Infrastructure Strategy

Executive summary

This Infrastructure Strategy is our plan for infrastructure investment that will build our resilience and improve community wellbeing over the next 30 years. Looking ahead, we face uncertainties, disruptions must be expected and we need to manage risks responsibly. Our ability to adapt to the impacts of climate change will define our future city and lives.

The Strategy is about these infrastructure assets: water supply, wastewater, surface water and waterways, transportation, resource recovery, facilities, parks and information technology. It identifies the significant infrastructure issues we face, outlines the strategic response and principal ways we will address these, and sets out the major decisions, programmes and projects required to deliver the most likely scenario for infrastructure investment through to 2051 (see Appendix 1 for a summary). It forms part of the Long Term Plan (LTP) 2021-31, along with the Financial Strategy and Activity Plans. They have all been developed during the COVID-19 pandemic and so reflect the pressures on the Council's budgets and need for socio-economic recovery.

The Strategy focuses on how we address six significant issues for infrastructure investment:

1. Looking after what we've got
2. Responding to community needs and expectations, as we grow
3. Adapting to climate change
4. Reducing greenhouse gas emissions
5. Responding to changing regulatory and commercial environments
6. Delivering within financial constraints.

In the early years of the LTP (years 1-3), our progress in addressing these issues will be tempered by our financial position, which is affected by COVID-19, and reflects current investment commitments and priorities. In the context of COVID-19, the size of some work programmes and projects have had to be reduced and/or deferred so that they are affordable and deliverable.

Maintaining a viable infrastructure network is the foremost priority, along with progressing projects already underway or committed to and optimising available external funding. At the same time, we need to do some important policy work, such as confirming our approach to infrastructure provision in areas vulnerable to the impacts of climate change, working alongside vulnerable communities to adapt to natural hazards, finding pathways for reducing our emissions, and defining the future urban form we want for our city.

To guide our investment in and management of infrastructure assets and risks, we need to:

- *Focus on resilience*: Growing a resilient and liveable city, by responding to climate change, reducing emissions and preparing for disruption
- *Focus on condition and performance*: Being careful stewards by investing responsibly in developing and maintaining our city's assets, managing demand through greater use of existing assets, and balancing our community's needs and expectations with what we can afford.

We want to work closely with all our strategic partners – in particular working in partnership with mana whenua to protect land and water, and finding a shared strategic direction for our urban areas through the Greater Christchurch Partnership 2050 work, which will influence our infrastructure planning.

Purpose and scope

The Infrastructure Strategy is one of several key 'ingredients' in the LTP 2021 -31.[1] It has a much longer horizon than the LTP as it describes the significant infrastructure issues for Christchurch over the next 30 years and our principal options for managing these issues, their costs and implications. As required by the Local Government Act 2002 (the LGA), we take into account:

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

The Strategy provides direction for this planning, as well as for activity planning, capital prioritisation and budgets, but does not replicate the detail in Asset Management Plans.[2] The Strategy frames and guides the approach taken to developing the capital programme and operational decisions about maintenance of assets. It reflects the complexity of our current and emerging environment, is firmly embedded in the context of risk and resilience as a measure for investment, and is mindful of consequential operational expenditure.

This Strategy covers the core infrastructure areas identified in the LGA:

- Water supply
- Sewerage and the treatment and disposal of sewage (termed wastewater in this Strategy)
- Stormwater drainage (termed surface water and waterways in this Strategy)
- Flood protection and control works (termed surface water and waterways in this Strategy)[3]
- Roads and footpaths (all as required by the Local Government Act 2002).

It also covers solid waste and resource recovery, facilities, parks, and information technology (IT) (These areas are included as they are important infrastructure for community wellbeing).

The Council's critical assets include those associated with water supply and wastewater, flood protection and control, and certain transportation avenues that act as lifeline routes.[4] Assets that support wellbeing and serve to connect our communities, for example parks and facilities, and that enable the Council to connect with its people, are also significant. Our IT assets, for example business-critical software, also provide critical support for the basic services listed above, the provision of which would be compromised if these assets were to fail. Any failure of these assets would cause significant disruption in services, and carry a financial, environmental, and/or social cost, therefore they warrant a higher level of management. Our portfolio of assets is significant and the current replacement value is approximately $17 billion (see Appendix 3).

[1] The key components documents of the LTP and their inter-relationships are explained in Appendix 8. The process followed in developing the strategy is summarised in Appendix 9.

[2] There are 14 Asset Management Plans encompassing the range of Council assets. They set out what assets the organisation manages and maintains, the cost of doing so, and signals forthcoming capital/operational expenditure.

[3] For the purposes of this Strategy, the water-related infrastructure asset classes are divided into the following three categories: Water supply, Wastewater, and Surface water and waterways. This terminology is consistent with the Council's Te wai ora o tāne Integrated Water Strategy, adopted in late 2019.

[4] The Council has also identified its 'strategic assets' as part of its Significance and Engagement Policy, ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Policies/Consultation/Significance-and-Engagement-Policy-November-2019.pdf

Introduction

Being ready for the unexpected

In our conversation with the community about the LTP 2021-31 we talked about finding the right game plan for the changing world we live in. This will set us up for the 30-year lifespan of the Infrastructure Strategy, so that we are resilient and ready to deal with disruptions, uncertainty, changing financial contexts. Our ability to adapt to the impacts of climate change will define our future city and communities.

Disruptions

As we have learnt in recent years, we need to be ready for the unexpected disruptions that can throw us off course and put new or changing demands on our infrastructure. Christchurch has been confronted by a number of acute shocks and chronic stresses over the past decade – foremost the 2010-11 Canterbury earthquakes and aftermath, Port Hills fires, flooding, the terror attacks, and loss of secure drinking water status. The COVID-19 pandemic has once again forced us to absorb an enormous shock, and deal with an unprecedented situation with widespread impacts on our economy and wellbeing.

This is the first infrastructure strategy since the earthquakes in which recovery and regeneration momentum are not the primary focus of our asset investment in the future. The earthquakes are still a legacy, but this Strategy's focus is on our resilience - anticipating disruption, managing uncertainty, and adapting to the impacts of climate change.

Uncertainties

Being mindful of risks underpins our decision-making about assets. At this time, however, we need to also consider uncertainty - we don't know the duration and breadth of the social and economic impacts of the COVID-19 pandemic. Based on recovery from earlier economic recessionary times, we can assume that over the medium to longer term, growth will resume at the rate predicted.

In addition to the uncertainty created by the pandemic, the Government's current programme of reforms to the management and delivery of water services to communities is likely to bring significant change to the way in which water-related infrastructure and delivery of services is currently delivered to the city. The full implications of the reforms are still unknown but we will have a better understanding within the next two years. The reforms are further discussed in the chapter on significant issues.

Financial constraints

The Council's strategy for budgeting for the LTP 2021-31 period has been heavily influenced by the need to reflect and respond to the impacts of COVID-19 and consequent financial constraints. We need to make savings, so have prioritised some programmes and projects and deferred others.

Although it is anticipated that we will be able to return to a more sustainable and resilient financial position by the middle of the decade (debt is forecast to peak in 2026 before reducing over time), the requisite financial constraints on spending in the first years of the LTP will clearly temper the pace at which we address some of our infrastructure issues. In particular it will increase the likelihood of reactive operational costs, where pre-emptive renewals and replacements work has not been able to be go ahead.

Delivering infrastructure within financial constraints is one of the six key issues identified in the Strategy. There is further discussion on the impacts and implications of these constraints in the significant issues section.

Resilience

To prepare for these disruptions and uncertainties, our systems, communities and infrastructure need to display the key characteristics of resilience - reflective, resourceful, robust, redundant, flexible, inclusive and/or integrated.[5]

[5] Resilience characteristics defined by the global Resilient Cities Network (of which we are a member)

As part of preparing the Asset Management Plans and Activity Plans for the LTP 2021-31, we took a close look at how we manage risk by improving and embedding resilience into our infrastructure and services. We need to make sure that the materials we use in our infrastructure are robust and flexible and our public and community spaces and places are designed to be inclusive and integrated, and ensure our assets are fit-for-purpose and designed with an appropriate level of redundancy.

The Ōtākaro Avon River Corridor (OARC) is a prime example of our infrastructure assets' vital role in building community resilience. The OARC Regeneration area is important to many in Christchurch; it is the location of nearly 7,000 former homes and many past residents feel a close connection with the area. Regenerating and transforming the OARC into a place where residents and visitors can explore, play, connect and learn will have intergenerational benefits. The Council is committed to co-governance of the area's development with the community and mana whenua.

"Developing resilience in the 21st century" is the overarching goal of the Council's Strategic Framework. Increasing our resilience to disruptions is really important to us as a city. We need to strengthen our capacity and systems so that the people living and working here can survive, adapt and thrive, no matter what kinds of shocks and stresses are experienced.

In Christchurch, the sorts of acute or sudden shocks that we need to prepare to cope with include earthquakes, flooding, coastal erosion, storm surge, wind and tsunamis, along with widespread events like the pandemic.

Climate change, availability of affordable, quality housing and the ageing of our population are examples of chronic stresses that can weaken the fabric and functioning of the city day-to-day or in waves. Often it is a combination of shocks and stresses that challenge us individually, as communities, and the systems we have in place. The impacts of COVID-19 are an example of this – the health-focused response of the lockdown and closure of borders created an immediate shock but the ensuing economic and social impacts are ongoing and risk exacerbating existing vulnerabilities of some groups in our community.

Our current infrastructure and context

What our community says

Reliability and safety are fundamental expectations the community has of our infrastructure. Communities also expect their neighbourhoods to be liveable, safe and green and have places to relax, play, and engage with others. Our infrastructure needs to be able to meet these expectations, and at the same time recognise we are changing from a suburban to a more urban city. Our citizens know well how important resilient buildings, infrastructure, workplaces, communities, homes and households are to being able to live well and safely, and to respond to and recover from disruptions.

We hear our community's views on the infrastructure and services provided by the Council through regular phone and point-of-contact surveys. The surveys measure degrees of satisfaction with the Levels of Service we commit to in our LTP. The latest surveys were undertaken in early 2020. The results tell us that, in relation to infrastructure provision and related services, residents are most satisfied with rubbish collection, libraries, recreation, sports, community facilities; arts and events; and are least satisfied with the condition of our roads and footpaths, stormwater drainage, on-street parking facilities, and the quality of water supplies. Residents are moderately satisfied with wastewater collection, treatment and disposal, and the reliability and responsiveness of water services.[6]

These surveys provide a means of engaging the community that informs and influences this Infrastructure Strategy. We will also hear our community's views on this Strategy, and take these into account, through the public consultation on the LTP.

How our infrastructure is performing

A summary of the current state of each infrastructure asset portfolio is in Appendix 2. The overall value of the Council's asset portfolio, broken down by infrastructure area, can be found at Appendix 3. There are some common threads that run through these asset summaries: the continuing legacy of damage caused by the Canterbury earthquakes; a decade of extraordinary, intense rebuild and repair of built and

[6] Christchurch City Council, Summary of point of contact levels of service results 2019- 2020; and Summary of general service satisfaction survey levels of service results 2020, https://christchurch.infocouncil.biz/Open/2020/05/CNCL_20200528_AGN_4756_AT.PDF
[7] 2020 Annual Report was adopted by the Council on 10 December 2020, ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/Annual-reports/2020-Annual-Report.pdf

horizontal assets; the compounding impact on some assets' condition from reduced capital and operational expenditure, including the increase in reactive maintenance across key networks (in some cases, accounting for approximately 70% of the maintenance costs); and increasing community and government expectations for asset provision and performance. These issues and their implications are discussed further below.

We measure the performance of our infrastructure and services against targets or Levels of Service (LoS) for each activity type. Performance against the LoS are reported on regularly, and a summary is provided each year as part of the Council's Annual Report. The LoS reflect how we are going in meeting both our community's expectations and asset performance against agreed measures or compliance with national standards.

It is important that we understand and respond to those areas where we are failing to meet our LoS, especially for our critical assets that underpin the provision of core services, and where there is widespread citizens' dissatisfaction.

- The critical area of water supply recorded some failures to reach its LoS targets for the 2019-20 year.[7] Notably, with regard to infrastructure asset planning, the Council failed its target set for *Council water supply networks and operations demonstrate environmental stewardship*, due to a recorded 23% of real water loss from the water supply network. This percentage has steadily increased from 11.7% in 2016 (the target is set at no more than 15%). The proportion of residents' satisfaction with the quality of water (48%) continued to fail the set LoS (≥70%) but trended upwards on the previous year (37%), which is likely a reflection of the diminishing level of chlorine in the water supply network.
- The 2020 Annual Report indicates that the Council did not achieve its resident satisfaction targets for road and footpath condition. The average satisfaction level with the condition of our roads continued to be low at 26% (the LoS target is 39%), and satisfaction with footpaths sat at 40% (LoS target is ≥53%). Safety issues with the transport network are evidenced by the continued failure to meet LoS targets around reducing the number of crashes on the road network (including involving cyclists and pedestrians).
- The community's perceptions about the condition of playgrounds and public conveniences did not meet the targeted LoS (82% achieved, against a target of ≥ 90%). Satisfaction with the presentation of community parks has continued to decline in recent years (falling to 57% satisfaction, against a target of ≥ 75%), but there is increasing satisfaction with the range and quality of recreation facilities in parks, albeit still falling below the targeted LoS (75% in 2020, against a target of ≥ 85%, but improving from 63% in 2017).
- Our failure to achieve the LoS for amount of recyclable materials collected for processing at the Materials Recovery Facility (91.07kg per person/year compared to LoS of 104kg per person/year which we have exceeded in recent years) illustrates the impact that a disruption such as the pandemic can have on household habits and consequently on Council activities: processing of recyclable materials had to cease during lockdown and since it recommenced there have been unacceptable levels of contamination in materials collected, and it is taking time for revert to earlier 'good' behaviours, and again reduce the amount of waste having to go to landfill.
- Resident satisfaction with community, sports and recreation facilities, art gallery and museum and libraries is high overall, and despite their hours of opening being reduced due to COVID-10 closures during lockdown, most were on track to achieve related LoS.

The earthquakes' legacy

The 2010-11 Canterbury earthquakes caused considerable damage to our public infrastructure, including roads, bridges, underground reticulation network, and community facilities. The cost of the earthquake rebuild has been estimated at an additional (to pre-event budgets) $10 billion expenditure for the Council,[8] including between $2 billion and $3.4 billion to repair infrastructure. Additionally, a further $4 billion earthquake-related capital expenditure is expected over the next 30 years.[9] (The total economic loss and cost of the earthquakes including the Crown, insurers and other parties is estimated at $40 billion.[10])

[8] Deloitte, Cost of the earthquake to the Council, December 2017, https://ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Strategies/Global-Settlement/Cost-of-the-earthquakes-Deloitte-Report-Final.pdf
[9] Crown and Christchurch City Council, Global Settlement Agreement, 23 September 2019, https://ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Strategies/Global-Settlement/CCC-Release-Global-Settlement-Agreement-23-Septmeber-2019.pdf
[10] The Treasury's advice, reported variously following the earthquakes

Much of the Council's horizontal infrastructure was repaired by the SCIRT alliance (Stronger Christchurch Infrastructure Rebuild Team[11]). Its $2.22 billion, five-and-a-half year programme involved more than 740 individual projects across the city, repairing and rebuilding underground water and wastewater pipes, surface water and waterways, wastewater pump stations, and roads, bridges and retaining walls. Not all damage to the Council's horizontal infrastructure was surveyed nor repaired by SCIRT and remaining earthquake repairs now form part of the Council's renewal programme.

As part of the massive recovery programme of repairs and rebuilding, the Council has invested heavily in increasing the resilience of its assets and reducing the risk of future damage from natural disaster events.

- New buildings are constructed to the higher building code (e.g. Tūranga public library's design features have won national and international accolades for their resilience).
- Existing buildings have been strengthened when repaired (e.g. the Christchurch Art Gallery).
- Modern, flexible materials have replaced older brittle materials in underground pipe networks.
- Alternative technologies have been used in underground networks (e.g. new vacuum and pressure sewer system technology for wastewater has replaced the old gravity network in some areas).
- Ground and structural improvements made during repairs to the wastewater treatment plant mean it will have the strength and flexibility to perform better in future events.
- Pipes joining structures have been designed to withstand differential settlement following land movement or liquefaction, and well heads have been raised above ground.
- There has been greater investment in transport infrastructure that provides for more resilient modes, such as cycleways.

Assessing condition

We use a range of tools to understand the condition of other assets, including the Asset Assessment Intervention Framework (AAIF) for understanding the condition of our underground pipes and the RAM data base to capture data (including about condition), of transportation assets. The most broadly applicable tool is the AAIF: it assists us to better understand asset condition and the risks of failure, which in turn helps determine priority of renewals and replacements' programmes.

Asset Assessment Intervention Framework

For some assets (such as water supply and wastewater), we now have much more accurate condition data than ever before, but in other areas (such as facilities) we still lack the robust information to inform budgets for maintenance and renewals. The AAIF has improved our understanding of the condition and performance of our water supply, wastewater and stormwater pipes. The AAIF uses condition and criticality information to inform the programming of asset renewals within available budgets, and helps us understand and reduce risks of asset failure. It takes into account expected theoretical useful life, actual condition, repair history, rate of deterioration, the risk/impact of failure, and amount of maintenance required to keep the pipe operational – thus helping establish an appropriate renewal year. The AAIF data increases our asset management capability considerably and given that reticulation assets represent approximately 75% of the total water asset portfolio.

Looking ahead, the AAIF could be used as a renewal planning tool for other Council assets, such as water supply pump stations and other asset portfolios. If applied across different asset portfolios it would enable consistent evaluation of high priority projects across assets, which could optimise programme spending. Continued investment in CCTV (closed circuit television) inspections of the wastewater and stormwater network is required to ensure the accuracy of the data collected.

[11] A significant programme of assessment and rebuilding followed the Canterbury earthquakes, carried out by the SCIRT alliance. Alliance members included the Council, Christchurch Earthquake Recovery Authority, NZ Transport Agency, McConnell Dowell, Downer, Fletcher Construction, City Care, and Fulton Hogan.

Strategic context

Working in partnership

The Council is committed to working in partnership with Ngāi Tahu. Since 2015, the Te Hononga Council – Papatipu Rūnanga Committee provides a formal relationship (a 'governing partnership') between the Council and the six Ngā Papatipu Rūnanga who have takiwā over areas within our district. The standing committee provides a strategic framework to lead the development of an enduring collaborative relationship between elected members of the parties involved.

The mana whenua values of Ngāi Tahu and the Papatipu Rūnanga are an important aspect of our planning for future infrastructure and carry statutory responsibilities, under the LGA and the Resource Management Act 1991, in particular. The Council and Ngā Rūnanga have a common goal of supporting the environmental, social, cultural and economic wellbeing of the district for the benefit of the community. The values and policies of the Mahaanui Iwi Management Plan[12] and other Rūnanga guidance and views will continue to need to be recognised as significant in our infrastructure planning.

In November 2019, Ngāi Tahu released Ngāi Tahu Rangatiratanga (full authority) over Freshwater Strategy[13], setting out the aspirations for the tribe's full authority of water across the Ngāi Tahu takiwā. Ngāi Tahu is opposed to Taumata Arowai (the Government water authority and Water Services Bill). If a wider water service provider is established as a result of the water reforms, Ngāi Tahu would prefer one entity to cover the tribal takiwā, with the expectation that Ngāi Tahu would have the opportunity to co-govern at that level, as a reflection of the Treaty partnership.

The Council works closely with our strategic partners in the Greater Christchurch Partnership. The Greater Christchurch 2050 strategic direction being developed by the Partnership is likely to influence our infrastructure planning. We talk about this further below.

At the outset of the Strategy's development we asked some of our strategic partners/ stakeholders[14] for their views about local infrastructure issues. These covered a range of issues and emphasised the need to adapt to climate change and manage growth sustainably. Their views are summarised in Appendix 10.

Strategic alignment

The early analysis that fed into development of the Infrastructure Strategy built in the Council's Strategic Priorities and Community Outcomes, which are set out in the Council's overall Strategic Framework. A range of activity or outcome-focused plans and strategies link the high-level Community Outcomes and Strategic Priorities with the Council's work programmes.

Additionally, the Council endorses strategies or plans developed at a regional level. Some of these provide strong direction for Council infrastructure investment. A list of strategies and plans that are relevant to the Infrastructure Strategy is in Appendix 6. National direction for infrastructure planning and provision also heavily influences our strategic infrastructure planning, in what is a rapidly changing regulatory environment. This is discussed further on in this Strategy, in the significant infrastructure issues section, and in Appendix 7.

Previous infrastructure strategies

The Infrastructure Strategies in the two previous LTPs largely focused on addressing issues brought about by the earthquakes, along with asset renewals, climate change and affordability.

The Infrastructure Strategy for the LTP 2015-2025 was the first to be written under the newly-introduced legislative requirement to prepare an infrastructure strategy. Priorities focused on repair or replacement of earthquake-damaged assets, renewal of assets as they reached the end of their useful lives, and ensuring replaced and repaired infrastructure was more resilient.

The Infrastructure Strategy for the LTP 2018-28 also focused on post-earthquake recovery and renewing ageing assets. Other priorities included climate change leadership, providing greater resilience in infrastructure assets, managing and building resilience to the impacts natural hazards, and continuing to support regeneration planning and central city regeneration.

[12] Ngāi Tūāhuriri Rūnanga Te Hapū o Ngāti Wheke (Rāpaki) Te Rūnanga o Koukourārata Ōnuku Rūnanga Wairewa Rūnanga Te Taumutu Rūnanga, Iwi Management Plan, 2013, https://www.mkt.co.nz/wp-content/uploads/2019/08/Full-Plan.pdf
[13] Te Rūnanga o Ngāi Tahu, Ngāi Tahu Rangatiratanga over Freshwater, November 2019, https://ngaitahu.iwi.nz/wp-content/uploads/2019/11/Wai-Maori-Strategy-web.pdf
[14] Problem identification workshops at the outset of the Infrastructure Strategy's development included external attendees from Canterbury District Health Board, ChristchurchNZ, Citycare, Environment Canterbury, Fulton Hogan, Lyttelton Port Company, Ministry of Education, Waka Kotahi: New Zealand Transport Agency, Orion, Selwyn District Council, Waimakariri District Council, and some individual infrastructure sector experts (apology from Ngāi Tahu invitee); they were joined by a range of Christchurch City Council infrastructure managers and asset experts.

Looking ahead

Christchurch is the largest city in the South Island and the second largest in New Zealand. The district includes the metropolitan area of Christchurch city, Banks Peninsula and surrounding rural areas. In 2019 our population was 385,500 people, and it is expected to grow to 490,000 in the next 30 years.[15] Selwyn and Waimakariri Districts have a combined population of 128,400 (2019), and this is projected to grow to 210,000 over the next 30 years. Around 40% of workers who live in Selwyn and Waimakariri travel to Christchurch city for work.

The Avon Ōtākaro and Heathcote Ōpāwaho Rivers wend their way through the city, meaning that much of the city is built on low-lying land and some areas are vulnerable to flooding and/or coastal hazards. The same is true for some of the urban settlements on Banks Peninsula. In coastal and low-lying inland areas these risks are expected to be exacerbated by the effects of climate change, particularly sea level rise.

Our future will be influenced by global social, demographic, and economic trends, climate change and other environmental shifts, and regulatory changes. This section of the Strategy indicates the changing context in which our infrastructure planning must take place, and assumptions (see Appendices 4 and 5) about our likely trajectory.

2050 plan for Greater Christchurch

The Greater Christchurch Partnership[16] has recently been focused on setting a 30-year strategic direction for our urban areas (Christchurch City, Waimakariri and Selwyn districts) – Greater Christchurch 2050. This direction will give us a clear, shared view of our future, and a plan for how we get there that supports the health and wellbeing of people living here, and the environment we live in.

During October and November 2020, the Partnership asked people about their priorities and concerns for Greater Christchurch in 2050. What mattered most to people included:

- having accessible and affordable public transport, walking and cycling, so it's easy to get around
- being able to live, work and invest in a sustainable, green, safe and affordable place
- protecting and respecting nature.

People's concerns for the future included:

- not enough being done to offset the impacts of climate change
- pollution and waste management issues
- worsening traffic congestion
- threats to our natural ecosystems and indigenous biodiversity
- lack of affordable and quality housing options.

Our infrastructure planning needs to take these perspectives into account and we need to make sure we make the necessary investments to support our desired future.

Climate change and natural hazards

The Ministry for the Environment and Stats NZ Environment Aotearoa 2019 report states all aspects of life in New Zealand will be impacted by climate change.[17] This Infrastructure Strategy assumes that climate change impacts will occur in accordance with the Intergovernmental Panel on Climate Change's greenhouse gas representative concentration pathway (RCP) 8.5 scenario.[18] Our response to climate change encompasses adaptation (responding to the impacts on communities and infrastructure), and mitigation (slowing the rate of climate change through measure to reduce emissions).

Different areas of Christchurch and Banks Peninsula will be affected by different hazards that are exacerbated as a result of climate change. Christchurch is recognised as the most exposed large urban area in New Zealand to sea level rise. Across the Canterbury region, according to current projections, a substantial number of settlements and urban communities are at risk in low-lying areas, as well as key infrastructure.[19]

The Council has committed to ambitious targets to reduce the greenhouse gas emissions of the organisation and the city as a whole. This Strategy signals a need for

[15] Updated Statistics New Zealand figures are expected to be released later in 2021, which will inform updated population projections.
[16] Comprises Christchurch city, Waimakariri and Selwyn districts, along with along with Environment Canterbury, Te Rūnanga o Ngāi Tahu, Canterbury District Health Board, Waka Kotahi (New Zealand Transport Agency) and the Department of Prime Minister and Cabinet (Greater Christchurch Group).
[17] Ministry for the Environment, Environment Aotearoa 2019, https://www.mfe.govt.nz/environment-aotearoa-2019.
[18] This methodology is accepted by the Council as a key assumption for the Infrastructure Strategy, https://www.mfe.govt.nz/publications/climate-change/arotakenga-huringa-%C4%81huarangi-framework-national-climate-change-risk
[19] Tonkin+Taylor, Interim Canterbury Climate Change Risk Screening report, April 2020, https://www.canterburymayors.org.nz/wp-content/uploads/Attachment-1-Canterbury-climate-change-risk-screening-interim-report.pdf

action to identify priorities for emissions reduction, and especially how we can reduce the emissions generated by the construction and operation of our infrastructure assets. These issues are further detailed in the significant issues section of this Strategy.

GNS Science assumes that the Alpine Fault has a greater than 30% chance of a magnitude 8.0 earthquake in the next 50 years.[20] The effects on infrastructure across the South Island would likely be significant, albeit the rebuilding of resilient infrastructure in post-earthquake Christchurch means that we are better placed to recover more quickly and could provide leadership in a wider response.

Global influences

This century has continued to shape Christchurch into a more globally connected city that shares technological, economic, social and cultural opportunities (as well as challenges) with the rest of the world. This affects the way we build and interact with public infrastructure. For example, new global standards and preferences for greener building practices and urban living can reduce waste and impacts on our stormwater and surface water. Emerging transportation alternatives from overseas, such as e-scooters, have begun to affect the way people travel around the city. Our city is dependent on global trade: this dependency carries with it both positive and negative risk. When the Chinese government stopped accepting the world's recyclable plastics, Christchurch was indirectly affected as the value of recovered material dropped significantly across the global recycling market.

Internet and mobile connectivity has been changing the way many businesses operate for several years, and with the COVID-19 pandemic, technology became absolutely essential for working and accessing goods and services. The digital age has meant that people have come to expect the instant access to information and services across a range of sectors, including when interacting with Council infrastructure and services.

Social and demographic influences

Christchurch's median age is slightly older than the national average, although this is expected to change significantly in coming decades. The number of residents in Christchurch aged over 65 will nearly double by 2048, with half our projected population growth expected to be in the 75 years and over age group. Over 80% of demand for housing is projected to be in one and two person households and 58,000 people are expected to be living alone in the city around 2050. These changes are likely to see demand shifts for types and locations of housing. Smaller homes will result in changing demands for infrastructure, for example, water infrastructure.

Our city is also becoming more diverse, with the number of residents born overseas increasing. This means that preferences for housing, community facilities and other services are likely to be different from that of today, and reflect the diversity of lifestyle and cultural preferences that enrich our communities.

Impact of growth on infrastructure

Our infrastructure needs for our current levels of growth are well planned for. Our growth scenario for Greater Christchurch is set out in Our Space 2018-2048. This directs 65% of housing demand be met in Christchurch city, with the remaining 20% in Selwyn and 15% in Waimakariri.[21] Christchurch's housing demand will be met through a balance of greenfield development and redevelopment of existing urban areas, with an increasing reliance on higher densities being achieved around centres and along public transport corridors.[22] Urban growth, form and design are stated as core strategic objectives in our District Plan, recognising the need to provide a well-integrated pattern of development and infrastructure, a consolidated urban form (intensification), and a high quality urban environment to support growth.

The Council is developing the Ōtautahi Christchurch Spatial Plan, which (along with other Council plans, such as Project 8011) will identify areas where intensification (additional redevelopment of housing and businesses, and population growth) can occur and is desirable, to meet medium and high growth scenarios. This is key to ensuring our infrastructure is integrated to support growth. Changes in national direction also set the direction for infrastructure provision. The National Policy Statement on Urban Development (NPS-UD) requires us to enable maximum development capacity within a walkable catchment from the city centre, and six-storey

[20] GNS Science, Alpine Fault, https://www.gns.cri.nz/Home/Learning/Science-Topics/Earthquakes/Major-Faults-in-New-Zealand/Alpine-Fault .
[21] Greater Christchurch Partnership, Our Space 2018-2048: Greater Christchurch Settlement Pattern Update, July 2019, https://greaterchristchurch.org.nz/assets/Documents/greaterchristchurch/Our-Space-final/Our-Space-2018-2048-WEB.pdf
[22] Greater Christchurch Partnership, Greater Christchurch Housing Capacity Assessment: Reports 1: An Overview of Housing Demand, February 2018, https://greaterchristchurch.org.nz/assets/Documents/greaterchristchurch/Our-Space-consultation/Greater-Christchurch-Housing-Capacity-Assessment-reports-1-4.pdf

development within a walkable catchment from any metropolitan centre and any mass transit stop. At this stage it is not known whether additional infrastructure will be required to support additional capacity, and we will therefore need to be flexible and adaptable in response to land use changes.

Economic challenges

Christchurch serves an important economic role for the country, accounting for about 9% of national Gross Domestic Product (GDP) and acting as the tourism and export hub for the South Island. Over time the city's economy has evolved from being a market town, supporting and processing primary goods, to a more mature urban economy with specialised industries. Population growth from migration has been a key contributor to GDP in recent years.

The COVID-19 pandemic has put significant pressures on some parts of the Christchurch economy, especially those areas focused on tourism (including hospitality, retail and accommodation sectors) and small and medium-sized enterprises. However, the city's strong regional and international connections and export trade through the Lyttelton port and international airport, crown research institutes, manufacturing base and essential service businesses (including primary industries) are helping it withstand the impacts and the city continues to perform relatively well.

The Ōtautahi Christchurch Recovery Plan,[23] led by the Council in partnership with mana whenua and iwi, is driving socio-economic recovery actions with central government and a range of local agencies and community organisations – focussing on both social and economic recovery. Stimulating productive infrastructure that creates jobs, such as fast-tracking 'shovel ready' projects that have gained Government support, is one of nine workstreams identified in the Plan that will impact on longer term infrastructure provision in the city.

Our significant infrastructure issues

The Infrastructure Strategy must answer the following question: What are the significant infrastructure issues across all Council assets over the next 30 years?[24]

Significance is defined in the Local Government Act 2002. The significant issues in this Infrastructure Strategy are essentially those that rank highly in terms of cost, impact on Levels of Service, risk, correlation to the Council's Strategic Priorities, and community interest. They are:

1. Looking after our assets
2. Responding to community needs and expectations, as we grow
3. Adapting to climate change
4. Reducing greenhouse gas emissions
5. Responding to changing regulatory and commercial environments
6. Delivering within financial constraints.

These issues are not new and most were reflected in the Council's two previous infrastructure strategies in some way. Our city's programme of recovery and regeneration also provides context for these infrastructure issues. However, given the progress made in recent years, legacy issues from the earthquakes now form part of the context for the significant issues, rather than being a stand-alone issue.

1. Looking after our assets

Each one of our assets has a finite lifespan and comes with a lifetime of operational costs set at a specified standard of maintenance. Some of our assets are old and in very poor condition. Continuing to defer both renewals and maintenance to manage budget pressures means that the condition of our assets is deteriorating and it will be increasingly harder to meet levels of service and there will be a greater risk of failure.

[23] Christchurch City Council, Ōtautahi Christchurch Recovery Plan, December 2020, https://resilientcitiesnetwork.org/
[24] SOLGM (2009) Dollars and Sense p.25.

In 2015, the Treasury identified the need for renewal of ageing infrastructure as a serious nationwide issue.[25] The Treasury also acknowledged that one of the biggest challenges facing the sector is trying to understand what the true costs are and when they will be incurred. Deferred renewals for ageing assets was identified as an issue in both our 2015 and 2018 infrastructure strategies. We now have an increasing proportion of deferred renewals.

The continued deferral of renewals has created a bow wave of capital expenditure and increases the risk of failure of poor condition and/or earthquake-prone infrastructure. Deferring renewals also increases operational expenditure as poor condition assets generally require more maintenance to keep them functioning at an acceptable standard until they are renewed. For example, multiple repairs on a poor condition water pipe incur the cost of digging up the pipe to repair it and pose other costs where levels of service, such as interruptions to water supply, are not met. It also increases the risk of contaminating the water supply. Similarly, the increased patching of potholes on degrading, ageing road surfaces is increasing operational costs and impacting on community satisfaction.

These issues are exacerbated as the size of our asset base increases, both through planned construction and vesting of assets by developers and central government. In the case of recreational, sports and library facilities and transport assets, operational and maintenance budgets have not kept up with the programme of new and replaced buildings that has occurred in the last decade following the earthquakes. In some places there is an imbalance between the number, size and standard of community facilities, and usage by the local community. Roads built either as part of greenfield developments, or as former state highways that have devolved to council control, also bring increased operating costs. We also have a legacy backlog of earthquake-related repairs to roads and footpaths that continues to attract public dissatisfaction. An increasing asset base will also create future capital expenditure liability for renewals.

Insufficient whole-of-life costing is another contributor to budget pressures. We do not always ensure that operational costs are fully integrated in funding discussions from the inception of projects and carefully managed over the lifetime of assets. When capital assets are constructed or inherited, operational expenditure is not always obvious or budgeted for. Savings in capital expenditure at design-and-build phase of new infrastructure sometimes come at the expense of whole-of-life operational efficiencies and sustainability of maintaining the assets.

Deferred renewals and maintenance, our increasing asset base, and insufficient whole of life costing are key contributors to this issue. A number of other factors add to the pressure on our expenditure requirements:

- Community expectations regarding a high standard and ready availability of infrastructure (see issue 2).
- Increased exposure to climate change stresses and events, particularly as Christchurch is a low-lying coastal city and at risk of sea level rise impacts through rising ground water, coastal erosion, and coastal inundation (see issue 3).
- New regulatory requirements for certain assets (see issue 5 for a discussion of new requirements for three waters).
- Increasingly, IT assets are cloud-based service contracts, rather than purchased products. The relatively short lifespan (around 5 years) of these cloud-based products means they require regular upgrading/renewal to remain fit for purpose. This makes them particularly vulnerable to decreases in operational funding.
- The difficulty in divesting assets that are no longer required (for example no longer economically viable), but which are interdependent with other assets (for example, roads and water/utility infrastructure).
- The difficulty in coordinating maintenance when interdependent assets are managed and funded in separate parts of the organisation.

2. Responding to community needs and expectations, as we grow

We need to accommodate a growing population and respond to their changing needs and way of life. At the same time, we need to find the balance between managing citizens' demands and high expectations for our services while retaining an affordable level of investment in infrastructure, so that we deliver broad wellbeing benefits to our citizens and businesses.

Our population is growing, and the needs and expectations of our communities are changing. We need to provide for this growth and meet demand sustainably.[26] Infrastructure has an important role to play in shaping our neighbourhoods and ensuring growth demand is met. We need to plan for an expected population increase, an ageing and increasingly diverse community, and expanded suburban areas; encourage residential intensification; make public and active transport networks

[25] The Treasury (2015) Thirty Year New Zealand Infrastructure Plan 2015 p.16. https://treasury.govt.nz/publications/infrastructure-plan/thirty-year-new-zealand-infrastructure-plan-2015
[26] Predicting future growth rates is difficult due to a lack of certainty. Historically, projections are often not realised, and this impacts on our planned infrastructure response to meeting demand for housing and business capacity. This Strategy will therefore need to be adaptable to changing growth projections.

safer, viable and attractive; and reduce growth-associated risks such as contaminants reducing the quality of waterways.

In recent years, there has been particular community dissatisfaction with the condition of our roads and footpaths. Current and historical land use and transport investment decisions encourage high levels of car usage, making sustainable modes less attractive. We need to balance the need to maintain our roads and footpaths to a condition that meets community expectations and addresses safety issues, with investing in public and active transport that will help us to provide for growth sustainably and in a way that helps us to meet our greenhouse gas emissions targets for the city.

Although as part of the rebuild we have been able to improve the amenity of some central city streets, most of our streets are currently designed for cars rather than people, making our city a less attractive place to live in, work and visit. In the last decade we have not achieved a comprehensive approach to street renewal that supports more effective use of street space, particularly in areas identified for medium and high residential development. As we seek to increase residential densities, it is increasingly important we transform our places and neighbourhoods to be resilient to environmental stresses and events, functional, and sustainable.

Another challenge we face in the next 30 years, in light of population growth, is managing the demand for water. At present, the large seasonal variability in demand for water supply means that during winter the capacity of infrastructure is more than sufficient and during particularly warm, dry periods in the summer it cannot keep up with demand, leading to water restrictions. Our infrastructure is generally sized to deliver peak demands, and the Council will thus need to consider ways to manage these demands on our infrastructure, such as volumetric charging and summer water conservation campaigns.

On Banks Peninsula, the Koukourārata and Ōnuku Rūnanga (in particular) have identified a lack of water infrastructure to support papakāinga/kāinga nohoanga development. We have committed to advance outstanding works to escalate repairs to Akaroa wastewater ($2.8 million) and Duvauchelle wastewater ($1.8 million) to reduce infiltration and overflows to the environment. We have also committed approximately $66 million for a new wastewater scheme for Akaroa, where reclaimed water will be irrigated to new areas of native trees. In Duvauchelle, we are also exploring options to remove the discharge of treated wastewater from the harbour and have budgeted $12 million for a land-based scheme. We have also committed to further work with the Rūnanga to find infrastructure solutions to support papakāinga/kāinga nohoanga development.

We are finding both increasing number and range of demands for our parks and sports facilities. They are greatly valued by the community but there are high expectations for their standards and level of amenity. At the same time, the community's expectations and preferences regarding the way they use parks are changing. For example, the growth in popularity of sports such as mountain biking, the emergence of new sports, and an increasing environmental awareness are some of the factors driving these changing expectations. Maintaining fit-for-purpose facilities and spaces will require us to respond to these changing demands and adapt where possible.

The way in which we grow is becoming increasingly important. The continuation of current settlement and travel patterns will result in increased travel costs, congestion, reduced accessibility to economic and social opportunities, and increased carbon emissions from transport if communities remain reliant on cars as a primary means of transport. Furthermore, ongoing greenfield development will negatively impact the environment and further deteriorate stormwater quality. Deteriorating stormwater quality and in-stream health is caused by a contaminant load that increases in proportion to development. For example, additional impermeable surfaces increase stormwater flows and channel runoff, which often contains heavy metals, into drains and rivers. Even without added greenfield development, the Council is struggling to meet national standards for stormwater quality (see issue 5).

Our plan is to grow up more, and out less. However, intensification can lead to poor wellbeing outcomes for communities where it is poorly planned and/or the infrastructure is insufficient to support it. We need to provide infrastructure to service growth in a way that promotes high quality urban environments, in order to achieve high liveability and amenity, improve environmental conditions and protect our highly versatile soils for future generations, and reduce the need to travel as people live in greater proximity to the opportunities they seek.

3. Adapting to climate change

Climate change is putting our communities and infrastructure at risk. We need to develop an approach to adaptation that will shape the future of affected communities and guide investment in and provision of infrastructure.

Climate change is the biggest challenge of our time. It is already affecting our weather, people's health and wellbeing, our natural environment, taonga species, mahinga kai, food production, health, biosecurity, infrastructure, and the economy. It was an emerging issue in our 2015-45 Infrastructure Strategy and had become a significant issue by the time of our 2018-48 Infrastructure Strategy. The scientific evidence that our planet is in crisis is irrefutable and the criticality of this issue for all of New Zealand is clearly outlined in a number of core central government strategic documents.[27] Our Climate Change Survey in 2019 indicated 77% of people surveyed thought that climate change was an extremely important issue. For these reasons, the Council declared a climate and ecological emergency in 2019 and agreed to prioritise 'meeting the challenge of climate change through every means available'.

Climate change threatens critical infrastructure including buildings, roads, and pipes, as well as having major impacts on people and communities. Our immediate major issues are:

- Flooding of coastal and low-lying areas in the east and parts of Banks Peninsula, as well as rising ground water levels. This affects low-lying inland communities as well as coastal communities.
- High temperatures and drought for our living assets
- Increasing demand for water with increasing temperatures
- Landslides and fire in the Port Hills and Banks Peninsula.

From current climate change impact assessments, we can assume the following scenarios will affect our infrastructure this century.

- Sea level rise of 0.3 m by 2050, and 1.0 m by 2115.[28]
  At the 1.0 m increment the Canterbury region has exposed water infrastructure valued at more than $630 million. This includes 650 km of water pipes and over 120 pump stations.[29]
- Average temperatures will rise from 0.5°C to 1.5°C by 2040, and by 3.0°C in 2090 (relative to 1986-2005 mean baseline).
- Rising groundwater in coastal and low-lying areas and saltwater incursion may accelerate degradation of some types of pipes. Modelling of coastal flooding that includes a one in 100 year storm surge suggests that by 2065, around 300 km of roads could be flooded, and by 2120, the same storm would flood more than 400 km of road.[30]
- Akaroa's potable water is supplied by surface water. With increasing frequency and intensity of drought, and increasing numbers of very hot days, when demand tends to increase significantly, ensuring water supply will become a more serious issue.
- Many species of plants in our parks and streets will become stressed by drought, rising temperatures, and rising groundwater, and there will also be increased fire risk.

Infrastructure has a role to play in managing the increasing risk posed by climate change to people and property. Major capital expenditure could be required to support infrastructure upgrades and/or relocations as part of the adaptation process. We are underway with work to identify and respond to climate change issues at the local and citywide level, and must work with the community closely on this. There are two key components to this programme: identifying exposure of assets to natural hazards resulting from climate change, and the consequence of this exposure; and determining how best to adapt to climate change.

We are partway through a first pass climate change risk screening that covers the built and natural domains. Our first challenge is to complete this work, and identify gaps where we need more work to understand our exposure. A new coastal hazards assessment is likely to be completed by mid-2021. This will be released alongside a decision-making framework for working with communities to identify adaptation pathways, and the funding of these over time, and will initiate a city-wide conversation about the expected impacts of coastal hazards.

[27] Op cit. see footnotes 17-21
[28] NIWA Report 2019339WN, Climate Change Projections for the Canterbury Region, February 2020, Macara, G, Wolley, J-M, Pearse, P,Wadhwa, S, Zammit, C, Sood, A, Stevens, S
[29] LGNZ, Vulnerable: The quantum of local government infrastructure exposed to sea level rise, 2019, https://www.lgnz.co.nz/our-work/publications/vulnerable-the-quantum-of-local-government-infrastructure-exposed-to-sea-level-rise/
[30] Tonkin + Taylor, Coastal Hazard Assessment for Christchurch and Banks Peninsula, 2017, https://www.ccc.govt.nz/assets/Documents/Environment/Land/Costal-Hazards/2017-Coastal-Hazards-Report.pdf; and NIWA, Coastal Flooding Exposure under future sea-level rise for New Zealand, March 2019, https://www.deepsouthchallenge.co.nz/sites/default/files/2019-08/2019119WN_DEPSI18301_Coast_Flood_Exp_under_Fut_Sealevel_rise_FINAL%20%281%29_0.pdf

We are facing a particular challenge in the lack of a clear direction for making asset renewals decisions to take into account adaptation to the impacts of climate change. Examples of critical decisions that are required include:

- How to direct spending for major renewals of assets designed to last 100 or more years in areas that will become highly susceptible to coastal hazards well before their end of life.
- How to balance the costs of renewing infrastructure in areas significantly affected by hazards against community expectations of maintained levels of service – and in extreme cases, how to withdraw services where these become unsustainable.
- How to manage just transition issues where levels of service are reduced or infrastructure is withdrawn.
- How to manage sea level rise and increased storm surge risk on our legacy assets, in particular, 15 of the 46 closed landfills that the Council owns are in coastal areas and may need ongoing management to mitigate pollution risk and potential environmental damage.
- Whether to use seawalls and other hard protection, or whether to use other adaptive methods such as natural defences that are more ecologically sensitive.

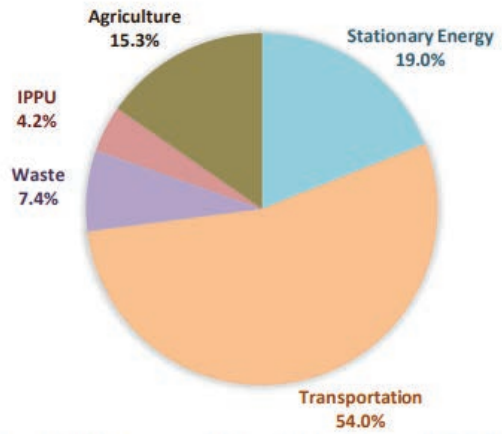
An interim approach to managing asset replacement and renewals is urgently needed to guide decisions and investment, in order to achieve consistency based on the same principles. This work needs to be completed by the Council in good time to inform the 2024-34 LTP. It will inform, and in turn be informed by, the collaborative adaptation planning processes being undertaken as part of the Coastal Hazards Adaptation Planning programme.

Adaptation planning with specific communities that will be affected by the impacts of sea level rise is set to begin in 2021, and will be carried out in tranches over a number of years across the 23 communities that have been identified as having higher levels of exposure. We need to work with communities to understand the impacts and the values the communities place on their assets, and co-create area-specific adaptation pathways.

4. Reducing greenhouse gas emissions

Our infrastructure directly and indirectly generates greenhouse gas emissions. We now need to develop a comprehensive plan to achieve the required emissions' reductions and manage our infrastructure accordingly.

Climate change is causing the atmosphere to heat, resulting in a long-term rise in our planet's temperature caused by increased concentrations of greenhouse gases in the atmosphere, mainly from human activities such as burning fossil fuels, deforestation and farming. The graph below summarises Christchurch's gross greenhouse gas emissions, by sector, for the financial year 2018/19. In the 2018/19 financial year, we emitted an estimated 2,723,016 gross tonnes of carbon dioxide equivalent (tCO_2-e) – a gross increase of 2.2% from 2016/17. That equates to 7.1 tCO_2-e per person. The largest contributor to our city's emissions is transportation, accounting for 54% of Christchurch's greenhouse gas emissions, with on-road transportation producing 36% of total gross emissions. Greenhouse gas emissions related to stationary energy made up the second largest emissions sector of the district (19%).[31]



Christchurch District's gross GHG emissions, by sector, for the financial year 2018/19

[31] AECOM, Christchurch Greenhouse Gas Emissions Inventories for Financial Years 2018/19 and 2016/17, October 2020, https://ccc.govt.nz/assets/Documents/Environment/Climate-Change/AECOM-Christchurch-GHG-Emission-Inventories-for-Financial-Years-201819-and-201617.pdf

We have set a number of ambitious targets to reduce organisation and district-wide emissions. In 2019 the Council adopted the following targets for Christchurch:

- Net zero greenhouse gas emissions by 2045 (excluding methane), 5 years ahead of the national target
- 50% reduction from 2016-17 baseline levels by 2030 (excluding methane)
- For methane, at least a 25% reduction by 2030 and 50% reduction by 2045 (from baseline year 2016-17)

The Council has also set a target of being net carbon neutral for its own operations by 2030. Kia Tūroa Te Ao, Ōtautahi Climate Resilience Strategy 2021 sets out a series of climate change action programmes that directs us towards four goals:

- Net zero emissions Christchurch
- We understand and are preparing for ongoing impacts of climate change
- We have a just transition to an innovative low-emission economy
- We are guardians of our natural environment and taonga.

We need to develop a comprehensive plan to achieve the required reductions and manage our infrastructure accordingly. In the immediate term, the focus on infrastructure to respond to the recession caused by the COVID-19 pandemic has triggered fears that emissions could be exacerbated. The Climate Change Commission, established in 2019 to guide the Government to carbon neutrality, has expressed concern that the wrong investments will make people and costly infrastructure more exposed to damage from climate change. The Commission urged a climate change lens be applied to the economic response to the pandemic, cautioning against long-term investments that lock New Zealand into a high-emissions development pathway, and encouraging climate-friendly projects that support a low-emissions and climate-resilient economy.[32]

We need to grapple with and resolve similar tensions in terms of the programme of works put forward in the 2021-2024 planning period. We also need to ensure we make the most of opportunities already available within our asset classes to reduce our emissions. For example, opportunities exist with the creation of wetland facilities and forest cover of eroding hill land for stormwater works to absorb carbon and improve biodiversity (and at the same time assist with recreational and landscape amenity). Diverting more organic waste from landfills can reduce the amount of emissions and leachate from landfills. Moreover, some landfills use the gas to generate energy. For example, landfill gas from the closed Burwood Landfill in Christchurch is used to heat the QEII swimming pool and sports complex (though this is a short-term measure only and is due to run out in the near future).

The focus on mode shift from single occupancy, fossil-fuelled vehicles to active and public transport also offers an opportunity to reduce emissions. Research suggests however, that this will not be sufficient. To reduce transport emissions, a full range of tools needs to be considered. These could include congestion pricing, parking policies, travel demand management and other behavioural change strategies, measures to support the transition to more environmentally-friendly electric vehicles, and a sustainable urban form.

In terms of meeting our organisation's emissions' reduction target, we face decisions about how to manage wastewater treatment, as our wastewater treatment plant accounts for nearly 50% (FY2019/20) of our organisational emissions (although only an estimated 0.4% of Christchurch's overall greenhouse gas emissions). We may be able to reduce the plant's carbon footprint through changes in its operation and construction of new assets. However any such option is likely to be extremely expensive, and we will need to consider whether this money could potentially be better spent in other ways, to reduce more emissions overall.

Finally, our infrastructure is also responsible for large amounts of embedded carbon or emissions (carbon produced in the production of an asset such as concrete, or carbon embedded in an asset such as timber framed buildings), as well as for emissions produced by the energy that our infrastructure uses. At present, there is no clear plan to reduce these emissions in the future, although whole-of-life carbon emissions are considered at the options stage of some large projects. We need to develop a plan, in time to inform the 2024-34 LTP, for how we are going to reduce emissions so that we work towards meeting our emissions reduction targets.

[32] New Zealand Climate Change Commission, Letter to the Government, April 2020, https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/Climate-Commission-advice-re-stimulus.pdf

5. Responding to changing regulatory and commercial environments

Changing regulatory requirements impose new and higher standards on our infrastructure and fluctuating commercial environments remove or alter market opportunities. Higher standards benefit our communities but they also increase costs. Lost market opportunities can increase our costs, reduce our revenue, and adversely impact on our environment.

Many forms of infrastructure last for generations. Councils aim to think ahead when planning and investing, but it is difficult to predict future regulatory and market changes, and technological advances. Infrastructure tends to be built to present day standards and needs, taking account of affordability. Over time, there has been an increasing emphasis on improving health and safety, which presents a significant opportunity to improve community wellbeing. At the same time, increasing regulatory standards can pose a financial burden on ratepayers, particularly when solutions require fundamental changes to assets.

At present, nowhere is the need to manage a changing regulatory environment more apparent than for Three Waters assets and services, most of which we own and deliver in Christchurch City. The Three Waters Review, commissioned by the Government in mid-2017, identified public health concerns for drinking water, and environmental issues for wastewater and stormwater systems. As a consequence of the review, the Government is introducing a new regulatory regime for Three Waters. In August 2020, the Council agreed to sign a Memorandum of Understanding with central government, committing it to stage one of the Government's water reforms, looking into different ways to deliver water services. Central government proposes to consult on the proposed reforms in 2021.[33]

Drinking water quality

The Havelock North Drinking Water Inquiry found that there was a risk of contaminants entering bore water through unsecure below-ground well heads.[34] The inquiry led to a much lower tolerance for risk across drinking water suppliers, expert assessors and regulatory agencies, and an immediate tightening of the regulatory environment.

We have strict hygiene procedures in place for the safe operation of our drinking-water supply network, and have traditionally provided untreated drinking water safely and securely to Christchurch, Lyttelton Harbour and Wainui. In December 2017, however, we lost our bore security status. This was a response to an assessment of the risk of contamination rather than a change in actual water quality. We subsequently commenced a temporary chlorination programme and initiated a $35 million wellhead improvement programme, with the aim of returning to supplying unchlorinated water. However, the Government's proposed changes to drinking water regulations may mean that we need to permanently chlorinate the water supply.

To date, the Council (with strong community support) has opposed changes to the regulatory policy for drinking water that would require permanent chlorination and, if such a policy is introduced, is likely to seek an exemption. Seeking an exemption, however, will likely require meeting a higher standard for both infrastructure and operational procedures, which will demand more complex and costly security measures to be put in place. A decision on how the Council will continue to operate a safe drinking water supply is signalled as one of the upcoming significant decisions later in this Infrastructure Strategy.

We have undertaken a significant amount of work to address government concerns; however, uncertainty remains about the work still required to obtain an exemption from permanent chlorination. Government concerns about potential contamination risk to Christchurch's drinking water also remain, in particular due to long-term pre-existing factors, such as a backlog of infrastructure renewals resulting in an increase in leaks and service interruptions.

Wastewater disposal

Targeted regulatory reforms to improve the environmental performance of wastewater systems will include a new national environmental standard for wastewater discharges. The objectives are to stop sewage ending up on beaches, rivers and lakes, as well as to protect freshwater and marine environments. The Christchurch wastewater treatment plant processes the wastewater from all of the city. At the end of the process, the treated wastewater from the maturation ponds is discharged through a long outfall pipe which discharges three kilometres off New Brighton beach. Alternatives to direct discharges to water are possible but may be impractical or unrealistically cost prohibitive.

In 2021, all treated wastewater discharges to Lyttelton Harbour will cease, and the wastewater will be piped to the Christchurch wastewater treatment plant for treatment and disposal. For Akaroa, we have already decided to remove the treated wastewater discharge from Akaroa Harbour and instead use the reclaimed water to irrigate new

[33] https://www.dia.govt.nz/Three-Waters-Reform-Programme
[34] The inquiry followed an outbreak of gastroenteritis in Havelock North in August 2016, where 5,000 people were estimated to have fallen ill and four died as a result.

areas of native trees and public parks, and to flush public toilets. The new scheme will also result in a significant reduction in overflows to Akaroa's beaches. We are also considering options to remove Duvauchelle's treated wastewater discharge from Akaroa Harbour and expect to consult on this in 2021. If this discharge was also removed, there would be no treated wastewater discharges to Akaroa Harbour.

Stormwater treatment

There is a significant risk that contamination of stormwater and waterways will increase with population growth. The main pollutants are, in order of impact:

- sediment, which smothers habitat and food and is sometimes contaminated (the main sources are construction, land erosion, roads and vehicles, earthquake liquefaction)
- metals, in particular copper and zinc, which have toxic effects on ecosystems and deplete food chains (the main sources are brake pads, tyres and building claddings)
- bacteria affecting human health (the main sources are ducks, dogs and wastewater overflows)
- nutrients, in particular nitrogen and phosphorous, which can have toxic effects (the main sources are leaves and fertilisers).

The new Comprehensive Stormwater Network Discharge Consent has set a requirement for ongoing infrastructure investment over the next 25 years to reduce the stormwater contaminants entering the waterways. This will be difficult to achieve, and relies on retrofitting the older existing urban developments with stormwater treatment at source or in downstream facilities. Developers must meet new subdivision infrastructure requirements; however, the cost of retrofit infrastructure is met by ratepayers.

Solid waste and resource recovery

We collect and process approximately 35,000 tonnes of recyclables, over 50,000 tonnes of organics, and over 40,000 tonnes of residual waste per annum. Based on government figures, New Zealand's waste generation per capita is likely to increase, unless significant changes are implemented. Our quality of life, both now and in the future, is affected by the way we manage our solid waste and recovery of resources. Cost-effective waste minimisation is necessary for a sustainable and affordable way of life, and to support community wellbeing and environmental outcomes.

The regulatory and commercial environment for solid waste is highly dynamic and is expected to change significantly, both now and in the future. Managing solid waste is not simply an issue for Christchurch; it is a national and global issue. On the regulatory side, we are anticipating higher standards and cost increases. In particular, the Government is proposing to increase the landfill levy from $10 per tonne to $50/60 per tonne and apply it to more types of waste. By minimising waste, businesses and households would reduce the impact of the levy increases – but otherwise costs will increase.

On the commercial side, we are experiencing difficulties as global markets for our recycling fall away, in particular the export markets for mixed plastics and paper. We are now unable to sell into some offshore markets because destination countries have changed their policies and have banned imports of plastic and paper or have introduced very strict contamination thresholds. This is a significant change from the stable global recycling markets of the past decade.

We are investing in our organics processing plant so that we can continue to collect and compost organics and increase throughput, and to ensure the plant's operations meet the requirements of the resource consent with regards to discharges to air including odour emissions.

An uncertain future

The matters above outline changes in the regulatory and commercial environments that we are already aware of. It is much more difficult to anticipate and plan for longer-term changes. However, there is a clear trend in the regulatory environment toward environmentally sustainable infrastructure, as well as infrastructure that attains high health and safety standards, which we need to take account of throughout the term of this strategy.

It could be that, over the 30-year term of this Infrastructure Strategy, councils that own and operate infrastructure that damages the environment will be increasingly penalised. The potential for future carbon charges and other stringent climate change measures following a tangible and significant climate change shock is something we need to be aware of as we make planning and investment decisions that commit us to long-lasting infrastructure. Ideally, our planning and investment need to be sufficiently agile to anticipate and respond to future changes so that we do not increase our dependency on the use of assets that are likely to come under increasing scrutiny.

6. Delivering within financial constraints

We have to cut our budgets for investing in infrastructure because of the effects of the economic recession. We need to keep our work programme affordable and deliverable, especially over the first three to five years of the LTP 2021-31. This means less work than preferred is able to be undertaken on maintaining, renewing and replacing our assets, and slows down our progress in addressing some of our significant issues.

The Infrastructure Strategy looks ahead at least 30 years to the investment decisions, programmes of work and projects required to deliver agreed levels of service and activities, and support community wellbeing. Although its focus is on the 'long game', it is also strongly influenced by short-term shocks and changes to the Council and community's financial position, and by the regional, national and international economic situation.

COVID-19 has had a major impact on the Council's finances and citizens. Like many households, we need to make savings to our day-to-day spending on operating and maintaining our services and infrastructure. The impacts will continue to unfold in the months and years ahead. The Council's reduced income from dividends paid by its holding companies, lost revenue from fees and charges from our services and facilities, and resultant increased borrowing mean that investment in infrastructure is severely constrained in the short to medium term.

The Financial Strategy highlights the importance of finding an acceptable balance in our fiscal direction. It notes that on one hand we need to provide reliable, quality infrastructure and services that support the city's growth and address financial constraints brought by COVID-19, and on the other hand, we need to keep rates, fees and charges affordable, provide value for money, reduce debt over time and build our financial resilience. Trade-offs and reprioritisation have been required.

Three of the six key issues that the Financial Strategy identifies for the LTP 2021-31 are especially pertinent to the strategic focus of infrastructure investment:

- Planning for the financial requirements to adapt to the impacts of climate change.
- Building and maintaining reliable and resilient infrastructure networks and community facilities that promote community wellbeing.
- Completing the replacement of core community facilities following the 2010-11 earthquakes, including the Metro Sports Facility and the Canterbury Multi-Use Arena.

The other key financial issues that underpin the Financial Strategy, and also influence infrastructure decision-making, are delivering rates affordability and sustainability and value for money services, exercising prudent financial stewardship and building long term financial resilience through reducing debt over time.

For the first three years of the LTP 2021-31, and the start of this Strategy's span, capital and operational expenditure has been prioritised to maintain existing services and assets and to optimise available Government stimulus funding. This has required some trade-offs in making investment decisions that are affordable in the short term but do not compromise an acceptable level of risk to asset condition. At the same time, we need to look ahead and plan for additional financial requirements for infrastructure costs of adapting to and mitigating the impacts of climate change. Though some measures will be able to be achieved by doing things differently and utilising existing budgets, it is likely that additional funding will be required for some responses, which require further investigation and development in the next three years.

A strategic response to managing our assets

This section describes our preferred option for managing our significant issues, which ensures a strategic response is taken to managing our assets over 30 years.

We reached our preferred option by considering our Strategic Framework, including our Community Outcomes and Strategic Priorities, plus various infrastructure-related strategies. We followed direction from elected members and the parameters set in the Financial Strategy, and used evidence-based analysis of asset condition and performance. This option will progress us towards our community's aspirations over the next 30 years.

We started out developing this Strategy looking at options that centred on strong responses to address climate change, adaptation, water quality, and the condition of our roads, and ready our assets for future shocks and stresses. However, COVID-19 has meant our strategic response has had to be adjusted, and our options have been reduced, by the restricted environment.

Despite this our focus is still on the long term, and the priorities and issues remain the same.

Over 30 years

We will address our significant issues and manage our infrastructure assets over the next 30 years, by concentrating on these two focus areas:

- Growing a resilient and liveable city, by responding to climate change, reducing emissions and preparing for disruption.
- Being careful stewards by investing responsibly in developing and maintaining our city's assets, managing demand through greater use of existing assets, and balancing our community's needs and expectations with what we can afford.

Each focus area includes the principal approaches we must take to deciding how to manage our assets, prioritise investment and deliver programmes and projects. These decisions will be the basis of the Council's most likely scenario for the management of its infrastructure over the 30 years of this Strategy.

Focus on resilience

Growing a resilient and liveable city, by responding to climate change, reducing emissions and preparing for disruption, by making sure that we:

- Improve understanding and reduce the risks posed to our infrastructure and environment by climate change and natural hazards, so that decision-making is evidence-based and focusses on increased resilience.
- Develop and implement ways to reduce our greenhouse gas emissions, so that we can meet our committed targets.
- Improve our active and public transport infrastructure so that there is increased safety, satisfaction and uptake of these sustainable modes.
- Be adaptive and innovative in finding sustainable solutions for resource recovery, and in the fuel sources we create and use, so that we can reuse and recycle more, optimise circular economy opportunities and reduce our waste to landfill.
- Ensure our drinking water supply is safe and meets national standards, and that our infrastructure is adequately maintained.
- Ensure our provision of infrastructure is well integrated with the planning of our neighbourhoods, to create liveable and healthy places to live.

Focus on condition and performance

Being careful stewards by investing responsibly in developing and maintaining our city's assets, managing demand through greater use of existing assets, and balancing our community's needs and expectations with what we can afford, making sure that we:

- Ensure there is sufficient investment each year in renewing, maintaining and replacing our assets, so that we manage the compounding risks associated with our ageing and deteriorating assets; and be prepared to repurpose, rationalise or dispose of assets where necessary.
- Improve knowledge of asset condition and maintenance requirements, whole-of-life costs and risks associated with asset deterioration so that work programming is timely, ensures risk is managed to acceptable levels and enables us to meet agreed levels of service.
- Employ technology to enable a smart city and an efficient organisation, so that our services can be delivered securely, cost-effectively, and to suit contemporary lifestyle preferences and needs.
- Investigate and implement mechanisms to manage the demand for assets and services, so that we can encourage more efficient use of them while retaining equitable access.

2051 horizon

The implications of delivering the most likely scenario are that, by 2051, people in Christchurch can:

- ✓ Be proud of living in a city that - with residents - has responded to the challenge of climate change by adaptation of infrastructure and local communities.
- ✓ Choose to live in an intensified central city or suburban hubs, with attractive and convenient amenities that encourage a healthy lifestyle and wellbeing.
- ✓ Live safely in a city where resilient infrastructure can be expected to withstand the effects of a rupture on the Alpine Fault of magnitude 8.0 and other comparable natural disaster events.
- ✓ Adopt a lifestyle that generates low or zero greenhouse gas emissions and where waste materials are dealt with in sustainable ways.
- ✓ Be assured that the city's water supply meets national standards for delivery, and that wastewater and stormwater management has a positive impact on the environment.
- ✓ Be confident that infrastructure is managed efficiently and invested in responsibly, and the costs are affordable and sustainable.
- ✓ Be satisfied that the city's infrastructure performs to agreed levels of service, is well-maintained, enhances community wellbeing, and minimises risks to health, environment and safety.

In the short-term

For the first three years, at least, of this Strategy's implementation, our strategic response and asset investment decisions are shaped by:

- financial constraints that the Council faces in light of the impacts of the COVID-19 pandemic
- taking advantage of funding opportunities presented by Government stimulus programmes to fast-track infrastructure work that generates or retains jobs ("shovel ready" projects)
- the commitment to undertake renewals and maintenance work on the water supply network, as part of the Government's first tranche of water services' reforms
- balancing what is affordable in the short term with avoiding unacceptable risk to the condition of our assets – in particular our drinking water assets.

As a result of the COVID-19 pandemic, the Government introduced incentives to stimulate local economic recovery and jobs by speeding up 'shovel ready' infrastructure projects around New Zealand. The acceleration of these 'shovel ready' capital projects means delivery of some Council projects has been brought forward in timing, for example one of the major cycleways routes.

The Council was also able to take advantage of the Government's funding package to local authorities to provide immediate post-COVID-19 stimulus to maintain three waters infrastructure and to support reform of proposed local government water services delivery arrangements.

Policy and planning work required

Important policy and investigative work on infrastructure issues needs to happen over the next three years, to inform the next iteration of the Infrastructure Strategy and decisions that the Council needs to make for our longer-term wellbeing. Broadly this work relates to the following:

Climate change:	Outlining the options for infrastructure provision in areas vulnerable to impacts of climate change including sea level rise, alongside working with impacted communities to adapt to natural hazards
Greenhouse gas:	Identifying effective pathways across all of our activities for reducing emissions, and where we need to focus our efforts effectively to meet the Council's committed targets emissions' reductions as well as any future national requirements
Decarbonisation:	Finding design solutions and materials to reduce the carbon emissions from building and operating our infrastructure assets
Spatial planning:	Defining the future urban form we want for our city and integrating it with our transport system
Heritage buildings:	Finding ways to protect and restore significant heritage buildings that require major restoration following the earthquakes.

These priority areas for investigation and development of policy approaches are described more fully below.

Putting climate change at the centre of our strategic response

While looking after our assets is our priority in the short term, we must not lose sight of the challenges we are facing as a result of climate change.

Climate change is already affecting where we live, the way we live and our environment. We need to better understand what the impacts will be on our city's infrastructure in the years ahead. During the early years of this Infrastructure Strategy we need to work alongside local communities who will be particularly affected by climate change and natural hazards to find the pathways to adapt to the likely effects. We also need to further understand how our infrastructure planning can contribute to meeting our ambitious greenhouse gas emissions targets for our district, and identify actions to enable this.

Policy direction for adaptation

Until adaptation measures and tools are in place, an interim approach to managing asset replacement and renewals is urgently needed to guide decisions and investment. This work needs to be completed by the Council in good time to inform the 2024-34 LTP, and is part of a workstream identified in Kia Tūroa Te Ao, Ōtautahi Climate Resilience Strategy 2021 to identify the triggers and thresholds that indicate how our exposure and vulnerability to the impacts of climate change is evolving, and where adaptation steps need to be set in place.

Decarbonising our infrastructure and reducing emissions

Our infrastructure emits greenhouse gases, in both its construction and operation. It is important to take a whole-of-life approach to infrastructure and built environment emissions, because the form and function created dictates operational and maintenance requirements, and associated emissions. New infrastructure needs to be as efficient and sustainable as possible, using low-energy solutions, and be designed to minimise the amount of 'embodied carbon' in the materials used. This can be achieved, for example, through minimising the use of concrete, steel, and fossil fuels over the whole life of infrastructure assets, optimising the energy efficiency of buildings, and improving waste management with increased circularity of resources.

The Council's Resource Efficiency and Greenhouse Gas Emission policy aims to increase resource efficiency and reduce greenhouse gas emissions. A number of Energy Management Plans sit under the policy, according to asset and activity area. Examples of relevant projects include the water supply pump station energy efficiency investigation and optimisation programme, and the LED conversion of street lights (which will amount to an estimated reduction in greenhouse gas emissions of 1,463 tonnes per annum and is due to be completed by June 2021). LED (light-emitting diode lights) conversions are also happening at community and other Council facilities.

The Government announced in July 2020 that the standards for new buildings are expected to rise. The 'Building for Climate Change' work programme will focus on new buildings initially, with a primary focus on the operational efficiency of buildings (using less energy and water, improving air quality and temperature) and reducing the amount of greenhouse gas emissions from building.

We also need to continue to utilise 'blue-green infrastructure solutions' within infrastructure renewals and replacements. Incorporating 'blue-green infrastructure' (such as swales, rain gardens, sand dunes, street trees, natural waterways, plants, stormwater retention basins) is a means of reducing our infrastructure's carbon footprint, and preparing for future conditions. Developing a network of 'blue-green infrastructure' across the city will help us to better manage flooding, storm surges, and erosion along our coasts and hillsides, and clean our rivers and air.

Integrated spatial planning

Emissions' reductions of the scale needed to achieve our community, Council, and Government emissions reduction targets will require radical action, which must be supported by the way we plan our infrastructure activities and use our assets – particularly the integration of land use with the transport system. Current and historic land use and transport investment decisions encourage high levels of car usage, resulting in increasing congestion, rising emissions, reduced amenity, safety risks and poor health outcomes for local communities.

Our infrastructure must influence urban form by being well-aligned, prioritised and focused on those areas where the greatest growth and transformation is signalled, and also those areas that have relatively poor access and amenity. Our Spatial Plan (underway) will identify intensification opportunities and capacity along existing key public transport corridors, and potential future mass transit corridors. Focussing intensification along corridors provides opportunities for transport that use space efficiently, such as cycling and public transport, and connect key origins and destinations. (This work is based on a medium growth scenario for Christchurch; if population growth is greater than projected (i.e. a high growth scenario) then more work will need to be done to ascertain the impact of this on our infrastructure.)

This planning work aims to enable an increased number of households and jobs to be focused within 800 metres of high frequency public transport. This will aid a mode shift to public and active transport for households along the corridors, as more people will

have the opportunity to access key economic and social opportunities without the need to drive, thereby reducing carbon emissions.

The Spatial Plan will also include actions needed to support such development, including to:

- make streets places that support intensification (improving walkability and increasing connections to improve liveability across the city)
- increase tree cover and water-sensitive design solutions to offset greenhouse gas emissions, improve water quality, and increase neighbourhood amenity
- create a stronger city and neighbourhood identity
- prioritise areas facing the greatest need and opportunity for transformation.

Christchurch Transport Plan and liveable streets

The draft Christchurch Transport Plan is being developed and will need to identify bold actions we need to take to achieve our climate change goals. The Plan recognises the crucial role of our streets when we plan for our city, and encourages more people to use active and public transport. It will also need to support the Spatial Plan's focus on specific areas of intensification, and identifies transport goals to help achieve the vision by connecting communities and creating opportunities for people and businesses.

The concept of liveable streets (signalled in both the Spatial Plan and the draft Christchurch Transport Plan) has the potential to transform our street networks to support current and future growth. A liveable streets programme will serve as a tool for prioritising street improvements that are needed to support place and growth outcomes, by improving conditions for walking and cycling, and reducing traffic dominance. It is important that liveable streets becomes an integral part of infrastructure and future land use planning policy.

Aligning actions with our partners

The Government's focus on urban growth partnerships creates an enabling context for the alignment of land use and infrastructure planning (and housing). The partnerships create opportunities for greater integration and coordination between central and local government and mana whenua to deliver joint spatial plans and work programmes.

The Greater Christchurch Partnership is currently developing an overarching strategic framework and a vision and a Plan for the greater Christchurch communities. This will influence and be influenced by the land use and infrastructure planning for Christchurch city.

Protecting heritage buildings

The Council has a civic role to contribute to the protection and maintenance of significant heritage and public infrastructure of the city, including both assets we own and some whose care is entrusted to other entities (e.g. in trusts and through VBase, a Council-controlled organisation). We deliver this role in diverse ways, such as through heritage grants, partnership support, expert advice, district planning provisions and collection of historic records and images. We also support heritage and civic infrastructure through capital grants towards important asset maintenance or redevelopment projects. The LTP 2021-31 provides for capital grants towards notable civic amenities such as the Canterbury Museum ($23.5 million grant towards redevelopment), The Arts Centre ($5.5 million capital grant) and some smaller grants for other non-Council owned public amenities, and proposes using a targeted rate to fund this support. The Council also resolved to include $11.8 million additional funding for the base isolation work on the Robert McDougall Art Gallery (contingent on the museum raising the other funding needed for its redevelopment).

In the early years of this Infrastructure Strategy, the Council is likely to consider decisions relating to the restoration and future of the Canterbury Provincial Chambers. However, the nature and timing of such decisions is complex and still uncertain and requires further investigations.

Our scenario for investment over 30 years

Most likely scenario

Over the next 30 years, the most likely scenario for our infrastructure is driven by the need to be able to deal with further disruptions and absorb shocks – whether they be natural events, financial pressures, societal changes or environmental challenges. We need infrastructure that can help us address our significant issues, such as adapting to the impacts of climate change, reducing emissions, meeting community expectations and needs, and balancing what we can afford with what we can deliver.

Years 1 to 10 of the most likely scenario comprise infrastructure programmes/projects that form part of the LTP 2021-31; for the years 11 to 30, the scenario comprises programmes/projects that are detailed in respective Asset Management Plans. Projected capital and operational spending aligns with the assumptions and prudent financial view of expected revenue and expenditure that underpin the Financial Strategy in the LTP 2021-31.

Basis of the scenario

Our two focus areas, set out earlier in our strategic response, will lead the way in how we address the significant infrastructure issues we face. Our most likely scenario is also based on assumptions (see Appendix 4 - overarching assumptions and Appendix 5 – asset life cycle assumptions) that are reflected throughout this Strategy about:

- Christchurch over the next 30 years
- Expected growth or decline in the demand for services
- Lifecycle of our assets, and impacts of this on assessment of asset condition and planning for renewals
- Requirements for renewal and replacement of assets to maintain them to a standard that meets committed Levels of Service
- Costs of providing this infrastructure and the Council's finances over the 30 years.

The scenario draws on the Asset Management Plans developed for each infrastructure area and the Activity Plans that describe the activities we provide, and the levels of service for them. See Appendix 1 for a summary of the Infrastructure Strategy – the significant issues, the approaches and principal options for addressing them - resulting in the most likely scenario for investment, and what we can expect to see by 2051.

Looking at the scenario across all assets

In total, the most likely scenario requires a forecast investment of $19 billion in capital and operational expenditure (inflation adjusted) over the next 30 years. This is broken down into periods of forecast budgeted expenditure, in detail for years 1-10 and indicatively for years 11-30 of the Infrastructure Strategy.

The most likely scenario's budgeted figures for years 1-10 align with those agreed to in the LTP. These budgets aim to strike a balance between providing reliable infrastructure networks, facilities and services, addressing the financial impacts of COVID-19, and ensuring our infrastructure supports the growth of the city, while also maintaining financial prudence, building long term financial resilience, keeping rates and fees and charges affordable, and providing value for money for our community.

Forecast expenditure for the first ten years of the capital programme is between $634 and $688 million per year for the first three years[35], decreasing to between $568 and $638 million per year in years 4-10. The total capital programme includes infrastructure, as well as non-infrastructure programmes for community facilities and internal services such as IT, vehicle fleet and corporate accommodation. It provides for the renewal of existing assets, enables us to meet Levels of Service,[36] and includes additional capacity to meet demand growth.

Indicative estimates for years 11-30 of the most likely scenario are based on the forecasts set out in the Asset Management Plans. These take into account asset condition and lifecycle projections, and projects and programmes that have been deferred from the first ten years of the LTP, or have been significantly reduced, which nonetheless must be completed. These estimates are likely to change over the life of the LTP due to a number of factors:

- Changes in assumed growth rates
- Unanticipated changes to standards and compliance requirements
- New models of funding and delivery
- Greater certainty regarding projects and programmes and their timing
- Affordability and deliverability considerations

[35] This includes funding for the delivery of the Canterbury Multi-Use Arena (opening 2024) and the Metro Sports Facility (opening 2022), both co-funded by the Government. Without these projects, the core annual capital expenditure programme in today's dollars averages $450 million over the first 3 years, rising to an average of $530 million per year after that (as per the Financial Strategy, LTP 2021-31).

[36] Notes: An increase in Levels of Service for the condition of roads and footpaths is proposed in the LTP 2021-31 (rate of roading renewals increasing from 2% sealed local road resurfaced per year progressing to 6% by year 10, which is expected to result in an improvement to roadway condition and reduced roughness, and increased resident satisfaction). The opening of new community facilities in upcoming years (e.g. Hornby library, customer services, and rec and sport centre, and Te Pou Toetoe) are accounted for in relevant existing Levels of Service.

Operational expenditure figures for the most likely scenario's years 11-30 are extrapolated from the LTP figures, based on inflation and estimated growth factors; they include only the direct maintenance costs associated with the management of the relevant assets. The Council has identified savings of $27 million in total operational expenditure for 2021/22, on top of the reduction of $18 million for 2020/21.

This expenditure has been reprioritised over the long term to accommodate the loss of revenue from CCHL dividends in the first two years of the LTP, and new operational expenditure primarily generated by the new Metro Sports Facility and the Canterbury Multi-Use Arena following their completion. Once running, these facilities will require relatively significant operating expenditure, which needs to be integrated into the Council's annual budgets.

Significant decisions

Decisions to future proof our city

The following significant capital expenditure decisions will be required over the life of the Infrastructure Strategy. They reflect the two focus areas of the strategic response:

- Growing a resilient and liveable city, by responding to climate change, reducing emissions and preparing for disruption and
- Being careful stewards by investing responsibly in developing and maintaining our city's assets, managing demand through greater use of existing assets, and balancing our community's needs and expectations with what we can afford.

Focus on resilience

To grow the resilient and liveable city that we want, significant decisions will be required as to how we move towards our greenhouse gas emissions reduction targets, adapt to the impacts of climate change, and make sure our infrastructure processes and systems can cope with future disruptions and shocks. Such decisions include how we treat, recover or remediate solid waste; manage the treatment of wastewater; the location and nature of mass rapid transit; and the phasing and timing of infrastructure works to fulfil the regeneration plan for the Ōtākaro Avon River Corridor. We need to do more in the immediate years ahead to develop our understanding of how we will make future decisions about the infrastructure we own and maintain in areas that are vulnerable to climate change.

Focus on condition and performance

Following the Canterbury earthquakes the Council faced an enormous repair and rebuild programme of above and below-ground assets. Our focus for the future now shifts to investing in looking after these assets. Getting the balance right between the level of funding and timing of renewals with what is affordable and deliverable, and meets community needs and expectations, is fundamental to our strategic focus of looking after our assets responsibly.

Funding decisions about the ongoing renewal of existing infrastructure assets, such as three waters, roads and footpaths and facilities, are usually made as part of broad programmes of work adopted through the 10-year capital programme in the LTP. However, there are significant asset-specific decisions required that will direct our stewardship of assets. Foremost will be the decision about the ownership and delivery of water services, prompted by the Government's current sector reforms. We will also need to make significant decisions about how we will manage the restoration and future of some important heritage assets.

Significant decisions for capital expenditure

Drinking water safety	
The Council will need to make decisions about how its drinking water services can meet newly-introduced national drinking water safety standards, which are likely to have a higher threshold for compliance.	
Principal options including approximate scale/extent of costs	**Timing of decision**
1. Permanent residual disinfection of the water supply (i.e. chlorination) for Christchurch, Lyttelton Harbour, and Wainui ($30 million for installation of permanent dosing system) 2. Upgrade the infrastructure to obtain an exemption from residual disinfection (approximate costings for this fall within the range of $343 - $363 million capital expenditure)[37]	2021-22, dependent on timing of Water Services Bill

Mass Rapid Transit	
The Greater Christchurch partners are planning for the area's future growth, land use and ongoing development and improvements of the public transport network ("PT Futures"). As part of this, the Council needs to decide whether or not to approve a business case recommending preferred corridors for the provision of mass [rapid] transit (MRT). A number of associated decisions will subsequently be required to then progress the development of MRT.	
Principal options including approximate scale/extent of costs	**Timing of decision**
1. Approve the business case's recommendations for MRT corridor(s). Costs would be presented as part of the business case proposal. 2. Do not approve the recommendations. 3. Request alternative options to address transport and growth needs.	2022

Duvauchelle wastewater	
We need to decide on a preferred option for the removal of the discharge of Duvauchelle's treated wastewater to Akaroa Harbour. The discharge consent expires in 2023 and the Council is considering alternatives as part of the resource consent process. The Council expects to consult the community on options for disposing/reusing the treated wastewater in late 2021.	
Principal options including approximate scale/extent of costs	**Timing of decision**
1. Use treated wastewater to irrigate land, which could include native trees (costs are dependent on various site options still being explored) 2. Harbour outfall (status quo), including upgrade to the wastewater treatment plant ($5 million)	2022-23

[37] Costs estimated in report to Council, 13 June 2019, https://christchurch.infocouncil.biz/Open/2019/06/CNCL_20190613_AGN_3371_AT_SUP.htm

Water supply and wastewater disposal on Banks Peninsula	
We need to decide if and how we provide water supply and wastewater services to small communities on Banks Peninsula, where currently there is a range of private or community-run systems in place. We need to take into account public health considerations and environmental constraints and mana whenua values. We are likely to make case-by-case decisions based on a needs assessment that we will be undertaking in 2021.	
Principal options including approximate scale/extent of costs	**Timing of decision**
1. Provide water supply services to some or all small communities ($2 million for provision of water supply to each community) 2. Provide wastewater services to some or all small communities (Costly and dependent on preferred wastewater treatment option decided) 3. Do not provide any additional services	Various, over LTP and later years

Implementation of the Ōtākaro Avon River Corridor Regeneration Plan
The Council has commenced implementing the Ōtākaro Avon River Corridor Regeneration Plan. The Regeneration Plan signals overall investment of between $1.2 billion, for network infrastructure and development of the Green Spine over 30 years. As part of the LTP 2021-31, the Council has allocated $328 million of capital development funding across Parks, Transport and Three Waters (as per the Financial Strategy LTP 2021-31). This will contribute to the necessary infrastructure being in place to enable the activities and land uses anticipated in the Plan and by the community. Fully implementing the Regeneration Plan is a long-term commitment, with the Council focussing on land transfer, partnership-building, option identification and planning over the next three years. The Council, in partnership with Ngāi Tūāhuriri, is investigating and developing options for a new community co-governance model to guide the long-term use of the land. Decisions are required on this co-governance arrangement's exact nature, including who will be responsible for making decisions about the area's future use.
The options for co-governance arrangements are still being considered, but will be founded on our stated commitment to partnership and community leadership.

Waste to energy	
The Council needs to make decisions about the ways and extent to which it wants to invest in **waste to energy** solutions, which could include potential alternatives to landfill and processing of organic material. There are two important upcoming decisions: • Addition of anaerobic digestion to the process of composting organic material at the Organics Processing Plant, which will increase its capacity and enable generation of alternative energy sources to power Council facilities (methane). • Increasing the production of biogas fuel and/or building a solar electricity generation plant at the wastewater treatment plant, which will also enable generation of alternative energy sources to power Council facilities.	
Principal options including approximate scale/extent of costs	**Timing of decision**
1. Add anaerobic digestion to the front end of the composting process at the Organics Processing Plant ($15 million) 2. Install solar panel array and/or increase biogas production/anaerobic digestion at the wastewater treatment plant (solar – 10MW solution at $12 million; biogas - $30 million to re-purpose assets) 3. (And/or) look for other alternatives for waste to energy	2025-2026

Additional public transfer station	
Depending on the pace of population growth and demand for facilities to receive solid waste, the Council will need to decide if a fourth public transfer station is required.	
Principal options including approximate scale/extent of costs	**Timing of decision**
1. Proceed ($15 million) 2. Do not proceed	By 2030-35

Treatment of closed landfill sites	
The Council needs to decide how it will approach the remediation of closed landfill sites, particularly the 15 (out of 50 sites owned by the Council, and a total of 130 including those on private land) that are in vulnerable low-lying areas and exposed to the impacts of climate change.	
Principal options including approximate scale/extent of costs	**Timing of decision**
1. Maintain and monitor landfill aftercare programme for closed sites, identify emerging risks and respond to these on a case-by-case basis ($0.5 million per year) 2. Address the problem proactively by remediating vulnerable sites (approximately $2 million per year, plus additional funding to further reduce risk as required)	Ongoing

Programmes, projects and expenditure for each asset area

Water supply

Key programmes and projects

The Council supplies potable (drinkable) water to approximately 160,000 residential and business customer connections, through seven urban water supply schemes and six rural water supply schemes. Water supply is provided via 1,700 km each of mains and sub-mains, 108 reservoirs, 127 pump stations, 172 wells, seven stream intakes, and seven water treatment plants.

A key programme for the water supply asset area for at least the next ten years will be to focus on improving and maintaining key infrastructure, such as the reticulation network, in order to meet the increasing national standards for water safety. The Council has committed to an additional $200 million over the next ten years, to invest in water supply assets and avoid further deterioration of the network (and some additional funding over the period for the wastewater network too). We will also be focused on exploring how we can more efficiently manage demand for drinking water, including through mechanisms such as volumetric charging. A 'smart' water supply network will also enable the Council to better manage demand and improve the network's operation through smart monitoring technologies.

Improvements and increased renewals are required to reduce leakage rates. Many of our water supply pipes are in poor or very poor condition, with an upcoming significant peak in renewals as pipes made of different materials are all coming to the end of their useful lives at the same time. Their poor condition makes the pipes more vulnerable to leaks - leaks have increased by a third in the last two years and we lose the equivalent of 90 Olympic-size swimming pools each week. Reducing leakage is key to lowering the risk of interaction between potential contaminant sources and the water supply, and will also reduce power and conveyance costs and is an important issue to target alongside other demand management measures that the Council may consider. It will also improve the long term sustainability of the water supply, because while the Christchurch aquifers are plentiful, they are not infinite.

Modelling shows that there is a risk that land intensification north of the Waimakariri River increases the risk of nitrate concentrations in the Christchurch aquifers, which are the groundwater sources used for our drinking water supply. The city must do all it can to protect its aquifers from contamination, including through targeted investigations to improve understanding, further implementation of source protection, and partnership with Environment Canterbury and neighbouring district councils.

Table 1: Water supply – major programmes and projects

Rationale	Description and rationale	What we expect to see and contribution to addressing significant issues
Level of service	Water Safety Plan Improvement Programme: This Programme has a number of different components, which will occur concurrently (and some at the same time) over the next 30 years: - Well and wellhead upgrades – this is the first tranche of the programme, and will be completed in the next year or two. - Backflow prevention – generally a device is fitted at the property boundary; this project will be largely completed in the next year or two. - Reservoirs and suction tanks - including renewals, new works, and increased inspection and maintenance - Lead in pipes - investigate sources and target renewal of lead-jointed pipes	This will contribute to maintaining the condition of our assets, and thereby increasing the safety of our drinking water, with a greater chance of meeting new national standards.
Level of service	'Smart' water supply network: To achieve a sustainable water supply as a key objective of the Integrated Water Strategy, 'Smart' technologies could be used to improve network operation and reduce demands and leakage to prolong the long-term availability of the water sources. Instantaneous monitoring technology can also provide an assurance as to water quality and public safety. Furthermore, smart technology would be used to improve infrastructure asset renewal and/or to enable more efficient use of existing infrastructure.	This will improve the sustainability of our water supply – as well as quality and safety.
Renewal	Asset renewals: Proactive risk-based asset renewals to maintain efficient and resilient infrastructure, which is a key objective of the Integrated Water Strategy. This programme includes all water supply assets including, importantly, the reticulation network. Water network renewals are essential to reduce water lost through leaks. Involves the replacement of approx. $500 million of water supply pipes over the next ten years.	This will contribute to maintaining the condition of our assets, and thereby increasing the safety of our drinking water, and having a greater chance of meeting new national standards
Level of service	Water supply rezoning: Pressure management of water supply zones is a well-recognized national and international best practice with multiple benefits for extending infrastructure service life, and reducing leakage, operational costs and service interruptions.	Will achieve faster disaster recovery, allow for water pressure to be managed at a more optimum range across the whole city.

Projected capital and operational expenditure

Table 2: Forecast operational and capital expenditure FY2022-2051 (Inflated figures)[38]

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		9.6m	9.2m	9.7m	10.3m	10.2m	10.9m	11.6m	11.6m	12.1m	12.8m	69.9m	81.0m	94.0m	109.1m
Capex	Asset Renewal	54.3m	51.7m	64.3m	63.2m	65.8m	68.0m	67.1m	66.5m	65.8m	66.9m	391.1m	420.7m	346.1m	322.7m
	Growth	2.4m	6.1m	10.3m	5.1m	5.1m	5.4m	7.3m	6.8m	8.4m	11.7m	38.9m	41.2m	48.8m	51.9m
	LoS Improvement	0.5m	0.4m	0.4m	0.3m	-	-	-	-	-	-	-	-	-	-
	Meeting Current LoS	6.4m	9.5m	10.3m	12.8m	11.4m	14.4m	15.1m	18.3m	16.7m	15.8m	42.2m	3.7m	2.2m	2.4m
	New Service	1.3m	1.2m	-	-	-	-	-	0.3m	-	-	0.7m	0.8m	0.4m	0.9m
Capex TOTAL		**64.9m**	**68.9m**	**85.3m**	**81.4m**	**82.3m**	**87.8m**	**89.5m**	**91.9m**	**90.9m**	**94.4m**	**472.9m**	**466.4m**	**397.5m**	**377.9m**

[38] Note that operational expenditure figures, for all asset groups in this section of the Strategy, include only the direct maintenance costs associated with the management of the relevant assets; the total costs for the provision of the related service(s) are not included.

Wastewater

Key programmes and projects

The Council collects, treats, and disposes of wastewater from approximately 160,000 customers in Christchurch, Lyttelton, Diamond Harbour, Governors Bay, Akaroa, Duvauchelle, Tikao Bay and Wainui. This is done through 1,000 km of laterals, nearly 2,000 km of wastewater mains, 150 pump stations, 84 lift stations, and three vacuum stations. We provide treatment at eight wastewater treatment plants and disposal via one outfall pump station, six ocean/harbour outfalls, and two land irrigation schemes. The majority (98%) of wastewater generated within Christchurch is serviced by the Christchurch wastewater network for treatment at the Christchurch wastewater treatment plant). New pipework has recently been installed to enable the wastewater from Lyttelton, Governors Bay and Diamond Harbour to be pumped to the plant, and allow the existing Lyttelton Harbour Basin treatment plant to be decommissioned. In order to allow the current Akaroa Harbour discharges to end, a treatment plant is under construction on a new site, which will allow land disposal for some or all of the effluent.

Targeted regulatory reforms to improve the environmental performance of wastewater systems will include a new national environmental standard for wastewater discharges and overflows. Therefore, a major focus of the upcoming work programme will be on addressing wet weather overflows.

Table 1: Wastewater – major programmes and projects

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewal	Replacement programme: Renew poor condition assets to reduce risk of asset failure and need for reactive repairs.	Reduced inflow and infiltration, better utilisation of existing capacity, better provision for growth, reduced wastewater overflows
Level of service	Asset condition information: Condition-based monitoring is required to ensure that remedial interventions can be planned in a cost-effective manner to maintain reliability and ensure continued service for customers.	Better condition data will reduce uncertainty and ensure that we are able to manage the network in the most efficient way possible, including planning for renewals.
Renewal	Wastewater overflow reduction: Wastewater overflow reduction is a key objective of the Integrated Water Strategy and can be achieved through wastewater network upgrades, reducing inflow and infiltration from the public wastewater network and requiring repair and renewal of private sewer laterals. Wastewater network models must be maintained to understand and plan for reducing wastewater overflows.	Reduced wastewater overflows
Renewal/ Level of service	Sustainable wastewater systems: A key objective of the Integrated Water Strategy is to manage the effects of the wastewater systems to meet community needs for environmental, social, cultural and economic sustainability over the long term. This will be achieved through the reduction of wastewater at source (reduction in inflow and infiltration), removal of treated wastewater from the Akaroa Harbour, implementing the re-use of treated wastewater, and investigating wastewater options for small Banks Peninsula settlements.	Akaroa Reclaimed Water Treatment and Reuse Scheme Duvauchelle Wastewater Treatment and Disposal Upgrade Timely upgrades to CWTP Reduced I&I in Akaroa and Duvauchelle Banks Peninsula Servicing Strategy

Projected capital and operational expenditure

Table 2: Forecast operational and capital expenditure 2022-2051 (Inflated figures)

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		10.3m	9.6m	10.2m	10.7m	10.8m	11.3m	11.8m	12.1m	12.6m	13.1m	71.6m	83.1m	96.4m	111.8m
Capex	Renewal	44.4m	51.2m	54.3m	61.6m	64.2m	75.1m	71.6m	76.5m	66.9m	61.8m	451.3m	568.9m	725.4m	757.5m
	Growth	1.9m	3.0m	2.7m	1.6m	2.1m	2.3m	4.4m	3.2m	3.5m	3.9m	92.4m	23.5m	23.1m	25.9m
	Meeting Current LoS	10m	14.8m	12.9m	17.9m	26.0m	26.2m	14.8m	2.0m	1.6m	5.1m	32.8m	22.6m	49.0m	10.4m
	New Service	-	0.2m	2.6m	2.9m	1.2m	0.1m	-	-	0.5m	2.4m	9.0m	7.2m	0.2m	19.1m
Capex TOTAL		**56.3m**	**69.2m**	**72.5m**	**84.0m**	**93.5m**	**103.7m**	**90.8m**	**81.7m**	**72.5m**	**73.2m**	**585.5m**	**622.2m**	**797.7m**	**812.9m**

Surface water and waterways

Key programmes and projects

Key assets for this activity include underground conveyance networks (including pipes, manholes, sumps, inlets, outlets); open channels and overland flow path (including natural waterways such as rivers, streams and creeks, constructed drainage channels, in-channel structures, lining and retaining walls); pump stations and water flow control devices and structures such as valve stations, stopbanks, tide gates and basins; water quality treatment devices such as basins, wetlands, tree pits, raingardens and filtration devices; and hydrometric monitoring devices, measuring rainfall along with surface water, sea and groundwater levels.

A particular focus of this asset group for the LTP period will be on responding and adapting to the effects of climate change (informing and responding to organisation-wide strategic direction), and the delivery of the stormwater elements of the OARC work programme. We have an opportunity in the Ōtākaro Avon Regeneration Area to take an integrated approach to how we manage land, water and natural hazards. We have work planned that will reduce the flooding risk, bring ecological and environmental benefits, and create new recreational areas that people can enjoy.

A further challenge for the next few decades will be improving water quality and meeting the conditions imposed by the Comprehensive Stormwater Network Discharge Consent. The Consent sets a requirement for ongoing infrastructural investment over the next 25 years to reduce the stormwater contaminants entering the waterways. This is a particular challenge as development of greenfield areas continues, with an associated increased contaminant load. Meeting the requirements relies on increased intensification to provide for growth, and on retrofitting older existing urban developments with stormwater treatment at source or in downstream facilities.

Table 1: Surface water and waterways – major programmes and projects

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Level of Service	Floodplain management: high-level work programme to address flooding risks across the city, covers multiple facets of the activity including: - Stormwater treatment facilities - Storage basins (eg. Upper Heathcote) - Stop banks across the city – excluding the OARC corridor - Flood Management Projects - Multi-hazard investigations - Network modelling - Stormwater Management Plans - Strategic land purchases	Necessary to respond and adapt to the effects of climate change, protect land, assets and private properties from flooding;
Level of service	Implementation of OARC Regeneration Plan: initial work is needed to determine the different components of the work programme and their timings. A major part of this is stopbanks work – either temporary or permanent. Known and funded individual projects include: - Waitaki Street treatment facility, tidal wetland and section of permanent stop bank - Waikakariki – Horseshoe Lake Treatment Facility (Stages 1 & 2)	Respond and adapt to the effects of climate change
Growth	Storm water treatment facilities and waterway enhancement: this involves retrofitting and new facilities in response to growth, in the Avon, Styx, and Heathcote catchments, works to restore waterways to pre-quake conditions and naturalisation of waterways. Will help to meet conditions under the Comprehensive Stormwater Network Discharge Consent.	Providing for growth; keeping up with regulatory requirements; and ensuring maintenance of our assets
Renewal	Renewals: this is needed to respond to asset deterioration of pump stations, pipes, drains, swales, waterway linings. While not currently allowed for, in the future this programme will need to account for adaptation policy decisions and Council-wide strategic direction (example of PS205, which will need to be renewed/replaced in 2040; and stopbanks, which will need to be renewed across the city at different intervals).	Work towards building a 21st century garden city; ensure adequate maintenance of assets

Projected capital and operational expenditure

Table 2: Forecast operational and capital expenditure 2022-2051 (Inflated figures)

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		10.1m	10.5m	11.0m	11.6m	12.1m	12.8m	13.4m	14.1m	14.9m	15.7m	85.7m	99.4m	115.4m	133.9m
Capex	Asset Renewal	13.5m	18.6m	22.2m	27.6m	25.4m	24.4m	27.9m	30.3m	26.6m	27.6m	131.0m	196.7m	341.2m	368.8m
	Growth	24.2m	16.7m	18.2m	26.9m	20.9m	17.0m	17.9m	17.8m	20.9m	16.8m	101.5m	132.4m	168.2m	211.3m
	LoS Improvement	2.1m	12.1m	2.6m	3.8m	4.8m	2.8m	2.3m	2.5m	1.3m	1.0m	2.0m	2.0m	-	-
	Meeting Current LoS	25.0m	15.0m	15.1m	16.6m	26.6m	26.4m	24.7m	26.2m	25.9m	34.6m	343.9m	462.4m	428.9m	193.6m
	New service	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex TOTAL		**64.8m**	**62.4m**	**58.1m**	**74.9m**	**77.7m**	**70.6m**	**72.8m**	**76.8m**	**74.7m**	**80.0m**	**578.4m**	**793.5m**	**938.3m**	**773.7m**

Transportation

Key programmes and projects

The Council is responsible for the operation and maintenance of the transport network (roads and footpaths, cycleways, public transport, and car parking), maintenance and repairs of roads and footpaths, improvements and upgrades, and planning for the future. We own, plan and manage the 2,500 km local roading network that supports all transport activities.

Road transportation generates around 36% of total greenhouse gas emissions in Christchurch, and as one of the biggest contributors to emissions. While we will need to continue to invest in infrastructure to support active and public transport, ensuring our land use supports our identified transport corridors, and designing and prioritising our streets and footpaths to encourage active travel will also be effective in reducing emissions. However, we need to do a lot more. Work is underway to determine the most effective actions the Council and the community can take to reduce road transport emissions, and how we can work with central government to achieve the significant reductions required.

Over the next decade, we are planning to further expand and improve public transport and cycling infrastructure. This will include priority measures for public transport across the core routes to support the 'inner core package' developed through a partnership business case. This is a joint programme with Environment Canterbury (ECan) and NZTA and requires both ECan and the Council to ensure an integrated LTP programme for implementation. In addition, we will be completing the major cycleways across the city and linkages with local cycleways. The major cycle routes and other cycleways are designed to encourage people to ride because they can see it's a safe, convenient option to get where they want to go.

At the same time, we need to invest in renewals of our roads and footpaths. We need to maintain our city road and footpath network so that it is safe, and residents are satisfied with it. The network also needs to achieve acceptable standards for usage and reflect the changing uses of streets.

Table 1: Transport – major programmes and projects

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewals	To maintain our city road and footpath network so that it is safe and efficient and meets the needs of all users, the Council needs to invest appropriately in a programme of renewals for the transport network – aimed at better traffic management, and strengthening and smoothing of carriageways. Carriageway renewals include resurfacing, drainage, and kerb and channel, as well as changes to enable safe facilities for users other than cars e.g cycle lanes, cycleways, and pedestrian facilities.	Ensuring sustainable management of our road network, enabling a safe and accessible network for all users.
LOS Improvement	Significant network of cycleways – the major cycleway network is a series of 13 off-road facilities supported by a network of local cycleway connections, slow streets, shared paths etc that connect communities to the major network. This network is in addition to the on-road cycle lanes. It aims to foster connected and healthier communities, promote mode shift, make our city more accessible, and reduce emissions.	Getting more people cycling is key to addressing climate change, creating healthier communities, increasing access and reducing congestion.
LOS Improvement	Continued implementation of remaining investment phases for the Accessible City 2015 (Christchurch Central Recovery Plan transport chapter). This work identifies 130+ projects to be implemented in phases over 30 years. Phase 1 projects are all largely complete. The next 10 years is focused on phases 2 and 3, and on delivering a series of public realm and transport projects, including Antigua St cycleway, Colombo North, Ferry Road, High Street, Victoria, Hereford, Worcester East, Lichfield East.	Delivering a travel network that enables safe access for all road users and promotes a greater uptake of active and public transport to ensure access to the central city is easy and attractive, as the population and travel demand grows.
New service	The Council and its strategic partners are committed to improving the public transport system. A joint business case has identified a 10+ year programme of investment aimed to increase bus frequency and introduce bus lane priority and intersection improvements on core bus routes; improve bus stops, including bus shelter and real time information at bus stops; and upgrade the central city bus interchange, including provision to purchase land to expand. In addition to investing in improving the public transport system in the short to medium term, the Council is working with its partners to investigate the shape and form of future mass rapid transit.	Meeting these objectives: • Improve journey time and reliability of PT services relative to private vehicles by 2028 • Improve PT services to and from highly populated/growth areas and key destinations across Greater Christchurch by 2028 • Remove barriers to the uptake of PT by 2028 This is aimed at delivering growth in bus patronage and reducing car dependence, thereby improving economic, social and environmental outcomes.
LOS	Safety programme seeks to reduce deaths and serious injury crashes on the network by addressing the known high risk locations across the city –with a clear focus on safety improvements at intersections and other high-risk areas and considers vulnerable users such as cyclists and pedestrians.	A clear reduction of deaths and serious injuries – aiming to go from actual 115 in 2019/20 to 78 in 2030/31. This is in line with the national Road to Zero target of reducing death and serious injury crashes by 40% by 2030. For cyclists and pedestrians we expect to see an ongoing reduction of deaths and serious injuries despite an increase of cycling and walking over the ten-year programme.

Projected capital and operational expenditure

Table 2: Forecast operational and capital expenditure 2022-2051 (Inflated figures)

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		40.4m	40.9m	42.1m	43.1m	44.3m	45.4m	47.0m	48.3m	49.7m	51.1m	279.7	324.5	376.5	436.9
Capex	Renewal	64.9m	65.0m	62.8m	79.8m	76.0m	61.5m	60.0m	72.2m	82.4m	65.2m	380.9m	424.5m	493.9m	566.5m
	Growth	11.1m	28.0m	21.3m	10.0m	14.2m	6.5m	14.1m	12.5m	12.3m	17.9m	48.0m	45.4m	53.4m	61.7m
	LoS Improvement	55.6m	46.8m	49.4m	43.9m	47.3m	67.4m	71.7m	40.5m	34.0m	51.6 m	169.6m	152.5m	172.4 m	191.7m
	New Service	4.5m	4.4m	4.6 m	11.6 m	5.6m	5.0m	12.6m	6.4m	24.8m	22.6m	37.7m	69.3m	102.5m	80.4m
Capex TOTAL		**136.1m**	**144.2m**	**138.1m**	**145.3m**	**143.1m**	**140.4m**	**158.4m**	**131.6m**	**153.5m**	**157.3m**	**636.2m**	**691.7m**	**822.2m**	**900.3m**

Facilities

Key programmes and projects

This asset group includes more than 150 different facilities, plus over 1,900 community housing units (formerly referred to as social housing). Facilities include libraries, sports and recreation centres, pools, stadia, camping grounds, art gallery, local museum, community centres, bus interchange and corporate accommodation. The network will be enlarged and enhanced in the early years of the next LTP by:

- Te Pou Toetoe (indoor swimming pool, community and recreation spaces, opening summer 2021-22)
- Metro Sports Facility (aquatic and indoor recreation and leisure venue, opening in 2022)
- Hornby library, customer services, and rec and sport centre (opening late 2022)
- Canterbury Multi-Use Arena (opening late 2024).

There has been extensive rebuilding and repairs of facilities post-earthquakes, resulting overall in a modern network of well-designed buildings that demand regular, ongoing maintenance in order to remain fresh and fit-for-purpose, optimise usage and meet citizen expectations. However, some community facilities are not well utilised and decisions need to be considered for their future divestment (e.g. to community ownership) or disposal. Asset management needs to remain agile to stay abreast of changing consumer needs/expectations and technological trends, so that facilities retain relevance and are fit-for-purpose. Delivering services beyond buildings is anticipated to feature increasingly in the future.

Over the life of the Infrastructure Strategy, a significant bow wave of cyclical refurbishments of post-quake rebuilt or new buildings will be required.

The demand for community housing in the city has grown in recent years, and will continue to put pressure on the Council's commitment to invest in this area; also a large portion of the housing stock was built mid-century, and now progressively requires major refurbishment or modernising. By the start of the LTP 2021-31 period, a significant upgrade of stock to provide warm, dry homes will be completed as a first step to meeting Healthy Home requirements by mid-2023.

Table 1: Facilities – major programmes and projects

Community facilities

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewal	Maintain, refurbish or modify community facilities community centres to a standard that meets community needs and demand, and optimises usage.	Fit-for-purpose community facilities that enable participation and engagement in community life and events

Recreation and sport facilities

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewal	Maintain, refurbish or modify recreation facilities to a standard that meets community needs and demand, and optimises usage.	Optimised efficiency and effectiveness of the network of recreational assets.

Libraries

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewal	Maintain and refurbish libraries regularly so they remain fit-for-purpose and adapt to changing technologies and uses.	Optimised efficiency and effectiveness of the network of libraries.
Renewal	Complete substantial earthquake repairs to South Library and a small number of remaining community facilities still requiring repairs following the earthquakes, so that they are safe and fit-for-purpose for continued community use.	Earthquake repairs for our libraries will be completed and our facilities will be able to run as normal.

Community housing

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewal	Maintain, refurbish and replace community housing to a standard that contributes to meeting community needs and demand.	Existing community housing is maintained over its asset life Community housing complexes replaced as they reach the end of their 90- year life (programme projected from 2035 onwards)

Projected capital and operational expenditure

Table 2: Forecast operational and capital expenditure 2022-2051 (Inflated figures). NB: Includes community facilities, libraries, rec and sports facilities, community housing, Art Gallery, Canterbury and Akaroa Museums, and Canterbury Multi-Use Arena.

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		10.4m	13.5m	13.6m	15.0m	14.3m	14.6m	15.0m	15.4m	15.8m	16.2m	88.6m	102.8m	119.3m	138.4m
Capex	Corporate*	91.0m	1.0m	1.0m	-	-	-	-	-	-	-	-	-	-	-
	Asset Renewal	51.6m	34.0m	31.8m	38.4m	39.2m	42.0m	38.4m	36.8m	42.5m	43.0m	213.5m	256.3m	316.4m	360.4m
	Growth	18.6m	15.6m	1.4m	1.5m	0.4m	1.5m	0.4m	2.8m	3.0m	2.4m	14.3m	12.0m	5.5m	6.2m
	LoS Improvement	11.4m	16.3m	19.0m	4.8m	4.5m	4.7m	4.9m	6.6m	6.8m	7.1m	-	-	-	-
	Meeting Current LoS	56.4m	191.4m	184.0m	24.1m	0.1m	0.2m	0.2m	0.4m	0.4m	0.1m	1.6m	1.5m	2.1m	1.6m
	New service	11.5m	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex TOTAL		**240.5m**	**258.3m**	**237.2m**	**68.8m**	**44.2m**	**48.4m**	**43.9m**	**46.6m**	**52.7m**	**52.6m**	**229.4m**	**269.8m**	**324.0m**	**368.2m**

* Corporate = including carry forward provision from 2020/21 and $1m for each of the first three years for improved level of service (Tsunami Warning System)

[39] Includes $40 million carry forward for Metro Sports Facility.

Parks

Key programmes and projects

We have an extensive network of parks and gardens (home to playgrounds and fitness circuits, walking tracks and paths, park furniture and amenity, plants and trees, sports turf) reserves, cemeteries, bridges, and foreshore and marine access ways that serve recreation, sport, garden, heritage, cultural and community activities. In total we maintain 1,248 park asset sites across 9,378 hectares of land.

There is an increasing level of service demanded by citizens of our parks, and the impact of deferred maintenance has resulted in an increased risk of asset failure, reduced reliability and performance and costly, reactive repairs. Over the next ten years, in order to meet and satisfy citizen expectations and demands, and enable optimal use of park assets, there needs to be a strong focus on ensuring sufficient operational expenditure to maintain existing assets and for commensurate funding of operating costs for any assets added to the portfolio.

There is an ongoing need for Parks to respond and adjust asset provision to reflect changes in the way people and communities of interest choose to recreate, participate in sports, enjoy the outdoors, value our landscapes and biodiversity, and a growing breadth of cultural practices.

The Council is responding to changing and increasingly varied demands with multi-use spaces, increased community involvement in planning and managing parks, and diverse recreation and sport facilities for all ages and abilities. Network plans for the provision of parks and facilities are being developed to guide Council investment. They establish processes for prioritising new developments and upgrades to meet community needs equitably, within available resources, and include guidance on design.

Parks also has a large role to play in responding and adapting to climate change. A big focus of the next 10 years will be providing the millions of plants required for the ecological restoration of the Ōtākaro Avon River Corridor.

Table 1: Parks – major programmes and projects

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewal	Renewals-Heritage Buildings: several large, high-profile projects, including: - Old Municipal Chambers - Robert McDougall Gallery – Strengthening - Cuningham House - Canterbury Provincial Chambers	Continued regeneration of the city and its heritage assets – looking after what we've got
Renewal	Renewals – Foreshore: Akaroa Wharf Renewal Marine structures and seawalls	Looking after our foreshore assets
Growth	Naval Point Development	Looking after our foreshore assets
Renewal	Ōtākaro Avon River Corridor (OARC) development and RRZ asset renewals	Preparing the corridor for implementation of preferred land uses outlined in the OARC Regeneration Plan; helping to respond and adapt to climate change impacts
Renewal	Parks buildings and assets renewals programmes to maintain parks so they are in good condition to meet community/recreation/sporting needs and expectations	Meeting community needs and expectations and looking after our assets
Demand & Growth	Cemeteries development: programme of works for provision and upgrades of facilities and infrastructure provided on cemeteries to maintain burial capacity and optimise use. This includes development of the $9.56 million Templeton Cemetery in the west of the city, and $24 million land purchases and developments for cemetery extensions.	Meeting community needs and expectations and providing for growth
Demand & Growth	Community Parks: programme of works for provision and upgrades of facilities and infrastructure provided on community parks so they continue to be fit-for-purpose for sporting and recreational use. This includes $7.39 million Lancaster Park redevelopment and 10.8 million QEII stage 2 developments.	Optimised efficiency and effectiveness of parks network
Demand & Growth	Regional Parks: programme of works for provision and upgrades of facilities and infrastructure provided on Regional Parks so they continue to be fit-for-purpose for ecological and recreational use in the Port Hills and Coastal Plains management areas.	Optimised efficiency and effectiveness of parks network
Improve & Meet Levels of Service	Planned sports fields developments, and upgrade sports facilities on sports parks so they continue to be fit-for-purpose for sporting and recreation needs, and their use is optimised.	Optimised efficiency and effectiveness of network of sports fields
Meet Levels of Service & Demand	Programme of works for provision and upgrades of facilities and infrastructure provided in Botanic Gardens and Hagley Park so they continue to be fit-for-purpose as a major attractions.	Work towards building a 21st century garden city; ensure adequate maintenance of assets

Projected capital and operational expenditure

Table 2: Forecast operational and capital expenditure 2021-2051 (Inflated figures)

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		18.3m	18.7m	19.1m	19.6m	20.0m	20.5m	21.0m	21.6m	22.2m	22.8m	124.6m	144.6m	167.7m	194.6m
Capex	**Renewal**	16.7m	26.0m	30.7m	32.0m	24.0m	22.6m	44.4m	21.5m	19.4m	1.1 m	77.2m	258.3m	72.3m	104.0m
	Growth	2.6 m	6.5m	10.1m	16.9m	17.9m	14.5m	13.9m	16.5m	16.2m	15.8m	52.2m	28.3m	17.5m	17.1m
	LoS Improvement	2.1 m	4.2m	6.2m	6.3m	7.6m	4.6m	3.5m	2.1m	2.5m	2.1m	25.4m	5.2m	4.2m	3.4m
	Meeting Current LoS	0.9m	9.9 m	11.0m	3.1m	1.7m	1.5m	6.4m	4.4m	2.7m	2.7m	15.1m	12.6m	11.3m	9.5m
	New Service	9.0m	4.4m	4.0m	5.6m	12.3m	20.8m	26.9m	22.3m	31.6m	32.9m	68.0m	34.1m	29.9m	28.5m
Capex TOTAL		**31.3m**	**51.0m**	**62.0m**	**63.9m**	**63.5m**	**64.0m**	**95.1m**	**66.8m**	**72.4m**	**74.6m**	**237.9m**	**338.5m**	**135.2m**	**162.5m**

Solid waste and resource recovery

Key programmes and projects

Solid waste and resource recovery infrastructure supports the collection and management of waste - through organics and recycled materials processing, transfer stations and residual waste transfer to landfill (including landfill gas capture and operation), processing, disposal and treatment of construction and demolition waste and contaminated soils, and aftercare of closed landfills.

There is a high level of resident satisfaction with our kerbside collection system for waste materials, and growing community aspirations for sustainable ways to manage and recycle waste, and reduce what goes to landfill. This, combined with dynamic markets for recycled materials, means that asset investment needs to be agile and responsive to changing markets and technologies.

Implementing actions from the Council's six-year Waste Management and Minimisation Plan 2020 will be a key driver of capital and operational expenditure in the respective years in the LTP 2021-31. Actions will be reviewed annually (and revised as relevant) to keep the focus on diverting organics and recyclable materials from landfill, diverting hazardous substances from the environment, providing local leadership and innovation in waste management and changing consumer behaviours through education and communication. An additional, important focus will be on contributing to meeting the Council's zero emissions targets, through exploring ways to reduce greenhouse gas emissions from waste processing activities, the household kerbside collection vehicle fleet, and the transport of waste materials to processing plants/landfill.

Table 1: Solid waste and resource recovery – major programmes and projects

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Meet level of service/ renewal	The Material Recovery Facility and the Organics Plant require adaptation and/or upgrading so that they can sustainably process an increasing range and volume of respective recyclable and organic materials, take opportunities to convert waste to energy, and adapt to market opportunities and conditions	A system that sustainably processes waste while meeting regulatory requirements and reducing waste to landfill
Meet level of service	The methods used for household kerbside collection need to be able to adapt to changes in consumer behaviour, processing systems and the markets and uses for recoverable materials	A responsive and adaptive waste system
Renewal/ level of service	Explore ways to reduce greenhouse gas emissions from processing activities, household kerbside collection vehicle fleet, and the transport of waste materials to processing plants/landfill	Reduction in greenhouse gas emissions contributing to meeting our lower emissions targets
Renewal	Management of risk of land or groundwater contamination at closed landfill sites that are identified as vulnerable to coastal inundation and sea level rise	Adapting to the effects of climate change and meeting regulatory requirements, by protecting communities and the environment

Budgets for these programmes/projects are part of the following table of total operational and capital expenditure.

Projected capital and operational expenditure

Table 2: Forecast operational and capital expenditure 2021-2051 (Inflated figures)

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		0.9m	0.8m	0.8m	0.8m	0.9m	0.7m	0.7m	0.8m	0.8m	0.8m	4.4m	5.1m	6.0m	6.9m
Capex	**Renewal**	2.6m	1.4m	2.6m	2.0m	2.1m	2.2m	2.3m	1.7m	2.6m	2.9m	16.9m	11.4m	12.7m	14.2m
	LoS Improvement	1.0m	0.5m	-	-	-	-	-	-	-	-	-	-	-	-
	Meeting Current LoS	15.9m	7.9m	0.1m	0.1m	1.1m	2.4m	2.5m	1.3m	0.2m	0.2m	0.9m	24.1m	1.1m	1.2m
	New Service	0.4m	1.2m	1.0m	-	-	-	-	-	-	-	-	-	-	-
Capex TOTAL		**19.9m**	**11.0m**	**3.7m**	**2.1m**	**3.2m**	**4.6m**	**4.8m**	**3.0m**	**2.8m**	**3.1m**	**17.8m**	**35.5m**	**13.8m**	**15.4m**

Information technology

Key programmes and projects

Information technology (IT) services are essentially the enablers of Council services and interactions with citizens. These services have a primary focus on ensuring citizens can engage effectively and efficiently with Council services and enabling the Council workforce to use IT solutions to deliver efficient and quality services and make better informed business decisions.

The useful life of IT assets is a lot shorter than most other assets across other asset classes. Existing assets have varying lifecycles generally ranging from three to seven years; programmes of renewal and replacement are run on a four-yearly cycle. Underlying technologies are constantly changing and evolving, and it is difficult to know what the context of the digital world will be in even five to ten years' time. Adding to the uncertainty involved in planning is that information technology is a driver and enabler of the business of Council – it is a service and a means to an end, and therefore needs to respond (often relatively quickly) to changes in the needs of the business, and business service level expectations.

Table 1: IT – major programmes and projects

Driver for investment	Description and rationale	What we expect to see and contribution to addressing significant issues
Renewal	Renew or replace assets to ensure sustainable services that meet demand, including business transfer systems and continuous improvement	Fit-for-purpose assets that meet business needs and respond to changing commercial environments
Meet Level of Service	Deliver improved network capability, ability to up or down scale as required, provide enhanced wi-fi network, improved monitoring and reporting, future-proofed network capability, improved security, increased cloud-based activity and utilisation of Internet of Things for monitoring and response. This Opex is for associated licensing	Provide systems that provide future-proofing and are a foundation and can sustain growth in demand for business solutions and respond to changing commercial environments
Growth	Understanding who is using what and when; adjustment deployments to fit usage; ensuring license type equates to a value proposition	Ensure software investment delivers best value

Budgets for these programmes/projects are part of the following table of total operational and capital expenditure.

Forecast capital and operational expenditure FY2022-2051

This is the forecast operational and capital expenditure on I.T. assets and services over the 30-year lifespan of the Infrastructure Strategy. It includes the agreed budgets for the 10 years of the 2021-31 LTP, and forecast expenditure over the subsequent years taking into account financial affordability and programme deliverability, and drivers such as asset condition/renewals, growth, any new services, and meeting current or improved Levels of Services.

Table 2: Forecast capital and operational expenditure 2021-2051 (Inflated figures)

Timing of Expenditure		FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32-36	FY37-41	FY42-46	FY47-51
Opex		2.6m	2.8m	2.9m	2.9m	3.m	3.1m	3.2m	3.2m	3.3m	3.4m	18.7m	21.6m	25.1m	29.1m
Capex	**Asset Renewal**	7.9m	8.1m	7.3m	7.5m	7.6 m	7.8m	8.1m	7.9m	8.1m	8.3m	44.5m	49.9m	55.9m	62.6m
	LoS Improvement	7.8m	13.9m	10.6m	9.8m	9.4m	9.7m	9.9m	10.4m	10.7m	11.0m	59.0m	66.1m	74.1m	83.0m
	New Service	3.2m	-	-	-	-	-	-	-	-	-	-	-	-	-
Capex TOTAL		**18.9m**	**22.0m**	**17.9m**	**17.3m**	**17.0m**	**17.5m**	**18.0m**	**18.3m**	**18.8m**	**19.3m**	**103.5m**	**116.0m**	**130.0m**	**145.6m**

Appendices

Appendix 1: Summary of the Infrastructure Strategy

Our significant issues are…	We address these issues by….	Making sure that we…	By focussing on key programmes and projects over 30 years…
• LOOKING AFTER WHAT WE HAVE GOT • RESPONDING TO COMMUNITY NEEDS AND EXPECTATIONS, AS WE GROW • ADAPTING TO CLIMATE CHANGE • REDUCING EMISSIONS • RESPONDING TO CHANGING REGULATORY AND COMMERCIAL ENVIRONMENTS • DELIVERING WITHIN FINANCIAL CONSTRAINTS	**Growing a resilient and liveable city, by responding to climate change, reducing emissions and preparing for disruption**	Improve understanding and reduce the risks posed to our infrastructure and environment by climate change and natural hazards, so that decision-making is evidence-based and focusses on increased resilience.	**SURFACE WATER*** As part of implementing the Ōtākaro Avon River Corridor Regeneration Plan, we need to undertake initial work to understand the scope of work required to build temporary or permanent stopbanks; and then decide on the programme of works required and implement it. •
			SURFACE WATER/RESOURCE RECOVERY To protect our environment where closed landfill sites are located in areas that are vulnerable to coastal inundation and sea level rise, we need to identify and manage the risk of them contaminating land or groundwater. *(yrs 4-30 refers to likely government funding)* • •
			SURFACE WATER Undertake work programmes to address flooding risks across the city, such as stormwater treatment facilities, stopbanks, storage basins (e.g. Upper Heathcote), multi-hazard investigations, coastal hazards adaptation planning, and stormwater management plans. • •
			WATER SUPPLY We need to reduce the size of water supply pressure management zones, because large zones make it more difficult to get water supply back on following a disaster; by rezoning we can make disaster recovery faster and allow for water pressure to be managed at a more optimum range across the city. • • •
			WASTEWATER So that we manage the effects of the wastewater systems to meet environmental, social and cultural expectations and long-term economic sustainability, we need to reduce wastewater at source, remove treated wastewater from the Akaroa Harbour, implement the re-use of treated wastewater, and investigate wastewater options for small Banks Peninsula settlements.(Additional: + $5.5m to reduce inflow and infiltration in Akaroa Harbour, + $1.0m opex) • •
		Develop and implement ways to meet our greenhouse gas emissions targets.	**SURFACE WATER/PARKS** Pursue opportunities to create wetland facilities and forest cover of eroding hill land, so that stormwater works can absorb carbon and improve biodiversity and take a leading role in carbon sequestration by exploring ways to increase tree canopy cover. • •
			TRANSPORTATION To develop a more attractive, accessible public transport network, that with increased use will reduce greenhouse gas emissions, we need to prioritise measures for public transport across the network - developed through a partnership business case. • •
		Improve our active and public transport infrastructure to increase safety, satisfaction and uptake of these sustainable modes.	**TRANSPORTATION** To foster connected and healthier communities, we need to complete the major cycleways and link it with the local cycleways connection programme across the city. • •
		Be adaptive and innovative in finding sustainable solutions for resource recovery, and in the fuel sources we create and use.	**RESOURCE RECOVERY** To enable us to sustainably process an increasing range and volume of respective recyclable and organic materials, comply with consent conditions, take opportunities to convert waste to energy, and adapt to market opportunities and conditions, the Material Recovery Facility (MRF) and the Organics Plant (OP) require adaptation and/or upgrading. MRF funding is likely to be external; OP funding is likely to be external an/or mix of CCC/external) • • •
			RESOURCE RECOVERY So that we can respond to changes in consumer behaviour and benefit from improvements to processing systems and opportunities for markets and uses for recoverable materials, we need to be able to develop flexible and adaptable methods for collecting and processing materials household kerbside collection. This includes changes to inner-city collection system and in medium term, options to add a 4th collection stream that could maximise recycling quality. *(yrs 4-10 refers to likely government funding)* • • •
		Ensure our drinking water supply is safe and meets national standards, so that our infrastructure is adequately maintained.	**WATER SUPPLY** We need to keep progressing the Water Safety Plan Improvement Programme so that our water supply continues to be safe and can meet national standards. Within the first tranche of work, which is likely to be completed over the next 2 years, are the well and wellhead upgrades and installation of backflow prevention devices at property boundaries. Further work is required to reservoirs and suction tanks - including renewals and increased inspection and maintenance. We also need to investigate contamination of the water supply from lead-jointed pipes, and target the renewal of them. • •
		Ensure our provision of infrastructure is well integrated with the planning of our neighbourhoods, to create liveable and healthy places to live.	**SURFACE WATER** – To help ensure we can meet the conditions of the Comprehensive Stormwater Network Discharge Consent we need to retrofit and build new stormwater treatment facilities in response to growth, in Avon, Styx and Heathcote catchments. • • • •
			TRANSPORTATION To help encourage residential living in the central city, we need to make it more attractive and easier to move around and live. We need to accommodate population growth and travel demand by completing the Accessible City programme that active travel and public transport easier. • • •
			PARKS To provide additional capacity for cemeteries to meet future needs, we need to acquire further land (Banks Peninsula) and develop what we already have (Templeton). • •
So that, by 2051 people can… Choose to live in an intensified central city or suburban hubs, with attractive and convenient amenities that encourage a healthy lifestyle and wellbeing + Be proud of living in a city that has responded to the challenge of climate change by adaptation of infrastructure and local communities + Live safely in a city where resilient infrastructure can be expected to withstand the effects of a rupture on the Alpine Fault of magnitude 8.0 and other comparable natural disaster events + Adopt a lifestyle that generates low or zero emissions and where waste materials are dealt with in sustainable ways + Be assured that the city's water supply meets national standards for delivery, and that wastewater and stormwater management has a positive impact on the environment + Be confident that infrastructure is managed efficiently and invested in responsibly, and the costs are affordable and sustainable + Be satisfied that the city's infrastructure performs to agreed levels of service, is well-maintained, enhances community wellbeing, and minimises risks to health, environment and safety			

*For the purposes of the Infrastructure Strategy, the term 'Surface water' covers stormwater and flood protection and control activities.
This terminology is consistent with the Council's Te wai ora o tāne Integrated Water Strategy, adopted in late 2019.

Our significant issues are…	We address these issues by….	Making sure that we…	By focussing on key programmes and projects over 30 years…
• LOOKING AFTER WHAT WE HAVE GOT • RESPONDING TO COMMUNITY NEEDS AND EXPECTATIONS. AS WE GROW • ADAPTING TO CLIMATE CHANGE • REDUCING EMISSIONS • RESPONDING TO CHANGING REGULATORY AND COMMERCIAL ENVIRONMENTS DELIVERING WITHIN FINANCIAL CONSTRAINTS	**Being careful stewards by investing responsibly in developing and maintaining our city's assets, managing demand through greater use of existing assets, and balancing our community's needs and expectations with what we can afford**	Ensure there is sufficient investment each year in renewing, maintaining and replacing our assets, to manage the compounding risks associated with our ageing and deteriorating assets and improve user satisfaction; and be prepared to repurpose, rationalise or dispose of assets where necessary.	**WATER SUPPLY** To ensure an efficient water reticulation network and support the programme to reduce leakage rates, we need to be able to maintain a comprehensive renewals and replacement programme for all water supply assets. •
			WASTEWATER To reduce the risk of infiltration by waste into the environment through overflows (and meet the conditions of our discharge consent), asset failure and reactive repairs, we need to be able to maintain programmes to replace or renew ageing and/or damaged assets at the right time. •
			SURFACE WATER Increased asset management is needed to respond to asset deterioration of pump stations, pipes, drains, swales, waterway linings. This programme will need to account for adaptation policy decisions and Council-wide strategic direction (example of PS205, which will need to be renewed/replaced in 2040; and stopbanks, which will need to be renewed across the city at different intervals). • •
			TRANSPORTATION To maintain our city road and footpath network so that it is safe, and residents are satisfied with, we need a programme of renewals that achieves acceptable standards for usage and reflects the changing uses of streets. • • •
			FACILITIES/ALL To ensure our libraries, sports and recreation facilities, pools, community housing and community centres are kept to a standard that meets community needs and demand, and optimises usage, we need to be able to sustain a regular renewals and replacements programme to maintain, refurbish or modify facilities. • •
			FACILITIES/COMMUNITY HOUSING We have a bow-wave of community housing complexes that near the end of their 90–year life around 2035, and will require replacement. •
			FACILITIES/LIBRARIES We need to do structural earthquake repairs and strengthening to South Library so that it remains safe and fit-for-purpose for continued community use. • •
			PARKS We need to maintain our community and regional parks, so they are in good condition, and fit for purpose to meet community/recreation/sporting needs and expectations and preferences. To cater for changing sporting activities and preferences; and to meet the needs of a growing population, we need to acquire land to develop as additional amenity and/or provide parks in different locations or re-purpose what we have. • • •
			PARKS We need to renew or re-purpose some sports parks, so they continue to be fit-for-purpose for sporting and recreation needs to optimise their usage. • •
			PARKS To realise the vision for the Ōtākaro Avon River Corridor we need to invest in the renewal and regeneration of open spaces and parks there. • • •
			PARKS Facilities on our foreshores need renewing or developing, to ensure they are fit-for-purpose, meet demand and adaptive to climate changes impacts – Akaroa Wharf renewal, Naval Point development, renewal of seawalls and marine structures. • • •
			PARKS/HERITAGE We need to make decisions about how we look after some of our significant heritage buildings, in particular the Provincial Council Building, Old Municipal Chambers (Our City) and improvements to Cuningham House in the Botanic Gardens. • •
		Improve knowledge of asset condition and maintenance requirements, whole-of-life costs and risks associated with asset deterioration.	**ALL ASSETS** We need to better understand how we can reduce asset risk. Reduction could be achieved either through investing in renewals/replacements and new infrastructure, transferring risk through insurance programmes, or finding an acceptable threshold for the level of risk on our balance sheet. •
		Investigate and implement mechanisms to manage the demand for some assets and services, to encourage more efficient use of them while retaining equitable access.	**WATER SUPPLY** We need to use smart technologies that will help improve the safety of our drinking water, improve network efficiency and detection of leakages, and contribute positively to demand management programmes and the sustainability of our water supply. • •
		Employ technology to enable a smart city and an efficient organisation, where services can be delivered securely, cost-effectively, and suit contemporary lifestyle preferences and needs.	**I.T.** So that we can respond to an increasing reliance on and growing demand from existing and new facilities for modern technology, stay ahead of cybersecurity challenges and exponential increase in cloud services, and be a smart city and organisation, our I.T. network needs to be scalable and agile. • •
			I.T. To ensure that I.T. can support the Council organisation to do its business efficiently and smartly, and the community can connect with the Council in ways that suits their preferences, we need to have fit-for-purpose software applications and hardware that is kept up-to date with fast-moving technological change and support. • •

So that, by 2051 people can… Choose to live in an intensified central city or suburban hubs, with attractive and convenient amenities that encourage a healthy lifestyle and wellbeing + Be proud of living in a city that has responded to the challenge of climate change by adaptation of infrastructure and local communities + Live safely in a city where resilient infrastructure can be expected to withstand the effects of a rupture on the Alpine Fault of magnitude 8.0 and comparable natural disaster events + Adopt a lifestyle that generates low or zero emissions and where waste materials are dealt with in sustainable ways + Be assured that the city's water supply meets national standards for delivery, and that wastewater and stormwater management has a positive impact on the environment + Be confident that infrastructure is managed efficiently and invested in responsibly, and the costs are affordable and sustainable + Be satisfied that the city's infrastructure performs to agreed levels of service, is well-maintained, enhances community wellbeing, and minimises risks to health, environment and safety

Appendix 2: Summaries of current asset condition

Water supply

The Council supplies potable (drinkable) water through approximately 160,000 residential and business customer connections, through seven urban water supply schemes and six rural water supply schemes. Water supply is provided via 1,700 km each of mains and sub-mains; 108 reservoirs and tanks; 127 pump stations; 172 wells; seven stream intakes; and seven water treatment plants.

The Canterbury earthquakes did not impact on water supply assets to the same extent as wastewater. Repairs and temporary solutions were completed rapidly after the earthquakes to restore service. Although some renewals were completed as part of the SCIRT work, the $160 million spent during the earthquake re-build accounted for 6% of the current overall valuation with:

- 96km of pipes repaired/replaced (equates to roughly 3% of total length of pipe network)
- 25 pump stations repaired/replaced.

Water supply infrastructure is monitored and controlled by an extensive communications system (Supervisory Control and Data Acquisition, or SCADA), which underpins the water supply network.

Reticulation

The materials used to construct pipes greatly affects their life span. From 1890-1950, cast iron was the predominant pipe material, followed by asbestos cement from 1950 to the mid-1980s, and plastic from the mid-1980s to the present. The theoretical useful lives of cast iron pipes and asbestos cement are 120 and 60 years respectively, meaning that much of this initial network is approaching end of life, with estimated poor conditions. Asbestos cement water pipes are generally the least long-lived of the reticulation pipe materials, and these pipes make up the majority of the current expected pipe replacements for the next 30 years.

The number of unplanned interruptions to the water supply reticulation network is high compared to national benchmarks. This is an important indicator of a deteriorating reticulation network and the need for targeted pipe renewal.

Station and treatment assets

There is a high proportion of station assets in very poor condition (29% with a condition grade of 5 under the AAIF framework). This is because station assets have been 'sweated' over extended periods rather than renewed. At a portfolio level, there is limited condition data held for treatment assets. The majority of treatment assets do not have a start-up date, and so we cannot judge their condition based on their age.

For further detail on asset condition, refer to the Water Supply Asset Management Plan (AMP).

Performance

Fault response times and flow and pressure complaints have consistently been tracking better than target levels. Power costs per unit of water supplied are very low compared to national benchmarks due to the decentralised nature and ease of abstraction of Christchurch's groundwater bore sources.

In the 2017-18 reporting year, all Christchurch water supplies failed to meet the water quality standards for protozoa. Water supplies for 74% of the Christchurch population failed to comply with the Health Act requirements for safe drinking water supplies. This resulted in the Council chlorinating the city's water. Following the start of temporary chlorination in 2018, resident satisfaction dropped to just 37% in 2019 (compared with averages of between 84% and 92% in the preceding years). The drinking water regulatory environment in New Zealand is changing and there is a need for improvements to the water supply activity in order to keep up. This includes protozoal and bacterial compliance, as well as targeting leakage and backflow prevention.

Implications for management of assets and Levels of Service

The Asset Assessment Intervention Framework (AAIF) is providing the evidence basis for the renewal profile of our reticulation assets, based on the criteria of condition, RMO (Repairs, maintenance and operation), degradation, and consequences of failure.

The SCADA system is due to be upgraded, with full replacement needed at older sites. Selection and testing of replacement design is planned; this will be followed by full-scale replacements.

Current operations and maintenance data is not easily used of for long-term decision making. This data needs to be better collected and updated, in order to support coordinated asset management planning across the network. Such data improvements will also help to refine the AAIF framework.

Wastewater

The Council collects, treats, and disposes of wastewater from approximately 160,000 customers in Christchurch, Lyttelton, Diamond Harbour, Governors Bay, Akaroa, Duvauchelle, Tikao Bay and Wainui. This is done through 945 km of laterals; nearly 2,000 km of wastewater mains; 150 pump stations; 84 lift stations; and 34 odour control sites. We provide treatment at eight wastewater treatment plants and disposal via one outfall pump station, six ocean/harbour outfalls, and two land irrigation schemes. The majority (98%) of wastewater generated within Christchurch is serviced by the Christchurch wastewater network for treatment at the Christchurch wastewater treatment plant.

New pipework has recently been installed to enable wastewater from Lyttelton, Governors Bay and Diamond Harbour to be pumped to the wastewater treatment plan at Bromley, and allow the existing Lyttelton Harbour Basin treatment plant to be decommissioned. In order to allow the current Akaroa Harbour discharges to end, a treatment plant is under construction on a new site, which will allow land disposal for some or all of the effluent. Land disposal is also being investigated for Duvauchelle Bay. The wastewater treatment plant is our biggest single infrastructure asset in terms of replacement value - $644 million.

Asset condition and performance

SCIRT carried out a significant programme of assessment and rebuilding followed the earthquakes. By cost the $1.6 billion expenditure during the earthquake re-build accounted for 32% of the current overall valuation with:

- 513 km of wastewater pipe were renewed, lined or repaired
- 84 pump stations installed, repaired or replaced

Some existing network catchments were also replaced by local pressure sewer systems and vacuum sewer systems. The SCIRT programme did not remediate all earthquake damage and many pipes with different levels of defects remain. The wastewater reticulation and treatment infrastructure is monitored and controlled by SCADA.

Reticulation

A significant increase in the rate of installation of wastewater assets began in the 1950's, the majority of which was concrete gravity sewer reticulation. These older concrete pipes, along with earthenware pipes from the early 1900s, make up the majority of expected pipe replacements and planned renewals for the next 30 years. Concrete and earthenware pipes are brittle and compared to plastic pipes were more badly damaged in the earthquakes. Concrete, including reinforced concrete, is also vulnerable to corrosion from sewage gas by-products and can degrade over time.

Stations and treatment assets

There is a backlog of assets that are obsolete and beginning to fail, some of which are running on spare componentry gifted from other councils. Mechanical assets at terminal stations are old, have been overhauled several times, and require reactive repair and renewal. These are high-value assets where renewal includes a long lead-in time for design and construction. Some pump stations are degrading rapidly due to hydrogen sulphide gas (H_2S). A new H_2S monitoring programme is proposed in the Wastewater AMP.

Limited condition data is held for treatment assets. The Council has IAC (instrumentation, automation and control) software that has not been targeted for funding or sufficiently budgeted for over its history. This has led to a deficiency in the standards and quality of the systems in place that has yet to be fully resolved.

Implications for management of assets and Levels of Service

The new condition grading process developed as part of the AAIF has significantly improved the condition profile of wastewater assets compared to what has been previously available in asset management plans.

Similar data management improvement measures as outlined for water supply, are also needed to improve the management of our wastewater assets.

Surface water and waterways

Surface water and waterways covers the Council activities of stormwater drainage and flood protection and control works. The stormwater network collects and conveys stormwater during rainfall events. This is designed to work with secondary flow paths, which can include roads in larger storm events. The flood protection and control works activity delivers floodplain and stormwater management plan objectives, to reduce the harm from flooding to our community and to improve the quality of surface water.

Key physical assets include underground conveyance networks (including 915km of pipes, manholes, sumps, inlets, outlets); open channels and overland flow path (including natural waterways such as rivers, streams and creeks, constructed drainage channels, in-channel structures, lining and retaining walls); 45 pump stations and water flow control devices and structures such as valve stations, 12km of stopbanks, tide

gates and basins; water quality treatment devices such as basins (710 basins/swales), wetlands, tree pits, raingardens and filtration devices; and hydrometric monitoring devices, measuring rainfall along with surface water, sea and groundwater levels.

Asset condition and performance

The Canterbury earthquakes caused significant land displacement across the region resulting in damage to infrastructure and service disruption. During the re-build SCIRT expended $160 million repairing or replacing damaged storm-water infrastructure, accounting for 8% of the current overall valuation.

As with the wastewater reticulation pipes, the older concrete pipes built in the 1950s make up a large proportion of expected replacements and renewals over the next 30 years. The proportion of brick and rock barrel pipes approaching end of life is a concern as these pipes are typically larger and of higher criticality, but also more difficult to repair than newer pipes.

The primary data source for determining condition grading is CCTV data that was recorded after the Canterbury earthquakes. Extensive CCTV inspections were carried out by SCIRT with 37% of the total network inspected. Although this is only approximately one third of the network, the Water New Zealand 2017-18 National Performance Review shows this to be the highest level of stormwater CCTV coverage in the country and more than seven times the national average of 5%. A challenge in using the condition data to its full extent is its increasing age. The current budget for CCTV has not allowed for follow-up inspection, meaning that decisions rely on inspections that date back to 2011.

There will be a significant peak in waterway lining reaching the end of its useful life in the next six to 10 years and again in 16 to 20 years. This is due to the large amount of timber lining installed by the then Drainage Board lining gangs in the 1970s and 1980s coming to the end of its 40-year useful life.

Christchurch stormwater pump stations range in age from one to 51 years (based on commissioning date). There are 50 individual pump stations located across the city. Following the earthquakes and subsequent recovery, new pump stations including associated stormwater treatment facilities, were constructed for residential areas and subdivisions. Despite this, over 90% of pumps are considered to have reached a 'fail' condition grade, due to the pumps being near to or exceeding the design base life of 40 years.

Implications for management of assets and Levels of Service

The Land Drainage Recovery Programme (LDRP) was formed in 2012 to investigate the consequences of the earthquakes on the whole land drainage network, deliver capital works and develop processes to be included in normal operations. The $1.2 billion programme comprises both operational expenditure (investigation) and capital expenditure (construction) components. Currently there are 13 committed capital works projects set to provide a response to the remaining areas of the city with a flooding risk. These, and the subsequent list of prioritised projects, are currently tracking to take longer than 30 years to complete.

The Council has seven Stormwater Management Plans, which are required under the Comprehensive Stormwater Network Discharge Consent (CSNDC) issued by Environment Canterbury, authorising the discharge of stormwater, and the acceptable contaminate limits. The plans detail what infrastructure is required to meet the consented water quality and quantity outcomes for a specific catchment, in order to meet the demands of growth.

The implementation of the AAIF is also underway to improve asset management maturity. It is operational for reticulation, determining renewals requirements through a multi-criteria assessment.

Transport

The Council is responsible for the operation and maintenance of the transport network, maintenance and repairs of roads and footpaths, improvements and upgrades, and planning for the future. We own, plan and manage the 2,500 km local roading network that supports all transport activities. This includes:

- 2,200 km of sealed road, 300 km of unsealed road, 3,600 km of kerb and channel, 34,000 catchpits, and 2,600 km of footpath
- 350 road bridges, 116 foot bridges, and 1,600 retaining walls
- 38,000 street lights, 250 signalised intersections, 56,000 street signs
- 65,000 street trees and 10,000 landscaped areas
- 540 km of cycling/shared path network including on road cycle facilities (Greenway or cycle lanes), separated cycleways and shared paths
- 1,000 bus shelters, 4 km of tram line and 437 parking meters, 1 bus interchange and 1 parking building.

Asset condition and performance

SCIRT works repaired or replaced 1,378,000 square metres of road damaged in the earthquakes; 144 bridges or culvert; and 181 retaining walls. Although much of the earthquakes-related damage has been repaired, the effects of the earthquakes on the condition of our transport assets is still evident. For example, condition modelling on our carriageways indicates that even with increased levels of operational expenditure and renewals funding, it will take between 10 and 20 years to return the assets to a condition that is on par with the national average.[40] The condition of our footpaths and structures has also been dominated by earthquake effects; although many have been restored there is a way to go.

Currently, 50% of our network of carriageways is beyond its expected life – many roads are rough, and customer satisfaction is very low. At the same time, growth and new subdivisions are resulting in increased traffic volumes and heavy vehicle use in certain locations, which is impacting the useful life of the carriageways and increasing maintenance costs.

Christchurch has areas of deep dish channel approaching end of life and needing replacement before further deterioration and ultimately, failure. There is a backlog of work, which will rise as the assets built in the 1950s near their end of life.

Currently the cycleways network is in a good condition, and is not detrimentally affecting performance. Most off-road cycleways have base layers are less than 30 years old and are therefore unlikely to need renewal for at least 50 years.

Implications for management of assets and Levels of Service

The Council's asset management units are working to improve data collection systems and use of data. It is hoped this will provide a better understanding of the condition of some assets.

Significant future improvement projects, forming part of the Asset Management Improvement Programme (and outlined in further detail in the Transport AMP) are:

- Alignment with 2021 Government Policy Statement on Land Transport
- Knowledge transfer from experienced asset management practitioners
- One Network Framework implementation
- Transport asset risk.

Facilities

Community facilities

Community assets include a network of 82 community facilities, comprising community centres, halls, volunteer libraries and early learning centres across Christchurch and Banks Peninsula. This includes 63 community facility halls, 14 early learning centres, and five volunteer libraries, - eight of which are new assets built post-earthquakes and 12 have heritage status (some exceeding 140 years of age).

Many community facilities are ageing: 60% of assets exceed 50 years of age, and the average asset age of the portfolio is 60 years (with a 70-year useful life span). Deferred maintenance - due to lower operational and capital budgets than are optimal - and a reluctance to limit or reduce the portfolio, has impacted on the overall asset condition of the network and created an impending bow wave of assets with maintenance works required.

The Community Facilities Network Plan provides a framework for Council decision making on facilities across the city. It promotes community groups operating facilities, and a consistent approach to considering new facilities or changes in use (optimising asset utilisation), and recommends an increased focus on activation through partnership. The CFNP has found that the number of facilities provided by the Council, in conjunction with other providers such as churches and schools, cumulatively provide for a well-dispersed and adequate supply across Christchurch.

Libraries

The network of 20 libraries (plus a mobile library service and digital platform) across the city and Banks Peninsula is in good condition, and has benefitted from a substantial programme and repairs and rebuilds following the earthquakes. Tūranga, the city's recently-completed flagship central facility has won awards for its innovative and sustainable design. The South Library is the only library still requiring completion of post-earthquake repairs (strengthening). A decision on the long-term future location and nature of a permanent Linwood Library facility may be required at a later point, subject to the ongoing suitability of the currently leased space in a retail mall. In recent years, libraries and walk-in Council customer services have co-located, in line with the Council's Citizen Hub Strategy.

[40] Note: This refers to a number of measures; the proposed increased LTP 2021-31 investment is in resurfacing, will result in improved road smoothness, comparable to other major metropolitan centres, over 10 years.

Other facilities

The Christchurch Art Gallery Te Puna o Waiwhetū, which opened in May 2003, as an activity also has responsibility for the 'Akaroa Museum Complex'. A repair and strengthening project of the Christchurch Art Gallery was completed in 2015, and a project to gather condition information for key building elements was completed in 2017.

The corporate accommodation portfolio also includes strategic land, storage, service centres, and parking buildings, the Bus Interchange, and the Tram Barn. The primary facility within the portfolio is the Christchurch Te Hononga Civic Offices building located at 53 Hereford Street in the central city. Ownership of the facility is split equally between the Council and Ngāi Tahu.

A key issue for Te Hononga Civic Offices and the Christchurch Art Gallery Te Puna o Waiwhetū is the decline in fuel source stock (land fill gas) from the Burwood Resource Recovery Park, which powers these facilities. It is estimated that the flow of gas extracted will fall to an unacceptably low volume, with an associated reduced quality, within three to five years from now (or earlier). We are undertaking an options study to determine the best future fuel source. Depending on the replacement fuel source selected, there could be a significant impact on operational expenditure (from a likely increase in the cost of an alternative fuel), and capital expenditure (from the cost of modifying or replacing existing supporting infrastructure).

Community housing

The Council began its commitment to providing community housing (formerly referred to as social housing) for vulnerable people by building eight units in 1921 in Sydenham. Nearly a century later, this has grown to a stock of over 2,300 units and we are the second-biggest landlord in New Zealand. Where possible, provision is undertaken in partnership with others. The building of new community housing is rates-neutral.

Central government subsidies and low-interest loans financed the capital costs of a community housing boom from the 1960s-1980s. However, operational expenditure for maintenance fell on the Council, and time and budget deferrals have resulted in a bow wave of mid-century buildings being inadequately maintained to meet current regulations and expectations for safe and healthy homes (50% of the Council's asset base now exceeds 40-50 years of age and is at the point where midlife refurbishments are needed/expected).

The Ōtautahi Community Housing Trust was set up in 2016 to access supply contracts from the Government to increase the amount of public housing. The Trust runs the day-to-day operation of the Council's community housing portfolio. We loaned the Trust $30 million (2018) and a further $25 million (2020) to build 215 new units and develop plans for a further 54 units.

Implications for management of assets and Levels of Service

Community facilities

The recently-adopted Community Facilities Network Plan highlights a need to capture further asset data to facilitate more advanced asset management analysis. It recommends an assessment of each Council-owned asset regarding its fitness for purpose and capital works requirements is undertaken.

The following improvements to asset planning processes are included and outlined in further detail in the Community Facilities asset plan:

- upgrading capture and storage of asset condition data
- advancing asset data storage
- investigating retrospective Building Information Management (BIM) data capture on existing assets.

Community housing

The following improvements to planning processes are included in the Asset Management Improvement Programme in the Community [Social] Housing AMP:

- interpretation of asset data to inform advanced and prioritised works programmes
- prioritisation based on age and condition of assets, alongside demand, demographic and locational factors
- facilities infrastructure design project to assist building specifications
- planning for resilience to climate change, sea level risk and natural disaster events
- options and analysis on potential stimulus package for post-COVID-19 pandemic economic situation
- options and scenarios for growing the number of community housing units in Christchurch and potential funding source.

The new Community Housing Strategy 2021-2031, adopted in January 2021,[41] will inform the future direction of the portfolio. It reflects the need to think more broadly about assisted, including social, housing in Christchurch in order to meet future demand for it.

[41] https://ccc.govt.nz/the-council/plans-strategies-policies-and-bylaws/strategies/community-housing-strategy/

Parks

The Parks Unit manages around 1,250 sites, covering over 9,378 hectares[42] of park land and improvements (with a land value of $771 million).

The Parks portfolio of assets includes the following:

- Community parks
- Local neighbourhood parks
- Garden and heritage parks
- Sports parks
- Cemeteries
- Botanic Gardens
- Hagley Park and Ngā Puna Wai
- Regional Parks
- Parks foreshore (marine access assets)
- Residential Red Zone
- Heritage/taonga items that are located on Council parks, such as: Council-owned items listed in District Plan-schedules, artworks, monuments, clock mechanisms, ornamental fountains, museum collections, archaeological artefact collections and plaques.

Asset condition and performance

We face issues with the continual growth and development of new green space and improvement of assets: these need to be added to the existing, deteriorating asset base, and the need to find operational expenditure to maintain them adequately places significant pressure on operational and capital budgets. Another pressure on these budgets is the fact that Council's parks do not generate income and are therefore unable to offset the long-term cost of maintenance and renewal.

The expected life for constructed assets typically varies from five to 100 years. Due to the varied nature of the assets it is very difficult to accurately predict their design lives. On the basis of modelled data, it is reasonable to assume that there will be a significant peak in some assets reaching the end of their useful life within this 30-year LTP period. This data was gathered either on the basis of physical inspection, or by estimating the remaining useful life based on install dates and in some cases, where the install dates are not known, based on the average known install date for that asset type.

[42] Christchurch City Council, Parks Asset management Plan, August 2020

For Parks Heritage assets, the overarching Our Heritage Our Taonga Heritage Strategy 2019-2029 sets out goals and actions for all of our heritage assets (not only Parks Heritage). The Strategy has goals to best manage and preserve our heritage, in its many forms, in Christchurch and Banks Peninsula. For Parks Heritage assets, age profiling and the standard renewals lifecycle approach is not applicable for heritage assets as for other assets.

Implications for management of assets and Levels of Service

The following improvements to data quality are included and detailed in the Parks and Foreshore AMP:

1. ongoing condition assessment of assets, predominantly building condition
2. finding solutions as to how refurbishment works completion updates asset condition
3. facilitating more advanced data analysis once data is captured.

For Parks Heritage assets (i.e. those parks that have recognised heritage values and are dealt with separately in asset planning) a number of improvement tasks have been identified:

1. transferring all heritage building assets to the same profit centre
2. verifying and completing data collection for all Parks Heritage assets
3. completing an Asset Management Maturity assessment for Parks Heritage Management
4. reviewing and developing maintenance plans.

Information technology

Information Technology assets provide IT enablement for the delivery of services across the Council. Key activities delivered by IT include:

- Technology enablement (e.g. per annum - 4.5 million library book issues; 650,000 calls or email to contact centre; 126,000 requests for services (40% on digital channels); and 1.8 million web site visits, and supporting $13 billion worth of city assets).
- Information and records management services (over 17.5 million official digitised records, more than 30,000 cartons containing historical paper records and 1,600 linear meters of Council archival material).
- Asset and infrastructure management (including over 3,500 user devices; third party Infrastructure as a Service (IaaS) operating 600+ line of business applications; and a secure and resilient data network across the city, which connects over 70 council facilities, is used for critical services such as water and waste and Christchurch Transport Operations Centre, and free Wi-Fi access at Council facilities).
- IT support services
- Cyber Security Programme and operational services.

The Council engages a number of contractors to deliver IT services, outsourcing tasks or service assets that are not part of our core business. Increasingly, service outcomes are better delivered by a party specialised in that area, freeing up IT to focus on higher-value business services. There is likely to be continued shift to cloud-based services in the future.

Asset condition and performance

Asset condition is generally not measured in the same way as it is for other asset types. The useful life of IT assets is a lot shorter than most other assets across other asset classes. For example, the average lifespan of the desktop fleet is four years, necessitating a continual cycle of replacements.

Implications for management of assets and Levels of Service

The utilisation of assets is likely to change as a result of demand, leading to potential gaps in Levels of Service and increased maintenance and renewal costs. Asset utilisation will need to be monitored more effectively so that trends, issues and solutions can be identified to respond to demand changes.

The Council does not have a comprehensive performance and utilisation monitoring solution in place across all IT assets, however we are able to monitor utilisation of different asset groups via various methods. We are currently reviewing a number of software solutions that would enable Council to accurately monitor, assess and forecast asset investment.

Solid waste and resource recovery

The vision of the Council's statutory Waste Management and Minimisation Plan 2020 is, a city of opportunity where nothing is wasted. This will be achieved by education initiatives, kerbside collections services, a used products reuse facility, an organics processing plant, a materials recycling facility, and transfer stations and community collection facilities - in order to minimise residual waste before it is sent to landfill. These activities support a healthy environment and sustainability of resources by facilitating education, reuse, recycling and composting.

Assets covered under the Resource Recovery portfolio are largely managed through operations and maintenance contracts, which include individual asset management processes and a return of assets at the end of the contract. These assets include: transfer stations and community collection points, a material recovery facility, an organic processing plant, the regional landfill (Kate Valley, of which the Council is a 39% shareholder of owning body Transwaste Canterbury Ltd), the Burwood Landfill – gas collection and treatment plant, and 50 closed landfills owned by the Council (there are a further 80 closed landfills across the district).

We provide both kerbside and drop-off facilities for residential waste, organics and recycling. Traditional council-run landfills, where residents could discard unwanted material directly to the tipping face, have been replaced with high tech collection and resource recovery systems with any residual waste now sent to Kate Valley, which is owned by joint venture between Canterbury Councils and Transwaste Canterbury Ltd. Council owns the Materials Recovery Facility and the land and buildings at the Organics Processing Plant, however both are operated and maintained under contracts. Waste collection is managed through a service contract, which includes provision of the bin infrastructure and the fleet.

Recent developments

The Canterbury earthquakes led to a rise in waste that peaked in 2014, when most earthquake work was being completed, and has slowly started to decline. With the economic downturn effects of COVID-19, waste has dropped off quickly and will only slowly rise as the economy improves. Waste levels generally fluctuate in relation to economic growth and downturn.

The collapse of international models for low-grade recyclables will mean increasing costs and a dependency on NZ market to respond with viable alternatives for waste and resource recovery. The Council is working with central government, industry and other territorial authorities to ensure investment decisions enable a shift towards a circular economy focused on diversion of resources from landfill.

'Excessive, wasteful consumption and new composite products are overwhelming our ability to recycle or compost'. During 2019 various new national waste reduction and minimisation initiatives were announced by the Government. These include expanded product stewardship and priority products initiatives, a proposed container return scheme, restrictions on certain plastic products, and a review of the landfill levy.

The Council must consider the impacts of carbon emissions generated by our collections fleet and processing facilities. Also, many of our facilities and closed landfills are vulnerable to anticipated changes in sea level and associated impacts.

Asset condition and performance

The ageing infrastructure across the city's transfer stations poses an issue as many of the buildings and plants are nearing their end of life. See the Resource Recovery AMP for further detail on this.

Closed landfills present a significant risk, with unknown conditions and resilience challenges. The Council is currently undertaking an assessment on known closed sites to better understand the costs and requirements for remediation, to inform a closed landfill prioritisation process.

EcoCentral has received a government grant to upgrade the Materials Recovery Facility and improve the processing of recyclables. The Council is investing in upgrades at the Organic Processing Plant to better control odour emission and improve the processing capacity.

Implications for management of assets and Levels of Service

The Council must review its Waste Minimisation and Management Plan (WMMP) at least every six years, with the latest iteration completed in 2020. The WMMP outlines the Council's strategy and approach towards resource recovery services, and establishes demand for collection and waste processing facilities. The Plan's focus areas over the next six years are: maximising composting of organics; maximising recycling of recyclable materials; safe management of hazardous substances; showing leadership and innovation across the sector; and delivering effective resource recover education and communication.

Appendix 3: Value of our asset portfolio

Asset class	Replacement Cost (Excludes Land)	Replacement Cost % of Portfolio
Transport	4,146,014,977	24.6%
Three Waters & Resource Recovery	10,409,980,882	61.9%
Parks	796,141,288	4.7%
Facilities	1,259,234,960	7.5%
IT	164,501,843	1.0%
Other	53,341,890	0.3%
	16,829,215,840	**100%**

Asset Portfolio Replacement Cost[43]

[43] Strategic Asset Management Plan, June 2020 data

Appendix 4: Overarching assumptions for the Infrastructure Strategy

Assumption	Level of uncertainty and reason/s for this and implications/risks
Growth/population *NB growth projections are likely to change in early 2021 as a result of updated StatsNZ population projections, based on the 2018 census.*	
The population of Christchurch City will continue to grow, reaching around 490,000 by 2051.[44]	There is a low level of uncertainty regarding this assumption for years 1-10, and a medium level of uncertainty regarding this assumption for years 11-30. Achieving these levels of population and household growth is reliant on cooperation between Christchurch City and neighbouring district councils (Waimakariri and Selwyn), to achieve the agreed policy direction for settlement. It is also reliant on other external factors, such as immigration policies and trends, and economic opportunities. The Council must plan for growth and provide the right infrastructure at the right time to service growth demand. Planning and delivery of infrastructure to service growth development is under constant review and adjusted through the LTP and Annual Plans where required.
The population of the Selwyn district is projected to grow by 42,000 to reach 110,000; Waimakariri district is projected to grow by 23,500 to reach 89,000 – both by 2051.	There is a low level of uncertainty regarding this assumption for years 1-10, and a medium level of uncertainty regarding this assumption for years 11-30. Many residents from neighbouring districts work in Christchurch, which adds to demand on our infrastructure and particularly our road network, as well as our community infrastructure such as sports facilities, pools etc.
The number of households in Christchurch City will continue to grow, reaching around 197,000 by 2051.	There is a low level of uncertainty regarding this assumption for years 1-10, and a medium level of uncertainty regarding this assumption for years 11-30. The Council must plan for growth and provide the right infrastructure at the right time to service growth demand. Planning and delivery of infrastructure to service growth development is under constant review and adjusted through the LTP and Annual Plans where required.
The average household size is will decrease over time, resulting in a decrease from 2.5 to 2.4 persons per household between 2028 and 2033. Eighty per cent of household growth will be in one and two-person households.	There is a low level of uncertainty regarding this assumption; it is based on 2017 household projections (StatsNZ) and reflects trends that occur with an ageing population. This will result in changes in average household demand on infrastructure and for services. Planning and delivery of infrastructure to service growth development is under constant review and adjusted through the LTP and Annual Plans where required.

[44] This is a hybrid growth scenario based on Stats NZ medium-growth projections for Christchurch for years 1-10 and the medium growth projections with Our Space's policy direction (70% of total growth across Greater Christchurch directed to Christchurch City) for years 11-30

<table>
<tr><th>Assumption</th><th>Level of uncertainty and reason/s for this and implications/risks</th></tr>
<tr><td>The population will age. The number of people aged over 80 years will be around 45,000 by 2051 (almost tripling the current number of people).</td><td>There is a low level of uncertainty regarding this assumption; it is based on StatsNZ December 2016 population figures and Our Space 2018-48 settlement pattern projections.

An ageing population is likely to mean some levels of service will need to evolve to meet specific requirements of older residents. Levels of service are under constant review and can be adjusted through the LTP or Annual Plan as required.

Older residents are more likely to be on fixed incomes and be more sensitive than other residents/ households to increased Council costs including rates.</td></tr>
<tr><td>Financial</td><td></td></tr>
<tr><td>Inflation will be as forecast in the BERL local government cost adjusters 2020. The assumed inflation rates by year for the 2021/31 period are:

<table>
<tr><th></th><th>Opex</th><th>Capex</th><th></th><th>Opex</th><th>Capex</th></tr>
<tr><td>2021/22</td><td></td><td></td><td>2026/27</td><td>2.4</td><td>2.6</td></tr>
<tr><td>2022/23</td><td>2.10</td><td>2.30</td><td>2027/28</td><td>2.5</td><td>2.7</td></tr>
<tr><td>2023/24</td><td>2.20</td><td>2.40</td><td>2028/29</td><td>2.7</td><td>2.8</td></tr>
<tr><td>2024/25</td><td>2.30</td><td>2.50</td><td>2029/30</td><td>2.7</td><td>2.9</td></tr>
<tr><td>2025/26</td><td>2.4</td><td>2.5</td><td>2030/31</td><td>2.6</td><td>2.7</td></tr>
</table>
Inflation following this period is assumed to be:

Opex annual: 2.2

Capex annual: 2.3</td><td>There is a low-medium level of uncertainty regarding this assumption. The level of inflation is managed through 3-yearly LTP adjustments.</td></tr>
<tr><td>The Current Funding Assistance Rate (FAR) of 51% on qualifying expenditure will not change. We will receive the total amount of subsidy that we have assumed we will receive.</td><td>There is a moderate level of uncertainty regarding this assumption. Changes to government funding priorities and Waka Kotahi funding decisions are outside Council control and the risk varies from project to project. The maximum financial impact would be the elimination of the subsidy, which is extremely unlikely.

Decisions on what projects will be funded through the National Land Transport Fund will not likely be confirmed until after 30 June 2021, and this means there is some uncertainty around funding for some projects.</td></tr>
<tr><td>The Council will retain access to, at the least, the level of insurance cover it currently has on its infrastructure and facilities. The Council will have the ability to increase cover if it deems this to be financially prudent.</td><td>There is a low-medium level of uncertainty regarding this assumption – the Council has no control over external factors that may affect access to insurance.</td></tr>
</table>

Assumption	Level of uncertainty and reason/s for this and implications/risks
The Council will receive funding from central government towards 'shovel-ready' infrastructure projects, as part of the Government's stimulus package response to the economic effects of COVID-19. Funding confirmed to date (November 2020) is for the completion of six cycle routes, resulting in $90.8 million included in the capital programme over the first three years of the LTP.	There is a low level of uncertainty regarding the assumption that the Council will receive funding for the six cycleways the Government has already committed to. However, there is a medium-high level of uncertainty regarding any assumed funding for the remainder of the $818 million of projects submitted by the Council, as decisions have not yet been made regarding them. Any further funding confirmed will be included in Council LTP or AP documents as appropriate. The latter creates uncertainties in planning and prioritising projects: delivery of some other infrastructure projects may need to be pushed back, to enable earlier than planned completion of 'shovel ready' ones. Also, increased demand on contractors to deliver projects may impact on pricing, and labour force or materials availability.
The Council will receive funding from central government for infrastructure projects from the Christchurch Regeneration Acceleration Fund, as follows: - $40 million for developing the Green Spine through the Ōtākaro Avon River Corridor red zone. - $40 million for improving roads and footpaths, safety initiatives, and bus priority measures on key public transport routes. - $220 million for the Canterbury Multi-Use Arena.	There is a low level of uncertainty regarding the assumption that the Council will receive funding, as the Government has committed to this.
The Council will receive funding from central government (around $20 million + a share of a regional grant) to spend on three waters infrastructure and service delivery, as part of stage one of the Government's three waters reforms.	There is a low level of uncertainty regarding this assumption. The Council has signed an MOU with the Government to enter into discussions as part of stage one (this was a condition of receiving this funding).

Assumption	Level of uncertainty and reason/s for this and implications/risks
Environmental/natural hazards	
Climate change occurs following the IPCC scenario, representative concentration pathway (RCP) 8.5, as per *MfE recommendations*[45], *National Climate Change Risk Assessment methodology*[46] *and NIWA projections*[47,48]*:* increased frequency and intensity of storm events; more intense and frequent extreme rainfall events; increased number of landslides and worsening erosion; more severe droughts. Average temperature rise of 0.5°C to 1.5°C by 2040, and 3.0°C hotter by 2090 (average maximum temperatures up to 3-4°C hotter by 2090 and average minimum temperatures 1-2°C hotter by 2090); more very hot days (>25°C); more fire hazard days; more frequent and extreme high winds; fewer frosts; annual rainfall similar to current, but seasonally shifted and concentrated into extreme events.	There is a low-medium level of uncertainty regarding this assumption in the first 30 years, a medium level of uncertainty for 50 years, and a medium-high level of uncertainty for 100 years. This is due to flat early exponential trend and similarity of different scenarios in short to medium term (and steepening/diverging trends in longer term). If the changes are different from what is predicted, this will be assessed as it becomes evident.
Projected sea level rise of 0.3m by 2050, 0.5m by 2075 and 1m by 2115; shallow groundwater also expected to rise in coastal areas and near tidal reaches of rivers. *(MfE recommendations and 2017 Coastal Hazard Assessment for Christchurch and Banks Peninsula, Tonkin and Taylor based on IPCC RCP 8.5, as used in National Climate Change Risk Assessment)*	There is a low-medium level of uncertainty regarding this assumption in the first 30 years, a medium level of uncertainty for 50 years, and a medium-high level of uncertainty for 100 years. The further into the future we look, the more there is uncertainty in the IPCC scenarios. Continuing to monitor and adapt to the impacts of natural hazards on our infrastructure and communities, will need to be a priority for the Council. Christchurch is the most at-risk city in New Zealand from the effects of sea level rise. We have significant infrastructure that will be affected by the assumed sea level rise. The Council's approach to how it will respond to rising sea level will evolve as it gains increased understanding of the threat and of options available to adapt to that threat.
There is a 30% chance of a rupture on the Alpine Fault of magnitude 8.0 in the next 50 years.	There is a medium level of uncertainty regarding this assumption. This is based on scientific modelling - GNS Science, Alpine Fault, https://www.gns.cri.nz/Home/Learning/Science-Topics/Earthquakes/Major-Faults-in-New-Zealand/Alpine-Fault What is ***not*** known is the extent and degree of the impacts of an AF earthquake - therefore the risk in this sense is not well understood. Other, local earthquakes may be more damaging. However, building infrastructure to seismic design standards recommended by seismic engineers *should* cover what is needed to mitigate the risk.

[45] https://environment.govt.nz/publications/coastal-hazards-and-climate-change-guidance-for-local-government/
[46] https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/national-climate-change-risk-assessment-main-report.pdf
[47] NIWA Client Report 2016160AK, Climate Change and Variability- Ngāi Tahu, Pearce, P.R, Tait, A., Bell, R.G., Mullan, A.B., Paul, V., Law, c., Collins, D., Zammit, C, Sood,A.
[48] NIWA client report 2019339WN, Climate Change Projections for the Canterbury Region, February 2020, Macara, G., Woolley, J-M., Pearce, P., Wadhwa, S., Zammit, C., Sood, A., Stephens, S.

Assumption	Level of uncertainty and reason/s for this and implications/risks
Assets and services	
Demand for services will grow in line with a growing city.	There is a low level of uncertainty regarding this assumption. Low risk of infrastructure development misaligning with demand.
The Council will continue to own three waters assets, and deliver these services, over the life of the LTP.	There is a high level of uncertainty regarding this assumption. Central government announcements and funding indicate that the service delivery model and funding for three waters will be required to reform. It is highly likely that we will be required to move towards a regional, arms-length service model, for water supply and wastewater within five years. This could impact on the Council's respective investment decisions in the short-medium term.
We will retain ownership of our assets.	There is a medium level of uncertainty regarding this assumption. Significant decisions within the 30 year period of the Infrastructure Strategy may see the Council divest and/or gain assets and/or ownership and responsibility for assets, particularly in light of three waters reforms (above). Change in ownership of infrastructure assets could affect revenue, expenditure and debt levels, asset planning and investment decisions and levels of service. Most Council assets of any significance are listed as strategic assets in the Council's Significance and Engagement Policy, which means the Council needs to include any proposal to sell or dispose of these assets in its LTP and therefore undertake a special consultative procedure on any such proposal.
Legislative	
Changes to legislation and policy during the development of the Infrastructure Strategy will impact on the management of our assets and delivery of services.	There is a low level of uncertainty regarding this assumption. We know there will be changes to legislation and national policy, including wide-scale reform of resource management legislation.

Appendix 5: Assumptions about asset life cycle

Water supply			
Asset type	*Theoretical useful life*	*Where does the asset sit in its life cycle*	*Level of uncertainty (if applicable)*
Reticulation	Cast iron – 120 years Steel – 100-120 years Asbestos cement – 60-80 years Blue PVC pipe – 30-60 years	13% < 5% TUL remaining (condition grade 5) All materials are heading towards a renewals peak at the same time.	Low level of uncertainty
Stations	Civil and structural – long asset life Mechanical, electrical and IAC – shorter asset life	Nearly 30% < 5% TUL 44% > 50% remaining TUL (condition grade 1)	There is a medium level of uncertainty associated with this assumption – a large number of start-up dates are missing
Treatment assets	Water supply treatment plants		There is a medium level of uncertainty associated with this assumption –the majority don't have start-up dates.

Wastewater			
Asset type	*Theoretical useful life*	*Where does the asset sit in its life cycle*	*Level of uncertainty (if applicable)*
Reticulation	Concrete – RCRR – PVC – 30-60 years Asbestos cement – 60-80 years EW/VC -	14% < 5% TUL A significant proportion of the network was renewed after the Earthquakes, so the renewal peak is less pronounced. RCRR (reinforced concrete with rubber ring joints) pipes make up a large proportion of the remaining poor condition pipes	
Stations	Civil and structural – long asset life Electrical and IAC assets – shorter asset life	13% < 5% TUL. High proportion, leading to renewals forecast spike in 2021	There is a medium level of uncertainty associated with this assumption, as the condition data is sparse
Treatment assets	Bromley WWTP Banks Peninsula WWTPs		There is a medium level of uncertainty associated with this assumption – many treatment assets don't have start-up dates.

Surface water and waterways			
Asset type	*Theoretical useful life*	*Where does the asset sit in its life cycle*	*Level of uncertainty (if applicable)*
Reticulation	Concrete – RCRR -	6.8% < 5% TUL. High proportion of these are RCRR pipes with EQ damage still, as well as brick and rock and earthenware	Low level of uncertainty
Waterway lining	Timber – 40 years Concrete – 100 years Rock -	Timber lining reaching the end of its useful life in peaks in 6-10 years, and 16-20 years 10% of network between < 5% and < 15% TUL	Low level of uncertainty (due to LDRP inspections)
Pump station assets	Pumps - 40 years Civil and structural – long asset life	Range from 1-51 years. Nearly 60% at condition grade 5. Remaining useful life of actual pump stations cannot be provided due to number of asset groups and components within a pump station	
Flood protection structures	Stopbanks - Valves – 100 years		Low level of uncertainty
Treatment and storage facilities	Lining Soakpit Basins	Approx 45% lining and 62% soakpits are condition grade 3-5	

Transportation			
Asset type	*Theoretical useful life*	*Where does the asset sit in its life cycle*	*Level of uncertainty (if applicable)*
Carriageways	At least 80 years 'economic life'	50% beyond expected life	
Drainage (kerb and channel)	Concrete – 80 years	Approx 135 km (of total 3,500 km) beyond expected life (as at October 2019)	
Footpaths	Asphaltic concrete – 25 years Concrete – 80 years	Approx 300 km (of total 2,580 km) of asphaltic concrete beyond expected life	
Bridges	Concrete, steel – 100 years Timber – 70 years		
Retaining walls	50 years		
Cycleways	80 years approx	Majority of off-road cycleways are less than 30 years old and in good condition	

Resource Recovery			
Asset type	*Theoretical useful life*	*Where does the asset sit in its life cycle*	*Level of uncertainty (if applicable)*
Transfer station – plants	Depends on future requirements and cost of refurbishment vs new options		
Transfer station – buildings	50-100 years, depending on future requirements and cost of refurbishment vs new	30-40 years old (Parkhouse, Styx Mill, Metro)	
Material Recovery Facility		Developed since 2000 (currently owned and operated by EcoCentral)	
Organics Processing Plant	Building - 50-100 years Aeration and biofiltration system – 25-30 years	Building commissioned in 2009	
Burwood Landfill; other closed landfills			

Parks			
Asset type	*Theoretical useful life*	*Where does the asset sit in its life cycle*	*Level of uncertainty (if applicable)*
Parks furniture	25 years	Varied	Low level of uncertainty as based on industry literature, performance observations and staff knowledge. However, there is a high level of uncertainty regarding the age of many of the assets due to start up dates being largely unknown.
Sports equipment, fountains, play surfaces, backflow	10-20 years	Varied	
Fence, hedge, tree planter	30 years	Varied	
Boat ramp, car park, stairs, track, shelter	35 years	Varied (but hard surfaces asset group has highest proportion of poor condition assets; requires prioritised attention in the next 10 years)	
Boardwalk, gate, flagpole, bollard, viewing platform, cattle stop	40-50 years	Varied	
Bridge, jetty, retaining wall, water tower, terraces, culvert	60-80 years	Varied	
Heritage assets	N/A	Varied	High level of uncertainty, as it can be difficult to estimate useful lives, which in some cases could be several hundred years. The standard renewals lifecycle approach is not applicable to heritage.

Facilities			
Asset type	Theoretical useful life	Where does the asset sit in its life cycle	Level of uncertainty (if applicable)
Libraries	60-70 years	A number were built in the mid-90s – will be nearing end of life by 2050	Low level of uncertainty
Community housing	90 years	Almost half of stock was developed during the 1970s; a quarter during 1960s; these are due for mid-life refurbishments in the next few years	Low level of uncertainty
Art Gallery		Opened 2003	Low level of uncertainty
Community facilities	70 years	60% > 50 years of age	Low level of uncertainty
Early learning centres	70 years	Acquired or developed in 1990s	Low level of uncertainty
Volunteer libraries	70 years		

Appendix 6: Infrastructure-relevant strategies and plans

Key strategies and plans that direct or influence infrastructure planning and provision	
Canterbury Regional Land Transport Plan 2015-2025, reissued 2018 (Environment Canterbury Regional Land Transport Committee) 2021 version currently in development	Published every three years as the Canterbury region's bid for the National Land Transport Programme funding. This enables the Council to receive funding from Waka Kotahi. The document outlines the agreed priorities for the regional transportation network, and the challenges we face now and in the future.
Canterbury Regional Policy Statement (Environment Canterbury, 2013, republished 2020)	Supports the city's intensification targets, providing higher density developments (including mixed use) and a greater range of housing types, particularly in and around the Central City, Key Activity Centres, and larger neighbourhood centres, and in greenfield priority areas and brownfield sites. Directs that intensification development within the Central City achieves an average of 50 households per hectare.
Canterbury Regional Public Transport Plan 2018-2028 (Environment Canterbury, 2018)	Describes future services proposed to meet the needs of new and existing customers and the policies which those services will operate by, and the partnership model in place with operators and local territorial authorities.
Central City Action Plan (Christchurch City Council, 2018)	Aims to encourage people back to the central city, through bringing together a range of regeneration projections and activities.
Christchurch District Plan (Christchurch City Council, operative from 19 December 2017)	Regulates spatial planning across the district and thus influences infrastructure location, provision and requirements to support development.
Christchurch Transport Plan (currently being developed, Christchurch City Council)	The Plan will set the 30-year transport vision for Christchurch City, with an immediate focus on the next 3-10 years. The new Plan will address key challenges of reducing emissions, improving road safety, the impacts of an over-dependence on private vehicles, and the need to create people-centric streets that make the city attractive to live in, work and visit.
Government Policy Statement on Land Transport (Ministry of Transport, 2020)	Sets the Government's priorities for land transport investment over a 10-year period, and how money from the National Land Transport Fund (NLTF) is spent on activities such as public transport, state highway improvements, local roads, and road safety. Local authorities need to ensure spend on transport reflects Government priorities outlined by the GPS.
Citizen Hub Strategy (Christchurch City Council, 2015)	Sets out direction for how and where we enable citizens' interaction with the Council regarding services, including whether it is digital or facility-based.
Kia Tūroa Te Ao, Ōtautahi Climate Resilience Strategy 2021	Identifies goals and action programmes to guide the Council's response, along with its communities, to addressing the impacts of climate change, including a first step of identifying infrastructure that is vulnerable to sea level rise and other impacts, to inform community discussions and asset planning.

Community Facilities Network Plan	Maps out Council-owned and community-owned facilities across the city so that we can work with the community to make the most of each facility in the network, and identify and support opportunities for the community to activate, operate or own facilities. The Plan does not identify any closures and recognises future consideration should be given to the effects of any further population increases to the south west and north of the city.
Community Housing Strategy 2020–30 (Christchurch City Council, adopted January 2021)	Identifies the strategic roles and actions for the Council so we can help ensure sufficient community housing is provided for in Christchurch.
Mahaanui Iwi Management Plan (Ngāi Tahu, 2013)	Guides councils and other agencies' decisions about the environment and protection of resources, and infrastructure provision, by providing valuable insight to Ngāi Tahu values, issues and aspirations for the recognition, protection and management of taonga (treasures) and cultural interests.
National Policy Statement on Freshwater Management (Ministry for the Environment, 2020)	Sets quality and quantity targets for freshwater - raising standards for infrastructure such as stormwater assets, in particular.
National Policy Statement on Urban Development (Ministry for the Environment, 2020)	Requirement for infrastructure to service anticipated growth (medium and long-term) by supporting the provision of sufficient development capacity to meet expected demand for housing and business land.
Ngāi Tahu Rangatiratanga over Freshwater (Te Runanga of Ngāi Tahu, 2019)	Sets out strategic intent of: establishing Ngāi Tahu title over freshwater in the takiwā ; establishing a regulatory authority; and securing Ngāi Tahu fiscal authority over freshwater in the takiwā.
New Zealand Coastal Policy Statement (NZCPS)(Department of Conservation, 2010)	Statutory framework, which directs Councils to give effect to policies specific to the identification, avoidance and management of coastal hazards; including ensuring that coastal hazard and climate change risks are managed by locating new development away from vulnerable areas prone to such risks, considering responses including manage retreat for existing development; and protecting or restoring natural defences to coastal hazards. The Canterbury Regional Policy Statement (2013) gives effect to the NZCPS and sets out objectives, policies and methods for district plans. This will be reviewed by Environment Canterbury in 2023, alongside the Regional Coastal Environment Plan (2005).
Ōtākaro Avon River Corridor Regeneration Plan (Regenerate Christchurch, 2019)	Sets our vision and objectives for future use of the 602 hectares of red zone in east Christchurch: implementation requires key infrastructure provision of stormwater management areas, stopbanks, open spaces and amenity, and transport links.
Our Heritage, Our Taonga – Heritage Strategy 2019-2029 (Christchurch City Council, 2019)	Sets out how we intend to work in ongoing partnership with Ngāi Tahu and in collaboration with our communities to identify, protect and celebrate heritage - including the built and natural environment, tangible and intangible heritage, including stories, memories and traditions, and movable heritage.
Our space 2018-2048: Greater Christchurch Settlement Pattern Update (Greater Christchurch Partnership, 2018)	Outlines land use and development proposals to ensure there is sufficient development capacity for housing and business growth across Greater Christchurch to 2048, and thereby influences the location, timing, provision of infrastructure to support land use and development.

Public Open Space Strategy (Christchurch City Council, 2010)	Provides a framework to guide provision and development of public open space within Christchurch and Banks Peninsula, taking into account the protection of outstanding (natural and cultural) features and landscapes the demands and pressures of increasing urban density, demographic and lifestyle changes, environmental costs and effects.
Spatial Plan for Christchurch (Christchurch City Council, under development)	Once completed, the Spatial Plan will establish the steps required to achieve our desired urban form, and show what this will look like spatially. It will show how and where we are accommodating growth through intensification, incorporating our green space, public space and environmental aspirations; the services and infrastructure needed to support intensification; and the integration of transportation modes and residential development.
Sports Facilities Network Plan (under development, Christchurch City Council, 2019)	Considers current and future residents' needs for next 30 years with regard to quantity, style, size, quality and location of sports facilities to ensure they are fit-for-purpose for changing expectations and financially, environmental and socially sustainable.
Te wai ora o tāne Integrated Water Strategy (Christchurch City Council, 2019)	Tasks the Council with taking all possible action to minimise nitrate incursion and other contaminants into groundwater sources; managing and adapting to flooding risk and sea-level rise; and managing assets in an integrated manner including stormwater networks.
Waste Management and Minimisation Plan (Christchurch City Council, 2020)	Delivering on five key groups of actions will impact on infrastructure capacity and capability: maximising composting of organics; maximising recycling of recyclable materials; safe management of hazardous substances; show leadership and innovation across the sector; and deliver effective resource recover education and communications.

Appendix 7: Government and regulatory influences

Meanwhile, our city must keep step with regulatory changes and the direction set by the Government. For the next few years, regulatory changes in the three waters areas look likely to dominate the landscape. Our infrastructure must be fit for purpose and our investment decisions should be geared towards achieving this. More detail on the issues Council faces in managing the rapidly changing regulatory and commercial environment can be found in the significant infrastructure issues section of this Strategy. However, anticipated reforms are briefly summarised here.

Resource Management Act Review

In July 2019 the Environment Minister launched a review of the Resource Management Act (RMA) to cut complexity and costs and better protect the environment. The scope includes spatial planning, which has the potential to help make better and more strategic decisions about resources and infrastructure over longer timeframes.

In July 2020, the Resource Management Review Panel released its report and recommendations on RMA reform. The recommendations included repealing the RMA and replacing it with three new Acts: the Natural and Built Environments Act, the Strategic Planning Act, and the Managed Retreat and Climate Change Adaptation Act.

The Urban Development Act 2020 provides for streamlined consenting powers for Kāinga Ora (the Crown Agency responsible for implementing the Government's housing and urban development agenda), for urban development projects.

Managed Retreat and Climate Change Adaptation Act (proposed)

The planned Managed Retreat and Climate Change Adaptation Act includes powers to change established land uses, and provide for compensation/funding mechanisms to address adaptation and reduction of risks from natural hazards.

Climate Change Response (Zero Carbon) Amendment Act 2019

In 2019, the Government amended the Climate Change Response Act 2002 to enable decision makers to take New Zealand's net zero emissions by 2050 target into account. It is reasonably likely that the courts will find that the 2050 target, emissions budgets, and emissions reduction plans (once they are produced) are relevant to a range of central and local government decisions (and potentially a mandatory consideration in some cases).[49]

National Policy Statement for Urban Development

This provides direction to councils about when and how cities should plan for growth and how to do this well. It aims to remove unnecessary restrictions on development, to allow for growth 'up' and 'out' in locations that have good access to existing services and infrastructure. The final NPS for Urban Development came into effect in August 2020, replacing the NPS – Urban Development Capacity.

New Zealand Infrastructure Commission/Te Waihanga Bill 2019

This Bill establishes the New Zealand Infrastructure Commission/Te Waihanga as an autonomous Crown entity. The Commission will be mandated to develop a long-term national infrastructure strategy, working with central and local government as well as the private sector with a view to tackling the systemic problems the sector has faced for many years.

National Policy Statement for Freshwater Management

This will direct regional councils, in consultation with their communities, to set objectives for the state of fresh water bodies in their regions and to set limits on resource use to meet these objectives. It is proposing new requirements that would:

- strengthen Te Mana o Te Wai as the framework for freshwater management
- better provide for ecosystem health (water, fish and plant life)
- better protect wetlands and estuaries
- better manage stormwater and wastewater, and protect sources of drinking water
- control high-risk farming activities and limit agricultural intensification
- improve farm management practices.

[49] Infrastructure: review, reform and recover, September 2020, Simpson Grierson, links.simpsongrierson.com/assets/pdf/Simpson-Grierson-Infrastructure-review-reform-and-recover_Sept2020-web.pdf

Water Services Bill (introduced to Parliament late 2019)

The Bill will introduce a new regulatory framework for drinking water supplies. A new water regulator will be established to oversee the regulatory regime - the scope, roles and institutional form of which will be decided by Cabinet. The Council engaged in the first phase of the reforms, signing a non-binding Memorandum of Understanding (MoU) with the Government in August 2020, by which we commit to sharing information on our water network and services with the Government and neighbouring councils, and to working constructively with the Government and other parties on how three water services could be delivered in a more financially sustainable way. As part of the MoU, we received a stimulus investment grant of $20.26 million from the Government to spend on three waters infrastructure and service delivery, and will receive a further $20 million as works are progressed. The extra funding will enable the early delivery of a significant amount of 'shovel-ready' work on Christchurch's water supply and wastewater networks.

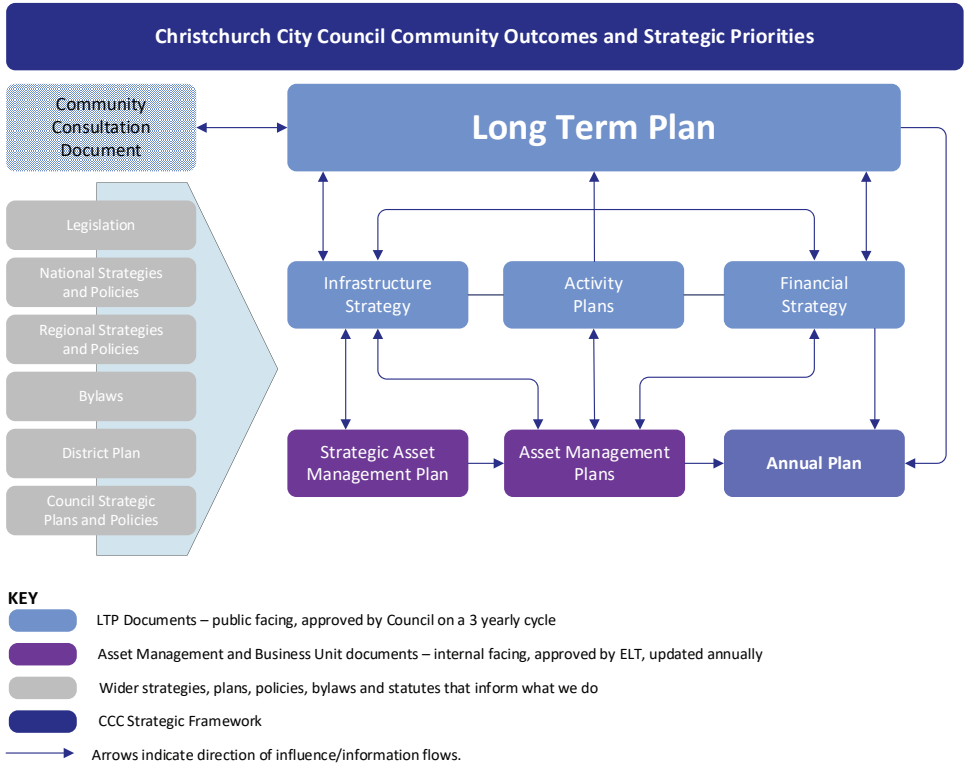
Government Policy Statements on Land Transport

Government policy has substantially shifted in recent years towards efforts to reduce transport emissions and improve transport safety. The Government has signalled a desire to reduce both emissions and road fatalities to zero. This will be a particular challenge for transport assets and operations, given that transport is the largest contributor to greenhouse gas emissions in the Christchurch district; and more than one hundred people are killed or seriously injured on Christchurch roads each year.

Appendix 8: How the Infrastructure Strategy fits within the LTP

Our LTP is made up of several large ingredients. These include the Infrastructure Strategy, Finance Strategy, Activity Plans and Levels of Service, Asset Management Plans (AMPs), and Capital Programme. Together they form our statement of commitment to the community about what activities and services we will provide. The Infrastructure Strategy signals the level of infrastructure investment needed, and reflects the Council's Strategic Priorities and Community Outcomes.

Building the LTP[50]



[50] Christchurch City Council , Draft Strategic Asset Management Plan (SAMP), version 26 February 2020

Appendix 9: Strategy development process

The Infrastructure Strategy was developed through a three-phase process involving internal and external colleagues. It was a co-development process with Elected Members and there were six workshops/briefings at various stages of the Strategy's development, to ensure their strong input and feedback.

We adhered closely to the requirements of the Local Government Act 2002, section 101B, which details the purpose and contents of infrastructure strategies. The strategy process sought to maintain a disciplined, objective and evidence-based strategic lens throughout:

- Identifying the significant issues relating to infrastructure (i.e. the Preliminary Infrastructure Assessment (PIA))
- Identifying asset-specific issues and assessing the range of options to address these; and identifying the most likely scenario for the management of our infrastructure assets
- Compiling it all together to tell a comprehensive story for the next LTP.

Phase I - The front end (problem definition and overall direction setting)

Task 1 – Establish background and gather evidence - Inputs to the Strategy were gathered and integrated from a range of internal and external sources.

Task 2 – Problem definition - Workshops with internal and external stakeholders/subject matter and technical experts to define the problems and challenges for the Infrastructure Strategy.

Task 3 – Preliminary Infrastructure Assessment - A direction-setting document that summarised the challenges and opportunities defined in Task 2, and developed the overall direction for the Strategy.

Phase II - Building the back end (issues breakdown and options analysis)

A 'deep dive' into the issues and opportunities, breaking them down by infrastructure type. An options assessment was then undertaken of a long list of potential options to address these issues, for all infrastructure activities. This determined a draft Infrastructure Strategy programme and the most likely scenario for the management of our assets. The key tasks are outlined below.

Task 4 – Infrastructure-specific issues and options analysis

This task involved infrastructure-focused working groups of subject matter experts to first identify asset-specific issues, and then develop and assess options to address these, by infrastructure type.

Task 5 – Balance options across asset groups/infrastructure areas

A desktop analysis to balance the options for each infrastructure area to produce a preferred programme that address all issues, with an appropriate diversity and risk profile. Identification of significant decisions and options over the next 30 years.

Phase III - Write up preferred scenario/Infrastructure Strategy

This phase pulled together all material developed in Phases 1 and 2, to articulate the most likely scenario for the management of our infrastructure assets over the 30-year period. This phase included alignment of the Strategy with other LTP programmes of work – in particular the Financial Strategy, Asset management plans and Activity Plans.

Appendix 10: Strategic partner and stakeholder views

Strategic partners and stakeholders

At the outset of the Strategy's development we asked some of our strategic partners and stakeholders[51] for their views about their – and our - infrastructure issues. In our discussions, we delved into four issues that our asset and activity managers told us were important:

- Looking after our assets: to what extent does the growth we are accommodating pay for itself? Failing assets ultimately cost more to maintain.
- Sustainably managing our natural and built environment to accommodate growth, otherwise we will get poor social and environmental outcomes, and this has a financial cost.
- Reducing our carbon footprint and improving community resilience to climate change and natural hazards. The infrastructure we provide has a significant impact upon our climate impacts, and also our ability to respond to significant events.
- Responding and adapting to changing community demand and preferences, new or altered legislation and fast-changing technology. With long lead times, how can infrastructure keep up with this?

Their views were similar to those of our elected members and Council asset managers and operational leaders.

We heard key concerns such as:

- The importance of dealing with change, uncertainty and risk - we need to take 'adaptive pathways' over the life of the 30-year Strategy and harness opportunities and challenges: the impact of rapidly-changing technology on services and customer expectations, and the impact of climate change on land use and infrastructure provision, are crucial to all infrastructure providers.
- The role of infrastructure in shaping our neighbourhoods and ensuring growth demand is met – we need to plan for an expected population increase, an ageing and increasingly diverse community, and expanded suburban areas. We also need to encourage residential intensification; make public and active transport networks safer, viable and attractive; and we need to reduce growth-associated risks such as contaminants reducing the quality of water supply and waterways.
- The financial viability of infrastructure options, potential for trade-offs, opportunities for alternative funding models (such as public-private partnerships), risk of intergenerational inequity and positioning infrastructure spending within a wider investment context.

[51] Problem identification workshops at the outset of the Infrastructure Strategy's development included external attendees from Canterbury District Health Board, ChristchurchNZ, Citycare, Environment Canterbury, Fulton Hogan, Lyttelton Port Company, Ministry of Education, Waka Kotahi: New Zealand Transport Agency, Orion, Selwyn District Council, Waimakariri District Council, and some individual infrastructure sector experts (apology from Ngāi Tahu invitee); they were joined by a range of Christchurch City infrastructure managers and asset experts.