions created to house displaced residents.

The budgets allowed in the capital programme are summarised in Section 9.

8.3.15 Disposal Plan

Options for complete disposal are often limited by existing utility services but can include additional opportunities for landscaping, cycling and passive use.

Realignment of footpaths in conjunction with carriageway and kerb and channel renewals can create lengths of footpath surplus to current needs. While the layers and surfacing may be removed and disposed of, the available space provides opportunities for other users of the road reserve. The RAMM database and asset register are updated to remove the redundant footpath data.

Costs of footpath disposal are included within the funding provided for the development of a new use, therefore no budget for the disposal of footpath assets has been allowed for in this AMP.

8.4 Structures

8.4.1 Asset Inventory

This section covers the following assets:

- bridges, underpasses, culverts and fords – provided to allow vehicles, pedestrians and cyclists access across barriers such as waterways, railways and roads (note that only culverts larger than 3.4m^2 are included);
- retaining walls – provided as physical support to the road platform or to prevent erosion of the hillside onto the road (note that retaining walls not in transport corridors are included in the Parks, Marine Structures or 3 Waters Asset Management Plans);
- guardrails – provided to prevent vehicles straying off the road;
- gantries – which hold advance directional signage.

Council is responsible for managing a total of 1822 transport structures. The oldest road structure on record is a 156 year old masonry culvert.

Data for transportation structures owned by the Council are currently held in the RAMM database, with a breakdown shown in the following table, by structure type and function.

Asset Type	Function	Number
Bridges	Traffic	247
	Pedestrian	56
	Culverts	98
Retaining walls	-	1797
Gantries	-	103
Guardrails	-	153
	Total	**2454**

Table 8-21: Breakdown of structures inventory by type

8.4.2 Asset Age

The known age of Council's bridges and retaining walls are illustrated in the graph below.

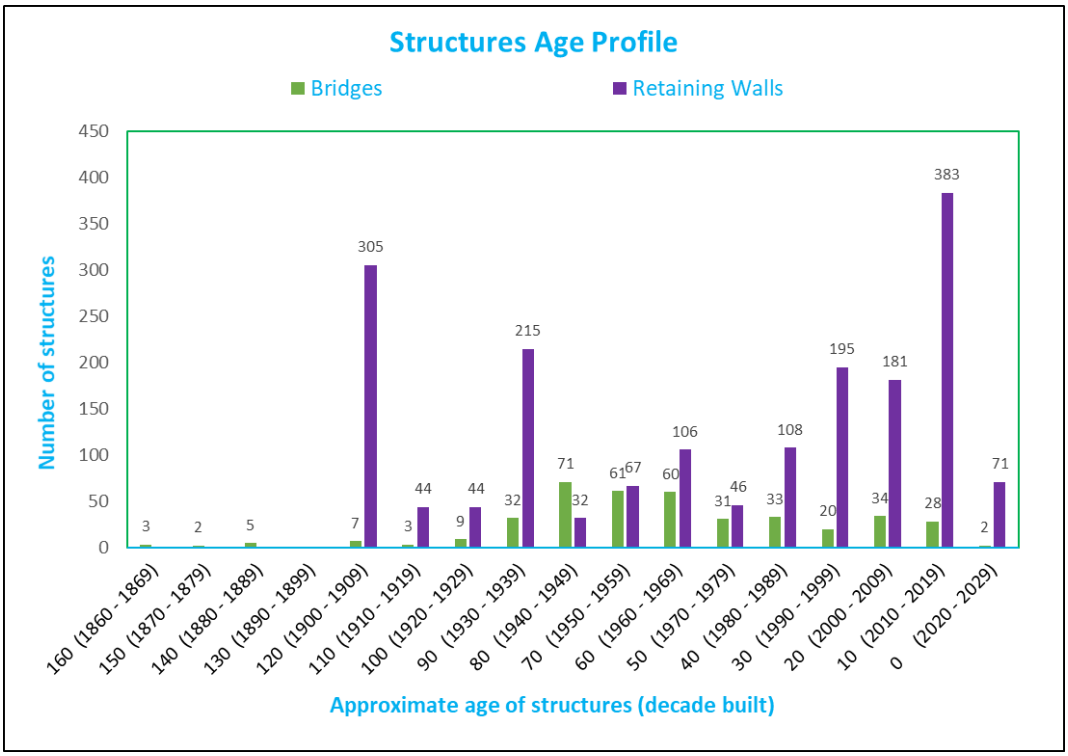


Figure 8-15: Age profile of transport structure assets

Typical design lives for each type of structural asset are given below.

Asset Type	Typical Design Life
Bridges and culverts	50 ~ 100 years
Retaining walls	50 ~ 100 years
Gantries	25 ~ 50 years
Guardrails	25 years

Design life varies depending on a number of factors:

1. Construction era – Modern structures tend to have more onerous design life requirements than older structures.
2. Criticality and importance level – eg, whether the structure is on a life-line route.
3. Material – Timber structures, especially when not treated properly, is potentially less durable than steel and concrete.
4. Durability elements – eg, concrete cover, steel protective coating and timber preservative.
5. Type of loading, number of cycles of loading and any fatigue that the structure may experience throughout its life.
6. Environmental factors – eg. Chloride induced corrosion near coast.
7. Vulnerability to natural disasters – eg. structures built on a flood plain or a high liquefaction risk zone.

8.4.3 Asset Condition

Condition inspection practice

The condition inspection of Council structures is programmed using the *NZTA S6 Bridges and Other Significant Structures Inspection Policy 2022* as a general guideline. NZTA states this policy is mandatory for state highway structures and "recommended" for local authority structures. Many Councils have adopted this policy as a baseline and modified the inspection frequencies to suit their own individual circumstance.

The S6 Policy lists four categories of inspections:

1. **General inspection**
   Includes all elements that can be inspected via foot access.
2. **Principal inspection**
   All elements shall be inspected at close quarters (preferably at touching distance or within 3m). Special access shall be used where this is not possible, eg. TTM, elevated platform, rope, boat, confined space, etc.
3. **Special inspection**
   Involves particular types of structures or particular circumstances, eg. vulnerable structural elements, posted bridges, inspection following natural disasters or overload damage, etc.
4. **Routine surveillance inspection**
   Undertaken by the network maintenance contractor identifying any defect which may affect the safety of highway users or anything else needing urgent attention.

The above is a summary of the scope for each inspection category. For full details refer to the S6 Policy document.

The inspection frequency for Council structures is determined based on:

- **Structure type**
  The more significant structures, such as bridges or retaining walls, are generally inspected at a higher frequency than less significant structures such as gantries and guardrails.

- **Risk rating**
  Risk rating is calculated by considering factors such as condition, weight restriction, availability of detour routes and resilience to natural disasters.
  Structures with higher risk ratings are inspected at a higher frequency.
  Note that the risk rating is a relatively new system developed in 2022 for bridges and retaining walls only. A similar system may be adopted for other transportation assets in the future.

The table below summarises Council's current inspection frequencies for various types of structures.

Asset Type	Inspection Frequency			
	General	Principal	Special	Routine Surveillance
Bridges	3 Yearly	6 Yearly	As required	Annually
Retaining Walls	3 Yearly (Higher risk walls) 6 Yearly (Lower risk walls)	6 Yearly (Higher risk walls) 12 Yearly (Lower risk walls)		
Gantries	3 Yearly	6 Yearly		
Guardrails	2 Yearly	6 Yearly		

Table 8-22: Structure inspection frequency

Council also monitors slip sites, including drone topographical surveys, as a prelude to eventual site remediation in the form of a new retaining wall, or erosion protection structure, as appropriate. These site are now recorded in the RAMM database.

The condition of the Council structures has been dominated by earthquake effects as mentioned previously, and the restoration of these structures to pre-earthquake levels of service has been a dominant activity over the past nine years.

Current condition of inventory

- **Bridges**

The latest round of inspections was completed in 2022. The proportions of bridges with their respective condition ratings are shown in the pie charts below.

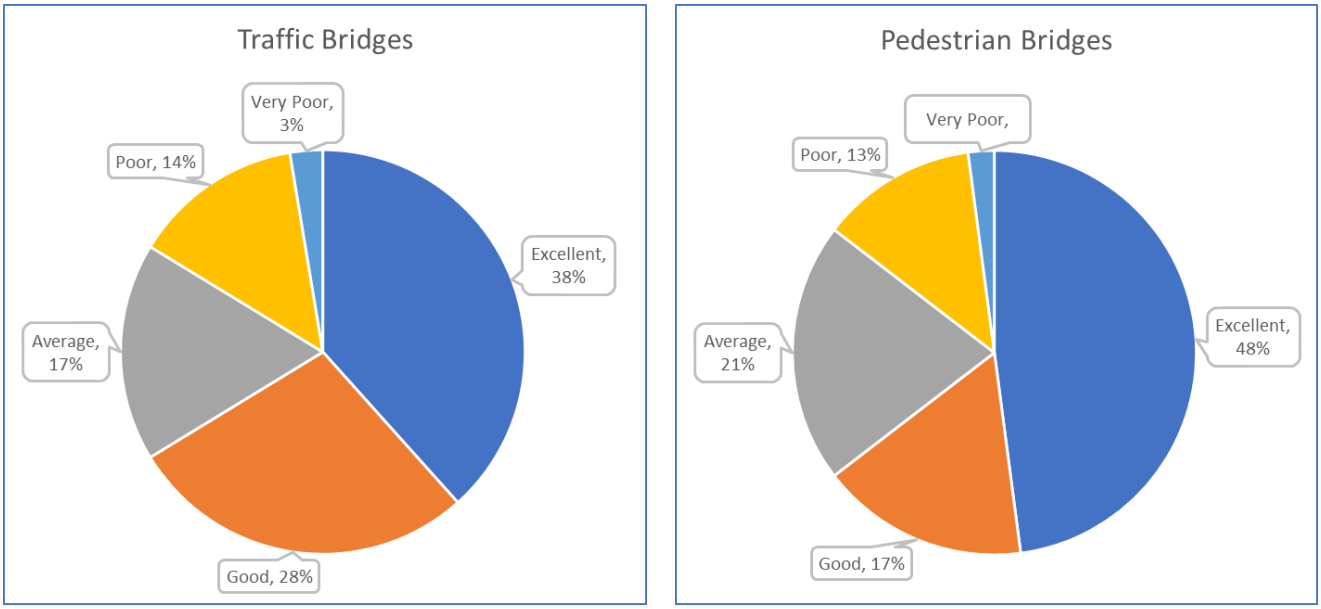


Figure 8-16: Condition rating of bridges

The overall condition rating noted during the 2022 inspections are largely unchanged from the previous round in 2018.

The bridge element with the largest decrease in condition rating appears to be the foundations. This is still relatively minor and possibly due to flood events causing erosion and scour.

Timber bridges have the poorest condition rating compared to steel and concrete bridges. They should continue to be the focus for improving the overall condition of the bridge stock.

There are still a number of bridges with outstanding earthquake damage that are yet to be repaired due to funding constraints. Given it has been 12 years since the 2011 earthquakes, these outstanding defects are starting to influence the structures remaining useful life. Structure specific asset management plans should be developed.

- **Retaining walls**

The latest round of inspections was completed in 2022 and 2023. The proportions of retaining walls with their respective condition ratings are shown in the pie chart below.

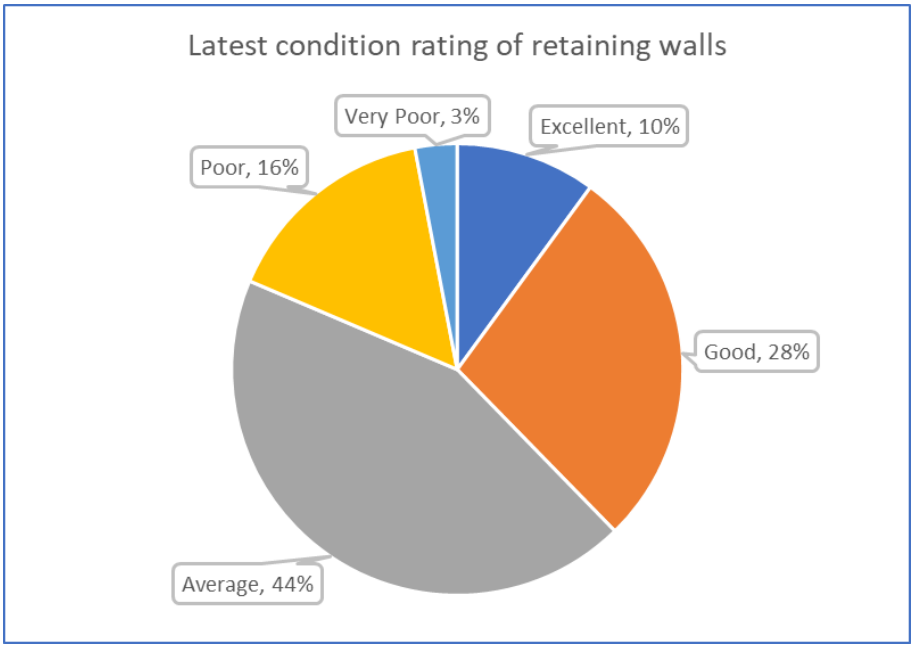


Figure 8-17: Condition rating of retaining walls

Compared to the previous inspection round in 2016-2018, the condition rating has remained the same for most types of walls, but has decreased for timber crib and concrete gravity walls. Stone and brick facing walls remain to be the type of wall with the worst condition rating. This is expected, as most of these walls were non-engineer designed and are therefore non-structural.

Following the 2011 earthquakes, there were approximately 140 damaged walls that required major repair or replacement. Most of these have been replaced with structural walls, such as timber post and panel, modular block or reinforced concrete. Walls with residual earthquake damage are mostly stone facing and gabion walls. The most common defects observed were bulging, rotation and outward displacement. Slumping of the footpath/road above was common where this movement had occurred. Most these walls are still considered sufficient to resist soil pressures regardless of past movement. Plans to monitor or undertake re-paving works above the wall have been made.

- **Gantries**

The latest round of inspections was completed in 2021. The proportions of gantries with their respective condition ratings are shown in the pie chart below.

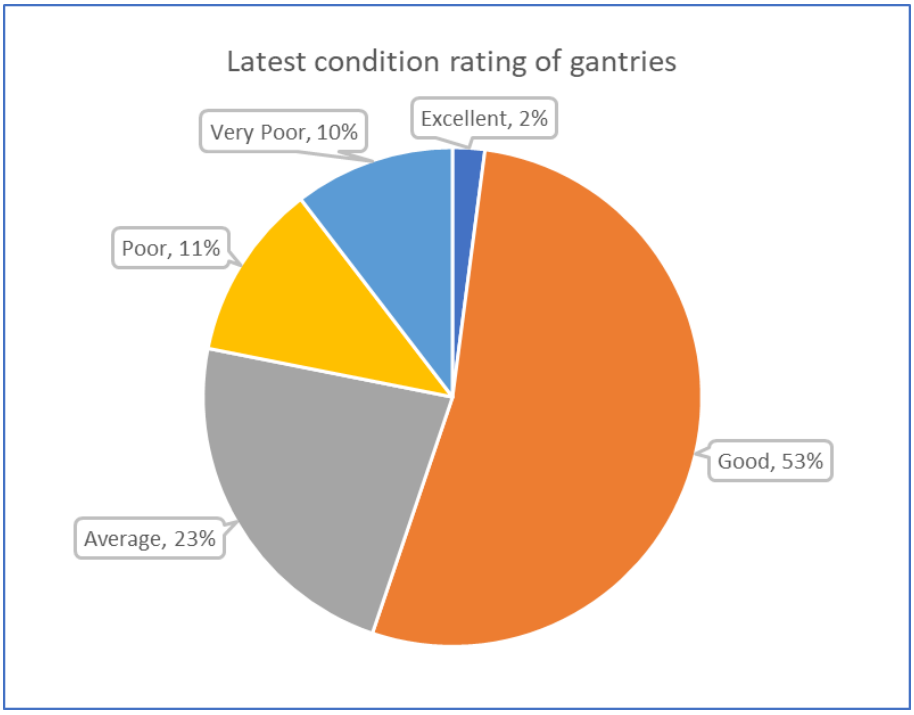


Figure 8-17: Condition rating of gantries

The overall condition rating noted during the 2021 inspections has slightly improved from the previous round in 2010. The main reason for the improvement is because the total stock has increased from installation of new gantries in the 2010's, which increased the average condition rating.

The older gantries exhibit various degree of deterioration. Common defects noted during the inspections include:

- Insufficient protrusion length of hold down bolts
- Deterioration of mortar pad
- Loose connections
- Corrosion of steel components and welds
- Deterioration to knee joint between column and cantilever
- Vehicle impact damage to sign panels
- Poor visibility of text on sign panels due to wear of reflective coating

Two gantries were identified as having critical defects. Impact damage and tilting of the posts were observed. The gantries were strapped to a concrete block at the base. The straps appeared to be inadequate to support gantry.

These were:

1. Gantry 6943 – Cranmer Square 1 East
   Subsequently replaced.

2. Gantry 7420 – Montreal Street 2 (Moorhouse to Cranmer)
   Subsequently removed but not replaced, after being identified as not needed in an Advance Direction Sign study.

- **Guardrails**

The latest round of inspections was completed in 2023. The proportions of guardrails with their respective condition ratings are shown in the pie chart below.

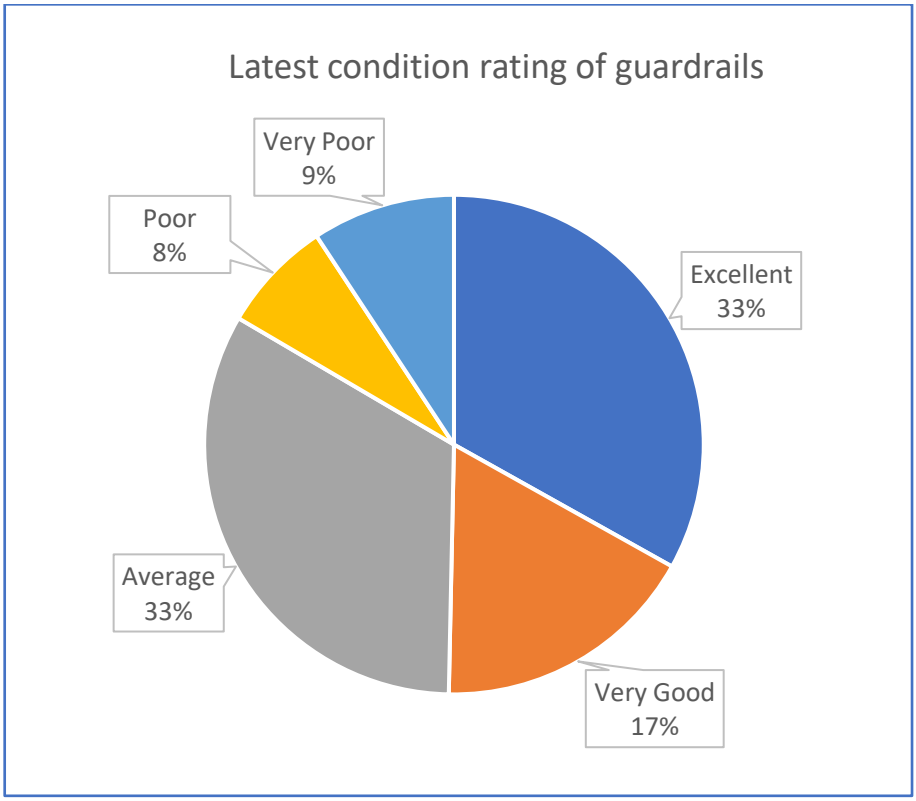


Figure 8-1 Condition rating of guardrails

Further investigations required

Following the latest round of General Inspections, a number of transport structures were identified as requiring further investigation. The main reasons for needing further investigation include special access to fully inspect structure and in-depth analysis of specific defects, which are outside the scope of the General Inspections.

For bridges and retaining walls, the further investigations will be prioritised and gradually completed over a 5 year period due to the large scale of work.

For gantries and guardrails, all sites requiring further investigation will be completed at once due to the relatively minor scale of work.

The cost of further investigation work are included under the maintenance budget. Refer Section 8.4.11.

- **Bridges**

Further investigations include:

- Confirm construction details, eg. presence of shear connectors to enable composite action.
- Undertake live load assessment to determine posting limit.
- Confined space entry required to inspect small diameter culverts.

The total cost is estimated to be in the order of $350,000.

- **Retaining walls**

Further investigations include:

- Stability analysis for walls that are bulging, rotating, or showing outward displacement.
- Determine cause of seepage and erosion.
- Rope access required to inspect whole wall due to its height.

The total cost is estimated to be in the order of $120,000.

- **Gantries**

Further investigations include:

- Clear vegetation cover to reveal base connection for visual examination.
- High access inspection required to enable close quarter inspection and weld testing along knee joints.

The total cost is estimated to be in the order of $30,000.

- **Guardrails**

Further investigations include:

- Guardrail #50069 on Summit Road was unable to be inspected because the road was closed at the time of inspection. Reinspect once road is open. Temporary traffic management is required.

The total cost is estimated to be in the order of $2,500.

8.4.4 Valuation Data

Asset valuations are established at 3-yearly intervals, this was last undertaken in June 2022. For valuation purposes structures are split into sub-categories by type.

Asset Type	Optimised Replacement Cost (ORC)	Optimised Depreciated Replacement Cost (ODRC)	Annual Depreciation (AD)
Bridges	$263,311,286.00	$112,578,134.00	$2,604,740.00
Retaining Wall	$331,351,160.73	$109,224,353.73	$7,371,897.22
Railings	$11,632,592.46	$4,980,663.99	$300,175.98

Table 8-23: Bridge and structures asset valuation data (from 2022 Valuation Report)

8.4.5 Known Problems in Network and Intervention Strategy

A number of problems have been identified relating to transport structures in Christchurch, some have been ongoing for a number of years, but remediation works have been deferred due to funding constraints. Addressing these problems will help achieve Council's strategic outcomes in the following areas:

- **Safety** - Reduced risk of structural failure and therefore reduced risk of injury or fatality
- **Access** - Reduced instance of road closures or weight/speed restrictions
- **Affordability** - Reduced maintenance cost due to improved structure condition

	Known Problems in Network	Intervention Strategy
1	A number of bridges, in particular timber bridges, are approaching the end of their remaining useful life. This has resulted in weight or speed restrictions been imposed due to condition deterioration.	Replace with new bridges designed to current standards. ~ Improves **Access** and **Safety**.
2	The non-compliant timber handrails on the Old Waimakariri River Bridge, which is on a bus route needs to be upgraded before there is a fatal penetration. In the meantime there are several non-fatal penetrations each year, which are expensive to repair.	Replace with new compliant barriers designed to withstand the appropriate vehicle collision loading. ~ Improves **Safety** and **Affordability**.
3	Concrete retaining walls built in the 1960's are rapidly deteriorating and there are increased instances of the public reporting slumping and cracking.	Assess risk, followed by repair, strengthening or replacement. ~ Improves **Safety**
4	Post-earthquake there is an increased level of risk of failure of certain retaining walls that exceeds the Council target for level of risk.	Undertake periodic survey monitoring to check for any wall movement. Develop renewal programme to assess and strengthen/replace walls with high seismic risk. ~ Improves **Safety**
5	Many post-earthquake repairs to retaining walls were focussed on 'make safe' and further work is required to fully repair some assets.	Plan for full repair works under the maintenance programme. ~ Improves **Safety**
6	At current funding levels and frequency of extreme weather events, slips that compromise road serviceability and safety are occurring at a faster rate than can be remediated with new structures.	Increase annual funding allowance for remediation of slips. This will reduce backlog and ensures roads can return to an operational state as quickly as possible. ~ Improves **Access** and **Safety**.

Table 8-24: Known problems in network and intervention strategies

8.4.6 Levels of Service

There are currently no specific level of service measures relating to bridges and structures. However the Council has certain legal obligations as stipulated by Schedule 10 of the Local Government Act, and as owners of the structures in relation to the Building Act and the Building Code. As such Council is obligated to maintain structures such that they may be safely used for their intended purpose by members of the public. Council may choose to divest this obligation by closing or disposing of them through the available legal channels.

Further to this, there are a number of structural methods available to determine the performance of structures. These are set out in the requirements of Waka Kotahi guidance documents and the Building Act.

The Waka Kotahi references include:

8. Highway Structures Design Guide 2016
9. SP/M/022 - Bridge Manual – design of new bridges and retaining walls, assessment of existing bridges - Includes geometrical requirements such as vertical clearances (Appendix A, Fig A2)
10. S6:2222 – Bridges and other significant highway structures inspections policy
11. S7:2022 – Geotechnical structures inspection policy (note, geotechnical structures used to be part of S6)
12. SM30:2020 – Management of state highway bridges, geotechnical structures and other significant structures
13. Road safety barrier systems (TM2000, TM2001, TM2002, TM2003, TM2004, TM2005, TM2008, TM2009, TM2010, TM2011, TM2012, TM2013)
14. M23 Road safety barrier systems 2022 – specification and guidelines
15. ZH/MS/01 2016 - Health and Safety in Design Minimum Standard 2016.
16. WC114 – Structures maintenance

(Where not covered by Waka Kotahi, the default reference is Austroads).

Building Act requirements include:

1. NZS4121:2001 Design for Access and Mobility
2. Building Code, Section D1, Access Routes

8.4.7 Gap Analysis

This section outlines how Council's roading structural assets are currently performing against the key Levels of Service measures detailed above.

- **ONRC Accessibility CO1** - proportion of the network not available to heavy vehicles.

Bridges with weight or width restrictions limit the types of vehicles that can use them. While this is less of an issue within the city limits (due to the high number of route options), it can be an issue for parts of the Banks Peninsula.

- **Compliance with the Building Code**

As a building owner Council is obliged to comply with the Building Act and the Building Code. Bridges and retaining walls in particular are a challenge as they are considered buildings under the Act and are used by the public on a regular basis.

Since the 2010 and 2011 earthquakes the Building Code requirements have become more onerous. Further to this Council has adopted policy such that all buildings meet 67% NBS.

It is worth noting that the Earthquake Prone Building provisions of the Building Act has a series of exclusions, however staff are of the view that the guidance and targets in the Act are relevant for all structures – owners have 2.5 years as of July 2017 to properly inspection their stock, then 7 years to rectify earthquake prone structures in the public realm, and a further 7 years for all other structures.

8.4.8 Options to Address Gaps

Council has developed the following options to address the identified gaps in the network for roading structure assets.

Options	Output	Benefit / Consequence
Maintain current level of investment Keep the quantity of work static.	Approximately 4 bridges and 5 retaining walls per year.	Not achieve any improvements to network condition. Likely reduction in customer satisfaction and higher costs in medium to long term as assets deteriorate.
Increase investment over time Incrementally increase spending over a 5 year period.	Ramp up the programme over 5 years to achieve 5 bridges and retaining walls per year.	Sustainable increase in quantity of work. Return network to appropriate state over 10 – 20 year period.
Increase Investment now Increase investment for the next 3 financial years.	Deliver on the back log of works over the next 3 years.	Concentrated effort to get assets back to appropriate standard. High level of capital outlay, and likely disruption to residents due to increased scale of works.
Run to failure Don't plan to remediate assets until they have clearly broken.	Don't plan for a stable quantity per year, wait for assets to break and respond accordingly.	Uncertainly of workload, and likely higher costs due to reactive nature of work.

Table 8-25: Option development

8.4.9 Recommended Option

Council recommends adopting the increase investment now option for the maintenance, operation and renewal of its roading structure assets, as it considers this the best option to deliver the strategic outcomes.

This option aims to deliver ONRC fit-for-purpose Levels of Service, and plans to renew assets before they fail.

A particular area of focus for increased investment is retaining walls, as the backlog and consequential risk is high for this part of a portfolio.

New retaining walls and geotechnical structures form part of the above and they are effectively component renewal of the road itself.

- **How is this option optimised and does it address the issues?**

Value for Money – where possible components of structures are renewed rather that the entire structure. This targeted use of money can extend the life the structure and make the money go further. Also smaller scale works can be built faster and this reduces the disruption to road users.

Whole of Life Costs – this is assessed against an expected life of 50-100 years depending on the structure e.g. timber retaining walls are 50 years, concrete bridges are 100 years.

Life Cycle Management – like the other major transport assets, structures are renewed based on condition in accordance with the building code and the Waka Kotahi NZ Transport Agency Bridge Manual.

8.4.10 Operations and Maintenance Plan

Operations

Bridge live load capacity

Design loadings have increased to suit as vehicle sizes and carrying capacity have increased through time. Table 8-22 below summarises the load capacity of the traffic bridges and culverts.

Load Capacity	Major Arterial	Minor Arterial	Collector	Local	TOTAL
Overload	-	-	2	-	-
Class 1	15	26	4	0	38
HPMV	2	1	1	4	8
Restricted	-	2	-	1	1
TOTAL	17	29	7	5	47

Table 826: Summary of bridge and culvert load capacity

Load capacity is not usually a limiting factor within the city as alternative routes are almost always available, although previously accepted alternative routes may no longer be appropriate in the central city due to post-earthquake changes to the CBD.

The posted bridges tally is due to reduce by two with the replacement of the old timber Poynder Avenue and Garden Road bridges in 2023.

Maintenance

Maintenance works are undertaken to provide for the safety of users, and protect the investment in bridges, culverts and retaining walls by maintaining the life of the structure and minimising repair costs.

Waka Kotahi classifies maintenance work for structural assets under two types of work categories, these are:

- **Work Category 114 – Structures Maintenance**

  Routine work necessary to maintain the function, structural integrity and appearance of structural assets, such as:

  - Minor concrete spall and crack repair

  - Repairs to handrails and guardrails associated with structures

  - Cleaning and painting of steel members

  - Stream clearing and debris removal

- **Work Category 215 – Structures Component Replacement**

  Replacement and renewal work such as:

  - Major concrete spall and crack repair

  - Replacement of deteriorated bridge deck and beams

  - Installation of anchors through reinforced concrete retaining walls

  - Construction of shotcrete facing in front of deteriorated stone walls

- Construction of scour protection using gabion baskets and riprap

Maintenance programmes are developed from the schedules of defects identified during the inspections. Recommended timeframes for various maintenance work priorities, based on interpretation of Council risk policy, are as follows:

- Urgent Prompt action required – within 3 months
- High Complete within 1 year
- Medium Complete within 2 years
- Low Complete within 5 years or as resources allow

The estimated costs and recommended timeframe of maintenance work are included in the inspection reports. A summary is shown in the pie charts below.

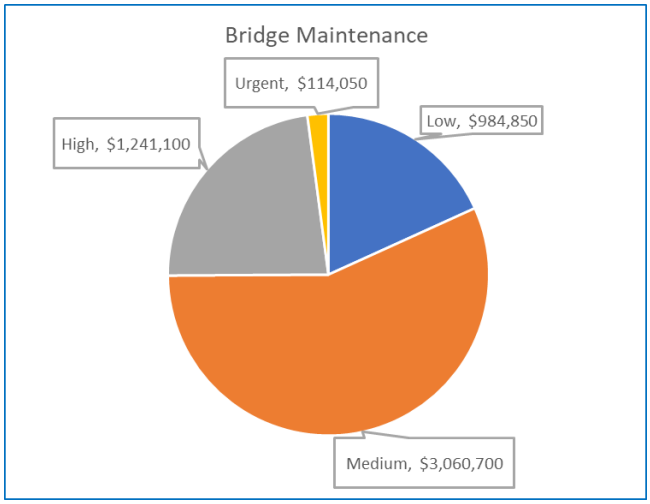


Figure 8-2 Bridge maintenance priority and cost

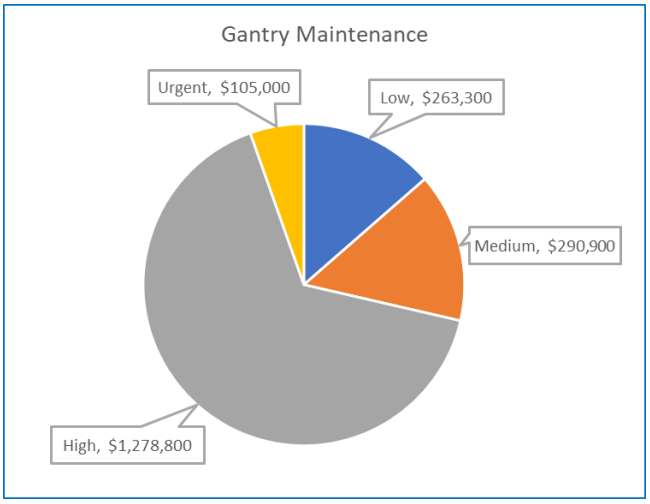


Figure 8-4 Gantry maintenance priority and cost

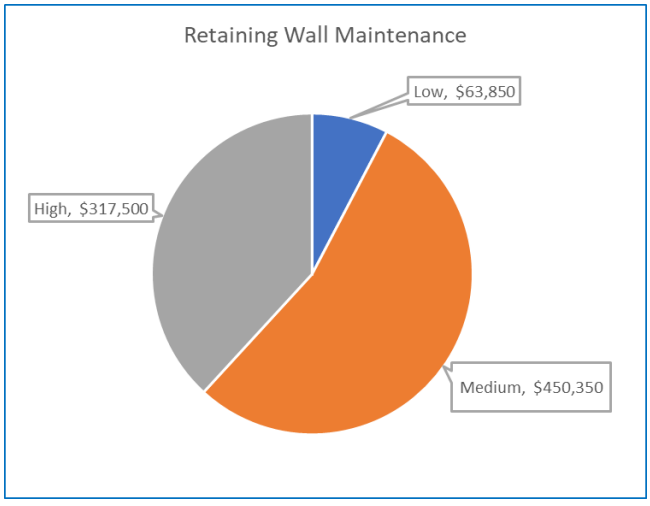


Figure 8-3 Retaining wall maintenance priority and cost

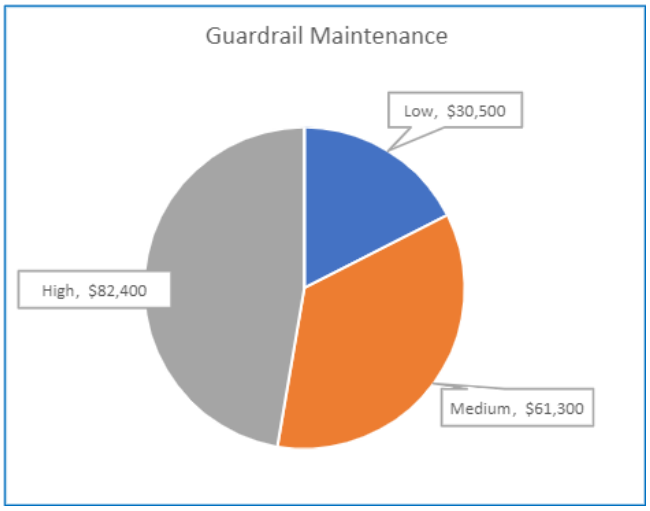


Figure 8-5 Guardrail maintenance priority and cost

8.4.11 Maintenance Expenditure

Work Type	OPEX Budget ($M)									
	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34

Depreciation	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
Operations								?	?	?
Maintenance								?	?	?
Total								?	?	?

Table 8-27: Structures OPEX expenditure including maintenance

8.4.12 Renewals Plan

Asset renewal in the bridges and structures activity is generally undertaken when a structure, or a significant component of a structure has reached the end of its economic life. Following the earthquakes, a number of significant bridges and retaining walls were repaired / replaced by SCIRT.

A significant programme of bridge renewals has been completed over recent years. This work has focussed on replacing timber bridges with concrete structures.

Some of the common types of renewal works undertaken include:

- replacement of an entire bridge, culvert or retaining wall; or replacement of individual components (e.g. timber bridge deck or piers);
- rehabilitation of structural components (restoring the integrity of structural components); and
- major retrofitting due to problems identified in conjunction with natural hazard studies (e.g. tieing back retaining walls using anchors to reduce risk of collapse in a seismic event).

One of the issues in determining future funding needs is the requirement to address the rate of retrofitting of existing structures in parallel with the major structure renewal / replacement programme. Renewal and replacement needs are identified from the planned inspection programmes. Prioritisation of works and the selection of renewal options is made by the asset engineer on the basis of economic evaluations using the Waka Kotahi NZ Transport Agency criteria for transportation structures, with projects being justified when the future savings achieved by doing the work exceeds the cost of the work and meets current benefit / cost cut-off criteria. The lowest cost option, considering all life-cycle costs, is selected except where funding limitations necessitate shorter term (lower cost) options for works that cannot be deferred.

- **Bridges and culverts**

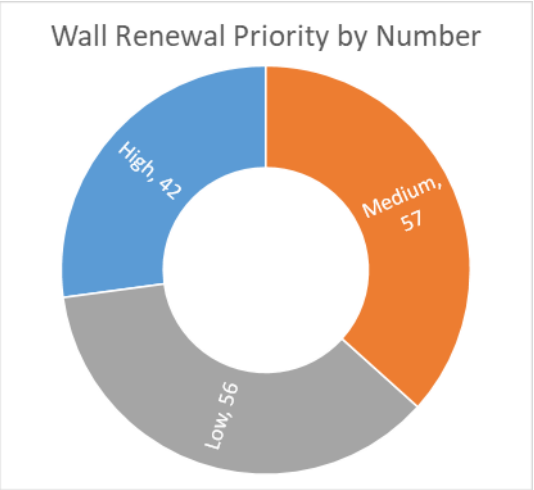
Relative remediation priorities for bridges and culverts, which relate generally to their condition, are shown in the Figure above.

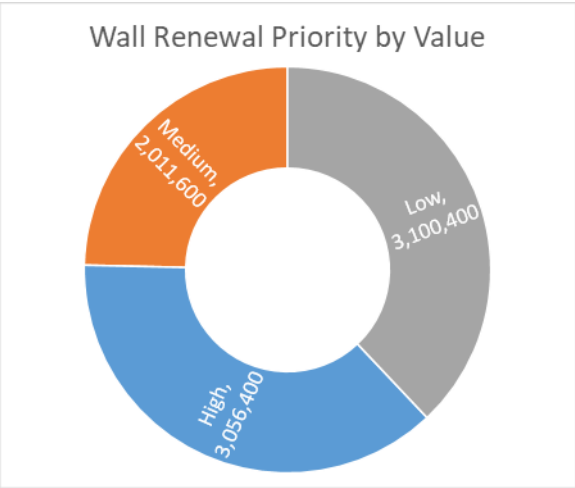
The earthquakes caused damage to many structures, with the priority for repair / rebuild is driven in part by the criticality of routes post-earthquake, which is dependent in turn on the identification of retreat and new development areas.

A number of earthquake damaged bridges were repaired or replaced by Stronger Christchurch Infrastructure Rebuild Team (SCIRT), but with SCIRT having been disestablished, bridge renewals are now being managed under Council's bridge renewals programme. The current need for replacement has been determined by the ongoing structural inspection programme. This renewal programme is based on the:

1. continuation of the Banks Peninsula timber bridge replacement programme;
2. consideration of asset age and condition for non-earthquake damaged bridges; and
3. need to maintain target levels of service

- **Retaining Walls**





Total Renewal Numbers = 155 walls Total Renewal Value = $8,168,400

Figure 8-17: Retaining wall renewal priority

With a nominal current annual renewals budget of $800,000 it would take 10 years to complete the current backlog of renewals work, and 8 years to complete the high and medium priority component, which is estimated to cost $5,068,000. Recommended timeframes for various renewal work priorities, based on interpretation of Council risk policy, are as follows:

- High Complete within 1-2 years
- Medium Complete within 2-5 years
- Low Complete within 10 years, subject to engineer review and as resources permit

To complete the high and medium priority renewals work within the maximum recommended 5 years, the annual renewals budget would need to increase to $1.25 million, over that period. Completing it sooner would require a corresponding increase in annual funding.

Furthermore, there is no money currently budgeted for the retrofitting of walls that would come within the definition of Earthquake Prone Buildings (EPBs), if retaining walls were included within the definition.

A number of our stone facing walls are above footpaths and could be hazardous in earthquakes – the earthquake itself makes no distinction. In any case, it could be argued that these walls are not retaining walls, they are non-structural facings, and, as such, could come into the scope of the Earthquake Prone Building (EPB) regulation. Therefore it is recommended that in the interests of public safety, stone facing walls be treated as if they were potential EPBs.

There are 18 walls with heights >= 1.5m in the EPB category, with an estimated retrofitting cost of $3,731,500. Completing this work within 7-15 years, i.e. an annual spend of $248,800 - $533,000, would be to a time scale that sits comfortably with legislative requirements.

Of the 815 walls requiring maintenance, valued at $2,429,200, some 61.6%, or a value of $1,496,400, is structural. This work could be capitalised because it extends the life of the wall.

Renewal Quantities and Expenditure

Work Type	Quantity									
	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Bridge renewal	5	5	5	5	5	5	5	?	?	?
Retaining wall renewal	10	10	10	10	10	10	10	?	?	?
New retaining walls, planned	4	3	3		2	2	2	?	?	?

New retaining walls, contingent	5	5	5	5	5	5	5	?	?	?
Guardrail renewal	4	6	6	6	2	2	2	?	?	?
Gantry Renewal	2	2	2	2	2	2	2	?	?	?
Total	**30**	**31**	**31**	**28**	**30**	**30**	**30**	**?**	**?**	**?**

Work Type	CAPEX Forecast ($M)									
	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Total	13.64	7.30	7.29	6.74	11.41	17.94	2.30	?	?	?

Table 8-28: Proposed renewal work programme and CAPEX forecast for bridges/retaining walls/gantries/guardrails

8.4.13 Capital Development Plan

The development and acquisition of structural assets are generally triggered through:

- construction of new bridges to allow land development or to achieve traffic efficiencies by providing links across significant features (waterways, railways, grade separation etc.)
- replacement of, or additions to, existing bridges to upgrade traffic capacity and / or load capacity
- bridges are sometimes acquired through the subdivision process, but this is relatively uncommon
- new retaining walls necessitated by the need to restore road functionality caused by slips following severe weather events or gradual climate change
- road safety improvements requiring the construction of guardrails
- Way finding needs requiring the construction of sign gantries

Developments are prioritised by considering the total benefits to road users and the land transport system using the economic evaluation procedures found in the Waka Kotahi NZ Transport Agency Economic Evaluation Manual.

The budgets allowed in the capital programme are summarised in Section 9.

8.4.14 Disposal Plan

Disposal activity for structural assets relates to the demolition of structures and sale of surplus materials. Some cost recovery may be possible by recycling materials that are still in usable condition, eg timber and steel beams on bridges.

It is not very often that a structure is removed without being replaced by the same or similar structure in the same or similar location. As such, in most cases the disposal cost is generally included in the budget of the renewal project. Therefore no budget is allowed for the disposal of structural assets.

RAMM is updated to remove disposed assets from the database and new assets are added in line with data standards.

8.5 Street Lighting

8.5.1 Asset Inventory

Council is responsible for managing 41,765 street lights and 25,521 poles[10]. There are an additional 1,700 (non-Transport Unit) lights connected to the street lighting network which are associated with Parks, Facilities and Social Housing. These assets include poles (where the electricity network is underground), outreach arms, light fittings, Central Management System (CMS) for controlling lights and some of the cable.

Detailed asset data relating to the road lighting system is stored in RAMM. Data is stored on an individual pole/light basis and includes condition grading data. The transport road lighting network consist of lights for roads including zebra crossings, cycle and pedestrian ways and decorative lighting. The purpose of street lighting differs according to the use of the space:

- arterial and collector traffic routes - the objective is to provide a lighted environment that is conducive to the safe and comfortable movement of vehicular and pedestrian traffic at night and the discouragement of illegal acts, while protecting the integrity of the night time environment through control of light spill and glare;
- local (low volume) roads - the objective is to provide a level of light that is sufficient to allow pedestrians to orientate themselves, detect potential hazards and discourage fear of crime while protecting the integrity of the night time environment through control of light spill and glare; and
- pedestrian areas (malls and Inner City) – to provide a level of light that promotes safe night time use of significant and popular areas.

Light / lamp type	Quantity
LED	32,893
High pressure sodium	6,924
Fluorescent	1,160
Other	788

Table 8-27: Quantity of lighting assets (as at February 2021)

Asset valuations are established at 3-yearly intervals. For valuation purposes road lighting assets are split into sub-asset categories (pole, bracket / arm and light).

Assets	**Optimised Replacement Cost** (ORC)	**Optimised Depreciated Replacement Cost** (ODRC)	**Annual Depreciation** (AD)
Pole	$54,121,943	$30,565,615	$1,333,459
Bracket / arm	$20,019,764	$12,347,006	$497,138
Light	$35,860,085	$16,372,338	$1,661,253
Total	**$110,001,791**	**$59,284,959**	**$3,491,850**

Table 8-28: Lighting asset valuation data (from 2019 Valuation Report)

8.5.2 Problems

The following problems have been identified relating to street lighting in Christchurch:

[10] As at February 2021

- the current pole renewal programme is not keeping up with replacement of 'poor' and 'very poor' condition lighting poles and outreach arms which increases risk of significant failure or collapse. Some of this damage is due to slow deterioration of concrete poles due to minor cracking during the earthquakes;
- the streetlight network is prone to damage from car versus pole crashes adjacent to roads;
- substandard illumination on the road, particularly at intersections, can contribute to night-time crashes; and
- investment is required to complete the upgrade to more energy efficient LED lights, current lamps are becoming difficult to source and more expensive.

8.5.3 Benefits

Addressing these issues will help achieve Council's strategic outcomes as shown in the table below.

Journeys are safe	Journeys are reliable	Customers have choice	Journeys are comfortable	Council is responsive to the needs of customers
Street lighting helps address the high number of fatal and serious crashes that occur at intersections in Christchurch	n/a	Street lighting helps encourage walking trips at night	Street lighting helps improve the perception that Christchurch is a walking friendly city	The conversion of the street light network to LEDs will reduce energy consumption and maintenance costs and aligns with climate change priorities

Table 8-29: Alignment with strategic outcomes

8.5.4 Consequences of Not Addressing the Problems

Poor lighting that is non-compliant with current lighting standards, increased risk of asset failures, reduced amenity value. These may contribute to night-time vehicle crashes and other issues.

8.5.5 Differential Levels of Service (dLoS)

Te Ringa Maimoa has been workshopping in partnership with road controlling authorities (RCA's) and have developed a new tool. The new tool provides options to evaluate the 10-year programme & quantities of work, alongside cost, risk and the level of service, which each programme option provides.

The idea is to provision visibility of the risk and level of service associated to each programme option, and associated cost.

To achieve this, each asset type needs to consider its current service level, gaps, and determine what outcomes the asset requires.

Below displays the level of service differential outcomes for Council's streetlight assets.

Asset type	Streetlights
Asset Owner	CCC Transportation
Number of Assets	27,324
Metric	Reduce volume of structures deemed as a poor, or a very poor level of service (LoS)
LoS Indicator	Age, Condition & Risk weightings combined, determinesa the LoS Indicator & renewals strategy
Current LoS	The current LoS is determined by the current Poor & Very Poor Los volumes, divided by the total amount of assets
Risk	Risk is determined by likelihood x consequence - consequence determined by ONF (GT & W cat's)
Cost	Average Cost of Streetlight Pole (can vary due to size and TTM)

Cost			Service				Risk	
Programme			Service Level		Performance Measure		Risk	Risk
Annual Ave Qty	Annual Ave Cost	Prog Cost	Option	Benefits or Consequence	Metric	Target	Score	Rating
500	$ 2,299,441	$22,994,414	A	The current spend trajectory determines that the LoS will reduce from 68% down to 50% and that the risk portfolio will grow. A large volume of assets are coming to maturity.	Reduce volume of structures deemed as a poor, or a very poor level of service (LoS)	50%	15	Very High
840	$ 3,864,878	$38,648,781	B	A 17% increase in LoS - increasing from 68% to 85%. Reducing current risk over time, but unable to deal to future risk	Reduce volume of structures deemed as a poor, or a very poor level of service (LoS)	85%	9	Moderate
989	$ 4,546,915	$45,469,154	C	A 32% increase in LoS - increasing from 68% to 100%. Reducing current risk to zero, and eliminate any future risk which comes into play.	Reduce volume of structures deemed as a poor, or a very poor level of service (LoS)	100%	3	Low

Below the three programme options are outlined.

Option A The current spend trajectory determines that the LoS will reduce from 68% down to 50% and that the risk portfolio will grow. A large volume of assets are coming to maturity.

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Ave	Total
Programme Cost												
Qty	500	500	500	500	500	500	500	500	500	500	500	5,000
Rate (Ave $)	$ 4,200	$ 4,284	$ 4,370	$ 4,457	$ 4,546	$ 4,637	$ 4,730	$ 4,824	$ 4,921	$ 5,019	$ 4,599	
Cost	$ 2,100,000	$ 2,142,000	$ 2,184,840	$ 2,228,537	$ 2,273,108	$ 2,318,570	$ 2,364,941	$ 2,412,240	$ 2,460,485	$ 2,509,694	$ 2,299,441	$ 22,994,414
Service												
Target (%)	68	66	64	62	60	58	56	54	52	50	59	
Risk												
Likelihood	3	3	4	4	4	4	5	5	5	5		
Consequence	3	3	3	3	3	3	3	3	3	3		
Risk Score	9	9	12	12	12	12	15	15	15	15		
Risk Cost												
Emissions												
Carbon (tonnes)												

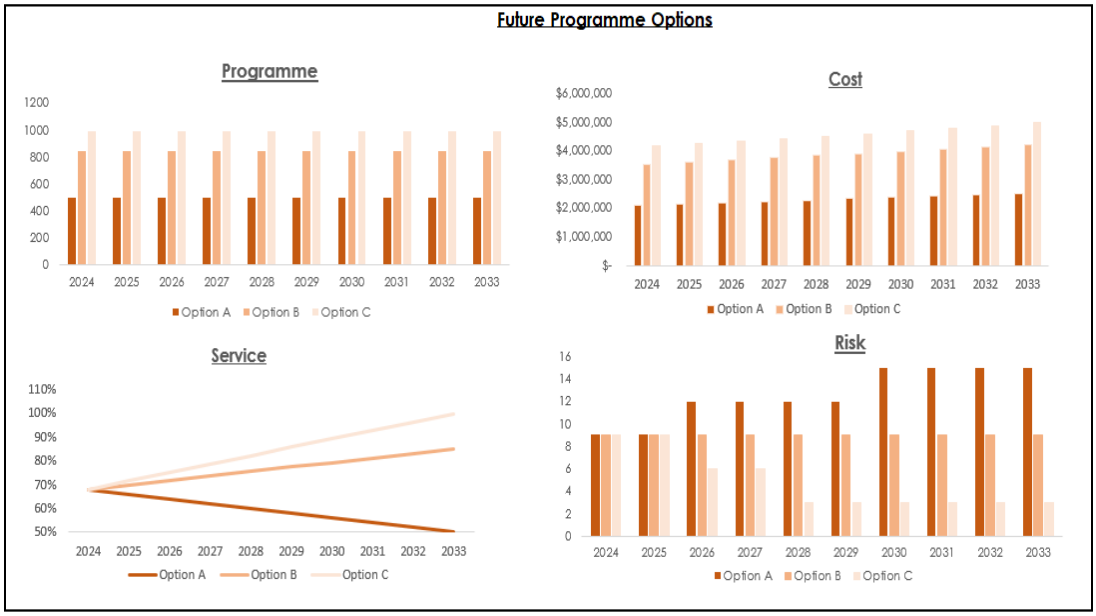
Option B A 17% increase in LoS - increasing from 68% to 85%. Reducing current risk over time, but unable to deal to future risk

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Ave	
Programme Cost												
Qty	840	840	840	840	840	840	840	840	840	840	840	8,404
Rate (Ave $)	$ 4,200	$ 4,284	$ 4,370	$ 4,457	$ 4,546	$ 4,637	$ 4,730	$ 4,824	$ 4,921	$ 5,019	$ 4,599	
Cost	$3,529,659	$ 3,600,252	$3,672,257	$ 3,745,702	$ 3,820,616	$ 3,897,029	$3,974,969	$4,054,469	$ 4,135,558	$ 4,218,269	$ 3,864,878	$ 38,648,781
Service												
Target (%)	68	70	72	74	76	77	79	81	83	85	76	
Risk												
Likelihood	3	3	3	3	3	3	3	3	3	3		
Consequence	3	3	3	3	3	3	3	3	3	3		
Risk Score	9	9	9	9	9	9	9	9	9	9		
Risk Cost												
Emissions												
Carbon (tonnes)												

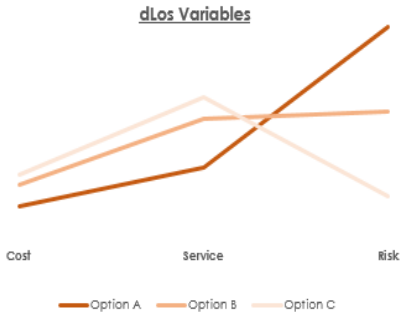
Option C A 32% increase in LoS - increasing from 68% to 100%. Reducing current risk to zero, and eliminate any future risk which comes into play.

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Ave	
Programme Cost												
Qty	989	989	989	989	989	989	989	989	989	989	989	9,887
Rate (Ave $)	$ 4,200	$ 4,284	$ 4,370	$ 4,457	$ 4,546	$ 4,637	$ 4,730	$ 4,824	$ 4,921	$ 5,019	$ 4,599	
Cost	$ 4,152,540	$ 4,235,591	$4,320,303	$ 4,406,709	$4,494,843	$ 4,584,740	$4,676,434	$4,769,963	$4,865,362	$ 4,962,670	$ 4,546,915	$ 45,469,154
Service												
Target (%)	68	72	75	79	82	86	89	93	96	100	84	
Risk												
Likelihood	3	3	2	2	1	1	1	1	1	1		
Consequence	3	3	3	3	3	3	3	3	3	3		
Risk Score	9	9	6	6	3	3	3	3	3	3		
Risk Cost												
Emissions												

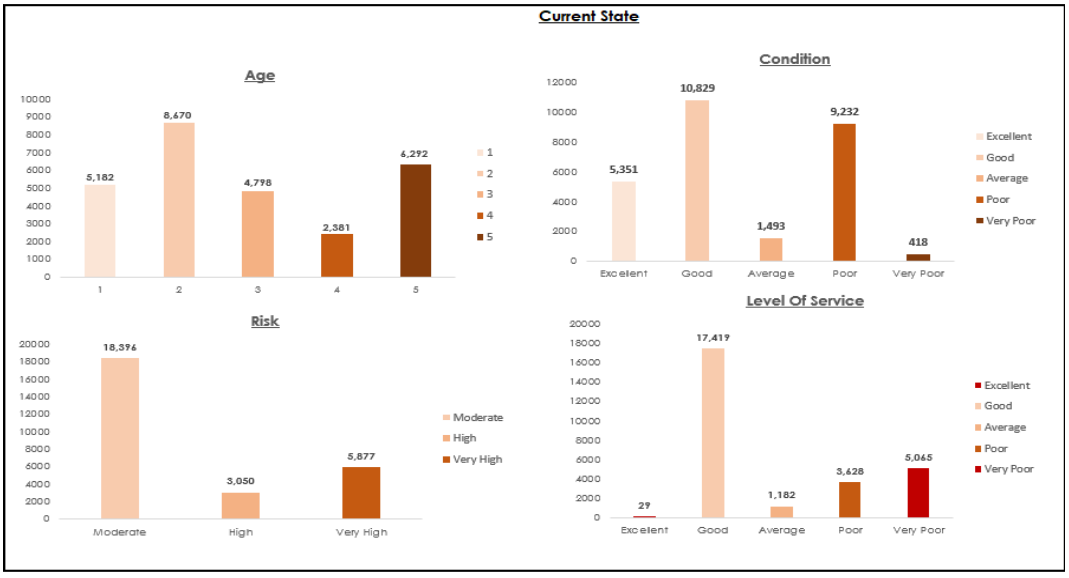
The three programme options are then displayed in the below graphs, to compare the outcomes.



The three options are also summarised into one graph as follows. This assists clear decision-making with respect to the funding allocation required to affect the desired service, acknowledging the respective levels of risk.



To supplement this approach, the current state is displayed as below, with data taken from RAMM.



This dLOS information is as calculated on 29 March 2023. As further data is gathered and/or our data is cleansed and improves over time, we will have a better understanding of cost and risk by employing this method with the improved data.

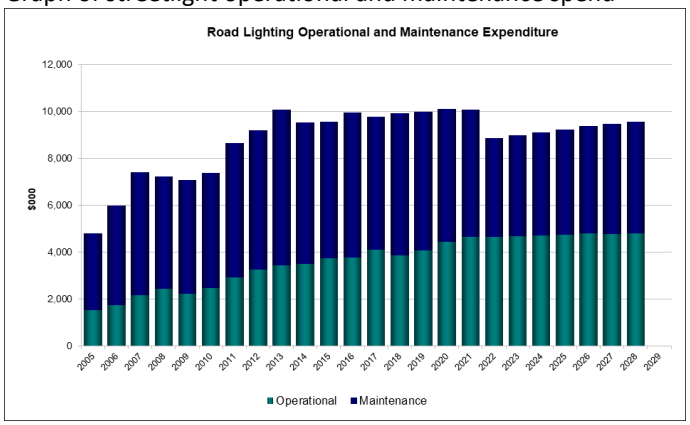
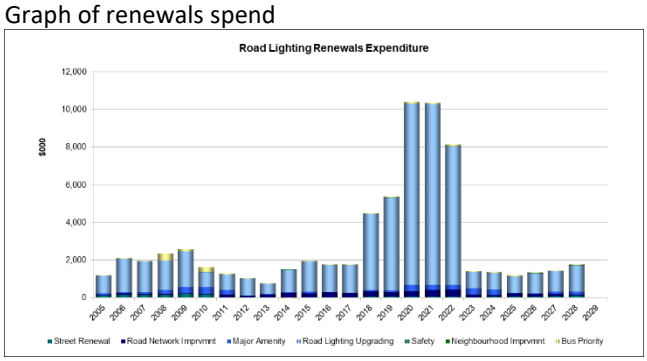
8.5.6 Levels of Service

Street lighting contributes to a number of the ONRC performance measures and Council measures, the most relevant of these measures are listed below:

- ONRC Safety TO5 – loss of driver control at night;
- ONRC Safety TO1 – crashes on poles;
- ONRC Safety TO9 – vulnerable users; and
- ONRC Cost efficiency CE5 – overall network cost.

8.5.7 Gap Analysis

This section outlines how Council's street lighting assets are currently performing against the key levels of service measures detailed above.

ONRC Safety TO5 – Loss of driver control at night	A 2015 study in NZ showed the safety benefits of road lighting varies depending on crash type. Road lighting is not effective at reducing loss of control or cornering crash types.
ONRC Safety TO1 – Crashes on poles	A 2015 study in NZ showed the safety benefits of road lighting varies depending on crash type and is extremely effective for reducing collisions with pedestrians and obstructions, and highly effective for reducing manoeuvring and rear end crash types.
ONRC Safety TO9 – Vulnerable users	A 2015 study in NZ showed the safety benefits of road lighting varies depending on crash type and is extremely effective for reducing collisions with pedestrians and obstructions, and highly effective for reducing manoeuvring and rear end crash types.
ONRC Cost efficiency CE5 – Overall network cost	Graph of streetlight operational and maintenance spend  Graph of renewals spend 
CCC – Asset Condition Condition data is updated at each maintenance visit. Assessments consist of a visual inspection with assets being graded from 1 (excellent) to 5 (very poor).To minimise the risk of collapse or items falling, assets	Pie chart showing result of visual inspections – proportion of assets by condition grade

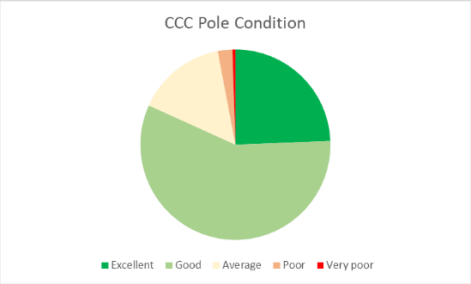
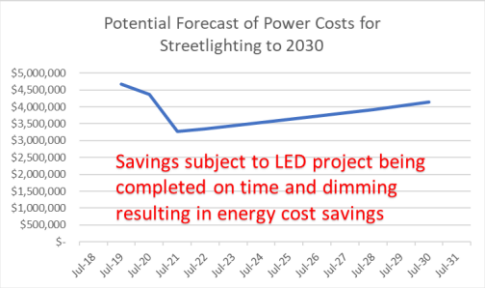
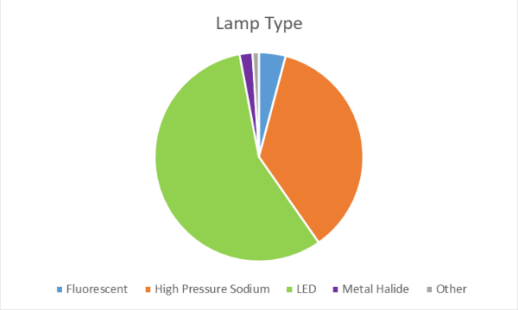
identified in category 4 or 5 are considered for renewal. The condition data shows that most poles are in good or excellent condition. Grade 5 poles require urgent attention to prevent collapse. Grade 4 poles are targeted for renewal to prevent them becoming Grade 5. In 2012 all new luminaires were required to be LED type. LEDs offer significant power savings and reduced greenhouse gas emissions compared to the technologies previous used. The Accelerated LED Replacement Project which started late 2017 with a completion date of 30 June 2021. The project will replace all remaining old technology (e.g. high pressure sodium vapour, fluorescent etc) luminaires that qualify for Waka Kotahi subsidy. At 25 August 2019 there were 39,411 Waka Kotahi subsidised lights, 19,811 of which are LED. There are 1,183 non-subsidised Transport Unit lights and 1,700 lights associated with other Council Units.	 Graph showing electricity cost. The drop is due to the current LED conversion project  Graph showing lighting assets by lamp type 
Wider Considerations Standard AS/NZS1158 Lighting for Roads and Public Spaces outlines requirements in relation to the road lighting activity. Waka Kotahi M30 Specification and Guidelines for Road lighting Design provides further recommendations and guidance. The Council complies with these guidelines as a minimum. In addition to these: ▪ Reliability is controlled by performance criteria stipulating that 99% of lights are required to be operating at all times, and that light output is maintained at or above the designed levels; ▪ Safety is considered in three categories: the standard of lighting provided, asset failure (e.g. pole collapse), and the location of poles to minimise the risk of injury from car accidents.	▪ Adverse effects from lighting is currently not measured at a network level but is considered and minimised during the design process of each lighting scheme; and ▪ Energy efficiency is an important indicator of capacity and performance. Electricity charges make up approximately 80% of the operational/maintenance costs each year. Upgrading the Council's Waka Kotahi subsidised lights to LED and introducing dimming during periods of low use of the roading network is expected to reduce energy consumption by approximately 69% and greenhouse gas emissions by 1,500 tonnes per year. ▪ Through the ongoing monitoring and improvement of the above measures, road lighting capacity and performance is optimised.

Table 8-30: Gap analysis and evidence base

8.5.8 Options to Address Gaps

Council has developed the following options to address the identified gaps in the network for its street lighting assets.

Options	Output	Benefit / Consequence
Status quo Make no changes to the current approach to street lighting maintenance and renewal.	Maintain and clean lights at regular intervals, and repair damage. Complete upgrade of Waka Kotahi subsidised lights to LED by June 2021	High proportion of lights are operating, and damage / safety issues are addressed within appropriate timeframes. Majority of lights converted to LED reducing electricity consumption
Increase investment over time Pole Renewal	Increase pole renewal budget from FY 2024	Poles and outreach arms are safe and risk of failure or collapse is minimised.
Increase Investment now Upgrade remaining council owned 'old technology' lights to LED.	Upgrade remaining Council owned street lights to LEDs between July 2021 and 2024.	Reduce electricity consumption of these lights. Reduced maintenance costs and eliminate supply issues relating to old technology lamps (likely to become more difficult and expensive as demand drops)
Run to failure Don't plan to remediate assets until they have clearly broken.	Don't plan for a stable quantity per year, wait for assets to break and respond accordingly.	Uncertainly of workload, and likely higher costs due to reactive nature of work.

Table 8-31: Street lighting option development

8.5.9 Recommended Option

Council recommends continuing with the 'increase investment now' and 'increase investment over time' options for the maintenance, operation and renewal of its street lighting assets, as it considers this the best option to deliver the strategic outcomes.

This option aims to deliver fit-for-purpose levels of service, and plans to renew assets before they fail and minimise operational costs.

8.5.10 Operations and Maintenance Plan

Procurement for electricity follows the MBIE process. Prices are peer reviewed by an external consultant to ensure the pricing represents best value. The current contract expires in September 2022. Approximately 40% of the total energy costs are fixed and therefore are not affected by reductions in energy consumption, although this percentage will change as lights are upgraded to LED.

The Maintenance contract is performance based and key performance indicators manage contractor performance. A planned lamp replacement and cleaning programme ensures light output is maintained to the designed levels between renewal cycles. The current contract stared in November 2018 and is a 3+1+1 year contract. The contract also included an option to deliver the LED renewal project which has been accepted.

Maintenance of lights includes:

- routine maintenance - keeping the lights operating at their required output, including, lamp replacement and cleaning, condition rating in conjunction with visits, maintaining asset data and systems. Many of the decorative lighting poles are painted which need repainting; and
- unscheduled maintenance – this is the reactive repair of faults and/or damage of lighting assets including accident damage and vandalism.

The business case accepted by Waka Kotahi for the LED replacement project includes the installation of a Central Management System (CMS). The CMS will:

- turn lights on and off;
- enable dimming of lights when there is low use of the roads;
- send notifications of light failures and performance of the luminaire; and
- monitor electricity consumption.

This project will further reduce electricity consumption, and improve maintenance effectiveness, night time patrols to identify lamp failures will not be required for lights controlled by the CMS and lights will be repaired faster. Asset data will also be improved and will enable better information with regard to the operation of the lighting network to be provided to the community. To achieve these benefits for LEDs that have already been installed it will be necessary to fit controllers to the LED lights that were installed prior to the system being implemented. Where possible this improvement work will be done in conjunction with the luminaire cleaning cycle.

The LED renewal project is estimated to reduce electricity and maintenance costs by $1.6 million per annum once the project is complete.

The network will continue to grow due to subdivisions, roading projects and other developments/ improvements which will result in slight annual increases to electricity and maintenance budgets.

8.5.11 Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	5.1	5.4	5.5	5.6	5.8	5.9	6.0	5.8	4.2	4.3
Operations	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Maintenance	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Energy	3.67	3.73	3.79	3.85	3.92	3.98	4.05	4.12	4.19	4.23
Total	9.7	10.0	10.2	10.4	10.6	10.8	11.0	10.9	9.3	9.5

Table 8-32: Street lighting Opex expenditure including maintenance

8.5.12 Renewals Plan

Renewal projects may include upgrading to achieve the appropriate lighting standard. The strategy relating to the renewal of road light assets, or components of those assets, is to:

- replace faulty or damaged equipment that cannot be repaired because of obsolescence;
- replace faulty or damaged equipment when replacement is more economic than repair, or the existing equipment does not meet the design / safety standards;
- replace poles and arms that are in poor condition;
- one-for-one replacement of all Waka Kotahi subsidised lights with LED lights by June 2021. Remaining lights to be replaced by 2023; and
- upgrade lighting assets in conjunction with roading projects and renewal programmes.

- **Pole and Arm Replacement**

Condition grade 4 and 5 poles identified during condition assessments are prioritised for replacement under this programme. They are usually concrete poles with signs of cracking or spalling, and steel poles that show signs of fatigue or significant corrosion. Replacement is generally carried out on a one-for-one basis.

- **Safety Improvements**

The lighting safety improvement programme identifies projects that need to be upgraded to a higher lighting standard or an additional light added to achieve compliance with the standards. These are usually on arterial or collector roads with medium to high traffic volumes, however the LED upgrade project has identified some locations that require additional lights due to very wide spacing between lights.

- **Conversion to Light Emitting Diodes (LED)**

The Council's role is to facilitate and implement action on energy efficiency, renewable energy, transport energy efficiency and security of energy supply.

Conversion of the existing Waka Kotahi subsidised street lights to LEDs provides a significant reduction in electricity consumption and carbon emissions as well as financial benefits of reduced operational expenditure. Before this project was undertaken street lighting was the second largest business activity in the Council in terms of energy use and therefore carbon emissions footprint.

The project is a one-for-one replacement of existing lights and aims to maximise compliance with current standards.

The LED conversion project is strongly aligned to the following council policies documents, schemes and plans:

- Christchurch City Council Sustainability Policy (2008);
- Christchurch City Council Supply Chain Sustainability Policy (2003);
- Christchurch City Council Resource Efficiency & Greenhouse Gas Emission Policy (2017);
- Council energy management programme framework;
- Council emission management programme framework; and
- Council energy efficiency.

Council also has two priority goals related to climate leadership and maximising opportunities to develop a vibrant, prosperous, and sustainable 21st Century city which this proposal contributes towards.

Waka Kotahi provided guidance on the benefits of changing to LED lighting including the use of a Central Management System (CMS). In March 2017 this was further reinforced with the increase of the Waka Kotahi financial assistance rate (FAR) from 49% to 85% through to June 2018. The 85% FAR has been extended through to 30 June 2021. Further information relating to the LED upgrade project can be found at https://ccc.govt.nz/transport/transport-projects/roads-and-underground-services/led-street-lighting.

The LTP includes the costs to upgrade the remaining lights (Transport, Parks, Facilities and Social Housing) to LED with luminaire controllers and convert the LED lights that were installed prior to the introduction of the central management system. These lights were not part of the Waka Kotahi subsidised project. This work is proposed to be completed in the first two years of this LTP period and will reduce Opex by $140,000 per annum.

Renewals Quantity and Expenditure

Work Type	Quantity (Km)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Poles	324	322	490	490	490	490	478	468	468	468
Luminaires	1,111	898	100	100	200	300	500	500	1000	1100
Luminaire Controllers	5,000	4,042	0	0	0	0	0	0	0	0
Total	6,435	5,262	590	590	690	790	978	968	1468	1568

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	10.66	1.71	2.74	2.16	2.88	2.14	2.31	2.71	2.86	2.65

Table 8-33: Proposed street lighting renewal work programme and Capex budget

8.5.13 Capital Development Plan

Road lighting is acquired or upgraded through:

- extensions constructed by Council where no road lighting previously existed;
- taking over new road lights installed with subdivision development (constructed at the developer's expense), or with roads handed back to council by Waka Kotahi;
- street upgrading programmes (additional lights installed); and
- power underground conversion work.

From 2012 all new lights in the CCC area (including renewals and subdivisions projects) have been LED.

The budgets allowed in the capital programme are summarised in Section 9.

8.5.14 Disposal Plan

Disposal of road lighting, in this context, refers to removal of the capability or functions provided by the lighting, and not the removal of particular items and their replacement with others, or redevelopment of an installation at the end of its engineering life. The residential red zones will result in the disposal of the associated lighting, which will be managed and undertaken in conjunction with the retreat from these areas at the appropriate time.

8.6 Traffic Systems

Note that this section of the AMP was developed by the Christchurch Transport Operations Centre (CTOC), which has been subsequently disestablished. Going forward, Council will need to undertake additional planning to better forecast the future requirements for these assets.

8.6.1 Asset Inventory

Intelligent Transport Systems (ITS) are the control, monitoring and detection devices that operate the road corridor in real-time to maintain optimal safety and efficiency. Asset types are varied to satisfy a number of functional needs, are generally electronic, involve complicated technologies, and require appropriately trained staff and suppliers to operate and maintain. Systems are well-established to cater for vehicular road users, however are increasingly also being used to support walking, cycling, public transport and active modes, alongside improving safety, information and supporting activation of public spaces. Transport technology is in a phase of rapid evolution and change is a constant factor.

Real Time ITS assets managed by RTO include:

- traffic signals - includes 276 intersection controllers and cabinets, 2,614 traffic signal poles, 263 overhead mast arms, 7,535 traffic signal lanterns, 2,721 pedestrian lanterns, 288 cycle lanterns, 238 illuminated signs, and several SCATS servers;
- CCTV systems – includes 464 Traffic cameras and associated systems & servers, and 150 Police *'Crime Cameras'* and associated systems & servers. This latter system also supports the Council's Parking Enforcement team to manage Bus Lane enforcement;
- electronic road signage – includes 71 Variable Messaging Signs (VMS), and 126 electronic Speed Warning Signs near schools and accident-prone curves; and
- communication systems – includes fibre optic and copper cable networks, and 5 communication towers (25m) and the Mt Pleasant Tower for 'air bridge' radio communication links. Systems integrate with the Lyttelton Tunnel control centre, Waka Kotahi regional office and WTOC.

The main functions of the ITS assets are to:

- operate the transport network in real-time. This includes both BAU operations and during incident response situations;
- optimise network performance in terms of safety and efficiency and in alignment with strategic plans. For example, by removing traffic conflicts at intersections thereby reducing the number of collisions, by prioritising modes such as Public Transport along designated routes, and by synchronising green signals along strategic and freight corridors;
- maintain or enhance journey time reliability 24 hours per day, 7 days per week, 365 days per year;
- support community safety and regulatory activities of the NZ Police and Council teams; and
- provide journey time and incident-related information to road users to enable informed travel choices to be made.

8.6.2 Valuation Data

Asset valuations are established at 3-yearly intervals and this was last undertaken in June 2019. For valuation purposes traffic systems is split into two sub categories as shown in the Table below.

Assets	Optimised Replacement Cost	Optimised Depreciated Replacement Cost	Annual Depreciation
Cameras	$1,985,015	$532,155	$187,667
Traffic Signals	$48,334,799	$27,771,461	$2,061,817

Table 8-1 ITS asset valuation data (from 2019 Valuation Report)

8.6.3 Problems

The following problems have been identified relating to ITS systems in Christchurch:

- underground asset condition, particularly traffic signal ducts and cables, is largely unknown but expected to be generally in average condition. Many signals were installed decades ago when ducts were either not included or road widening has since occurred rendering ducts incomplete. Many ITS components have not been renewed since original installation date and are commonly beyond expected service life. Additionally, the earthquakes damaged ducts and stretched cables, and are believed to have accelerated deterioration in asset condition;
- increasing frequency of traffic signal outages being caused by faulty cables with no spare cores, meaning that the intersection cannot be restored following an outage unless cable replacement is carried out. Approximately 42 intersections are overdue for recabling, however the historic renewals budget enables only two intersections per year to be completed. This rate is insufficient to maintain the asset base in line with scheduled renewals;
- a recent audit of controller cabinets identified a variety of non-compliances with the NZ Electrical Safety Regulations 2010 and AS/NZS 3000. Issues include cabinets that are old, rusty, with holes enabling water and vermin ingress, and non-compliant electrical wiring practices inside. These installations are deemed to be *'electrically unsafe'* under the regulation definition and pose risk to workers until issues are rectified. Approximately 16 cabinets require replacement and 224 require repair to internal electrical wiring and fittings to restore them to a state of compliance with the regulations;
- ITS asset numbers have increased over the years through capital projects without a corresponding increase in Opex and renewals budgets. For example the number of signalised intersections has increased by 24% since 2010, however Opex and renewals budgets have not changed. This misalignment is necessitating reduced or no maintenance activity on increasing numbers of assets;
- the new 5G communications systems being deployed by telecommunication providers is causing interference with the older (LTE) technology utilised on parts of the Council traffic signals network. The older technology also presents security, bandwidth capacity, and reliability issues;
- lack of an agreed Transport Technology Strategy / Roadmap across RCAs and partners. This is resulting in uncoordinated ITS development, adoption of diverse and sometimes non-integratable systems, stop-gap control solutions for the edge (field) devices, long-term resilience risk, and burden on staff to navigate in the absence of clear direction or strategic goals;
- reactive maintenance and asset replacement is undertaken on ITS assets due to vehicle-collisions damaging or destroying components such as poles and cabinets. Cost recovery is sought from responsible third-parties wherever practicable however full recovery is not possible, meaning that this cost erodes the budget available for planned renewals. In years with high accident numbers and/or lower than anticipated damage recoveries, planned renewal works become deferred;
- it is estimated that at least 41% of the ITS assets owned by Council are beyond their expected service life. Additionally, 63% of these have been assessed or estimated to be in poor condition; and

- overall, the number of assets reaching end-of-service-life or requiring urgent renewal due to operational failure is outpacing the budget available.

8.6.4 Benefits

Addressing these issues will help achieve Council's strategic outcomes as shown in the following Table.

Journeys are safe	Journeys are reliable	Customers have choice	Journeys are comfortable	Council is responsive to the needs of customers
ITS reduce death and serious injury crashes	ITS optimise performance of the network, provide priority for certain modes, and enable travellers to make informed decisions	Modal shift is encouraged through travel time comparison provided by variable message signs	CCTV and Speed Warning Signs improve safety and support Enforcement activities	Well managed ITS are responsive to changes in traffic demand, support incident response, and respond quickly to customer needs

Table 8-35: Alignment with strategic outcomes

8.6.5 Consequences of Not Addressing the Problems

The risk of not undertaking maintenance and asset renewal at end of service life or at time of operational failure is that ITS systems deactivate. The consequences for road user customers would be signalised intersections, speed warning signs and VMS going into full blackout (non-functional). Non-functional devices substantially undermine the level of safety within the road corridor and extended outages would increase serious injury and death accident rates. Deactivation of CCTV and communication systems would compromise ability to optimise day-to-day network performance, to manage incident responses, to identify third parties who cause damage to infrastructure (for cost recovery purposes), and to support Police and Council enforcement activities.

Less visible consequences of not addressing the problems include increasing time and resources spent on 'stopgap' temporary solutions rather than proper resolution of issues, increasing reactive maintenance, increasing electrical safety risk, decreasing asset reliability, and diminishing ability to improve the systems, support innovation, and keep pace with technological change.

8.6.6 Levels of Service

ITS contribute to a number of the ONRC performance measures and Council measures, the most relevant of these measures are listed below:

- ONRC Travel time reliability CO1 – customer satisfaction;
- ONRC Safety TO6 – deaths and serious injuries at intersections.

8.6.7 Gap Analysis

This section outlines how Council's traffic system assets are currently performing against the key Levels of Service measures detailed above.

▪ **ONRC Travel time reliability CO1** – Customer satisfaction Travel Time is monitored through a network of Bluetooth sensors across 39 strategic routes, alongside public transport (bus) timepoint data provided by ECan. Refer to Traffic Dashboard.	Over the period March 2019 – March 2020, travel times for both general traffic and public transport remained broadly unchanged and under the LTP targets. Bus stop reliability increased by 5-10% over this period, though still falls short of the LTP target.
▪ **ONRC Safety TO6** – Deaths and serious injuries at intersections	Crashes at intersection by road classification and crash severity

Table 8-2: Traffic system Gap analysis and evidence base

8.6.8 Options to Address Gaps

Council has developed the following options to address the identified gaps in the network for its traffic system assets.

Options	Output	Benefit / Consequence
Status quo Make no changes to the current approach to ITS maintenance and renewal.	Selective, and sub-good practice maintenance and renewals programmes. Elements that cannot be funded are left to run-to-fail. Reducing opportunities over time for system improvement, innovation, and keeping pace with technological change.	Deferred renewal backlog increasing. Increasing risk of operational failures and inability to restore ITS functionality. Increasing risk of Electrical Safety Regulations and Health & Safety at Work Act non-compliance. Increasingly unreliable budget forecasts due to increasing reactive maintenance/renewals. ITS assets progressively become less responsive to customer needs.
Increase investment over time Increase maintenance and renewal budgets until the deferred renewals backlog has been cleared and a sustainable level of ongoing funding is confirmed.	In the short-term, still require a selective and less than Good Practice maintenance and renewals programme approach, however this would reduce over time as a sustainable balance is reached.	Decreasing backlog of deferred renewals, and a progressive improvement in asset condition up to good-practice standards. Decreasing risk of operational failures and inability to restore functionality. Decreasing risk of Electrical Safety Regulations and Health and Safety at Work Act non-compliance. A sustainable level of ongoing investment identified.
Increase Investment now Increase maintenance budget to meet market prices. Increase renewals budget to address deferred renewals backlog, and keep up with scheduled renewal programme as assets reach end of service life.	Comprehensive and good practice maintenance and renewals asset management approach.	Assets maintained in line with industry standards. Deferred renewal backlog rectified. Compliance with Electrical Safety Regulations and Health and Safety at Work Act. Reliable ITS assets and predictable budget requirements going forward. ITS assets responsive to customer needs.

Table 8-37: Traffic system option development

8.6.9 Recommended Option

Council recommends adopting the *'Increase Investment Now*' option for the maintenance, operation and renewal of ITS assets, as it considers this the best option to deliver the strategic outcomes and to meet legislated worksite health and safety requirements.

This option aims to deliver ONRC fit-for-purpose Levels of Service, and to renew assets at end-of-service-life, before they fail and impact on operational and safety outcomes.

It has been assessed that 16 electrical cabinets require urgent replacement (renewal) and 224 require repair to comply with electrical safety regulations.

An investment increase is recommended to:

- address the backlog of deferred renewals;
- rectify electrical safety non-compliances;
- keep pace with the scheduled renewal programme going forward;
- reflect current maintenance market prices - that include additional costs to comply with the Health and Safety at Work Act 2015 (in particular, health and safety and temporary traffic management requirements); and
- accommodate additional Opex cost imposed by recent signal installations.

8.6.10 Operations and Maintenance Plan

Maintenance work is undertaken to:

- clean, tighten, cycle, lubricate, test etc. electrical and mechanical ITS components to maintain operational functions;
- maintain the exterior of cabinets, poles, lanterns etc. for cleanliness, correct orientation and function; and
- repair faults as they occur to restore service.

Planned Maintenance

Planned maintenance includes:

- undertaking regular inspections to monitor asset condition and check for correct and safe operation of all components;
- taking routine maintenance on physical assets;
- replacing signal lamps at end-of-service-life; and
- undertaking checks and rectifying faults/failures via electronic systems (e.g. SCATS).

Unplanned maintenance

Unplanned maintenance includes:

- repair on demand and within specified response timeframes faulty, damaged, and vandalized equipment;
- correcting defects identified during routine inspections; and
- make safe any issues as a temporary solution prior to ordered works being carried-out.

All maintenance, repair and renewal is carried out in accordance with the Waka Kotahi P43 Specification for Traffic Signals 2015 and the supplementary Regional Specifications.

The current traffic signals maintenance contract was let in 2013, is now substantially outdated, fails to support good asset management practices, and fails to adequately reflect current HSWA 2015 and temporary traffic management requirements. This contract is in the process of being re-tendered, with an expected increase in cost above previous levels.

8.6.11 Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	3.1	3.0	3.1	3.2	3.2	2.7	2.8	2.9	2.9	3.0
Operations	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
Maintenance	3.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Total	9.9	9.0	9.1	9.2	9.2	8.8	8.9	9.0	9.1	9.1

Table 8-38: Traffic system Opex expenditure including maintenance

8.6.12 Renewals Plan

The renewals strategy associated with ITS is primarily based on average component life expectancy. As budget permits, components are renewed with modern equivalent items when they reach the end of their economic and technological lives, thereby ensuring continuity of operational service and reducing future maintenance costs. An example of this is the replacement of Quartz Halogen (QH) lanterns with LED lanterns that have a substantially longer service life and lower power usage.

Alongside their age, components are prioritised with consideration of several other factors as outlined below.

Common ITS renewal works include:

- controllers – traffic signal controllers have an expected service life of 15 years based on *Austroads* guidelines, 74 cabinets require renewal;
- lanterns – traffic signal lanterns at 66 of the Council signalised intersections are yet to be upgraded from QH to LED. QH lanterns are now old technology and are becoming difficult and expensive to source and maintain;
- cables – the condition of underground cables and ducts is largely unknown due to age, and the majority of sites are expected to be damaged to some degree from the 2011 Christchurch earthquakes and various roadworks after the original date of installation. Historically renewing cables at signalised intersections has been largely reactive and undertaken when substantial faults occur. A more proactive renewals approach would be preferred however this is currently limited by budget availability;
- cameras – cameras are scheduled for renewal when they are around seven years old, and this ITS asset component is generally being renewed per its programmed schedule;
- communications systems – components such as communications devices, network switches, routers, radio transmitters etc. are scheduled for renewal at end of expected service life. Opportunities to improve quality and reliability are generally enabled through external Capex projects; and
- wall screens (large monitors) within the operations control room located in the Civic building – these are an integral part of real time operations as clear visibility of the scene is required for both BAU and incident management situations. The existing monitors have exceeded their service life, and are insufficient in quantity to accommodate the increasing number of applications supporting operations. It is currently unclear where the cost of wall screen renewal lies internally within Council (that is, whether it is an IMCT, Facilities or Transport cost).

Prioritisation Process

As above, significant quantities of ITS components are beyond their expected service life and could fail at any time. Alongside their age, components are prioritised with consideration of several other factors such as how critical the site is within the transport network (road classification/traffic volumes), the operating speed of traffic at the site, and any other identified concerns with component performance, predominantly identified through fault history and maintenance inspections.

The additional recent identification of electrical safety regulatory non-compliances, is currently forcing difficult decisions to be made between rectifying electrical safety issues or undertaking critical renewals at the highest risk (and sometimes already failing) intersections.

Historic budgets have been insufficient to keep pace with good-practise asset renewals, and further pressure now exists going forward to rectify the electrical safety non-compliances. This relative prioritisation is a work in progress for the 2020/21 financial year and beyond.

Prioritised renewals programmes will be delivered around available budget, however given that operational failures are likely to occur at other (unbudgeted) sites, unplanned reactive maintenance/renewal works are likely to be required to restore ITS functionality following operational failures. Some prioritised projects inevitably become deferred every year due to this. Reactive works on an aging asset base is not a good-practice approach for managing critical infrastructure long-term.

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	3.86	4.38	4.86	5.98	6.12	4.58	3.53	2.51	2.53	2.51

Table 8-39: Proposed traffic system Capex budget

8.6.13 Capital Development Plan

New assets associated with the traffic systems activity are used to improve the capacity, performance and safety associated with the traffic network as well as meeting growth requirements. They tend to be closely linked to intersection upgrade projects and are often funded from outside the traffic systems budget as road network or safety improvement works. Projects may include the re-development of existing signalised intersections or the creation of new intersections.

For traffic systems new asset projects are based largely on traffic analysis techniques and modelling software. For traffic signals this equates to approximately 70 new signalised intersections in the next five years. The majority of these are associated with the Major Cycleways Project and ongoing rebuild works.

The budgets allowed in the capital programme are summarised in Section 9.

8.6.14 Disposal Plan

Disposal of ITS assets is generally undertaken during repair, maintenance, renewal or safety improvement projects. Specific costs have not been broken out to date. Wherever viable, ITS components are salvaged, refurbished, and held in storage for redeployment to another site while they still have functional value. The new Traffic Signals maintenance contract includes the requirement for compliance with Council disposal policies.

No disposal is planned at this time.

8.7 Traffic Services

Traffic services include traffic signs and sight rails, road markings, and traffic calming devices.

Traffic signs are provided to aid the safe and orderly movement of traffic. They may be:

- 'regulatory' (including speed limit and parking signs), that is, it instructs road users by requiring or prohibiting specified actions in using a road;
- 'warning', that is, it informs road users of hazards or of other features requiring a safe response on or near a road; and
- 'advisory', that is, it provides road users with information or guidance (including information about destinations, routes, amenities, distances, street name signs and place names).

Traffic calming devices are provided to control movement and/or speed of traffic. They include:

- splitter and pedestrian islands;
- roundabouts;
- road humps and platforms; and
- kerb build-outs and thresholds.

Key issues include:

- the increasing amount of road markings on the network and associated costs (e.g. flush medians, cycleways, raised reflectorized pavement markers and raised reflectorized kerb top markers);
- the need to improve destination signs to enhance navigation, comparable with best practice on the state highway network;
- the traffic management requirements for maintaining traffic calming devices;
- increasing amount of coloured surfaces for bus and cycle lanes; and
- maintaining reflectivity of regulatory and hazards signs and markings.

Sign Type	Totals	Expected life	Quantity older than expected life
	Quantity	Years	Km
Hazard marking	10,002	15	7,277
Information	3,077	15	1,618
Local authority	15,157	15	11,711
Permanent warning	7,484	15	4,057
Regulatory	13,010	15	5,782
Parking	11,224	15	4,848
Misc.	184	15	111
Total	**60,138**		

Table 8-40: Breakdown of traffic services assets

8.7.1 Asset Condition

Staff are currently gathering condition data associated with traffic services which is dependent on the type of asset.

The maintenance and renewal processes for road markings are primarily managed by age-profile rather than condition. Experience has shown that the visibility of markings deteriorates too much if the repainting cycle is 12 months or greater. The nine month repainting cycle adopted has proven to keep the markings at an acceptable standard, and it is recommended that this is maintained.

The contract for maintenance of traffic signs includes measures of condition and intervention points that lead to maintenance or replacement of substandard assets. It is inappropriate to use age as the only trigger for maintenance or replacement because the rate of deterioration of signs is governed largely by position, exposure to weather and vandalism.

The condition of traffic calming devices is determined in the course of routine road inspections by the maintenance contractor. Some devices are replaced early for reasons other than condition failure; for example intersection modifications and kerb and channel replacement.

8.7.2 Asset Performance

The performance of road markings relates to the quality of both materials and application as well as the accuracy of placement. Deterioration is caused primarily by traffic and environmental factors. There is no condition rating system for road markings. However, in the future, it may be appropriate to measure reflectivity to better quantify the visibility of markings, particularly on high traffic volume roads. The nine month repainting cycle is carried out to keep the markings at an acceptable standard.

Greater use is being made of reflective pavement markings on arterial routes because of superior performance and visibility.

The performance of traffic signs and traffic calming devices relates predominantly to the type of materials used.

This information has not been recorded or retained, so it is not possible to make comparisons and therefore draw conclusions. This action has been added to the improvement plan.

8.7.3 Valuation Data

Asset valuations are established at 3-yearly intervals, which was last undertaken in June 2019.

Asset Category	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Traffic Services	55,979 signs & city-wide marking.	$40,242,885	$16,090,682	$2,001,019

Table 8-41: Traffic services asset valuation data (from 2019 Valuation Report)

8.7.4 Operations and Maintenance Plan

All road markings and traffic signs are maintained under contract. The remarking frequency for all roads is nine months.

Currently there are no planned inspections of signs and markings, to identify renewals. However, general roading inspections occur on an on-going basis and Council's contractor uses these to flag defects.

- **Planned Maintenance**

Repair options and priorities will be determined by considering the impact on:

  - public/road user safety;

- traffic movements;
- minimising life cycle costs; and
- markings are renewed through the remarking programme which will continue at the current nine month cycle.

Unplanned Maintenance

- the maintenance contractor is required to repair on demand and within the following time frames, faulty or damaged signs and associated equipment;
- urgent maintenance – within two hours of receipt of instruction;
- normal maintenance – within seven days of receipt of instruction; and
- replacement of signs and fixings – with 20 days of receipt of instruction.

Maintenance Standards

Standards for signs, markings and traffic management devices are covered in the following Christchurch City Council documents:

- Code of practice for land and asset development;
- Construction Standard Specification; and
- Manual of Traffic Signs and Markings (MOTSAM).

8.7.5 Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	1.7	1.7	1.8	1.1	1.0	0.7	0.8	0.9	0.9	1.0
Operations	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Total	5.2	5.3	5.3	4.7	4.5	4.3	4.4	4.4	4.5	4.6

Table 8-42: Traffic services Opex expenditure including maintenance

8.7.6 Renewals Plan

Road marking renewals are driven largely by the nine-month cycle of remarking and to a lesser extent by road or surfacing renewal projects. In terms of traffic sign renewals, these are identified through the planned maintenance inspection programme based on condition and reflectivity. Other renewals are generated through accident damage and vandalism.

Traffic signs will be identified for renewal through the planned maintenance inspection programme based on condition and reflectivity. Directional/guide signs are currently replaced on a reactive basis. Some signs are regularly replaced under maintenance because of accidents and vandalism damage and therefore never reach the end of their useful life. Route safety inspections and public reporting processes also identify signs requiring renewal. Street name signs are being progressively upgraded to the white on blue format. Priorities are established on a condition basis street by street. The Waka Kotahi street signs guidelines is being used to achieve uniformity over the network.

The development, management and maintenance associated with traffic calming assets falls under the umbrella of carriageways surfacing, kerb & channel and road landscaping, and so is not allowed for in the recommended traffic services budget.

Renewals Expenditure

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	0.33	0.45	0.41	0.44	0.40	0.41	0.42	0.43	0.46	0.43

Table 8-43: Proposed traffic services Capex budget

8.7.7 Capital Development Plan

It is anticipated that the CTSP will provide guidance in terms of network development which will in turn provide the direction for Council's traffic services assets. Currently expectations around additional roading (and as a result marking, signs and calming devices) are not well understood. It is recommended that the CTSP and its relevant content guide appropriate new asset projections, and this is included in the improvement plan. New asset funding is based largely on indications of new roading to be constructed by Council, in association with road renewal projects, subdivision developments and funding-requirements from previous years.

The budgets allowed in the capital programme are summarised in Section 9.

8.7.8 Disposal Plan

Realignment of carriageways and kerb and channel renewals can make some of the traffic services redundant. While the signs, markings, or layers and surfacing may be removed and disposed of, the space made available provides opportunities for other users of the road reserve. Complete closure and demolition is expected to be rare and to occur only following public consultation. The RAMM database and asset register are updated to remove the redundant data.

The retirement of red zone land in the eastern suburbs will result in the removal of some traffic services assets, but the scope of this is not yet fully understood. Costs associated with disposal are generally included within the funding provided for the development of a new use of that space, and so no allowance has been made for the disposal of traffic service assets within this AMP.

8.8 Street Trees and Landscapes

Trees and gardens make an important contribution to the health and wellbeing of Christchurch's residents and to the Garden City image through the quality of the city's landscape. Trees and gardens play a vital environmental, heritage, financial, social and cultural role. They also have an important contribution to make in the sustainable management of natural and physical resources.

Road landscape assets can be separated into three main categories:

- trees;
- gardens, hedges and natural areas; and
- turf (berm areas).

Trees

As at December 2019 the total number of trees currently recorded in the road corridor network is 66,511.

Ward	Count
AKAROA	149
BURWOOD	5,615
CASHMERE	4,138
CENTRAL	5,296
COASTAL	5,119
FENDALTON	4,398
HALSWELL	5,958
HAREWOOD	5,878
HEATHCOTE	4,222
HORNBY	1,961
INNES	4,022
LINWOOD	3,789
LYTTELTON	28
MT HERBERT	121
PAPANUI	4,130
RICCARTON	2,875
SPREYDON	3,121
WAIMAIRI	5,565
WAIREWA	126
Grand Total	**66,511**

Table 8-44: Number of street tree assets by Council Ward

Gardens, Hedges, Natural Areas

Council currently owns 368,000m^2 of amenity garden areas.

8.8.1 Asset Condition

Trees

It is estimated that 88% of street trees have been condition assessed.

Ward	Condition Grade						
	1 Excellent	2 Good	3 Average	4 Poor	5 Very Poor	Unknown	Total
AKAROA		2	41	14	2	90	149
BURWOOD		16	3,810	489	163	1,137	5,615
CASHMERE		78	3,187	666	102	105	4,138
CENTRAL		213	3,607	506	179	791	5,296
COASTAL		30	3,497	436	170	986	5,119
FENDALTON		5	3,733	315	114	231	4,398
HALSWELL		12	4,274	532	160	980	5,958
HAREWOOD		31	4,375	833	138	501	5,878
HEATHCOTE		12	2,796	670	203	541	4,222
HORNBY		17	1,358	290	33	263	1,961
INNES		4	2,992	458	139	429	4,022
LINWOOD	4	3	2,342	813	273	354	3,789
LYTTELTON		5	3	12	3	5	28
MT HERBERT		1	9	9	2	100	121
PAPANUI		5	3,149	474	129	373	4,130
RICCARTON		4	2,269	376	53	173	2,875
SPREYDON		14	2,306	307	63	431	3,121
WAIMAIRI		10	4,442	821	151	141	5,565
WAIREWA						126	126
Total	**4**	**462**	**48,190**	**8,021**	**2,077**	**7,757**	**66,511**
Percentages	**-**	**1%**	**72%**	**12%**	**3%**	**12%**	

Table 8-45: Street tree asset condition rating by Council Ward

Gardens, Hedges, Natural Areas

An area comprising 74,500m^2 has been assessed to-date with 15,500m^2 graded between 4-5 (needing renewal, 1 very good – 5 poor or empty). Council contractors are working to assess the rest of the asset base over the next 2 years.

Turf

There is no condition information available for turf at this point and there are no immediate plans to condition rate turf, except where residents request berm renovations.

8.8.2 Asset Performance

There are currently no specified Levels of Service for maintaining trees, gardens, hedges or turf such that they continue to contribute effectively to Community Outcomes.

Environmental measures

At present there is no system in place to measure the performance of trees or gardens towards the Community Outcomes. It is expected that capacity and performance of road landscapes will align closely with those developed for the Parks Unit approach to gardens and turf.

Overhead services

The Council has a statutory obligation under the Electricity (Hazards from Trees) Regulations 2003, to maintain its trees at a safe distance from electrical conductors. Achievement would require either the severe pruning or removal of several large trees (mostly Notable or Special Purpose (Road) Zone trees) where electrical conductors are in close proximity to, or in contact with, their branches.

Severe pruning would have a detrimental effect on the amenity that these trees provide, and would likely cause a negative reaction from residents. To attain full compliance without severe pruning or removal, alternative methods are required to be undertaken, including under grounding and aerial bundling of power lines. This will be addressed on a case-by-case basis.

The interim targets and timeframe to achieve 100% compliance are:

- 2016/17 – 96.5%
- 2020/21 – 97.5%
- 2030/31 – 100%

To achieve compliance for trees that do not require either severe pruning or removal, each tree that is in the vicinity of electrical conductors is surveyed annually and any maintenance required to keep them clear of the electrical conductors is undertaken. The number of trees requiring annual clearance is currently around 3,000. This figure will increase over time as smaller trees planted underneath electrical conductors mature.

8.8.3 Valuation Data

Asset valuations are established at 3-yearly intervals, this was last undertaken in June 2019.

Assets	**Optimised Replacement Cost** (ORC)	**Optimised Depreciated Replacement Cost** (ODRC)	**Annual Depreciation** (AD)
Street Trees*	$153,756,925	$73,557,749	$1,794,201
Berms and Landscaping[†]	$209,460,463	$133,047,790	$2,618,256

Table 8-46: Street trees and landscapes asset valuation data (from 2019 Valuation Report)

8.8.4 Operations and Maintenance Plan

Trees

For trees to remain structurally sound and healthy and able to contribute fully towards the Levels of Service, maintenance is undertaken to internationally recognised standards, practices and procedures.

There are two types of maintenance undertaken – planned and unplanned:

- **planned maintenance** of all applicable arboricultural activities is undertaken on a cyclic basis and may be seasonal. The cycle may be determined by the agreed Levels of Service or depending on the specific requirements of the tree(s). Programmed maintenance is undertaken to maintain safety for road users (including vehicles), adjacent residents, and an uninterrupted supply of electricity (overhead services clearance), as well as for the establishment of young trees; and

- **unplanned maintenance** is normally undertaken on single trees and is usually related to safety. It can involve one or more of the activities listed above under programmed maintenance.

All audits on the street tree maintenance Contractor's quality assurance system are performed six monthly, as well as quality of work undertaken on a monthly basis.

Gardens, Hedges, Natural Areas, Turf

For gardens, hedges, natural areas and turf to remain healthy and able to contribute fully towards the levels of service, regular maintenance is required to recognised horticultural standards and industry guidelines or, where these do not exist, to industry best practice. Each garden, (with the exception of Annuals which are visited weekly), is visited once per month including in Spring and Autumn.

As with trees there are two types of maintenance undertaken –planned and unplanned.

Unplanned maintenance is undertaken by a dedicated, fully resourced unplanned maintenance team. It can include one or more of the activities listed above. A maintenance programme using only unplanned maintenance would result in gardens filled with dead, dying, or diseased and overgrown plants, weeds in large quantity and size, and litter.

Currently, all audits on the Road Landscape Contractor's quality assurance system are performed by the Service Manager to the Maintenance of Road Landscapes Contract quarterly, as well as an external audit organised by the Contractor annually in October.

As well as unplanned response maintenance undertaken by arboricultural contractors, included are:

- overhead Low Voltage (LV) service clearance in urban areas - (noting that overhead service clearance in rural areas is undertaken by Orion NZ Ltd, independent of Council); and
- some hazard mitigation of roadside and storm damaged trees in rural areas - (noting that road clearance of storm damaged trees and vegetation is undertaken by Roading Maintenance Contractors).

8.8.5 Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	3.2	3.3	3.2	3.3	3.3	3.3	3.3	3.4	3.3	3.3
Operations	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Maintenance	5.4	5.5	5.5	5.5	5.5	5.5	5.6	5.6	5.6	5.6
Total	8.8	8.9	8.9	8.9	9.0	9.0	9.1	9.1	9.1	9.1

Table 8-47: Street trees and landscapes Opex expenditure including maintenance

8.8.6 Renewals Plan

Renewals are currently carried-out either reactively following identification, (by residents, Council staff or the Contractor), or as part of the programmed maintenance programme. Prioritisation is based on age, size, condition, generally trees condition rated 4 and 5.

Trees in excess of 6 metres height and with condition ratings of 4 or 5 are, or will, become hazardous if not renewed at the appropriate time. Monitoring and maintenance to keep them safe will need to be undertaken more frequently, depending on the risk of failure and the likely damage caused. Irrespective of size, unhealthy or poorly shaped trees are not fully contributing towards meeting the Community Outcomes and are also included in the renewal programme as a priority.

Where renewals are considered as part of maintenance, the decision to renew is made by staff and the contractor under the Transport Unit's delegation. If there a significant number and/or size of trees in the street, residents and Community Boards will be advised when trees are to be renewed, why they are to be renewed, and what the replacement species will be.

Examples of priority other than condition based approach include renewal of trees in conflict with power lines, inappropriate species of tree where potential health & safety and trees damaging infrastructure.

Where renewals form part of a wider street upgrade, a decision is generally made at Community Board level. This may follow a public consultation exercise to gain resident input and support, along with a preferred species choice.

Replacement trees are a minimum of pb95/45 litre grade with larger grades planted where appropriate and available. Smaller grade trees are not preferred, as they are more susceptible to vandalism, have less established roots and smaller trunks and do not provide the same visual amenity provided by large grade trees.

Gardens, hedges, natural areas and turf look neglected and detract from area character, identity, and the Garden City Image if not renewed. Renewal of these areas is a staff decision. Replacement plants vary depending on plant availability, and turf is usually either by seed or by turves where appropriate (e.g. high profile sites).

There is no intention for programmed berm renewals or to condition rate turf (other than to prioritise berm renovation work).

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	1.71	2.03	1.59	1.95	2.21	2.42	2.54	2.34	2.65	2.31

Table 8-48: Proposed street trees and landscapes Capex budget

8.8.7 Capital Development Plan

New road landscape assets are created as a result of subdivisions, road construction and improvement projects, footpath resurfacing and other Council projects. At present new trees are only provided in conjunction with other transport network improvements, with an emphasis on residential streets or through subdivision. With the exception of street improvements Council does not create new street gardens. As a result new assets are often funded through budget from other activities.

New street trees and other green assets are beneficial as they contribute to the Climate Smart Strategy (2010 - 2025) and the Open Space Strategy (2010 - 2040) through environmental, amenity and socio / economic factors. Therefore a case could be made for a programme of retrofitting arterial and collector routes to help achieve an effective canopy cover as well as making these routes more in keeping with the 'Garden City' image.

The issue with the supply of quality tree stock from commercial nurseries described above has resulted in frustration for developers as this is often not picked up until handover, and means that trees and plants with defects must be removed and replaced creating additional cost for them. Along with the recommendations above, the improvement plan includes informing developers that Council will only accept assets with a Condition Rating of Grade 1.

Most new street gardens are created through the subdivision process. This has led to inconsistency across Christchurch, with older areas having little or no street gardens and therefore less amenity and vegetative character and identity, while new areas are generally well provided for.

In addition approximately 10% of garden assets are located in streets where there is a limited viewing audience (i.e. cul-de-sac heads) in relation to the effort and expense of maintaining them.

The budgets allowed in the capital programme are summarised in Section 9.

8.8.8 Disposal Plan

Landscape assets and grassed areas are disposed of where other road related works lead to the alteration of alignments. Costs of disposal are generally absorbed by the budget for the project. The asset system is updated such that the disposed assets are removed from the database and new assets are added in line with data standards.

Trees can be disposed of where they are removed by either staff or Community Board decision, and not replaced. Staff decisions not to replace trees are based on either the appropriateness of the site or the adjacent resident not wishing the tree to be replaced. Community Board decisions not to replace trees are usually made at the request of residents.

8.9 Cycleways

The cycleway network is created to provide for the safety, travel efficiency and ease of use for cyclists; to encourage increasing levels of cycling. The routes needs to be safe, comfortable and convenient, while providing adequate links from key trip origins to destinations within a coherent and attractive cycle network.

Cycleways are categorised into the facility types outlined below. In total there are approximately 340 km of cycleway city-wide.

Asset Type	Urban (km)	Rural (km)	Total (km)
Cycle lane	294.1	8.0	302.1
Cycle path	22.7	-	22.7
Quiet street	16.3	-	16.3
Shared path	172.8	7.0	179.8
Total	**505.9**	**15.0**	**520.9**

Table 8-49: Breakdown of cycleways by facility

On-road marked and on-road separated cycleways:

- comprise of a dedicated lane on a sealed surface that is an extension of the carriageway;
- allow cyclists to ride side-by-side so that when overtaking another cyclist, a rider doesn't need to move into the traffic lane. Where adjacent to on-road vehicle parking the width allows cyclists to avoid 'dooring'; and
- are usually constructed in pairs (one on each side of the road) although separated cycle lanes may also be bi-directional on one side of the road only.

Shared (on-road) pathways:

- comprise of a pathway that is linked to the alignment of the carriageway; and
- are generally built for two-way cycle traffic and shared use with pedestrians.

Shared (off-road) pathways:

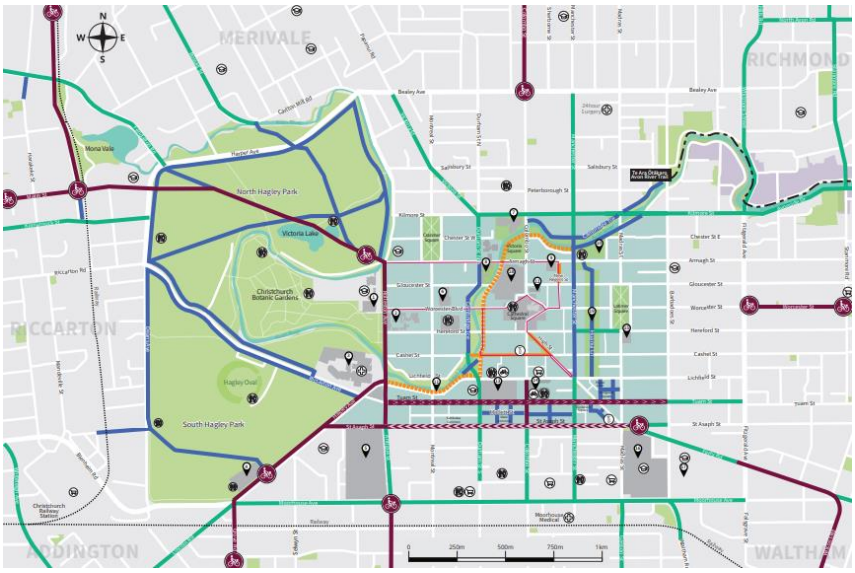
- comprise of a pathway that is not linked to the alignment of the carriageway (such as through a park); and
- are generally built for two-way cycle traffic and shared use with pedestrians, although separated cycle and pedestrian pathways are planned to be introduced on major cycle routes.

Cycle amenity:

- comprise of cycle parking facilities; and
- cycle crossing facilities, such as bicycle call buttons and lights at signalised intersections.

The facilities under the cycling section of the AMP are made up of a number of assets, which in many cases are maintained and discussed under different sections of this Plan. The figure below highlights the key associated assets and where they are discussed and allowed for within this lifecycle management section of the AMP.

Various maps of the cycle network can be found on the Council website, such as the map to the right.



Further to this, a public booklet is printed each year. https://ccc.govt.nz/assets/Documents/Transport/Cycling/map/A2-Bike-Easy-Guide-and-Map-Sept-2019-WEB.pdf

8.9.1 Asset Condition

Off-road cycleway condition was measured as part of the footpath condition survey. Most off-road cycleways have base layers that are less than 30 years old and are therefore not likely to need renewal for at least 50 years. As with footpaths, renewal of the metal course layers is usually driven by damage from vehicles, machinery or tree roots.

Staff undertake audits of the routes and currently the network is generally in a good condition, and is not affecting performance.

For on-road facilities, surfacing and pavement strength requirements and conditions are related to motorised vehicular use and are discussed in the carriageways section of this document.

8.9.2 Asset Performance

The performance of the cycling facilities pre-earthquakes can be measured by proportion of all trips made by cycling using the relevant Level of Service for cycling. This indicator was performing well against Auckland and Wellington benchmarks, and was generally trending upwards. This indicates that the Council's cycling facilities were performing well pre-earthquakes.

Post-earthquakes this metric has not been re-measured, and so the current performance of the cycling facilities is difficult to judge. However, the Christchurch Transport Strategic Plan (CTSP) cycle network and the Council commitment of funding within the capital budget give a strong signal that provision for cycling will sharply increase. Although there have not been any specific kilometre targets identified for the development of the cycleway network, this gives confidence that cycling levels will increase with particular concentration on the major cycle routes.

8.9.3 Valuation Data

For valuation purposes, on-street cycleways are included within the carriageway and traffic services figures. Off-road cycleways are included within the footpath figures.

8.9.4 Operations and Maintenance Plan

Cycleway maintenance has generally been a reactive activity only. Resources are therefore targeted to those areas initiated by customer contacts, rather than through a regular maintenance cycle. Maintenance needs are also identified from inspection surveys and observations made by staff in the course of their duties. A 24 hour call-out service is provided to attend to safety-related problems.

Typical work undertaken includes sweeping of spillages and debris, pothole repair, removal of tree roots, surface levelling/ smoothing, edge drainage improvements, seal edge alignment and trimming of vegetation.

It is essential that a planned maintenance process is introduced that is targeted at appropriate Level of Service for each level of cycleway hierarchy in the CTSP; this is included in the improvement plan.

8.9.5 Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	0.2	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Operations	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Maintenance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	0.8	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1

Table 8-50: Cycleways Opex budget including maintenance

8.9.6 Renewals Plan

As with the valuation, on-street cycleways are included within the carriageway and traffic services figures. Off-road cycleways are included within the footpath figures.

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	5.25	3.16	3.19	3.20	0.38	0.38	0.39	0.44	0.44	0.44

Table 8-51: Proposed cycleways Capex budget

8.9.7 Capital Development Plan

New cycleways are acquired as a result of:

- extensions to the network constructed by Council as part of the major cycleways programme, road network improvements, safety works, and neighbourhood improvement works;
- subdivision developments which are then vested to the Council; and
- upgrading work to improve the Level of Service e.g. from metal surface to AC.

Opportunities for new cycleways are generally identified periodically through a network implementation priority process, which considers usage / demand (latent and actual), safety levels, growth potential and Levels of Service and presents this to the Council. It is anticipated this process will be attuned to the CTSP.

As indicated earlier, the Council has included funding for the development of 13 major cycleway projects between 2014 and 2022, and this is reflected in the recommended budget. Beyond 2022 it is assumed that no further investment will be made, however this assumption should be reviewed once the current planned works are completed and in use.

The budgets allowed in the capital programme are summarised in Section 9.

8.9.8 Disposal Plan

Realignment of carriageways, and kerb and channel renewals, can make parts of existing on-road cycleways surplus to current needs. While the markings, or layers and surfacing, may be removed and disposed of, the space made available provides opportunities for other users of the road reserve.

Off-road cycleways may no longer be required through reduced use caused by demographic changes or other changes in the road and cycling networks. However, these cycle paths are also likely to be used by pedestrians and therefore complete closure and demolition is expected to be rare.

The costs of cycleway disposal are included within the funding provided for the development of a new use of that space, and therefore no budget is allowed for this work in this AMP.

8.10 Public Transport

The purpose of public passenger transport infrastructure assets is to provide and maintain the infrastructure for the safety, ease of use and comfort of public passenger transport users.

The City vision for public passenger transport is to provide ‘a well-connected and accessible city promoting active and public transport’.

Council is the organisation responsible for planning, providing and maintaining on-street public transport infrastructure, which meet the needs of passengers, bus operators and ECan who is responsible for the Metro bus services. In addition to the Council’s governance structure, the Greater Christchurch Public Transport Joint Committee brings together all parties including the Council’s neighbouring local authorities and ECan to coordinate the delivery of the public transport services and infrastructure. Assets included are:

- bus stop signs and markings;
- coloured bus priority lanes;
- Bus Interchange facilities;
- shelters and seats; and
- Real Time Information (RTI) system.

The table below indicates the quantity of public transport assets as at December 2017.

Asset description	Asset sub-description	Unit	Quantity
Operative bus stops		each	1,850
Bus stop signs		each	1,850
Bus stop posts		each (estimate)	9,25
Bus stop line markings		kilometre (estimate, provision estimate per marked bus stop: 26 metres)	24,050
Bus Passenger Shelters (Note: each shelter also has a seat)	CCC owned	each	289
	Adshel NZ Ltd owned	each	230
	Total	each	519
Seats (standalone)		each	549
Real Time Information	Bus Finder type	each	431
	Display type	each	33
Rubbish bin		each	210
Tactile pavers		metres (provision estimate per bus stop: 2m * 0.6m)	40.8
Passenger platform (footpath extension)	By front door	square metre (platform area estimate per bus stop: 3m *2m)	9,774
Tram lines and poles			
Trams stops and shelters			

Table 8-52: Breakdown of public transport assets

8.10.1 Asset Condition

Very few new bus passenger shelters have been installed since 2015. Between 2015 and 2017, the passenger waiting infrastructure associated with bus stops made redundant due to the 2015 bus network change, have been relocated to other bus stops around the city. Passenger waiting infrastructure from redundant stock has now been mostly exhausted. This means most bus passenger shelters installed from 2018 onwards will be from new stock.

Over time there has been variation to the shelter type provided by the Council. The structural condition of these shelters is considered to be good. However, the visual condition of many Council shelters is poor. Where the visual condition is poor, remediation through painting, is needed to improve the look of the shelters. The Council aim to initiate a shelter painting renewal programme from financial year 2018/2019 onwards to address this issue.

Remediation of the bus stops generally covers marking the bus stops to the recommended dimensions, positioning of the bus stop sign and post, and the provision of passenger platforms.

The Council has a mixture of Real Time Information (RTI) stock at bus stops. The RTI stock predominantly comprises of small RTI units, called 'Bus Finders'. The RTI stock also includes larger units, which are referred to as 'displays'. The majority of the existing Bus Finder units are no longer a supported version of the technology, this means that a broken Bus Finder can be difficult and expensive to replace. A number of Bus Finders are located at infrequently used bus stops, where they

are of limited use. Given the prevalence of internet availability at people's homes, destinations, and on smart phones, the Council and ECan may in the future need to review the application of how RTI is deployed at bus stops.

Asset information relating to public transport infrastructure is held in RAMM.

8.10.2 Asset Performance

As highlighted in Section 8.7.1, there a number of issues and deficiencies concerning public transport infrastructure at bus stops, which were highlighted in a bus stop audit undertaken in 2015. Since the audit was undertaken, a prioritised work programme has commenced to address a number of the issues and deficiencies identified.

8.10.3 Valuation Data

Asset valuations are established at 3-yearly intervals, this was last undertaken in June 2019.

Asset Category	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Public transport	943 bus shelters, signs and furniture.	$2,514,661	$834,485	$91,299

Table 8-53: Public transport asset valuation data (from 2019 Valuation Report)

8.10.4 Operation and Maintenance Plan

Bus passenger shelters and seats (excluding Adshel shelters) are maintained and cleaned under a contract managed by the Transport Unit. This includes non-routine maintenance of infrastructure assets. Signs and markings for passenger transport infrastructure maintained under the road markings and signs contract as described in Section 8.7 Traffic Services.

Maintenance of Adshel shelters is carried out by Adshel's contractors at their expense.

The Council took over the Christchurch Bus Interchange faciity in the 2019 financial year, however it is not included in the 2019 Valuation. For asset planning purposes, the facility is included in the Corporate Accommodation AMP.

Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	2.0	2.2	2.0	2.1	2.3	2.4	2.6	2.9	3.2	3.7
Operations	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Maintenance	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Total	5.0	5.1	5.0	5.1	5.2	5.4	5.6	5.9	6.1	6.6

Table 8-54: Public transport Opex budget including maintenance

8.10.5 Renewals Plan

The renewal plan is delivered in the following ways:

- Planned and unplanned operations and maintenance, which includes:
  - cleaning and regular maintenance of bus passenger shelters and seats;
  - maintenance of bus stop line marking and signage;

- repairing other bus stop furniture; and
- monitoring of bus priority lanes.

- Replacement (renewal) of assets that have reached their end-of-life or are in substandard condition. This includes:
  - relocating/repairing/replacing old and damaged bus passenger shelters and seats;
  - remediation of bus stops; and
  - remediating footpaths where passengers wait for a bus.

Renewals Expenditure

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	0.93	0.58	0.48	0.69	0.39	0.39	0.39	0.44	0.44	0.44

Table 8-55: Proposed public transport Capex budget

8.10.6 Capital Development Plan

The Council's role in providing good public transport infrastructure assets assists in the achievement of the wider goal to get more people choosing to travel by bus. Generally when that occurs the customer is satisfied with the public transport facilities provided.

Network improvements to make the service more attractive. This includes:

- construction of dedicated road improvements to provide passenger transport efficiency;
- construction of new facilities such as public transport interchanges; and
- installation of new bus shelters, bus stops, seats and associated infrastructure.

The budgets allowed in the capital programme are summarised in Section 9.

8.10.7 Disposal Plan

Relocation or disposal of public transport assets generally occurs when a bus service route is altered or is no longer necessary.

8.11 Parking

8.11.1 Asset Inventory

Council is responsible for managing and maintaining on-street car parking, two off-street car park buildings and associated assets such as 215 parking meters, pay stations, barrier arms, signage and fencing.

The provision of parking and management of the associated equipment, including the two off-street parking buildings, is the responsibility of the Transport Unit through the Transport activity. For asset planning purposes, the Lichfield Street carpark building is included in the Corporate Accommodation AMP and the Art Gallery carpark is included in the Christchurch Art Gallery AMP.

Due to the nature of the parking meters and the function that they serve, the meters are maintained to a high standard, such that their operational integrity is maintained. The majority of the meters (Metro meters) were installed in 2006 and

have a life-expectancy of 10 years and are inspected on a regular basis, so are generally in a good condition. A recent upgrade of the electrical components of the parking meters has further extended their life-expectancy.

Given that the parking activity is concerned with the provision of a service that generates revenue, it has been relatively easy to measure capacity and performance based on information provided by the Metro meters and the off-street parking facilities. Before 2008 the parking activity usually met its occupancy and revenue targets. In the 2008 and 2009 years however, occupancy was down. The parking activity utilises capacity and performance oriented targets in its horizon reporting facility as a means of measurement.

The total amount of parking available within the central city before the earthquakes as a proportion of the number of employees was very high by international standards at 87.5% (spaces per employee) – by comparison Auckland (70.3%), Hamilton (69.3%) and Wellington (54.8%) were well below this level.

In addition the total amount of parking provided in the central area of Christchurch has been greater than the demand for spaces over recent years. Pre-earthquake the occupancy of car parks was:

- On-street carparks 68%
- Off-street carparks 56%
- Weighted total 59%

The earthquakes resulted in much of the central city being closed. This has had continuing residual effects on the parking activity, including the ongoing failure to meet several financial targets. This has been further compounded by parking incentives offered by the Council. For example, the one hour free parking for on-street parks, and the two hour free parking for some of the parking areas created following building demolition.

Since the earthquakes the number and occupancy rates for central city metered on-street carparks has seen a reduction in occupancy rates compared with pre-earthquake figures.

'Occupancy without avoidance' refers to occupancy where the parking fee has been paid and the paid for time has not been exceeded.

8.11.2 Valuation Data

Asset valuations are established at 3-yearly intervals and this was last undertaken in June 2019, as shown in the table below.

Assets	**Optimised Replacement Cost** (ORC)	**Optimised Depreciated Replacement Cost** (ODRC)	**Annual Depreciation** (AD)
Parking Meters and Other Minor Structures[†]	$9,649,875	$2,723,888	$761,072

Table 8-56: Parking asset valuation data (from 2019 Valuation Report)

8.11.3 Problems

The following problems have been identified relating to parking assets in Christchurch:

- parking meter vandalism and theft is an ongoing issue that results in unplanned maintenance or replacement of parking meters; and
- some of the Council's physical meters are over 10 years old, however the electronics were upgraded a few years ago, which has extended their lifespan. There is no existing condition rating information. A programme of inspections and ongoing replacement of meters is required over time to ensure these assets remain in good working order.

8.11.4 Benefits

Addressing these issues will help achieve Council's strategic outcomes as shown in Table 8-7 below.

Journeys are safe	Journeys are reliable	Customers have choice	Journeys are comfortable	Council is responsive to the needs of customers
n/a	n/a	End of trip facilities such as parking provide customers with access to employment, retail and other key activities	Parking occupancy signage and electronic payment improves the customer experience	Council has a number of spare meters for parts and replacement in stock to respond to failures or damage reported by customers

Table 8-57: Alignment with strategic outcomes

8.11.5 Consequences of Not Addressing the Problems

There is a risk of failure of parking meters and reduced revenue if the meters are not maintained and operational.

8.11.6 Levels of Service

Parking assets contributes to a number of Council measures, the most relevant of these measures are listed below:

- CCC – Public off-street parking occupancy (quarterly surveys undertaken for Central City);
- CCC – Public off-street parking within walking distance of retail; and
- CCC - Public on-street parking occupancy.

8.11.7 Gap Analysis

This section outlines how Council's parking assets are currently performing against the key Levels of Service measures detailed above.

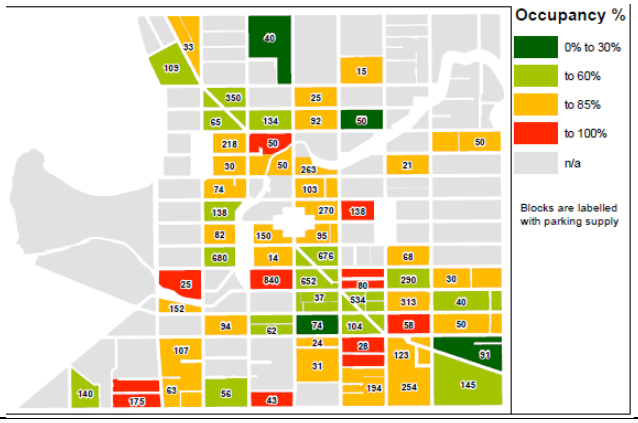
CCC - Public off-street parking occupancy Image based on June 2019 survey	
CCC - Public off-street parking within walking distance of retail	

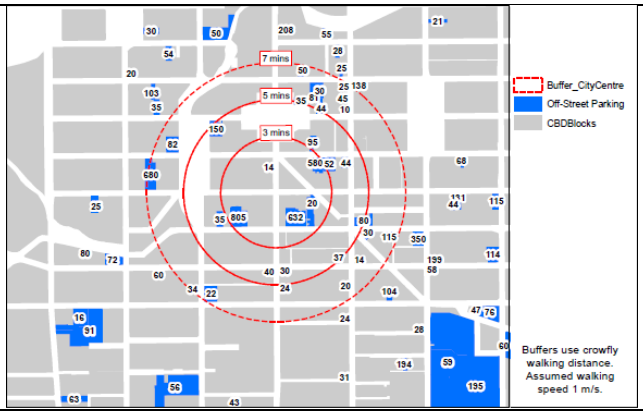
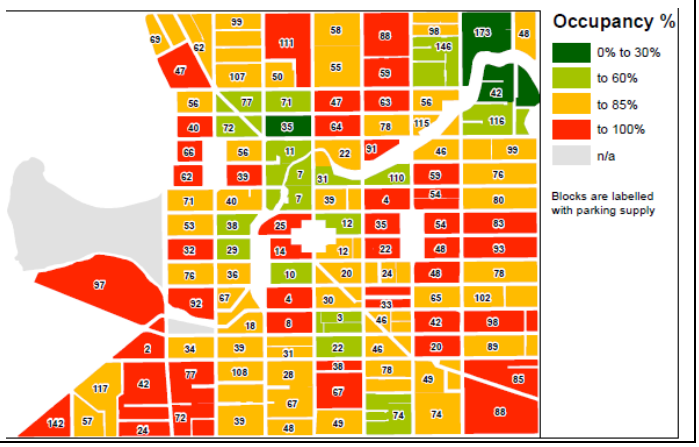
Image based on June 2019 survey	
CCC - Public on-street parking occupancy Image based on June 2019 survey	

Figure 8-38: Gap analysis and evidence base

8.11.8 Options to Address Gaps

Council has developed the following options to address the identified gaps in the network for its parking assets:

Options	Output	Benefit / Consequence
Maintain current level of investment Keep the quantity of work static.	Maintain the current quantity of work per year.	Not achieve any improvements to network condition. Likely reduction in customer satisfaction and higher costs in medium to long term as assets deteriorate.
Increase investment over time Incrementally increase spending over a 5 year period.	Ramp up the programme over 5 years to achieve y per year.	Sustainable increase in quantity of work. Return network to appropriate state over 10 – 20 year period.
Increase Investment now Increase investment for the next 3 financial years.	Deliver on the backlog of works over the next 3 years.	Concentrated effort to get assets back to appropriate standard. High level of capital outlay, and likely disruption to residents due to increased scale of works.

Run to failure Don't plan to remediate assets until they have clearly broken.	Don't plan for a stable quantity per year, wait for assets to break and respond accordingly.	Uncertainly of workload, and likely higher costs due to reactive nature of work.

Table 8-58:4 Option development

8.11.9 Recommended Option

Council recommends adopting the Maintain current level of investment option for the maintenance, operation and renewal of its parking assets, as it considers this the best option to deliver the strategic outcomes.

This option aims to deliver ONRC fit-for-purpose Levels of Service, and plans to renew assets before they fail.

8.11.10 Operations and Maintenance Plan

The contractor, Integrated Technology Services Limited (ITS), is engaged to inspect the condition of the parking meters on a very regular basis (for example some meters inspected daily), and supply the Council with a daily fault report indicating which meters, if any, require maintenance.

The Council owns a supply of spare meters and parts which are stored by the Contractor, and used for repair / replacement work when required. Meters are purchased as and when required, however Council has spare stock as many meters were removed post-earthquake and put into storage.

A significant portion of current investment in parking is to repair meters (preventative and reactive) due to vandalism and to collect cash (circa $1m paid to contractor per year).

Maintenance Expenditure

Work Type	Opex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Depreciation	0.7	0.9	0.9	1.1	1.3	1.4	1.4	1.5	1.5	1.6
Operations	3.5	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Maintenance	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Compliance	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Total	6.8	7.0	7.1	7.7	7.9	8.0	8.1	8.1	8.2	8.2

Table 8-59: Parking Opex budget including maintenance

8.11.11 Renewals Plan

As detailed in Section 8.11.3 Problems, renewals of parking meters are not currently undertaken, but this is an area that will be progressed in future years as the majority of meters are now 10-12 years. We will start to plan for their failure and replacement now and proactively address before issues arise. In addition new technology will need to be factored into renewals.

Work Type	Capex Budget ($M)									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Total	0.50	0.69	0.69	1.16	0.49	0.49	0.49	0.70	0.71	0.71

Table 8-60: Proposed parking Capex budget

8.11.12 Capital Development Plan

No new asset expenditure is forecast for parking infrastructure as it is assumed that any rebuild of parking buildings will not be covered under this AMP.

8.11.13 Disposal Plan

The disposal process associated with the on-street parking activity will be driven by the phasing out of the Metro meters. As indicated earlier in this section, the meters have an expected useful life of 10-years which will expire in 2016. Given this relatively short life expectancy, it is easy to plan for and manage. This process is managed by ITS and overseen by Council staff.

With regard to the off-street parking activity, there is currently no identified disposal process or programme and it is unlikely that the removal of these meters will have a significant cost.

9 Financial projections and trends

This section outlines the long-term financial requirements for the Activity based on the long-term strategies and tactics described earlier in the Plan.

9.1 Key Assumptions

General assumptions in preparing this forecast include:

- no smoothing of costs has been undertaken;
- figures are based on FY2022 dollars with no inflation for future years;
- growth of the asset base is as predicted in Section 4; and
- growth of traffic volumes is also as predicted in Section 4.

Significant risks associated with these assumptions include:

- certain price fluctuations are out of Councils control, such as the cost of bitumen. This has an impact on the cost of certain types of work.

Impacts of COVID-19 – short and longer term

Ongoing forecasting advice from economic commentators (e.g. The Treasury, ChristchurchNZ, financial institutions) has signalled significant economic impacts locally, nationally and internationally. This advice has been updated regularly and is likely to change over time.

What does this mean for the Transport Unit?

- an initial focus on infrastructure that supports COVID-19 recovery and delivers the remaining post-earthquake anchor and regeneration projects (e.g. progress 'shovel ready' infrastructure projects identified as part of central government stimulus package and complete committed projects);
- short-term (now, and LTP years 1-3) - some delays in scheduled capital programme works, potential issues with workforce availability/contractor viability following lifting of restrictions; uncertainty about materials supplies; changing priorities for work programming (e.g. accommodating the norm of physical distancing); opportunities for bringing forward 'shovel ready' work; increased financial pressure on Council budgets;
- medium term (LTP years 4-6): - possible re-prioritisation of capital works programme; changed programme priorities (as above); continued financial pressure on Council budgets; and
- longer term (LTP years 6 – onwards) - uncertain at this stage; potential bow-wave effect of deferred operational spend due to above factors.

9.1.1 Significant Changes

The significant changes in expenditure are shown in Table 9-1.

Item	Movement	Rationale for change
Personnel	Increase	2% allowed to match standard contacts
Contracts	Increase	Match inflation
Materials	Increase	Predict issues with supply and sustainability of current practices. Council will need to adapt its standards and this will likely increase costs
Energy		
Others		Monitored and largely managed by reactive actions

Table 9-1: Activity Operating Costs – Significant Changes

9.2 Operating Forecasts

As outlined in Section 7.5 Council is responsible for delivering safe, sustainable and integrated traffic operations and systems in line with traffic standards and bylaws, to achieve a safer and optimised transport network.

Road Maintenance is now delivered through four area contracts (3 awarded in 2017, North, South and Central across the City, and 1 for Banks Peninsula, awarded in 2015).

9.2.1 Financial Projections

The operating forecast outlined below contains depreciation, operational costs and maintenance costs. Staff costs have been included under operations at this stage.

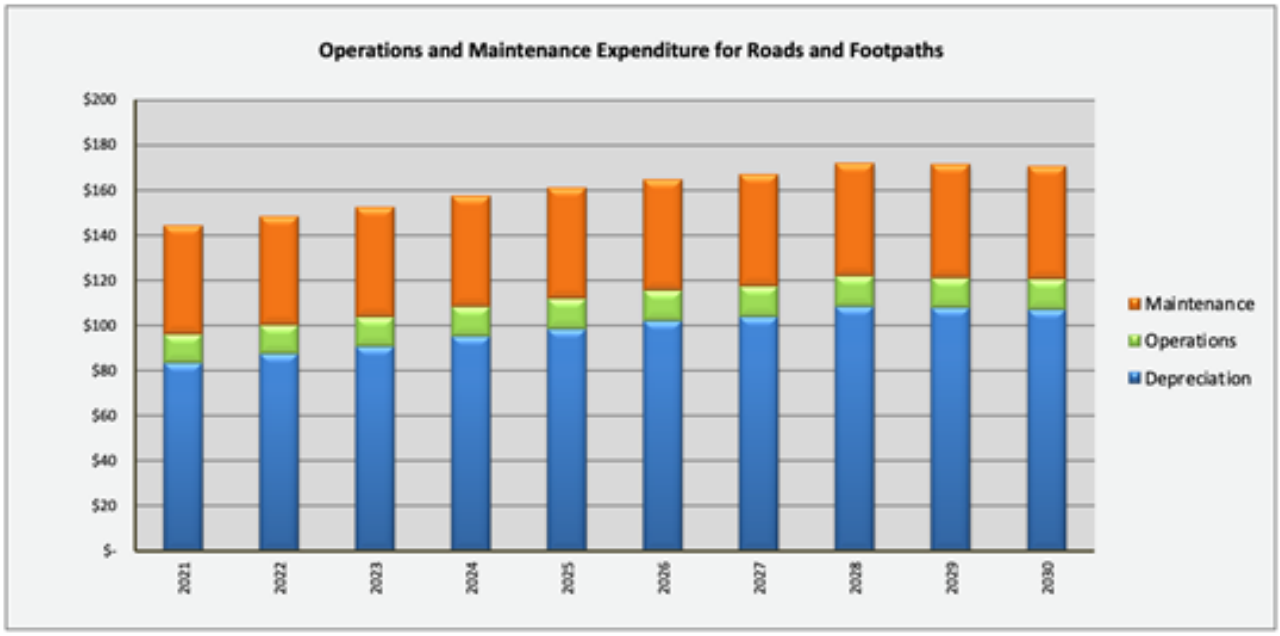


Figure 9.1: Operating forecast for the next 10 years.

9.2.2 Capital Forecasts

Renewal Forecasts

Renewal forecasts are outlined in Section 8 of this AMP and are based on current condition assessment information. The renewals forecasts are summarised below.

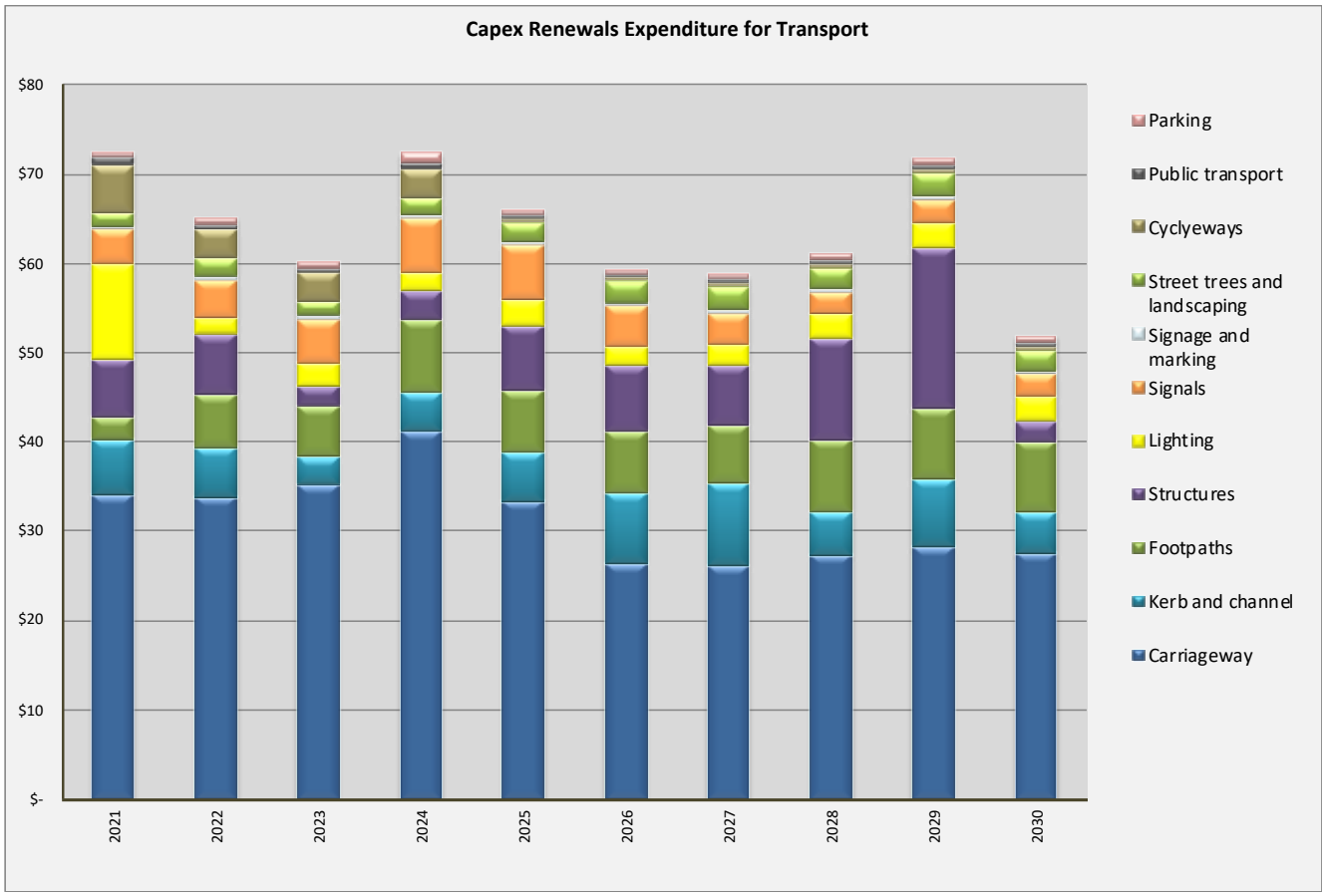


Figure 9-2: Capital renewal 10-year summary

The major renewals areas include:

- Carriageway;
- kerb and channel;
- footpaths;
- structures; and
- street lighting.

As outlined in Section 8 Lifecycle Management Plans, increased investment is recommended in the short term to rectify specific known issues. In the longer term, Council has an on-going requirement to maintain its asset base.

Capital Projects Expenditure

As outlined in Section 4.5 Council has adopted a range of activity or outcome focused plans and strategies that provide the detailed link between the high-level community outcomes and strategic priorities and the work programmes the Council undertakes to deliver on these. For delivery purposes these are grouped as follows:

LoS Pillar	Programme
Safety	Core Safety
Access	An Accessible City
	Access
	Amenity
	Growth
Environment	Cycleways
	PT Improvements
	Shovel Ready
	CRAF

Table 9-2: Alignment between Pillars and Programmes

Capital improvement expenditure and programmes are detailed in the Transport Activity Plan which can be accessed through the following link.

Long Term Plan 2021-31 Activity Plans and Asset Management Plans: Christchurch City Council (ccc.govt.nz)

9.2.3 Revenue forecasts

The Local Government Act 2002 requires Council to adopt a Revenue and Financing Policy that sets out how operating and capital expenditure will be funded from available funding sources. It is an important policy, as it determines who pays for Council's services and how those services will be funded.

Council receive Transport related revenue from several operating streams. These are rates, borrowing and the National Land Transport Fund (NLTF) subsidy, via the National Land Transport Programme (NLTP) which Waka Kotahi administer on behalf of the Government.

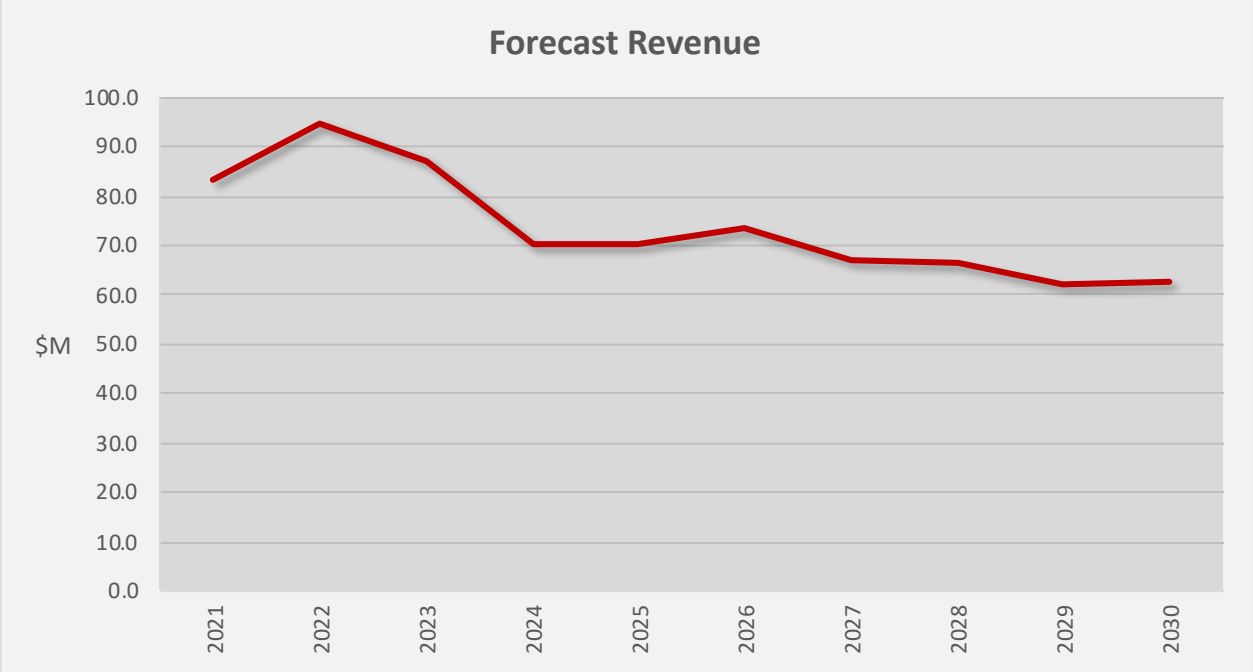


Figure 9-3: Forecast Revenue

9.3 Input Data Confidence Levels

The expenditure and valuations projections in this Asset Management Plan are based on best available data. Currency and accuracy of data is critical to effective asset and financial management. Data confidence (reliability of data) is assessed and classified on a 5 level scale as outlined in the Table below.

Data	Confidence Assessment	Comment
Demand drivers	B	Demand and growth are based on a regional model which has been peer reviewed
Growth projections	B	
Operations expenditures	B	
Maintenance expenditures	A	Well maintained
Projected Renewal - Asset values	B	Tested by valuer and external audit
- Asset residual values	B	
- Asset useful lives	B	
- Condition modelling	A	Undertaken by industry expert
- Network renewals	A	
- Defect repairs	B	
Upgrade/New expenditures	B	
Disposal expenditures	B	Low activity here

Table 9-6: Data Confidence Assessment for Data used in Asset Management Plan

Confidence Grade	Description
A Highly reliable	Data based on sound records, procedures, investigations and analysis, documented properly and recognised as the best method of assessment. Dataset is complete and estimated to be accurate to ± 2%
B Reliable	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example some of the data is old, some documentation is missing and/or reliance is placed on unconfirmed reports or some extrapolation. Dataset is complete and estimated to be accurate to ± 10%
C Uncertain	Data based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data are available. Dataset is substantially complete but up to 50% is extrapolated data and accuracy estimated to ± 25%
D Very Uncertain	Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete and most data is estimated or extrapolated. Accuracy to ± 40%
E Unknown	None or very little data held.

Table 9.7: Data Confidence Grading System

9.4 Valuation and Depreciation

9.4.1 Valuation Basis

Council values its assets on a 3 yearly basis. The most recent valuation for the Transport network was undertaken in June 2022. Below is a summary of the quantities and costs from the valuation.

Asset Category	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Carriageways	2,178.8 km sealed 323.7 km unsealed	$1,949,440,700	$1,137,167,122	$24,789,938
Road Drainage	3,593 km kerb & channel 34,195 sumps & associated pipes	$779,938,985	$409,715,191	$8,944,987
Footpaths	2,581.7km	$559,346,581	$279,856,932	$12,030,333
Bridges & Structures	353 roads bridges & 116 footbridges 103 culverts,1 ford & 2 underpasses 1,611 retaining walls Guardrails, railings and gantries	$646,098,086	$238,840,328	$10,675,279
Road Lighting	38,145 lights & 20,327 poles	$125,171,204	$79,645,515	$3,796,076
Traffic Systems	348 signalised intersections 247 CCTV sites & X school speed zone sites	$57,664,831	$28,621,741	$2,478,263
Traffic Services	55,979 signs & city-wide marking	$23,838,391	$8,602,576	$1,211,373
Road Landscaping	65,720 trees	$410,373,102	$238,726,584	$5,099,786

	Berms and 9,592 landscaped sites			
Cycleways	225 km of on-road lanes 115 km of shared paths			
Bus	519 bus shelters, signs and furniture.	$2,849,765	$729,273	$99,825
Tram	4km of tram line	$36,826,953	$29,526,387	$551,475
Parking	1,200 on-street metered spaces 437 parking meters	$11,060,673	$2,889,890	$792,745
Other Street Furniture	Includes bollards, furniture, wheel stops & gas lamps	$273,849	$27,472	$10,260
Total		**$4,603,803,750**	**$2,454,442,622**	**$70,524,932**

Table 9-8: Transport Network Asset Portfolio Summary (values as at 30 June 2022, from 2022 Valuation Report)

10 Continuous Improvement

Council has made a strong commitment to the improvement of Asset Management practices and seeks to further improve the approach. Council acknowledges the ongoing need to focus efforts to further improve Asset Management practices over the term of this AMP to an achievable and appropriate level of capability.

The historic approach to improvement planning has been to have an improvement list contained in the AMP. As a result this was inevitably a detailed technical plan; both for groups of staff and for specific identified staff. This typically led to difficulties with respect to operationally embedding change. For the 2018-21 LTP the improvement planning was elevated to be a tactical document. This meant that instead of focusing on one part of the business, it covered the whole Transport Unit.

The following section outlines the current and recent view of the improvement actions, and their progress. For further information on the wider Council Asset Management improvement process please refer to the SAMP.

10.1 Current Asset Management Practice

An assessment of current Asset Management practice was undertaken by an independent, external consultant (Infrastructure Decisions Ltd) through an Asset Management Maturity Assessment (AMMA) audit first carried-out in 2016 and repeated in 2018. These audits covered Council's transport, three-waters, facilities and parks activities in a consistent manner. The maturity framework used is taken from the International Infrastructure Management Manual, which is the basis for NZ Treasury asset management assessments of central government agencies.

The baseline AMMA audit was predominantly achieved through onsite interviews and facilitated workshops with a good cross-section of participants and stakeholders. The Asset Management performance (or maturity) of each group was ranked against a wide range of criteria and specific improvement actions were identified in order to close the gap between assessed performance and future aspirational targets. These future targets were based on best appropriate practice and considering the agreed business drivers. Strength and opportunities for improvement to close gaps are summarised alongside the results to acknowledge the baseline achievements.

Since then staff have been working-on the agreed improvements, and the level of maturity was re-assessed in 2020 for all of the activities covered in the earlier audits, with the addition of resource recovery which was assessed for the first time.

In this 2020 audit, the Transport Unit was ranked as 'Intermediate-Advanced' level with the average score increasing from 82% to 85% from the 2018 audit, with the average aspirational target of 93%.

It should be noted that it is not intended that Transport strive to be the world's best in all aspects of infrastructure asset management, but we aim to achieve a high level of excellence in appropriate aspects of Asset Management; in particular those that would make the most difference to the management and operation of the state highway network and local roads.

A summary of the 2020 audit findings for the Transport Unit follows in Figure 10-1.

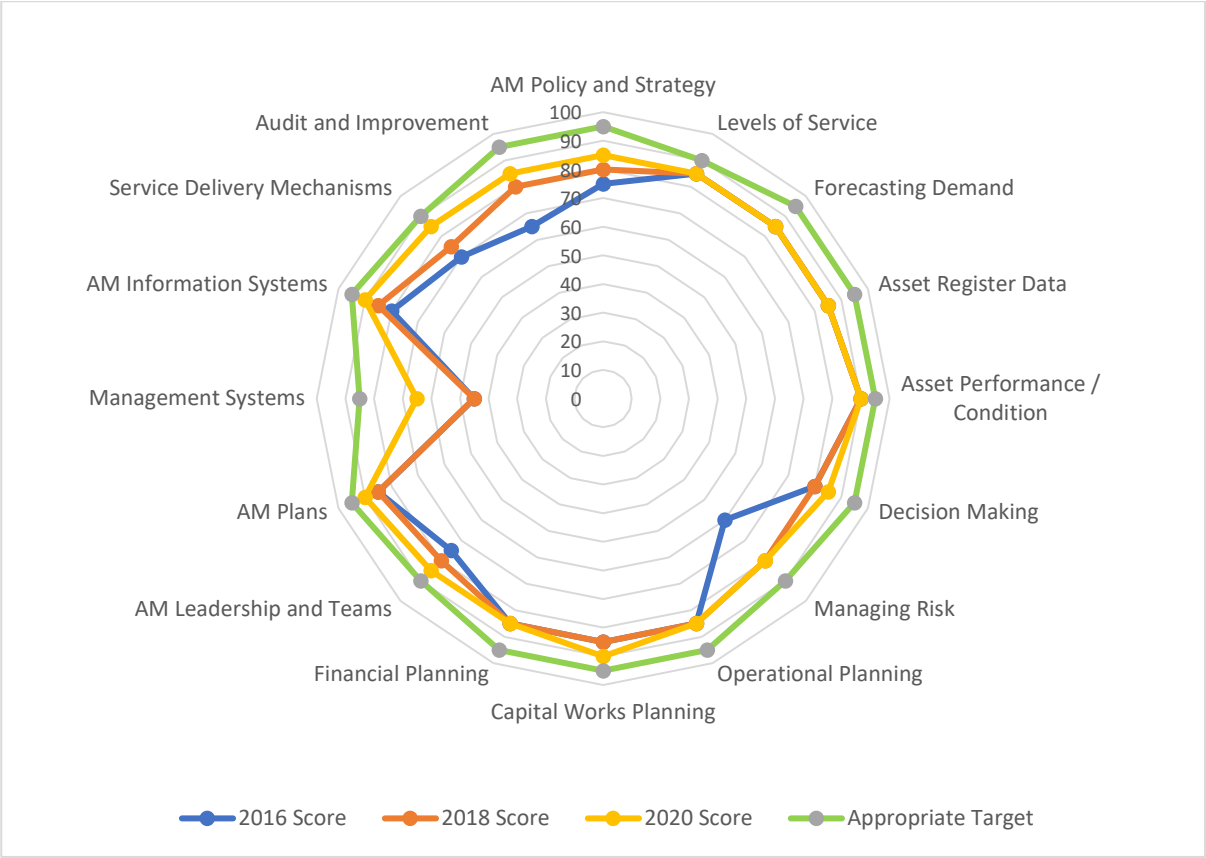


Figure 10-1: Outcome of 2020 AMMA audit

10.2 Current Improvement Plan

A modified approach has been adopted for the development and implementation of a comprehensive Improvement Plan for the Transport Unit and this is outlined in this 2024-34 AMP.

To gain a more comprehensive view of the Transport improvement projects, a programme of improvement initiatives has been compiled to bring together all the prioritised projects on a coordinated and prioritised basis for the next three years

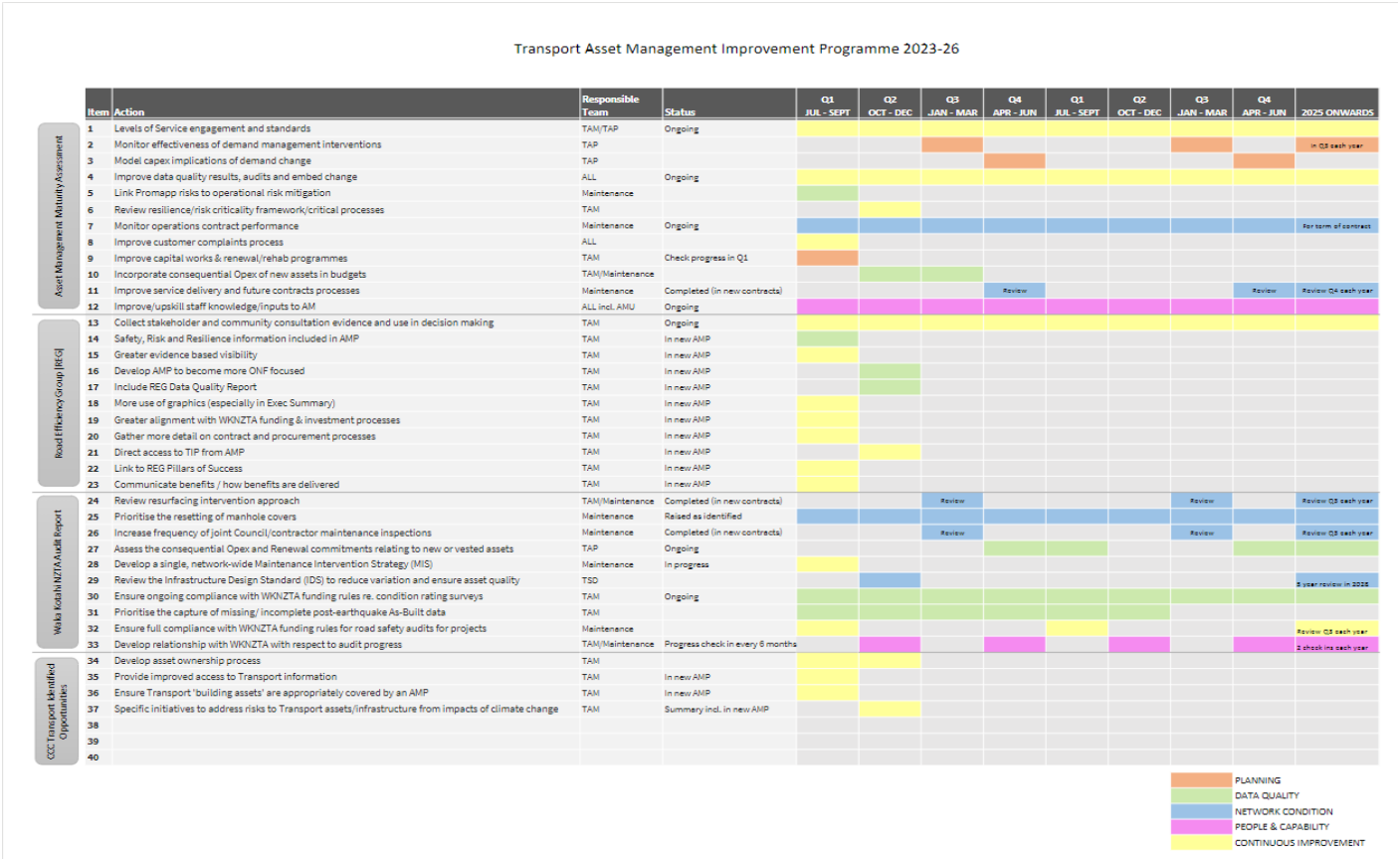
As a base we have taken elements of the previous Improvement Plan which were either Work In Progress or which had not been progressed and these are denoted by **EX** as a prefix in the summary Figure 10-2.

The outcomes of the 2020 AMMA audit which relate to the Transport Unit are specific identified 'Actions' which are denoted with the letter **A** as a prefix in the summary Figure 10-2 which follows (full AMMA report at TRIM ref 21/265374).

In March 2021 Waka Kotahi conducted their Investment Audit, with the final version of the Audit Report received in December 2021. The specific outcomes of the Audit are a series of 'Recommendations' which describe improvement actions recommended to close identified gaps in Council's practice and processes. These are denoted with the letter **R** as a prefix in the summary Figure 10-2 which follows (full Waka Kotahi report at TRIM ref 22/1074622).

In 2022 the Road Efficiency Group (REG) conducted an audit of Council's 2021-2031 AMP as part of the REG Excellence Programme. (The REG AMP review process, which is framed around the REG Pillars of Success criteria, evaluates the strategic content, investment narrative, use of asset management guidelines such as IIMM and ISO, business case principles and improvement planning in Council AMPs across New Zealand). The specific outcomes of this audit are a number of 'Actions/Opportunities' which describe improvement actions to close identified gaps. These are denoted by **AO** as a prefix in the summary Figure 10-2 below (full REG review report at TRIM ref 23/43594).

Summary improvement task information is included in this Section in Table 10-2. The detailed Improvement Plan, which is maintained as a 'living' document through regular updates and progress reporting, can be accessed at [Transport Improvement Programme (TIP)]



Transport Asset Management Improvement Programme 2023-26

	Item	Action	Responsible Team	Status	Q1 JUL - SEPT	Q2 OCT - DEC	Q3 JAN - MAR	Q4 APR - JUN	Q1 JUL - SEPT	Q2 OCT - DEC	Q3 JAN - MAR	Q4 APR - JUN	2025 ONWARDS
Asset Management Maturity Assessment	1	Levels of Service engagement and standards	TAM/TAP	Ongoing									
	2	Monitor effectiveness of demand management interventions	TAP										In Q3 each year
	3	Model capex implications of demand change	TAP										
	4	Improve data quality results, audits and embed change	ALL	Ongoing									
	5	Link Promapp risks to operational risk mitigation	Maintenance										
	6	Review resilience/risk criticality framework/critical processes	TAM										
	7	Monitor operations contract performance	Maintenance	Ongoing									For term of contract
	8	Improve customer complaints process	ALL										
	9	Improve capital works & renewal/rehab programmes	TAM	Check progress in Q1									
	10	Incorporate consequential Opex of new assets in budgets	TAM/Maintenance										
	11	Improve service delivery and future contracts processes	Maintenance	Completed (in new contracts)				Review				Review	Review Q4 each year
	12	Improve/upskill staff knowledge/inputs to AM	ALL incl. AMU	Ongoing									
Road Efficiency Group (REG)	13	Collect stakeholder and community consultation evidence and use in decision making	TAM	Ongoing									
	14	Safety, Risk and Resilience information included in AMP	TAM	In new AMP									
	15	Greater evidence based visibility	TAM	In new AMP									
	16	Develop AMP to become more ONF focused	TAM	In new AMP									
	17	Include REG Data Quality Report	TAM	In new AMP									
	18	More use of graphics (especially in Exec Summary)	TAM	In new AMP									
	19	Greater alignment with WKNZTA funding & investment processes	TAM	In new AMP									
	20	Gather more detail on contract and procurement processes	TAM	In new AMP									
	21	Direct access to TIP from AMP	TAM	In new AMP									
	22	Link to REG Pillars of Success	TAM	In new AMP									
	23	Communicate benefits / how benefits are delivered	TAM	In new AMP									
Waka Kotahi NZTA Audit Report	24	Review resurfacing intervention approach	TAM/Maintenance	Completed (in new contracts)			Review				Review		Review Q3 each year
	25	Prioritise the resetting of manhole covers	Maintenance	Raised as identified									
	26	Increase frequency of joint Council/contractor maintenance inspections	Maintenance	Completed (in new contracts)			Review				Review		Review Q3 each year
	27	Assess the consequential Opex and Renewal commitments relating to new or vested assets	TAP	Ongoing									
	28	Develop a single, network-wide Maintenance Intervention Strategy (MIS)	Maintenance	In progress									
	29	Review the Infrastructure Design Standard (IDS) to reduce variation and ensure asset quality	TSD										5 year review in 2028
	30	Ensure ongoing compliance with WKNZTA funding rules re. condition rating surveys	TAM	Ongoing									
	31	Prioritise the capture of missing/ incomplete post-earthquake As-Built data	TAM										
	32	Ensure full compliance with WKNZTA funding rules for road safety audits for projects	Maintenance										Review Q3 each year
	33	Develop relationship with WKNZTA with respect to audit progress	TAM/Maintenance	Progress check in every 6 months									2 check ins each year
CCC Transport Identified Opportunities	34	Develop asset ownership process	TAM										
	35	Provide improved access to Transport information	TAM	In new AMP									
	36	Ensure Transport 'building assets' are appropriately covered by an AMP	TAM	In new AMP									
	37	Specific initiatives to address risks to Transport assets/infrastructure from impacts of climate change	TAM	Summary incl. in new AMP									
	38												
	39												
	40												

PLANNING
DATA QUALITY
NETWORK CONDITION
PEOPLE & CAPABILITY
CONTINUOUS IMPROVEMENT

[Transport AM Improvement Prog Summary.pdf]

Figure 10-2 Summary Improvement Programme

10.3 Resourcing the improvement programme

The Transport Unit requires resources and budget to deliver the Improvement Plan tasks. Consideration of existing workloads and other corporate priorities may require changes to the indicative timeframes of initiatives which are shown in the improvement programme.

Given the recent and current pressure which Council has experienced, it is likely that a lack of resources (in particular experienced staff and available finance) across Council could adversely impact on the effective delivery of many of the improvement items. A prioritisation and costing exercise will be required to ensure the highest priority items and/or those focused on critical assets and processes are delivered first and that future delivery costs are understood, and sufficient budgets allocated within the LTP.

10.4 Funding the Improvement Programme

The previous improvement programmes were funded from existing internal budgets. To achieve this within resource and time constraints, Business As Usual tasks and improvement tasks were prioritised and scheduled in such a way to make best use of the available people resources and budget.

Council also receives significant co-funding from Waka Kotahi for transport planning, Asset Management and improvement works. As a Waka Kotahi requirement, the Improvement Plan is submitted to them as part of their three year funding cycle.

For the improvement programme proposed in this AMP, it is planned is to split the work into two primary groups. Firstly, those items that are continuous improvement to Business As Usual which will be embedded into the respective team members work objectives (which in Council are termed a 'Personal Development Plan' or PDP). Secondly, items of work that are targeted improvement initiatives will be treated as specific projects over and above Business As Usual. These will need to be specifically resourced and funded accordingly.

10.5 Monitoring and review

The improvement programme progress will continue to be reported to the Transport Management Team on a monthly basis. This is the appropriate level of escalation to keep a good 'line of sight' on delivery, and provide direction if progress is slipping.

Further to this the same reporting will be submitted through to Council's Asset Management Governance Board.

Appendix

Glossary of terms

AADT	Annual Average Daily Traffic
ActMP	Activity Management Plan
AD	Annual Depreciation
AFV	Alternative Fuel Vehicle
AMP	Asset Management Plan
AMPs	Asset Management Plans
Austroads	Collective of Australian and New Zealand transport agencies
AV	Autonomous Vehicle
BCP	Business Continuity Plan
Berm	Grass or landscape strip between property boundary and footpath or street
Boardings	Number of people boarding public transport vehicles
Capex	Capital Expenditure
CAR	Corridor Access Request
CAST	Christchurch Assignment and Simulation Transport model

CBD	Central Business District
CCDU	Christchurch Central Development Unit
CCTV	Closed Circuit Television (usually describes recording cameras)
CER Act	Canterbury Earthquake Recovery Act 2011
CMS	Central Management System
CNC	Christchurch Northern Corridor
CO_2	Carbon Dioxide
Council/CCC	Christchurch City Council
COVID-19	Coronavirus disease 2019
CPTED	Crime Prevention Through Environmental Design
CSM	Christchurch Southern Motorway
CSM2	Christchurch Southern Motorway Stage 2
CSS	Construction Standard Specification (Council documentation specifying construction requirements)
CTM	Christchurch Transport Model
CTOC	Christchurch Transport Operations Centre
CTSP	Christchurch Transport Strategic Plan
CV	Connected Vehicle
DSI	Death and Serious Injury accident
Earthquakes	Canterbury Earthquake Sequence events (largest events in 2010 and 2011)
ECan	Environment Canterbury
ELT	Executive Leadership Team of Council
EPB	Earthquake Prone Building (seismic capacity less than 1/3 of current design requirement or NBS)
EV	Electric Vehicle
GDP	Gross Domestic Product
GHG	Greenhouse gas (emissions)
GPS	Global Positioning System
GPSLT	Government Policy Statement on Land Transport 2021
IDS	Infrastructure Design Standards (Council documentation specifying infrastructure design requirements)
IIMM	International Infrastructure Management Manual
IS	Infrastructure Strategy
ITS	Intelligent Transport Systems
KiwiRAP	Waka Kotahi Risk Assessment Programme
KPI	Key Performance Indicator
KRA	Key Result Area

LED	Light Emitting Diode (lamp)
LGNZ	Local Government New Zealand
LPC	Lyttelton Port of Christchurch
LTMA	Land Transport Management Act 2013
LTP	Long Term Plan
LV	Low Voltage
MaaS	Mobility as a Service
MCA	Multi Criteria Analysis
MCR	Major Cycle Routes
NAASRA	National Association of Australian State Road Authorities
NBS	New Building Standard (used in context of seismic capacity)
NLTF	National Land Transport Fund
NPV	Net Present Value
ODRC	Optimised Depreciated Replacement Cost
ONF	One Network Framework
ONRC	One Network Road Classification
ONRC_PMRT	One Network Road Classification Performance Measure Reporting Tool
Opex	Operational Expenditure
ORC	Optimised Replacement Cost
Paper road	Unformed and unmaintained legal road
Promapp	Internal process mapping tool
PT	Public Transport
RAMM	Road Assessment and Maintenance Management software system
RCA	Road Controlling Authority (entity such as Council that operates part of the NZ Land Transport network)
RCAs	Road Controlling Authorities
REG	Roads Efficiency Group
RGCP	Resilience Greater Christchurch Plan
RLTP	Regional Land Transport Plan
RPS	Regional Policy Statement
RPTP	Regional Public Transport Plan
RTI	Real Time Information
SAMP	Strategic Asset Management Plan
SNP	Waka Kotahi Safe Network Programme
SOV	Single Occupancy Vehicle

TEU	Twenty foot Equivalent Units (shipping containers)
Transport Unit	Transport and Waste Management Unit of Council
TSG	Transport Steering Group (internal to Council)
VKT	Vehicle kilometres travelled
VMS	Variable Message Sign
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
Ward	Electoral subdivision of city (there are 16 wards in the city)
Water table	A drain to channel and direct stormwater from cut banks or berms along a road