GREATER CHRISTCHURCH

PT FUTURES MASS RAPID TRANSIT (MRT)

INDICATIVE BUSINESS CASE

MAY 2023

aurecon Boffa Miskell QTP Quality Transport Planning wsp

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Indicative Business Case

Appendices

GLOSSARY OF TERMS

Acronym	Term
BRT	Bus Rapid Transit
CCC	Christchurch City Council
CDHB	Canterbury District Health Board
CEDS	Christchurch Economic Development Strategy 2017
CEMP	Construction Environmental Management Plan
CERA	Canterbury Earthquake Recovery Authority
Core routes	Blue Line, Orange Line, Purple Line, Yellow Line and The Orbiter
CPTP	Canterbury Public Transport Plan 2018-2028
CRLTP	Canterbury Regional Land Transport Plan 2015-2025
CRPS	Canterbury Regional Policy Statement 2013
CRPTP	Canterbury Regional Public Transport Plan 2018-2028
DBC	Detailed Business Case
GCTS	Greater Christchurch Transport Statement 2012
GPS	Government Policy Statement on Land Transport
hh/ha	Households per hectare
IBC	Indicative Business Case
ILM	Investment Logic Map
IMD	Index of Multiple Deprivation
KAC	Key Activity Centre
KPI	Key Performance Indicator
LTMA	Land Transport Management Act 2003
LRT	Light Rail Transit
LTP	Long-Term Plan

Acronym	Term
LURP	Land Use Recovery Plan 2013
MaaS	Mobility-as-a-Service
MCA	Multi-Criteria Analysis
MCR	Major Cycle Route
MRT	Mass Rapid Transit
NLTF	National Land Transport Fund
NPS – UD	Draft National Policy Statement on Urban Development
NOR	Notice of Requirement
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
Our Space	Our Space 2018-2048: Greater Christchurch Settlement Pattern Update
PBC	Programme Business Case
Project Team	WSP New Zealand Limited, Aurecon New Zealand Limited, QTP Limited and Boffa Miskell Limited
PT	Public transport
PTI	Planning Time Index
SDC	Selwyn District Council
SH	State Highway
SMART	Specific, Measurable, Agreed upon, Realistic and Time-related
SOI	Statement of Intent 2018-2022
SOV	Single occupancy vehicle
SSBC	Single-Stage Business Case
TRoNT	Te Rūnanga o Ngāi Tahu
TDM	Travel Demand Management
UDS	Greater Christchurch Urban Development Strategy
WDC	Waimakariri District Council

EXECUTIVE SUMMARY

Christchurch has a significant opportunity to shape its future by investing into a Mass Rapid Transit (MRT) system. This Indicative Business Case demonstrates that best returns will come from a 22km city corridor from Hornby to Belfast, connected to the Waimakariri and Selwyn districts through the high frequency direct bus services funded by PT Futures.

Investing initially between $3.0b and $4.0b in this MRT solution, and funding its operation by $64m p.a., will return benefits worth up to 2.8 times the costs to Greater Christchurch.

MRT will improve people's access to the central city and their wellbeing by reducing the effect of congestion and reducing carbon emissions. By 2051 MRT will stimulate intensification, enabling the addition of 15,000 households and 54,000 jobs along the MRT corridor. MRT ridership is estimated at 39,000 people per day. This increases public transport patronage by 5.7 million trips per year, resulting in a total of 36 million passengers across the public transport system per year.

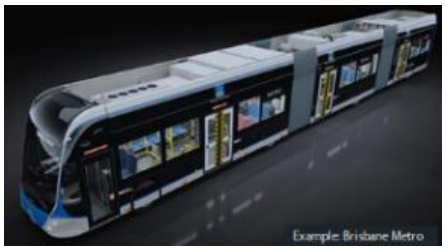
This opportunity requires further study through a Detailed Business Case to start in 2023, allowing construction to start in 2028 and services to operate by 2033, maximising the city shaping opportunities and benefits of MRT.

INTRODUCTION

Christchurch is currently being presented with a significant opportunity to make a 'step change' in how it plans and develops for its future. Its rapid growth combined with the damaging impact the 2010 and 2011 earthquakes have had on urban development is resulting in unsustainable development patterns for the city.

Without intervention it is likely development will result in a reduction in quality of life, disproportionate impacts on disadvantaged communities, constraints to economic growth and reduced ability to meet climate change commitments.

To address this Christchurch is planning to create quality compact and attractive urban places where people have less reliance on private vehicles and where a wider range of activities (social and economic) can be found close to where they live. This will build stronger, healthier communities, with greater vitality and economic prosperity. **High-capacity good quality public transport is a key enabler of this planned urban development.**



Manawhenua

Mahaanui Kurataiao Limited has prepared a report (March 2023) that sets outs the interests in, and position of, manawhenua on the route options.

In summary, the report advises that manawhenua support the transport objectives to reduce transport emissions and improve public transport. Manawhenua are supportive of the preferred MRT route within the City and the concept of an enhanced public transport service to Rolleston and to Rangiora, although it is noted that no priority has been identified for public transport to connect with or support Tuahiwi Marae or Māori Reserve 873 (MR873).

Fundamental opposition is however articulated to any form of public transport service that involves the need to widen the Woodend-Rangiora Road, risking the loss of Māori Land and reducing accessibility between MR873 and the wider transport network. There is also the potential for a MRT route linking Woodend and Rangiora to become a catalyst for further urban development along this part of the corridor. This would have the consequential effect of expanding urban development over wāhi tapu and encroaching upon ngā wai in the Woodend/Ravenswood locality.

The Whakawhanake Kāinga Komiti (WKK) is replacing the Greater Christchurch Partnership Committee (GCPC) as the project sponsor. Both committees have acknowledged the significant opportunity for the Region by endorsing the PT Futures Programme of works which seeks to proactively respond to the need for a Public Transport System with significantly increased patronage and mode share that:

- delivers high-frequency PT options to existing Key Activity Centres and planned growth areas.
- provides reliable services with journey times that are competitive with private vehicles.
- is attractive and safe to use for customers.
- takes people where they want to go, when they want to get there; and
- provides a catalyst for desired land use development.

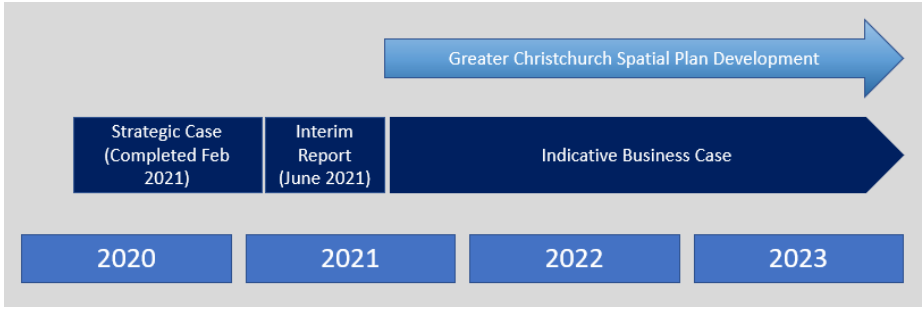
Public Transport Programme

The PT Futures Programme involves the development of two business cases that together explore an investment programme aimed at increasing the mode share of the public transport network in Greater Christchurch.

The first business case delivered in 2018 (Greater Christchurch Public Transport Combined Business Case) recommended a programme of improvements to increase the uptake of public transport over the next decade.

The second business case has a longer-term focus and considers the future role of mass rapid transit (MRT) in Greater Christchurch. Rapid transit is different from conventional public transport, being a quick, frequent, reliable and high-capacity public transport service that operates on a permanent route (road or rail) that is largely separated from other traffic.

Work commenced on the MRT business case in 2020 with the development of a Strategic Case and then an Interim Report that proposed three possible routes for MRT. The Interim Report was presented to the GCPC, and they supported progression of the project through the IBC process, in collaboration with development of Christchurch Greater Spatial Plan.



Indicative Business Case for Mass Rapid Transit

This report presents the Indicative Business Case (IBC) for Public Transport Futures Mass Rapid Transit (MRT). This IBC:

- Sets out the case for investment in rapid transit along the corridor to enable sustainable growth for the city as outlined in the Greater Christchurch Spatial Plan.
- Assesses a range of route options, including sub assessments on urban realm and land use, station stops and mode technology to recommend a preferred rapid transit solution, its costs, and benefits.
- Discusses how the Project can be delivered – including Governance structures to ensure strong partnerships:
  - The obligations of partnership, protection, and participation under Te Tiriti o Waitangi
  - Partner agencies including the Greater Christchurch Partnership (GCP) Committee and the newly formed Whakawhanake Kāinga Komiti (WKK) urban growth partnership.
- Determines timing and methodology for MRT implementation – as part of a wider strategy to enable the city's development and regeneration.

Strategic Context

The development of the MRT Business case is co-sponsored by Waka Kotahi, ECAN, WDC, CCC and SDC. Its development is, therefore, under the overarching strategic direction of the Canterbury Regional Land Transport Plan (CRLTP) 2015-2025 and Canterbury Public Transport Plan (CPTP) 2018-2028, with strong links to the GPS 2021 and National Policy Statement on Urban Development. It has also been developed in collaboration with the emerging Greater Christchurch Spatial Plan being prepared by the GCP and proposed Plan Change 14 prepared by CCC.

CONTEXT

Over the next 30 years, the Greater Christchurch population will exceed 700,000 people. This growth will inevitably increase travel demand in Greater Christchurch, from 2021 to 2051, the forecasted daily trips on the Greater Christchurch network are anticipated to increase by 32%.

Without intervention it is expected the majority (95%) of these trips will be by private vehicles with low occupancy.

Why now?

The time to further progress the development of MRT for Greater Christchurch is now, because:

- PT Futures programme of bus improvements has already been endorsed, with intentions to accelerate delivery. If this is not considered, along with various other projects proposed in the local and regional plans, in context of MRT then the opportunities for synergies will be diminished.
- MRT is a city shaping project, which if planned and delivered ahead of the growth can better influence how we grow as opposed to reacting to it. Current low densities across greater Christchurch provide an opportunity now to proactively manage and catalyse intensification enabled by MRT.
- Implementation of retrofitting a major infrastructure project such as MRT will become more complex, more expensive, and more disruptive, the longer we wait.
- Immediate progression will ensure the momentum currently underway, including the intellectual property and governance structures already in place, can continue.

THE PROBLEMS AND OBJECTIVES

The problems MRT is addressing

The strategic case identifies three overarching problems statements which an investment in rapid transit will address:

Problem 1: Current and forecast residential and business settlement patterns perpetuate high car dependence with more people expected to drive long distances, resulting in increased transport costs to users and the wider community, and a continuation of the low mode share for Public Transport.

Problem 2: The PT system is not sufficiently attractive (in terms of travel time, reliability, convenience, comfort and cost) to encourage its use in preference to private vehicles, resulting in a continuation of the low mode share for PT and higher congestion, which will constrain access to the central city and other key destinations, increase public and private transport costs and restrict economic growth.

Problem 3: As Greater Christchurch grows; a continuation of the current transport system is not sustainable and fails our climate change mitigation and adaption responsibilities. Higher vehicle use will result in higher levels of embedded carbon, higher greenhouse gas and particulate emissions, and poorer public health outcomes.

The benefits of addressing the problem

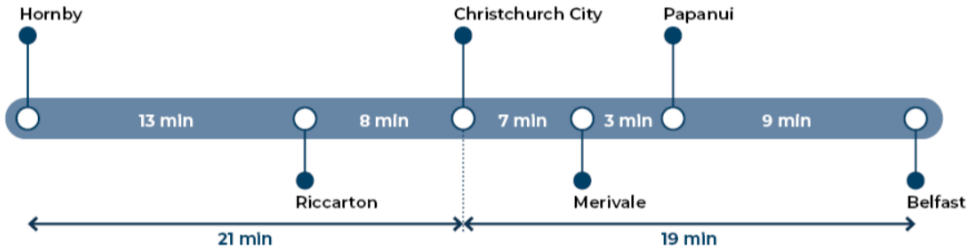
The strategic case identifies three Investment Objectives that articulate the desired outcomes of MRT investment:

Investment Objective 1: Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051.

The main aim of this objective is for rapid transit to shape the urban form and growth. It should support the redevelopment to higher densities through allowing locations to have better access to employment, education and social opportunities and become more attractive places to live. This in turn increases land values and makes higher intensity developments feasible.

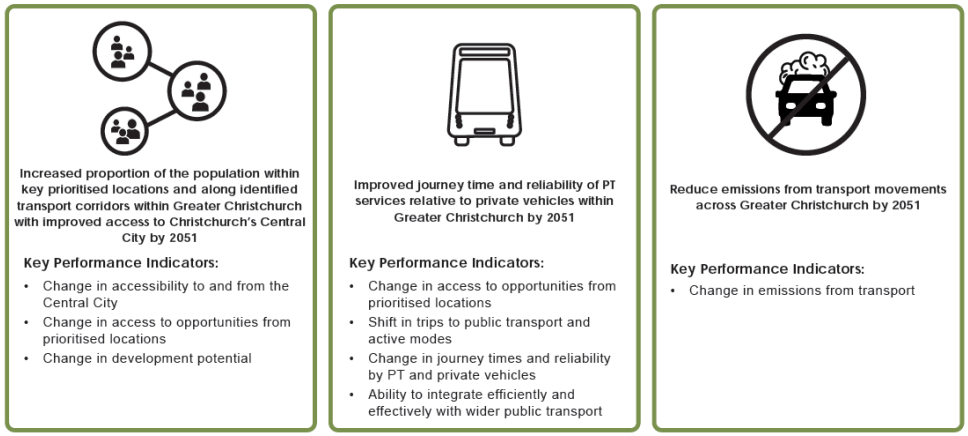
Investment Objective 2: Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051.

Reducing the impact of congestion on people's lives is a key component of improving accessibility and overall wellbeing. Mass rapid transit operates on dedicated corridors, so provides a fast and highly reliable travel option (as illustrated in the following MRT journey time map) even when other parts of the transport network are under strain and highly congested.



Investment Objective 3: Reduce emissions from transport movements across Greater Christchurch by 2051.

As a consequence of mode shift to public transport, Greater Christchurch will be able to further contribute to reducing its carbon footprint and greenhouse gas emissions. With less people using cars and more taking advantage of efficient rapid transit, positive environmental outcomes and climate change impacts will be achieved. In addition, intensification itself leads to less need for extensive travel.



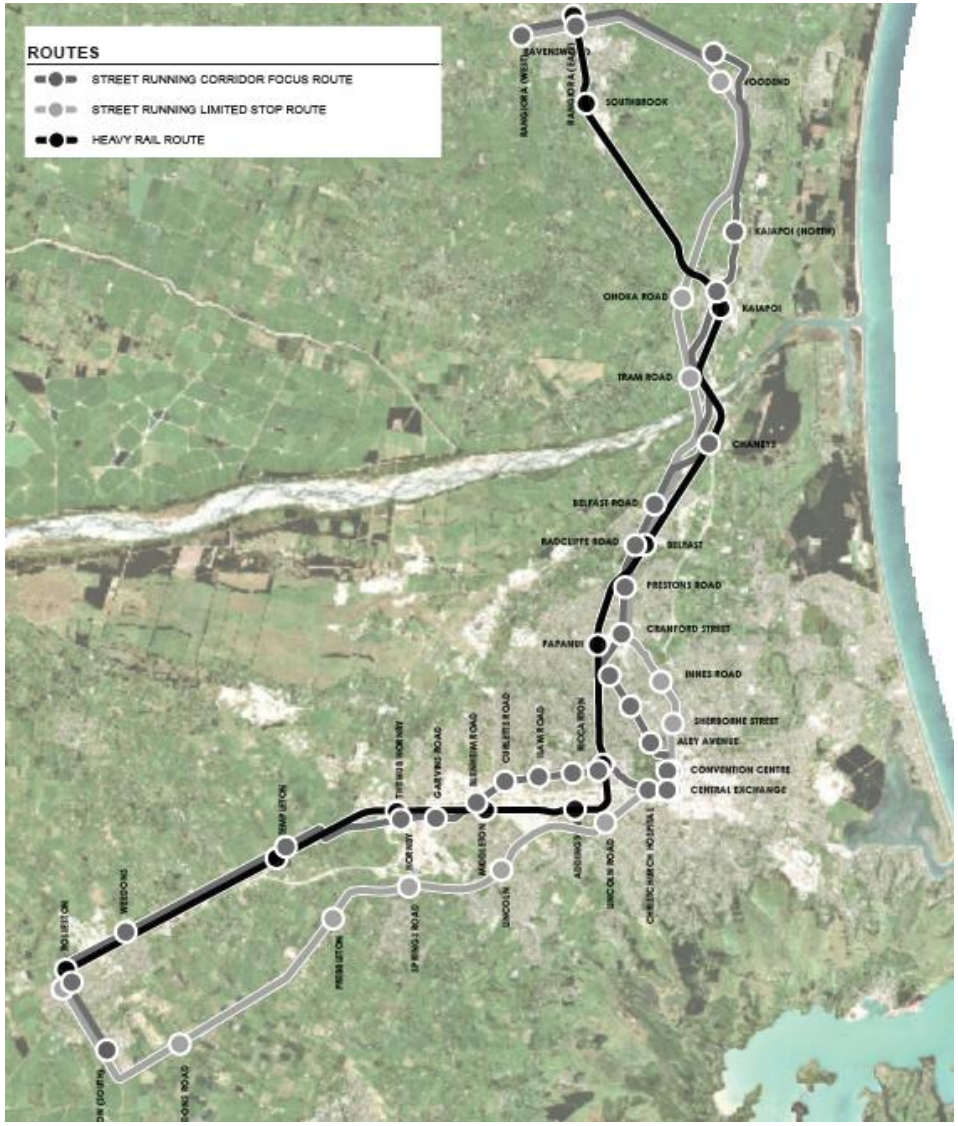
OPTION DEVELOPMENT AND ANALYSIS

To identify which form of rapid transit would best meet the desired outcomes, a range of options were assessed. The options were developed in stages to consider route alignment, urban realm and land use, station stops and mode technology.

A summary of the methodology and steps followed to assess the options is shown in the figure on the following page and outlined below.

Initial Stage – Interim Report: Defined two MRT corridors, north and southwest, and explored three MRT scenarios within these:

- **Scenario 1:** A heavy rail scenario – with limited stop opportunities but competitive travel times.
- **Scenario 2:** A street running scenario with limited stops focused on competitive travel times that generally follows the motorway.
- **Scenario 3:** A street running scenario (corridor focused generally following arterial corridors).

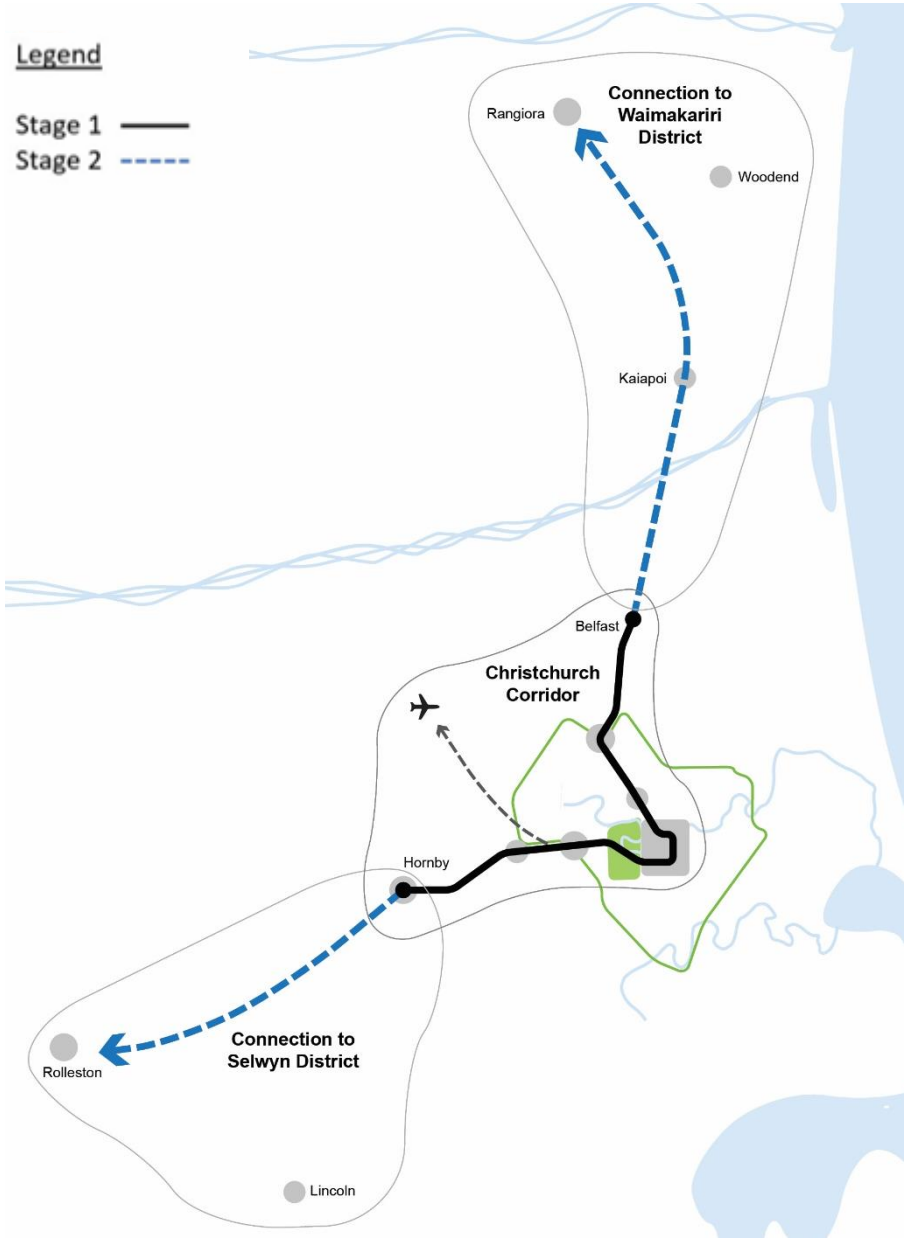


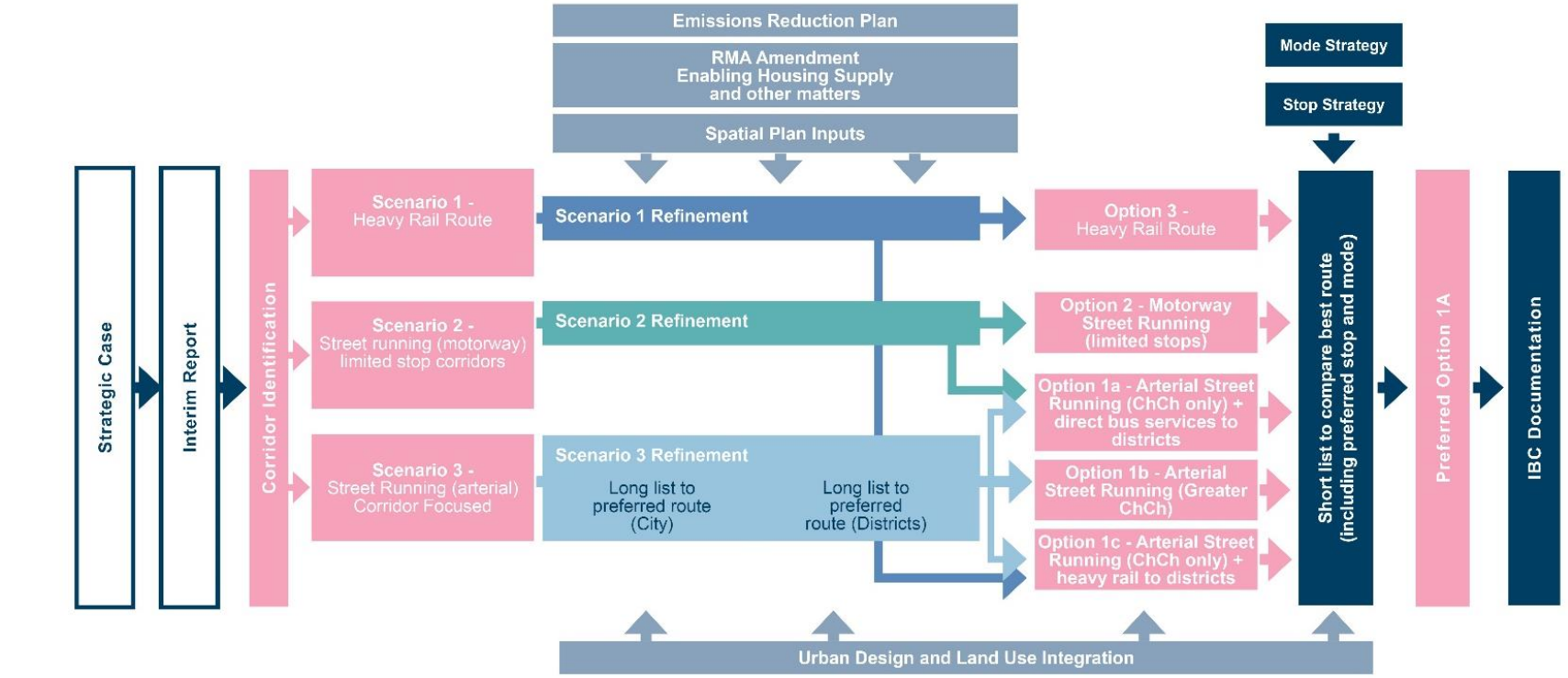
MRT Urban Design and Land Use Integration Assessment: Considered future land use integration opportunities for MRT related to relevant policy, strategic direction and the GCSP and the built environment outcomes anticipated to support MRTP.

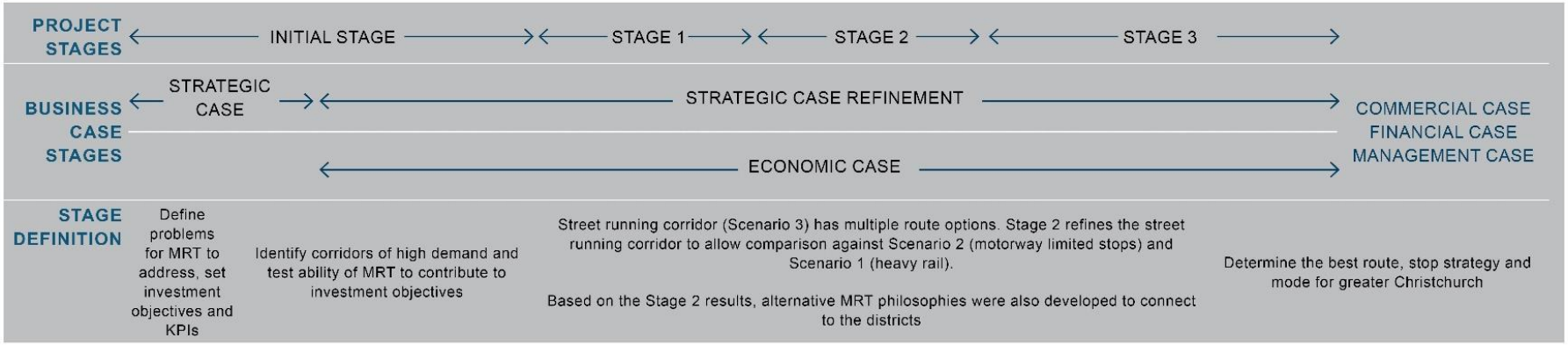
- **Long List Assessment:** Focuses on Scenario 3, as the interim study indicated this would provide the greatest uplift and had presented more variations for route and stop assessment.
- **Stage 1:** Investigates a preferred route for Scenario 3 within Christchurch City.
- **Stage 2:** Investigates a preferred route for Scenario 3 extending to Waimakariri and Selwyn Districts.

Stop and Mode Strategy: Confirmed the station stop locations and mode technology across all scenarios.

Short List Assessment (Stage 3) – Refined Scenario 3 is compared back with Scenario 1 and 2 from the Interim Report. In addition, other potential MRT district extension philosophies are considered.







Approach for MRT Development

THE PREFERRED SOLUTION

MRT is a high frequency and high-capacity public transport service on a dedicated corridor, that prioritises public transport. It is a step change from the current public transport service in Greater Christchurch and more importantly, an urban shaping initiative that is fundamental to catalyse the shift in urban form required to help achieve a zero-carbon future.

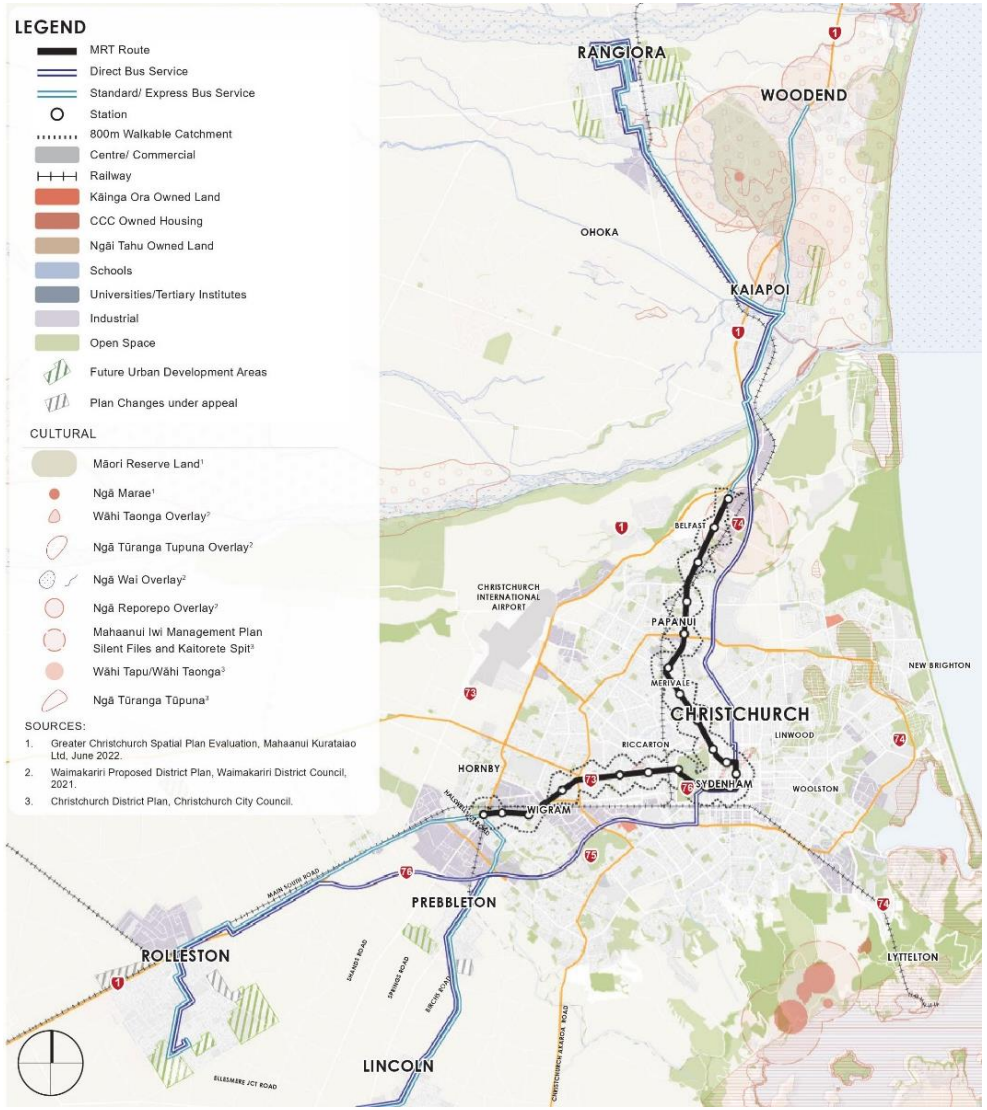
The Street Running option will result in the greatest land use integration benefits given the following:

- It will align with travel demand and where intensification is currently occurring within Greater Christchurch.
- It aligns with the greatest number of key centres and destinations, linking people with where they want to go.
- It will deliver a high amenity outcome in comparison to the other options given its 'Place' context.
- It will assist with reducing traffic congestion, as the corridor is aligned with current travel demand.
- Although the Heavy Rail and Motorway running options could provide for greater Transit-orientated development opportunities (Brownfield development), the benefits of increased densities in these locations will take time to be realised.

MRT Hornby to Belfast via the city centre ● 22km

21 station stops ● Light Rail or Bi-articulated Bus

Direct bus services connecting the districts



The preferred option description

Optioneering for mass rapid transit identified the preferred option as Option 1a: Arterial Street running MRT in Christchurch city with high quality direct bus services connecting Waimakariri and Selwyn Districts.

Northern Corridor: Papanui Road and Main North Road, supporting the urban centres of Merivale, Papanui, Northwood, and Belfast along this corridor.

- Aligns well with key activity centres and town centres.
- Includes a number of significant schools in the walk-up catchment.
- Includes opportunities for transit malls at key centres.
- Includes opportunity for intensification along the route.
- Aligns with pockets of Kainga Ora ownership with the potential to unlock development opportunities.
- Could utilise existing overbridge structures to cross the railway line.

City Centre: The route follows Victoria, Kilmore, Manchester, and Tuam Streets along with Riccarton Avenue through Hagley Park.

- Provides good accessibility to all key city centre destinations.
- Multi-use Arena, Ara Campus, East Frame residential area and future mixed-use developments to the east and south.
- Uses Manchester Street, which leaves Colombo Street to become the spine of a pedestrianised core.
- Aligns the Manchester Street corridor with PT as an identified function for this corridor and provides transfer connections with the Hospital 'Super Stops' and the Bus Exchange.
- Will enable PT only opportunities to exist along Manchester and Tuam Streets.

Southwest Corridor: The route follows Riccarton Road and Main South Road to Hornby.

- Aligns with Riccarton and Hornby emerging metropolitan centres as well as Church Corner Town Centre.
- Takes the shortest length in connecting Hornby and Riccarton.
- Provides an opportunity for a transit mall at Riccarton.
- Enables multi-modal transfer connection to the airport.
- Includes a high portion of residential catchment within corridor.
- Aligns with several Kainga Ora ownership parcels with the potential to unlock development potential.
- Already has high bus patronage along corridor (strong existing market).

District Connection

The PT Futures Combined Business Case includes frequency improvements to Direct Bus Services servicing the Waimakariri and Selwyn Districts. These improvements are included in the do-minimum base case for MRT. The proposed solution includes further enhancements to ensure the Direct Bus Services connect to the MRT system and provide a consistent user experience to the proposed MRT system. These additional improvements include:

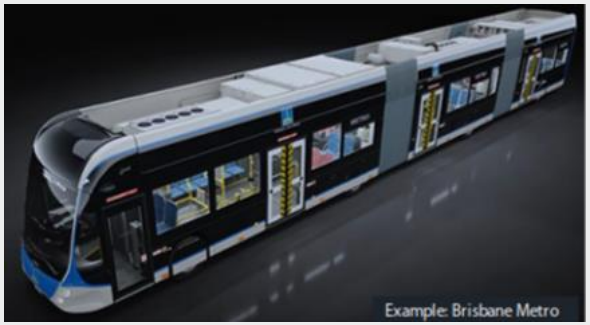
- **Direct Bus Services:** The Direct Bus Services travel non-stop between the districts and the city, with the route travelled depending on traffic conditions. These Direct Bus services to the district will be enhanced by increasing frequencies to 15-minute peaks and 30 minute off-peak.
- **Standard and Express Bus Services:** Standard bus services operate within the district and connect the districts to the city via fixed routes and stop at each pickup/drop-off location. During peak periods, these standard bus services also offer an Express Service which follow the fixed routes but reduce the number of pickup and drop off points. These bus services will be optimised in context of the MRT offering, to ensure suitable internal district connectivity (Intra-district) and connectivity to the MRT services. Connecting to the MRT stations, initially at Church Corner and Papanui, and ultimately at Hornby and Belfast, is essential in order to provide a smooth transfer onto the MRT system.
- **District Park and Ride Facilities:** Park and Ride facilities will be enhanced and optimised to ensure they are correctly scaled, configured, and spatially positioned to work effectively alongside MRT. Moving beyond this IBC, consideration should also be given to referencing these as 'Multimodal Interchanges' to reflect the wider function these sites offer, in connecting transfer facilities to PT and MRT from a variety of modes including cars, bikes and scooters.

Station Locations

Stations and stops have been located at key town centres along the corridor to provide opportunities to strengthen their role and function as primary destinations within the City and Sub-region. This alignment will also facilitate the integration with the wider public transport and cycle networks providing transfer opportunities to improve accessibility for the wider community. Each station has been given a hierarchy which will align with the existing future role and function of key centres and areas of intensification identified by the Christchurch City Council through draft Plan Change 14. They will also support the development of a legible urban form as the city continues to grow.

Mode Selection

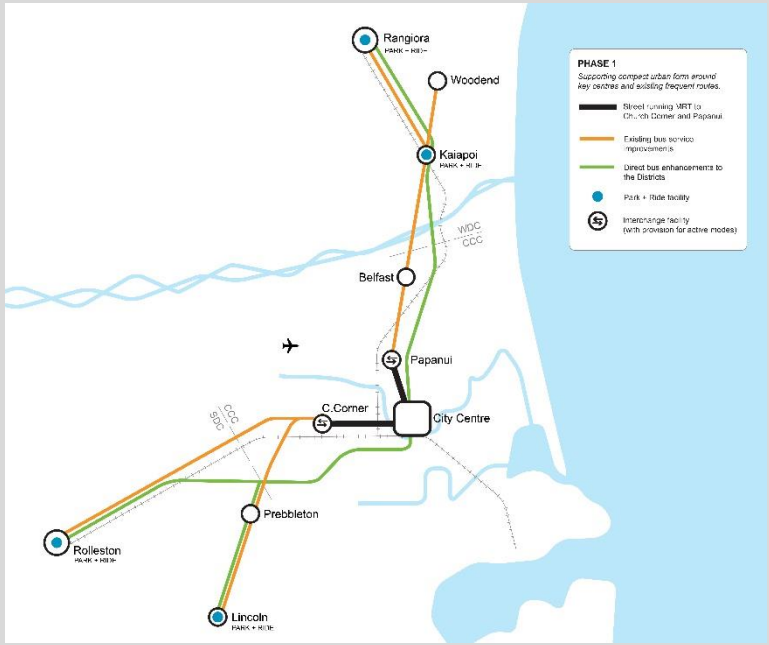
The Mode Assessment process determined that both Light Rail and Bi-articulated Bus solutions are the preferred ways forward in terms of mode technology for this rapid transit system. It is recommended a decision on mode technology is refined in the DBC.

Bus Metro  	Lower capital costs and easier implementation Flexibility to avoid traffic disruption More ability to stage implementation Resilience to natural disaster events
Light Rail  	Proximity of depot and route (land availability) Grade separation of mode from heavy rail (likely required) Infrastructure is perceived as permanent, which is a catalyst for development Higher capacity and ability to couple vehicles

Proposed Phasing

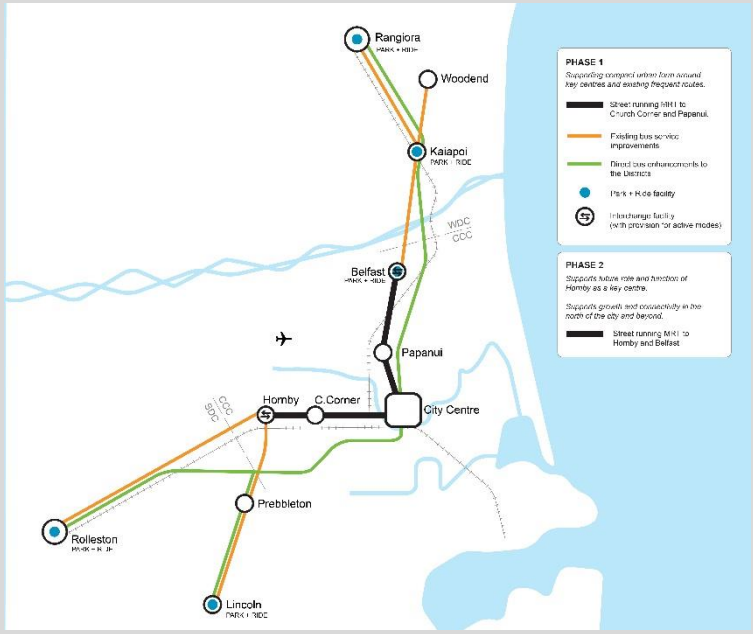
A phased introduction of rapid transit was considered to ensure optimal value for money that allows for the timely provision of additional services. Each phase is presented in the following figures, with both phases assuming improved direct bus services from the districts are already in place under PT Futures.

Phase 1



- Early introduction of MRT from the city to Church Corner and Papanui with interchange facilities at both.
- Realigns/improves bus services from interchanges (Church Corner and Papanui) to Rolleston/Prebbleton/Lincoln and Belfast to Kaiapoi/Rangiora.
- Direct Bus services from the Districts.
- Limits wider impacts to the freight and SH1 network (until phase 2).

Phase 2



- Introduces MRT extensions to Hornby and Belfast with interchange facilities.
- Reinforces future role and function of Hornby.
- Realigns/improves bus services from interchanges (Hornby /Belfast) to Rolleston and Prebbleton/Lincoln and Kaiapoi/Rangiora.

EFFECTIVENESS OF PREFERRED OPTION

The analysis considered how well the preferred option met the investment objectives:

Investment Objective 1:

Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051.

The preferred MRT solution focuses on high potential job and household growth locations. It compliments and enhances the vision of the Greater Christchurch Spatial Plan, unlocking urban development and increasing housing densification along the proposed route. MRT is expected to stimulate intensification with an additional forecasted growth of 15,000 additional households and 54,000 additional jobs (between 2021 and 2051) within the station (800m) catchments.

Investment Objective 2:

Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051

MRT will provide a dedicated right of way system with priority throughout the corridor, avoiding the effects of congestion and conflicts with other vehicles. The service will run reliably at consistently higher average speeds compared to a public transport bus service. Reliability is a key differentiator of MRT, which allows rapid transit services to compete with the private car as it provides users with the confidence and trust that they can get where they need to at the required time.

End-to-end (perceived) public transport journey times are expected to decrease as a result of improved in-vehicle journey times and frequency (decreased wait times). This improves access to a range of Key Activity Centre and employment areas. An additional 39,000 households are able to access an additional KAC within 30minutes using PT and accessibility to strategic land use areas, such as Hornby Mall, increases by up to 50%.

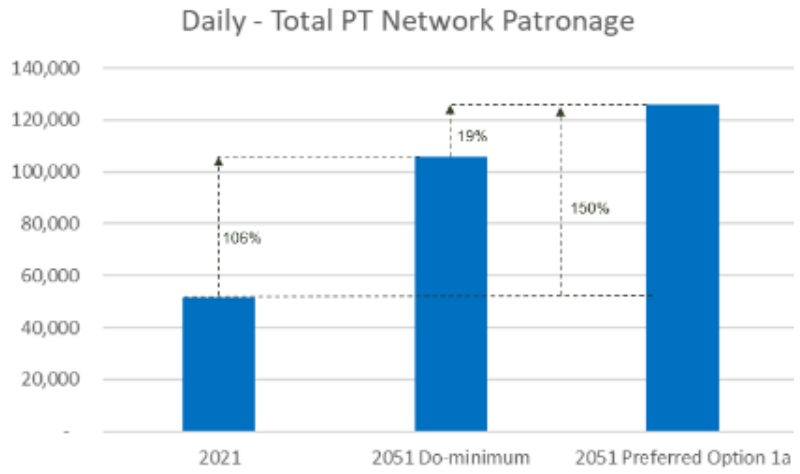
Investment Objective 3:

Reduce emissions from transport movements across Greater Christchurch by 205.1

Transport modelling forecasts MRT to reduce emissions by a further 2% beyond the 2051 do minimum option (PT Futures). In addition, there are several other factors and levers, (e.g., technology changes, human behaviours, and policies) that could lead to greater reductions in enabled emissions. MRT will not only provide a reduction in private vehicle kilometres and increased PT mode share but will also facilitate higher density land use. Intensification in targeted locations can result in people living closer to employment opportunities and other amenities. Hence, a greater proportion of people can live, work, and play in smaller geographical areas, with safe and convenient active and public transport options.

Daily Patronage

With PT Futures (2051 Do minimum) PT Patronage will increase from 51,000 per day in 2021 to 106,000 per day in 2051. MRT will further increase PT patronage to 126,000 per day in 2051 (a 20,000 per day or 19% increase from the 2051 Do Minimum). Annually MRT equates to an increase in PT trips of 5.7 million per year (2051 Option compared to 2051 Do minimum), resulting in the total PT system carrying 36 million passengers per year.



Other technical factors considered:

In making the decision on which option is preferred for MRT, a range of additional factors were considered:

Urban Design and Land Use Integration	The preferred option will enable the GCSP's compact growth scenario which supports intensification along the MRT corridor where growth is already occurring and is aligned with current policy direction and broader connectivity with the wider PT network. It also aligns with the greatest number of key centres and destinations, linking people with where they want to go. This option will deliver high amenity outcomes in comparison to the other options given its 'Place' context while assist with reducing traffic congestion, as the corridor is aligned with current travel demand.
Costs and Value for Money	The preferred option presents the lowest cost of the short-listed option. An investment of $4.0b (LRT) to $3.0b (BRT) and the best value for money of all the options. While initial investment costs in BRT are lower, whole-of-life costs estimated at this early stage of the project seem to be within close range. This indicates that excluding one of these technologies at IBC stage could preclude opportunities that can be best quantified at a DBC stage when uncertainty of the project's features reduces. In particular, ultimate passenger demand and capacity requirements of the system in the long term may favour an LRT option, which may also deliver higher land value uplifts.
Constructability	The construction of the preferred option is considered the least complex option and is limited to 22Km of treatment within existing road corridors. Despite this considerable disruption will occur on this route during construction and will need to be carefully staged and managed. Construction disruption has been identified as a key risk to the programme and controls and mitigations will be considered in the DBC phase.
Operational Implications	The preferred option is expected to strategically integrate well with the wider network, but detailed investigations are required to fully understand any constraint and connections that may need modification (e.g., removal of U-turns, access points, freight services).
Consenting and Environmental Impacts.	An assessment of the complexity and environmental impact of the preferred option was completed. The majority of the route is within existing road reserves and transport corridors. Where measures relate to network improvements (such as frequency improvements / non-infrastructure) or improvements such as the establishment of minor infrastructure upgrades (i.e., new bus stops within the existing transport zone/road reserve), it is anticipated that any associated environmental effects will be minimal, as it is occurring within existing urban transport corridors. It is recommended a full environmental assessment is completed in the early stages of the DBC to confirm any consents or fatal flaws that may be identified as the preferred option is refined.

Urban outcomes

The introduction of MRT provides the opportunity to reshape our key centres and neighbourhoods along the route to maximise the benefits of high frequency travel and create more attractive, safer, vibrant, and accessible centres. A range of interventions will help better connect people to where they want to go. Urban transformation through increasing housing and employment density, and the scale and nature of the urban form in our key centres will be key to the success of MRT, along with reducing sprawl and having boarder wellbeing and resilience benefits.

A greater focus on urban amenity and user experience will make public transport a more attractive option and encourage mode shift to alternative transport options. The city centre streets need to support the highest density of residential and commercial activities at all hours of the day and night. Walking and other active modes will be prioritised with opportunities to improve the look and feel of these areas, so they are attractive and safe. In other centres along the corridor changes to the look and feel of streets will support a range of residential and commercial activities and densities. Wider streets along parts of the corridor, such as the Main North Road will provide the opportunity for further green amenity, dedicated active modes and more generous footpath environments.

The land use scenario proposed for the preferred option seeks to establish a realistic growth scenario in alignment with GCSP and in response to MRT.

Corridor widths

In some cases, our existing road corridors are typically 20m wide, making it challenging to provide dedicated space for all users within the street. The addition of MRT and stations will require between 10 and 15 metres of the existing road width. This limits the remaining space to accommodate other modes of transport.

De-prioritisation of through-traffic within the corridor may be required along with:

- Introduction of 'Transit Malls' at key centres.
- Purchasing land.
- Compromising on the dedicated priority of MRT.
- Grade separation (bridge or tunnel) of MRT from private vehicles.

Strategic land acquisitions may be required to deliver the project outcomes near stations and major intersections. Given the city shaping nature of this project consideration should be given to targeted strategic land purchases to support the intensification anticipated (including changes in housing typologies), the change in the character of the corridor, and in achieving quality streetscape/public realm and specific 'place' outcomes.

Urban outcomes benefits

The introduction of MRT in Christchurch will:

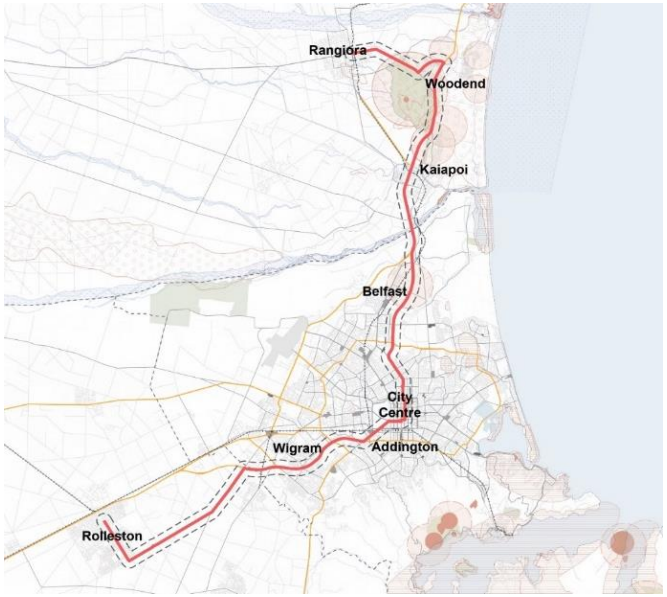
- Support more sustainable urban form outcomes across Greater Christchurch.
- Stimulate investment in higher density, mixed use neighbourhoods along the corridor.
- Encourage mode shift, reducing car journeys.
- Help decarbonise our transport network.
- Connect communities and improve accessibility to employment nodes within the city; and
- Support a range of wider policy initiatives.

Alternative Options and Routes Considered

Why not the motorway corridors?

A motorway option has also been considered along the existing motorways. This option is better for long distance commuters as few stations offers competitive travel time. However, it was discounted as an option for MRT in Greater Christchurch for the following reasons:

- It would have limited opportunity to integrate or stimulate growth and land use activities within Christchurch City.
- The size of our peripheral centres are not large enough, yet, to support the investment in infrastructure to service them with this form of MRT.
- The majority of Greater Christchurch's population is located within a 10 km radius of the city centre. For this option stations could be spaced more the 3 km apart that limits the number of people who live within a walk-up catchment of a station.



Why not the rail corridor?

Heavy rail was considered as a potential MRT option. However, this option was not selected as the preferred approach for the following reasons:

- The existing railway line does not go through the central city. To reduce the need to transfer, we would have to invest significantly to tunnel or trench a railway line into the central city.
- The existing railway line is not as well integrated with existing land uses and growth patterns. Given the location of the existing railway line, accommodating growth, and reshaping our key centres and neighbourhoods near the rail corridor would be necessary to achieve land use integration benefits.
- Analysis showed that heavy rail carried the lowest number of people out of the options investigated.
- The current rail infrastructure is constrained, and significant upgrades would be required to provide for passenger rail services. The cost to unlock the constraints on the network outweigh the benefits.
- While heavy rail has been dismissed as the preferred option for MRT, this does not mean that passenger rail will not happen in the future, potentially in the form of, or in conjunction with, inter-regional rail services which could be integrated with MRT interchanges.

FUNDING REQUIREMENTS

Indicative Cost of the Preferred Option

Option 1a requires a maximal capital investment of $3.0bn to $4.0bn, in real term 2023 qtr1 New Zealand dollars, including all contingencies and funding risk contingencies.

A **likely** delivery cost, **excluding** funding risk contingencies, while very uncertain at this early stage of the project can be estimated between $2.2bn and $3.0bn.

Elements of Capital Costs	$m, real terms, 2023 qtr1	
	BRT Solution	LRT Solution
Property Costs Allowance	119.03	119.03
Project Development	54.94	54.94
Pre-Implementation Phase	104.41	143.14
Implementation Phase	60.04	81.34
Physical Works	1261.80	1731.38
Rolling Stock	87.00	182.80
Contingency	506.16	693.79
Funding Risk Contingency	759.24	1040.68
Total excluding contingencies	1687.21	2312.63
Total with all contingencies equ. P(95)	**$ 2,952.61m ($3.0bn)**	**$ 4,047.10m ($4.0bn)**

Operating phase costs reported include the operational expenditures required for the management, operation (including energy) and maintenance of the fleet of mass transit vehicles, their depots, and facilities, as well as the operation costs of the PT Futures high frequency buses linking the preferred MRT corridor's end to districts.

The table below provides estimates of yearly operational and maintenance costs associated with Option 1a – LRT and option 1a – BRT. These are expressed in yearly averages over the first decade of operation and exclude bus connections to districts.

Elements of Operating Costs	$m, real terms, 2023 qtr1	
	BRT Solution	LRT Solution
Operation costs	34.86	33.94
Maintenance Costs	19.53	17.32
Contingency	5.44	5.13
Funding Risk Contingency	8.16	7.69
Total excluding contingencies	54.39	51.26
Total with all contingencies equ. P(95)	**$ 68.99m p.a.**	**$ 64.07m p.a.**

Funding Option

The Financial Case will be updated at the next phase once the preferred technical option is refined, procurement strategy is developed, level of urban development interventions and Delivery Entity taking the Programme forward is known. Funding for future stages including the DBC phase is not yet confirmed and will require decisions between the WKK partners.

ACHIEVING THE OUTCOME

Given the high benefit cost ratio (up to 2.8) and the city shaping opportunities associated with implementing the preferred MRT system as soon as possible focus should now turn to next steps to support successful delivery.

The next formal stage of works under a business case process is the detailed **business case (DBC)** which builds on this IBC to ensure the project is viable and will meet agreed objectives. This DBC will need to:

- **Develop a Stakeholder Communication and Engagement Strategy -** To date consultation and engagement for MRT has been jointly conducted with the GCSP. As this programme moves forward it is recommended that a stakeholder communication and engagement strategy specific to the MRT is developed and actively implemented. This strategy should incorporate and respond to feedback received from the joint Greater Christchurch Spatial Plan/MRT community engagement survey held from 23 February to 26 March 2023.
- Preliminary results of this latest engagement show, of the 7000 residents surveyed the majority are open to more public transport and higher density housing. 86% agreed population growth should be centred around key centres and public transport routes and 53% supported a proposed MRT system from Belfast to Hornby. Those who disagreed wanted to see the system expanded to other areas including Rolleston, Rangiora, and eastern and southern Christchurch.
- **Enable Urban Outcomes -** Once final outcomes of the GCSP and PC14 are available it is recommended a Land Use Integration Study is completed to investigate a range of regulatory and non-regulatory tools and incentives beyond zoning to drive a change in intensification and land use patterns to support MRT. GCSP and PC14 outcomes may also require modifications to the preferred MRT option as the technical solutions is refined.
- **Assess wider network and PT Futures Programme Integration** - Before commencing the detailed business case process it is recommended a network integration study is undertaken to understand how MRT will integrate with the cycle network, existing roading system (e.g. removing U-turns freight services and access at key locations), neighbourhood plans (Riccarton, Papanui, Merivale), and the city centre/bus exchange and transport plan projects (Kilmore Street). This work would provide valuable insights prior to going into conceptual design phases.
- As early as possible it is recommended partners meet to optimise and align the PT Futures Programme with MRT. This will reduce risks and maximise benefits and value for money across both programmes.
- **Develop a Property Protection and Acquisition Strategy** - Property implications have only been considered at a very high level within the IBC. It is recommended an early piece of work is conducted as soon as possible to understand property requirements and corridor protection that may be required to deliver the MRT programme. This will include strategic land purchase for amenity improvements which would increase clarity of the design philosophy moving into the full DBC stage.

Indicative Programme for Next Stages

An indicative programme has been developed for the Preferred Option which anticipates scoping, procurement, and award of professional services to occur within a 12–18-month period. This is then followed by a 24– 36-month design, consultation, and planning period. From the completion of the DBC, the planning approvals, land acquisition and service led design and construction phases are anticipated to be in place by 2033 to enable urban intensification. It is recommended prior to starting the DBC a review of the indicative programme activities and durations is completed once procurement models and funding arrangements are agreed.

NEXT STEPS

The success of the MRT Project is highly dependent upon its integration with the wider network and the PT Futures Programme. As the PT Futures infrastructure package is being accelerated, it is paramount for MRT not to delay the delivery of the PT Future Programme but to inform its delivery to protect the benefits that can be gained from a coordinated approach.

If the full funding of the next step in the Better Business case process, the Detailed Business Case (DBC), is not available, it is recommended that strategic pieces of work are commenced as soon as possible. These early elements of the DBC scope will mitigate critical risks identified during the IBC phase and will support key decisions in the DBC phase once it starts.

They will include:

- A Stakeholder Communication and Engagement Strategy
- PT Futures Integration Study
- Land Use Integration Study
- Wider Network Integration Study
- Land Use Integration Study – Priority Development Areas (PDA) within Central City, Papanui, Riccarton, and Rolleston.
- Land Use Integration – Hornby Master Planning Exercise
- Property Protection Study
- MRT Service and Technology Integration Study

To enable these early strategic elements to be delivered efficiently, it is recommended upon IBC endorsement, that:

- A comprehensive project delivery plan is developed by Waka Kotahi, including a delivery programme, to co-ordinate the strategic early pieces of work and ensure they are well timed and staged to provide the inputs required by PT Futures and the MRT DBC.
- Procurement processes for the early strategic elements described above are developed and/or they are delivered under current procurement processes and frameworks of leading organisations. It is expected the procurement approach for the delivery of future stages of the programme will continue to be developed through the next phase once there is greater certainty over the Project's technical solution, Delivery Entity, and governance framework, as well as market capability.
- Funding and affordability constraints are addressed to define funding streams between partners and the Central Government. This may rely in whole or in part on NLTF funding and/or other hybrid models.
- Whakawhanake Kāinga Komiti WKK (Project Partners) agree the most appropriate governance model, roles and responsibilities and delivery structures for the future of the project. Given its history to date and its future focus, the WKK is well placed to govern and support the ongoing delivery of this project and ensure its integration with other workstreams, such as the Greater Christchurch Spatial Plan/Future Development Strategy, and the Public Transport Futures Combined Business Case. As the WKK works to advance shared urban growth objectives relating to housing, infrastructure, and land use, it will adopt a flexible approach to ensure that governance structure stays relevant for each stage of the project and consider any applicable national direction on the delivery of MRT projects.

STRATEGIC CASE

WSP | Aurecon | Boffa Miskell |QTP

1 INTRODUCTION

New Zealand is made up of several main centres and Greater Christchurch is the second largest city and one of the fastest growing regions in the country (estimated to grow by an additional 150,000 people by 2051). The value economic output in Greater Christchurch reached around $28.65 billion in 2018, representing 10.1% of New Zealand's nominal gross domestic product. Greater Christchurch's economic success is therefore considered to be not just of critical importance to the Canterbury region and South Island but New Zealand as a whole.

Christchurch's urban growth strategy and development was severely impacted by the damaging earthquakes of 2010 and 2011. As a result, this has impacted its urban form and increased travel times between households and education and employment opportunities.

Greater Christchurch is not letting the earthquakes hold it back however and has a strategy to grow in size and economic performance between now and 2051. In the context of this anticipated growth, the Strategic Plans and Policy for Greater Christchurch (i.e., Our Space and the Canterbury Regional Transport Public Plan), outline aspirations for Christchurch to be a liveable, vibrant, and competitive city. Our Space specifically seeks to establish a network of vibrant and diverse key activity and neighbourhood centres that support the Christchurch Central City, incorporate mixed-use and transport orientated development, support increased density and diversity of housing, and provide access to community facilities. This will help achieve the original Urban Development Strategy vision of a Greater Christchurch with *a "vibrant inner city and suburban centres surrounded by thriving rural communities and towns, connected by efficient and sustainable infrastructure".*

However, Christchurch is currently a highly car dependent city and this is a trend predicted to continue. This continued perpetuation of the motor vehicle brings with it several undesirable outcomes (none of which align with the GPS, the NPS-UD, national and regional climate change and emission aspirations or Christchurch's own urban vision). Such outcomes include continued poor transport choices for residents, a high emissions transport system, poor urban form (low density development and sprawling form) that lacks integration with the transport network and other key opportunities, contributes to increased congestion and a loss of economic performance and will not support critical mass and density to help achieve vibrancy, liveability and ensure Greater Christchurch remains a competitive city of choice.

This perpetuation of the motor vehicle reflects that Christchurch, like many cities, has evolved over many decades in a way that prioritises travel by car with a dispersed urban form of low-density single-family homes and concentric rings of greenfield suburban development located at the periphery of the city. This has gradually added more and more people at greater distances from the central city and other major employment areas. Combined within the land use shifts post-quake this has resulted in a dispersal of jobs and residential areas that further reinforces this car dependence.

Over recent years there have been some improvements in density with localised infill with residential development starting to trend away from low density housing stock in the form of greenfield development towards redevelopment and intensification of existing urban areas as supported by the Christchurch District Plan and Our Space. However, this trend is not occurring fast enough or at a scale that will get Christchurch to where it wants to be.

This transition is not favoured by recent investment. At the same time as a proportionally low spend on public transport (PT), Greater Christchurch has had a comparatively high proportion of per capita spend allocated to Local Roads and State Highways, when compared to both Auckland and Wellington. This is made clear when looking at a direct comparison to Auckland which has per capita spend on Public Transport (PT) of approximately $1275, compared to approximately $225 in Canterbury.

Christchurch aspires to be a low-carbon city with transport choices, good urban amenity, strong economic performance, particularly of the central city. The current transport system, which strongly supports car use, is unlikely to enable Christchurch to achieve this or its objectives for growth and urban form and the GPS/PNS objectives for access and urban integration. As a result, there is a need for something to change and MRT is considered to have a role in this transition.

MRT, which is characterised as a high capacity, high-performance PT capable of moving a large number of people within largely dedicated or exclusive right-of-way routes) typically has the following characteristics:

- Dedicated transport corridors that ensure high-quality, high reliability, premium level transit services
- Provides exclusivity, priority, and segregation of transit vehicles from private vehicles
- Enables and supports transit oriented urban development through land value uplift that can help implement strategic intensification and place-shaping strategies
- Is proven to deliver mode shift from private cars
- Is easy to use, legible and accessible
- Designed to deliver a substantial increase in patronage and
- Providing customers with a premium PT service preferred over the use of the private vehicle

While MRT would be new to the Christchurch landscape, this Strategic Case identifies that there is a role for MRT to address the identified problems. The implementation of MRT can result in a range of potential quantifiable and qualitative benefits relating to a number of characteristics associated with transport, land use, environment, economic and system performance within the city. The extent of the benefits realised will also be dependent on a number contributing factors such as the amenity and quality of residential and mixed-use areas.

This Strategic Case identifies that there is alignment between many issues Christchurch is facing, and the problems identified in this business case. There is a potential role for MRT to address these problems given the typical characteristics of MRT that warrants investigation into options. The next stage is to develop options for MRT in Christchurch's context, confirm priority locations for MRT and test their effectiveness in achieving these outcomes and the efficiency, timing and need for any investment.

2 THE PROBLEMS

Project Partners (representatives from Waka Kotahi, CCC, Environment Canterbury (ECan), SDC, WDC and Christchurch 2050) have identified three problems that MRT has the potential to help resolve. They are:

- **Problem Statement 1:** Current and forecast residential and business settlement patterns perpetuate high car dependence with more people expected to drive long distances, resulting in increased transport costs to users and the wider community, and a continuation of the low mode share for PT (33%).

  Supporting evidence for this Problem Statement shows that:

  - NZ Household Travel Survey data 2014-2018 shows Christchurch has a car mode share of 83% compared to 68% for Wellington;
  - Christchurch residents each spend an average of 221 hours behind the wheel every year compared to 10 hours on PT (a substantially higher vehicle driving time than both Wellington and Auckland);
  - Canterbury has the second highest car ownership levels in the Country;
  - Christchurch has a low public mode share (Wellingtonians take around 2.8 times more PT trips than those in Greater Christchurch);
  - Current land development patterns encourage high levels of private car use and low PT uptake;
  - The Central City is forecast to strengthen its economic role, and have increased employment density;
  - Wellington and Auckland both invested significantly more per capita in PT than Christchurch, at the same time Greater Christchurch has had a comparatively high proportion of per capita spend allocated to Local Roads and State Highways;
  - Christchurch has a high volume of parking supply , especially in the Central City;
  - Christchurch has a relatively flat land value gradient from an approximate 5 km radius from the Central City, meaning developers are less encouraged to build intensively outside of the central core;
  - Future housing growth in greenfield areas including new communities in the northern and southwestern parts of the City (i.e., Halswell), growth in Selwyn at Rolleston and Lincoln and growth in Waimakariri at Rangiora and Kaiapoi will result in increased numbers of people driving longer distances to access opportunities;
  - The average trip length for private vehicles will increase from 8.4 km in 2021 to 8.8 km in 2051. The daily vehicle trips to the central city in 2021 is 174,000. Without any PT intervention the daily demand for vehicle trips to the city centre in 2051 will be 288,000 (I.e., an increase 114,000 or 65%) and
  - PT mode share in 2051 is forecast to equate to just 2.6% of all daily person trips

- **Problem Statement 2:** The PT system is not sufficiently attractive (in terms of travel time, reliability, convenience, comfort, and cost) to encourage its use in preference to private vehicles, resulting in a continuation of the low mode share for PT and higher congestion, which will constrain access to the central city and other key destinations, increase public and private transport costs and restrict economic growth (33%).

  Supporting evidence for this Problem Statement shows that:

  - Greater Christchurch has a low mode share for PT and a continuation of current trends forecasts that this will continue through to 2051;
  - Generalised cost analysis (expressed in minutes) confirms that traffic from all zones to the Hospital Precinct (the zone with the highest employment numbers in 2051) is 16.2 minutes longer for PT than the car;
  - The growth in travel demand to the central city, along with continued perpetuation of high car mode share will result in a growing deficiency of access to the central city;
  - By 2051 the main corridors into the city centre – which are shared by buses and cars are approaching a volume to capacity ratio of 70-%-90% which will result in a limitation on access and if left unchecked will continue to worsen over time;
  - In 2018 28% of all households in Greater Christchurch can reach the Central City during the AM peak by PT and by 2051 this reduces to 23%;
  - The Central City is of regional economic importance with the Central City responsible for 14.8% of Greater Christchurch's GDP and 10.5 % of the Canterbury region's GDP; and
  - By 2051, 27% of all jobs in Greater Christchurch are forecast to be located within the Central City.

- **Problem Statement 3:** As Greater Christchurch grows, a continuation of the current transport system is not sustainable and fails our climate change mitigation and adaption responsibilities. Higher vehicle use will result in higher levels of embedded carbon, higher greenhouse gas and particulate emissions, and poorer public health outcomes (33%).

Supporting evidence for this Problem Statement outlines:

- The New Zealand Government is committed to reducing emissions and preparing for the opportunities and challenges presented by climate change;
- The Government's Zero Carbon Amendment Act 2019 sets a New Zealand target of net zero greenhouse gas emissions by 2050, excluding biogenic methane;
- All Canterbury Councils (except for Kaikōura) and Ngāi Tahu are part of the Regional Climate Change Working Group and both ECan and CCC have declared a climate emergency;
- The Canterbury Regional Public Transport Plan 2018-2028 outlines it wants to improve health and environmental outcomes by delivering a zero emissions fleet by 2028;
- The Christchurch mode shift plan looks to encourage people to use more sustainable modes to support transport's contribution to emissions targets and to manage increasing congestion associated with the additional growth;
- Households in Waimakariri District and Selwyn District are more likely to have a higher car dependency than those within Christchurch City and a greater percentage of households with more than two cars. In addition, CO_2 emissions per commuter increase with distance from the Central City and transport contributes 53% of Christchurch's emissions (higher than the national contribution of 47%);
- Transport is a large contributor of the average New Zealand household carbon footprint (47% of carbon dioxide emissions in 2018 originated from transport (90.7% of which were from road vehicle emissions));
- Emissions contribute to poor air quality and in 2016 Christchurch had the worst air pollution of any of New Zealand's main centres;
- Continued high mode will result in worsening outcomes with a 45% increase forecast in carbon dioxide emissions per year from car and bus travel between 2021 and 2051;
- Transport can impact health (exposure to particulate matter exposure, more sedentary lifestyles, noise, and mental health related to reduced access and social isolation).

This Strategic Case provides evidence and analysis to show that these problems exist, have scale, and sets out a series of benefits that can be achieved by solving these problems. The benefits are:

- Improved choices for access to jobs, education, and social opportunities
- A more liveable, vibrant, healthier city that attracts and retains population
- Improved economic performance and investment in the Central City and priority locations
- Reduced emissions and environmental impacts from the transport system and
- Support for investment in density and quality growth in high priority locations

Resolving these problems is highly aligned to the Government Policy Statement on Transport (the GPS) including two of the Strategic Priorities identified in the GPS:

- To provide people with better transport options and
- Developing a low carbon transport system

In addition, resolving these problems is highly aligned with the Waka Kotahi Arataki Version 2 responses to:

- Improve urban form
- Transform urban mobility and
- Tackle climate change

3 STRATEGIC ALIGNMENT (STRATEGY)

This Indicative Business Case (IBC) for Mass Rapid Transit (MRT) in Greater Christchurch is one of three business cases that together form the Greater Christchurch PT Futures programme.

It comes out of the Greater Christchurch Public Transport Futures programme developed by Waka Kotahi New Zealand Transport Agency (Waka Kotahi), ECan, Waimakariri District Council (WDC), Christchurch City Council (CCC) and Selwyn District Council (SDC) to recognise the growth challenges occurring in Greater Christchurch following the 2010 and 2011 Canterbury earthquakes. The programme sought to proactively respond to the need for a public transport (PT) system with significantly increased patronage and mode share that:

- Delivers high-frequency PT options to existing Key Activity Centres (KACs) and planned growth areas;
- Provides reliable services with journey times that are competitive with private vehicles;
- Is attractive and safe to use for customers;
- Takes people where they want to go, when they want to get there; and
- Provides a catalyst for desired land use development.

This IBC is co-sponsored by Waka Kotahi, ECan, WDC, CCC and SDC. These five organisations are joined by the Ministry of Health and manawhenua to form a partnership approach.

The outcome of this IBC for MRT in Greater Christchurch is a collaborative, innovative and integrated approach to addressing land use and transport challenges in Greater Christchurch that recognises and responds to aspirations for economic, social, environmental, and cultural wellbeing outcomes. This IBC:

- Reconfirms and updates the activity and strategic context for the proposed investment;
- Re-examines and updates the evidence base for the key problems and rationale for investing;
- Demonstrates how the potential benefits of investing may be assessed using SMART (Specific, Measurable, Agreed upon, Realistic and Time-related) transport Key Performance Indicators (KPIs);
- Provides an investment case that is prioritised, affordable, fundable and offers strong value proposition that is aligned with the Government Policy Statement on Land Transport (GPS) 2021/2022-2030/2031 (GPS 2021); and
- Recommends a programme sufficiently robust to deal with the rapidly changing transport environment of Greater Christchurch, including the financial, economic, commercial and management case.

3.1 HISTORY OF WORK TO DATE

There is a long history of projects that have considered the provision of PT in Greater Christchurch with those identified in considered of most relevance to this IBC for MRT.

Table 3-1: Summary of Historic Work Undertaken

Year	Report
2011	Parsons Brinckerhoff: Rapid Transit Economic Benefits – Brief Research Report
2014	Aurecon: Greater Christchurch Northern Rail – Rapid Assessment
2016	Aurecon: High Level Analysis of Designated Rail Land: Future potential use
2017	GHD: Future of Public Transport in Christchurch Strategic Case
2018	Aecom: Future of Public Transport in Greater Christchurch PBC
2020	Greater Christchurch Public Transport Combined Business Case
2021	MRT Interim Report

3.1.1 The Programme Business Case

The PBC prepared in 2018 identified the role that PT has in stimulating regeneration of Greater Christchurch and the benefits that it has for accessibility, reducing the need for more developable land to be set aside for transport corridors and car parks.

The PBC identified several integrated recommendations including:

- Continuous PT priority lanes and Rapid Transit
- State-of-the-art vehicles
- Improved bus stops
- Alignment with spatial planning initiatives
- Higher frequency and extended operating hours
- Improved information provision

The PBC outlines that the improvements need to be undertaken in an integrated manner to achieve increased PT patronage.

The recommended programme from the PBC was staged to develop a flexible network that can respond to changes in travel demand through population growth, settlement patterns, and external factors such as emerging technology or pricing.

Specifically, in relation to Mass Rapid Transit it identifies that "the provision of high-quality PT (particularly rapid transit (RT)) can act as a catalyst for regeneration and result in increased economic activity and economic benefits, transforming interchange area precincts and communities"[1].

The PBC did not specify corridors or modes (mode-agnostic) for MRT in its recommended programme elements but did specify that segregated rapid transit should occur in the highest demand corridors and that coverage should be over two corridors which it refers to as:

- North MRT: (Central City – Belfast) supported by PT priority lanes: (Belfast - Rangiora) and
- Southwest MRT: (Central City – Hornby) supported by PT priority lanes: (Hornby - Rolleston)

It recommended that a business case for MRT should:

- Confirm MRT corridors, develop concept designs and ensure route protection is in place;
- Consider funding models and revenue opportunities; and
- Determine timing and methodology for MRT implementation – whether demand-based evolution from PT lanes, or part of a wider strategy to lead development and regeneration.

3.1.2 Greater Christchurch Public Transport Futures Programme

The Mass Rapid Transit (MRT) IBC is one of three business cases that together form the Greater Christchurch PT Futures programme. The PBC recommended that a core route and network optimisation business case proceed first as a Single Staged Business Case with the findings of this work influencing the final scale, scope, timing and point of entry for the other work streams (with Rapid Transit identified).

To effectively plan bus priority and complementary interventions, coupled with large scale interventions such as rapid transit, the PT Futures Investment Story identified that there were three key programme implementation packages that should be developed as interrelated business cases (Figure 3-1).

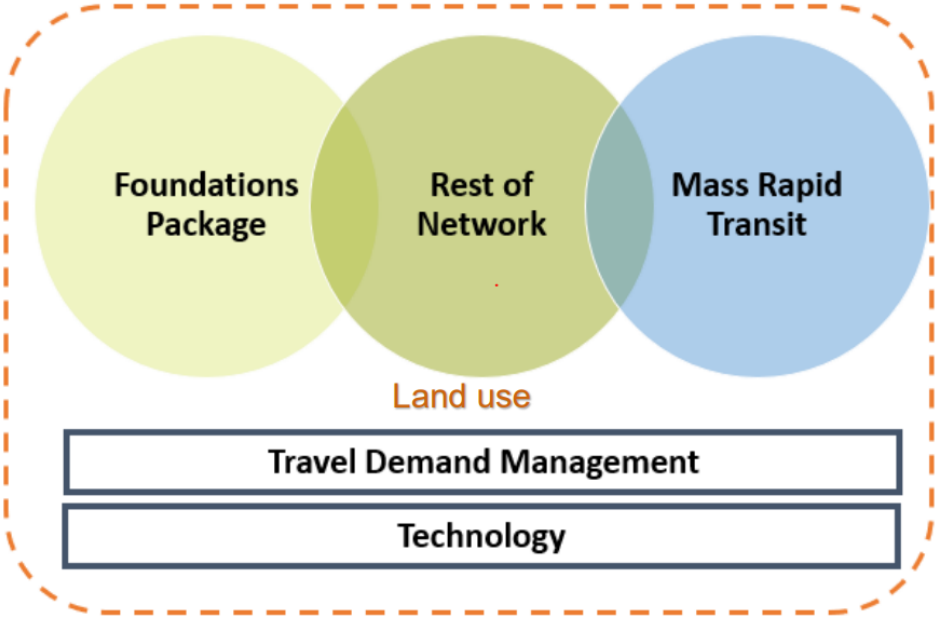


Figure 3-1: The PT Futures Programme Implementation[2]

[1] p. ii (2018) Future of Public Transport in Greater Christchurch: Programme Business Case

[2] Figure 10, p. 17. (2018) Greater Christchurch Public Transport: A Case for Investment – Summary of Programme Business Case

3.1.2.1 Greater Christchurch Public Transport Combined Business Case

The Greater Christchurch Public Transport Combined Business Case (the Combined Business Case) combined the Foundations and Rest of Network packages outlined in Figure 3-1. This was completed and endorsed in December 2020, with the recommended option providing for the following enhancements being:

- More services connecting residents more directly to social and economic opportunities;
- Provision of approximately 100 more buses running more frequently across the network (in peaks and off-peak periods) providing users with enough available seats as well as improved scheduled hours (early and late in the day);
- 229 more bus shelters providing users with better waiting facilities;
- 190 more real time display units across the network, providing users with accurate information on bus timetables and arrival times, as well as information about delays;
- 44 RTI screens within key centres (i.e., shopping malls, hospital, libraries, and airport) providing users with information on bus arrivals and departures screens;
- On-board audio-visual announcements providing information on upcoming stops and transfers;
- Approximately 22 kilometres of bus lanes making buses more reliable and faster;
- Priority measures for buses at key intersections across the city making journeys more reliable;
- Park and ride facilities at larger towns making it easier to access the bus network;
- Secure bike parking at key stops providing more options with a greater catchment to frequent bus route; and
- Enhanced on-board experience through audio announcements on upcoming stops as well as opportunities to access / transfer at these stops.

The recommended programme will be staged to ensure optimal value for money. The provision of additional service is expected to increase annual PT trips in Greater Christchurch by 3.5 million, growing at a 4.9% compound average rate from 2022 to 2028. This represents a 21% increase from 2028 Do-Minimum and a 44% increase from 2018.

The Combined Business Case is oriented toward short to medium term PT improvements (to 2038) to the existing core bus routes, additional new secondary routes, and the overall bus network. This Indicative Business Case (IBC) for MRT[3] in Greater Christchurch has a longer-term view (to 2051) toward identifying a preferred MRT corridor to serve and potentially act as a catalyst for anticipated land use and urban growth within Christchurch.

3.1.3 Point of Entry

The PBC recommended the Point of Entry for an MRT Business Case to occur following the Combined Business Case given the potential this has to influence the scope of a business case for MRT. As the need to investigate MRT was established in the PBC, the Point of Entry is defined as an Indicative Business Case.

The PBC specifically recommended:

> *five work streams are taken forward as business cases one being enhanced business as usual PT operations. The business cases and their suggested priorities are:*
> *1. Core routes and network optimisation*
> *2. Enhanced Business As Usual*
> *3. Bus Priority*
> *4. Demand Management*
> *5. RT Corridors.*[4]

It outlined that the focus of the Rapid Transit Corridor business case should:

- consider segregated PT infrastructure;
- confirm Rapid Transit corridors, develop concept designs, and ensure route protection is in place;
- consider funding models and revenue opportunities; and
- determine timing and methodology for rapid transit implementation – whether demand-based evolution from PT lanes, or part of a wider strategy to lead development and regeneration.

[3] Waka Kotahi define rapid transit in the Government Policy Statement on Land Transport (GPS) (p.59 of the 2018 GPS) as public transport capable of moving a large number of people with largely dedicated or exclusive right-of-way routes. Common characteristics of rapid transit include frequent services, fast loading and unloading capability.

[4] Future of Public Transport in Greater Christchurch, PBC, July 2018, p. 64-65

Given the Combined Business Case has not defined Mass Rapid Transit routes with certainty the Point of Entry for this business case is the Indicative Business Case stage (Figure 3-2).

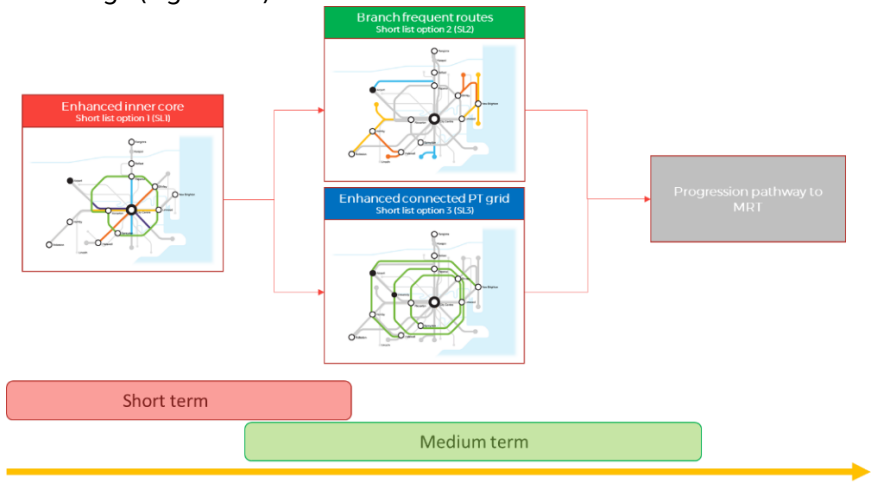


Figure 3-2: Combined Business Case relationship to MRT

3.1.3.1 MRT IBC Interim Report

Outcomes and Objectives were identified for an MRT scheme in Greater Christchurch through an ILM process undertaken in 2020, described in greater detail under the Investment Logic Map (ILM) of this Strategic Case.

The IBC was then placed on hold whilst further work was undertaken on the Greater Christchurch Spatial Plan work-programme (Section 3.5.6). In 2021 an Interim Report was completed to help decision makers understand the implications of the previously agreed MRT objectives and the likelihood of achieving them through investment in a MRT scheme.

The MRT Interim Report explored three rapid transit scenarios within the northern and south-western corridors of the City (Figure 3-3) that balanced access to the rapid transit system against the competitiveness with private vehicles. These scenarios were:

- **Scenario 1:** A heavy rail scenario – with limited stop opportunities but competitive travel times;
- **Scenario 2:** A street running scenario with limited stops focused on competitive travel times that generally follows the motorway corridors; and
- **Scenario 3:** A street running scenario (corridor focused) with more frequent stops focused on placing more households within the walk-up catchment, at the expense of travel time competitiveness.

Figure 3-3: Three Mass Rapid Transit scenarios previously investigated

The report concluded that the two street running scenarios (Scenarios 2 and 3) generated similar ridership, attracting approximately 70% more ridership than the heavy rail corridor (Scenario 1) given the frequency of stops and better integration with land use and key destinations.

The corridor focused street running scenario (Scenario 3) strengthens all day access to existing centres (including Hornby, Riccarton, and Papanui) whereas the limited stop scenario (Scenario 2) which follows the motorway corridors, bypasses some of these centres along with other stop locations that align with residential catchments. Scenario 3 also had the highest forecast use in PT ridership (Figure 3-4) and the most alternative routes through the central city and suburbs.

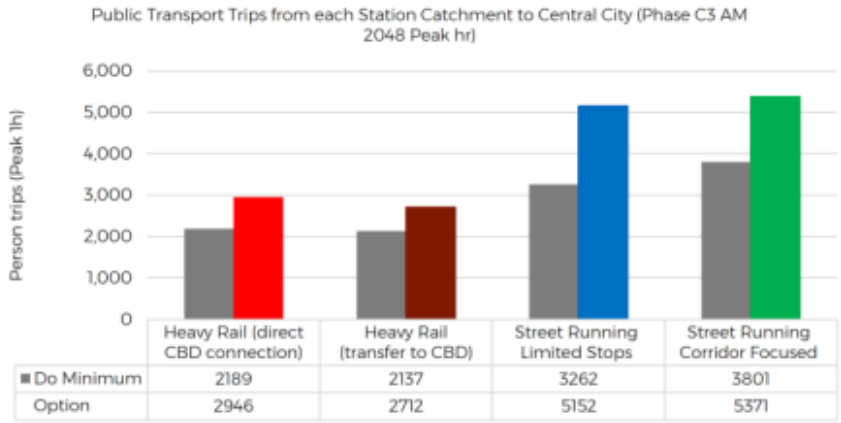


Figure 3-4: Total PT trips from station catchment areas to central city

The interim work findings indicated that the street running corridor scenario would have the highest forecast use in PT ridership, directly connecting existing Key Activity Centres (Riccarton Road and Papanui Road). Hence, while the IBC will test the value proposition of all three scenarios, the initial focus (Stage 1) of the IBC is further work surrounding the street running corridor scenario (Scenario 3) (refer to Part B).

3.2 CHRISTCHURCH'S STRATEGIC IMPORTANCE

Christchurch is of significant importance to New Zealand, being the country's second largest city and one of the fastest growing regions (estimated to grow by an additional 150,000 by 2051 (as compared to 2021). In addition, Christchurch is the largest city in the South Island and considered the gateway to the South Island.

Despite suffering from a series of damaging earthquakes in 2010 and 2011, the value of the economic output of Greater Christchurch reached around $28.65 billion in 2018, presenting 10.1% of New Zealand's nominal gross domestic product. Greater Christchurch's economic success is, therefore, considered to be not just of critical importance to the Canterbury region and South Island but New Zealand as a whole.

3.3 GEOGRAPHIC CONTEXT

The study area for this IBC is defined as Greater Christchurch, which includes and surrounds Christchurch City. As illustrated in Figure 3-5, Greater Christchurch extends from Rangiora in the north and the Selwyn River in the south, and from Lyttelton in the east to Burnham in the west.

The study area includes the existing overall bus network (including those changes proposed by the Combined Business Case), the existing rail corridors (comprising the Main North Line (Picton to Christchurch) and the Main South Line (Lyttelton and Invercargill)) along with state highways and local road corridors in Greater Christchurch which currently, or in the future, will carry Metro PT bus services, as well as the residential, commercial, rural, industrial and open space land use areas in Greater Christchurch.

The Greater Christchurch area is characterised by a large expanse of flat land to the west of the City which has enabled Christchurch City's urban area to spread. Despite this, a large portion of the population resides within 10km of the Central City, with growing outer areas dispersed approximately 18km and 24km from the Central City (Figure 3-6). When compared to Auckland and Wellington, this results in a much greater percentage of the population being located within a 10km radius of the central city, likely due to less geographical constraints for development.

Within the Greater Christchurch study area there are two corridors of particular focus for MRT following the PBC. These are:

- Northern Corridor (loosely travelling between Rangiora and the Christchurch Central City through northern suburbs such as Papanui to Belfast)
- South-Western Corridor (loosely travelling between Rolleston and Central City via suburbs in the south-west of the city such as Hornby, Addington, Riccarton, Ilam, Sockburn and Wigram)

These two corridors are described as 'minimum regret' options for MRT in the PT Futures Investment Story Public Transport, given centrally located rapid transit would provide benefit whether or not the city intensifies more or undertakes more greenfield development.

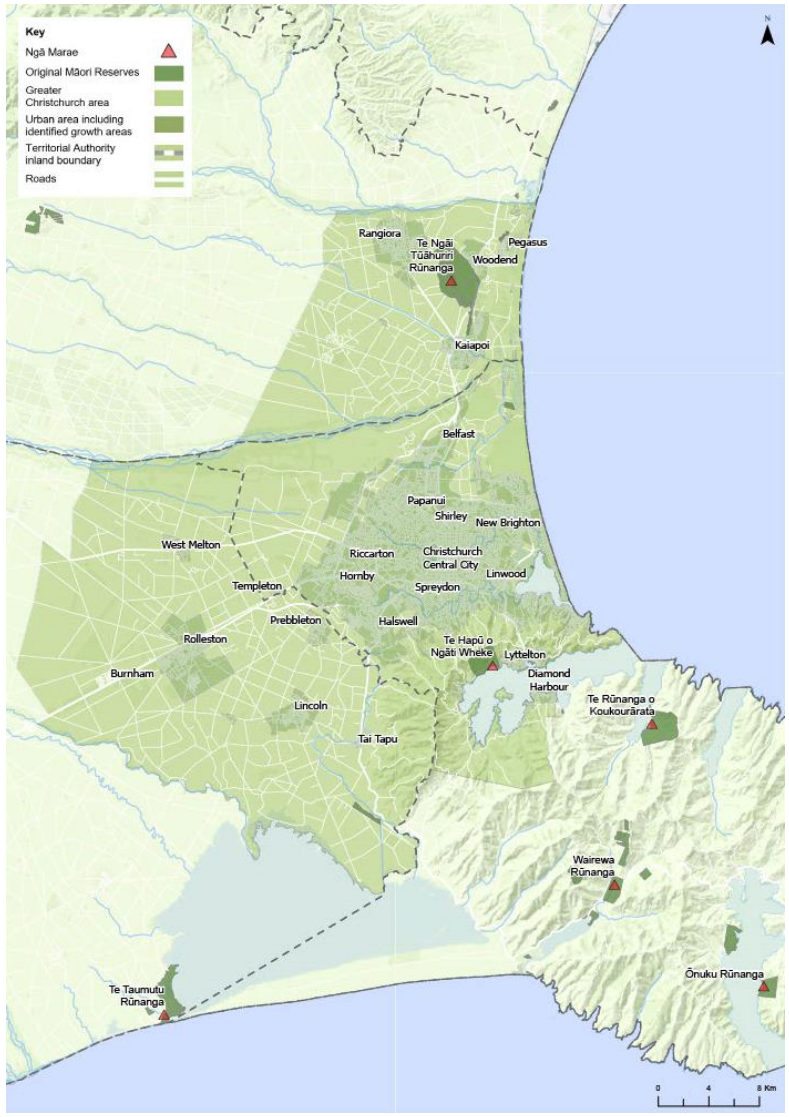


Figure 3-5: Greater Christchurch Extent

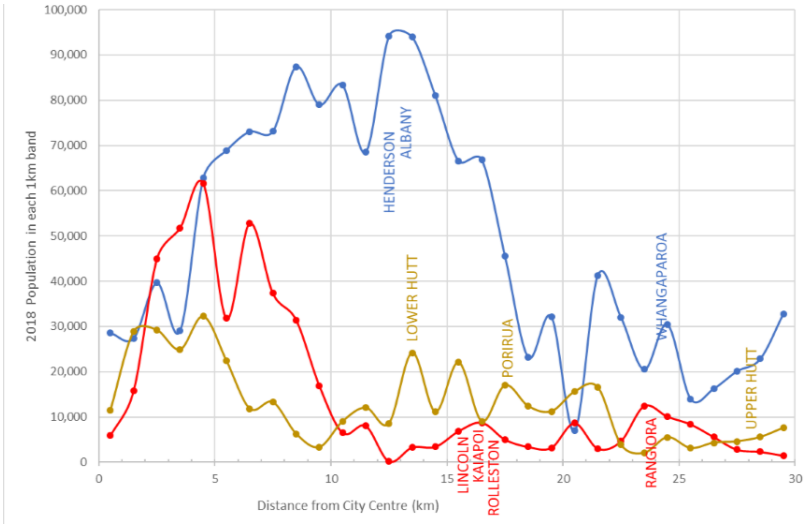


Figure 3-6: Distance of Population from City Centre - 2018 Census[5]

3.4 GOVERNANCE CONTEXT

This IBC is co-sponsored by Waka Kotahi, ECan, WDC, CCC and SDC. Development of this IBC is under the overarching strategic direction of the Canterbury Regional Land Transport Plan (CRLTP) 2021-2031 and Canterbury Public Transport Plan (CPTP) 2018-2028, with strong links to the GPS 2021.

This section explains how the scope of the proposed investment in MRT in Greater Christchurch aligns with the existing strategies of the investment partner organisations.

3.4.1 Organisational Overview

Waka Kotahi, ECan, WDC, CCC and SDC are together responsible for the planning, development, operation, and maintenance of the road transport network for Greater Christchurch. In addition, they are responsible for informing land use patterns through the development and implementation of the Urban Development Strategy, Our Space 2018-2048, the Regional Policy Statement and District Plans. Combined, the five organisations form part of the Greater Christchurch Partnership, which was set up to demonstrate cross-agency collaboration and leadership to plan and manage urban development across Greater Christchurch. They are joined by the Ministry of Health and manawhenua.

[5] Stats NZ, WSP Analysis

3.4.1.1 Waka Kotahi NZ Transport Agency

Waka Kotahi is responsible for managing, operating, planning for and improving the state highway network and delivery of PT across Aotearoa, New Zealand.

Waka Kotahi is a key investor in the transport system through funding contributions to transport projects, PT delivery, planning policies and programmes undertaken by ECan, CCC, SDC and WDC.

The strategic priorities for Waka Kotahi focus on creating a safer, more resilient, and sustainable transport system that improves access to social and economic opportunities and improves the wellbeing of all New Zealanders. Its PT function is integral to these strategic priorities and future outcomes.

As an investment partner to this combined business case, Waka Kotahi is fundamentally concerned with directing investment in PT to provide alternatives to cars, improve access to economic activities, ease congestion and help unlock the potential of our cities, as set out in the GPS 2021. Effective investment is needed to help solve the problems identified in the strategic case and move towards a One Network approach integrating land use and transport and achieving more value from PT investment.

3.4.1.2 Environment Canterbury

ECan is the lead agency responsible for advocating for Canterbury's regional transport needs nationally and planning and operating urban PT services in Greater Christchurch (Metro). Collaboratively ECan works with city and district councils to provide PT infrastructure to support its services. ECan has a pivotal role in driving and managing the future form and function of PT to improve patronage, coverage, efficiency, and perception.

ECan is also responsible for the Regional Policy Statement which identifies urban housing development areas in Rolleston, Rangiora and Kaiapoi and associated policy provisions that direct District Plans and drive land use development patterns.

3.4.1.3 Christchurch City Council

CCC is responsible for managing the local road network in Christchurch which forms, with the state highway, the land transport network in Christchurch. They are also responsible for PT infrastructure and for development and implementation of the Christchurch District Plan which restricts and/or enables land use within Christchurch City.

Investment by the CCC will be critical to provide the necessary improvements to the local road network, network management, parking provisions and PT infrastructure, and to ensure the land use planning framework is supportive of anticipated land use outcomes sought.

3.4.1.4 Waimakariri District Council

WDC is the asset owner and responsible for managing the local transport system, including PT facilities and infrastructure in the Waimakariri District. The Waimakariri District generates a large number of trips to Christchurch City from the north, and the WDC will be influential in ensuring a collaborative approach to the delivery of PT infrastructure and Greater Christchurch transport network efficiency.

WDC are also responsible for the development and implementation of the Waimakariri District Plan which restricts and/or enables land use within the Waimakariri District.

3.4.1.5 Selwyn District Council

SDC is the asset owner and responsible for managing the local transport system, including PT facilities and infrastructure in Selwyn District. The Selwyn District generates several trips to Christchurch City from the south, and SDC will be influential in ensuring a collaborative approach to the delivery of PT infrastructure and Greater Christchurch transport network efficiency.

SDC are also responsible for the development and implementation of the Selwyn District Plan which restricts and/or enables land use within the Selwyn District.

3.4.1.6 Te Tiriti o Waitangi

The contemporary relationship between the Crown and Ngāi Tahu whānui is defined by three core documents; Te Tiriti o Waitangi, the Ngāi Tahu Deed of Settlement 1997, and the Ngāi Tahu Claims Settlement Act 1998 ("NTCSA"). These documents form an important legal basis for the relationship between the Crown, its agencies (which includes the Waka Kotahi, Environment Canterbury, Christchurch City Council, Waimakariri District Council and Selwyn District Council) and Papatipu Rūnanga, entrenching the principles of Treaty partnership and obligations to work together. Papatipu Rūnanga expect that Waka Kotahi, the Councils, and other partners in the both the Greater Christchurch Partnership and the Whakawhanake Kāinga Committee will honour Te Tiriti o Waitangi and the principles upon which it is founded, including principles of Partnership and recognition of their rangatiratanga status.

Te Rūnanga o Ngāi Tahu (Declaration of Membership) Order 2001 establishes individual Papatipu Rūnanga as the entities with responsibility for resources and protection of tribal interests within their respective takiwā. Greater Christchurch traverses the takiwā of three Papatipu Rūnanga to varying extent. The significant majority of Greater Christchurch's geographic area falls within the takiwā of Te Ngāi Tūāhuriri Rūnanga. The takiwā of Te Hapū o Ngāti Wheke

Rūnanga centres on Rāpaki and the catchment of Whakaraupō (Lyttelton Harbour); while the takiwā of Taumutu Rūnanga is to the south of Greater Christchurch and centred on the waters of Te Waihora and its adjoining lands.

Waka Kotahi has commissioned a report from Mahaanui Kurataiao Limited, on behalf of manawhenua, to inform the Indicative Business Case. This report is attached as Appendix B – Report for Mass Rapid Transit Strategic Business Case and sets out the position of manawhenua in respect of the proposal for MRT.

3.5 LAND USE CONTEXT

3.5.1 History of Occupation and Cultural Landscapes

In 1848, the Crown acquired some 20,000,000 acres of land from Ngāi Tahu through the Canterbury Deed of Purchase. The terms agreed as part of the land purchase included the setting aside of kāinga nohoanga (translated as places of residence) as self-governing reserves. With each reserve came the rights to mahinga kai; to develop land (including subdivision) and community facilities; to develop a sustainable and growing economic base to sustain future generations; and an enduring timeframe – meaning that the reserves would belong to the people and their descendants without impediment

The Crown's agreement to the development and governance of the reserves has never been fulfilled and multiple statutes have removed these rights over time. The most significant Māori Reserve in terms of size and its location adjacent to potential growth areas in Greater Christchurch is Māori Reserve 873 (MR873) located at Tuahiwi. The Proposed Waimakariri District Plan has rezoned the full extent of the original Reserve as Kainga Nohonanga – enabling up to 7 dwellings per property, along with commercial, educational, social, cultural, and recreational activities. The future development of the Reserve is now limited by infrastructure including transport infrastructure and connectivity.

This history is of direct relevance to this Business Case; MRT has the potential to adversely impact Maori Land through the taking of land for a wider road corridor; whilst enhanced public transport services could potentially provide benefits with improved public transport connections. A more detailed narrative of the history of Ngāi Tahu whānui within the extent of Greater Christchurch is provided in Appendix B – Report for Mass Rapid Transit Strategic Business Case.

Greater Christchurch is part of a wider cultural landscape that holds considerable cultural and spiritual significance for manawhenua, reflecting the occupation of this location for over 1200 years. Accordingly, there are many sites and areas of specific cultural significance including wāhi tapu, wāhi taonga, tūranga tūpuna and ngā wai (important rivers). Figure 3-8 shows the sites and areas of cultural significance within the Greater Christchurch area as identified in the respective district plans. From a manawhenua perspective it is a priority for new urban development, including transport infrastructure to avoid wāhi tapu and wāhi taonga in particular, along with modification or disturbance to waterways.

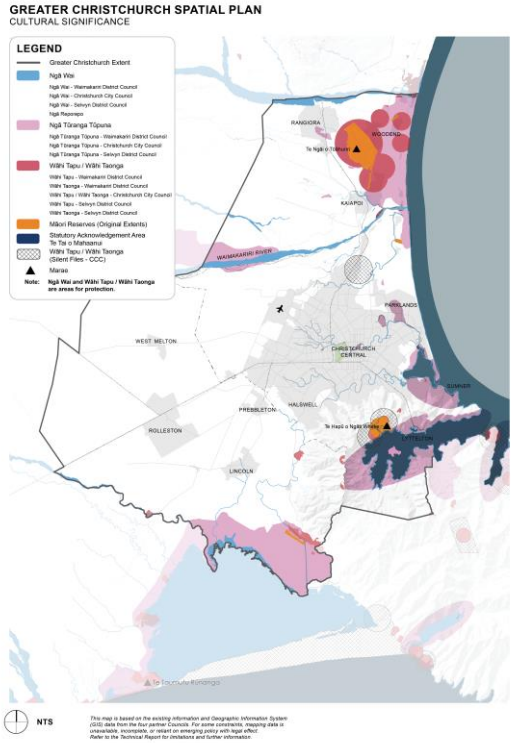


Figure 3-7: Sites and Areas of Cultural Significance within the Greater Christchurch Area (Source: Greater Christchurch Spatial Plan)

3.5.2 Earthquakes

In 2010 and 2011 Greater Christchurch experienced a series of earthquakes which resulted in widespread earthquake damage. It was estimated that some 7,800 residential dwellings were placed in the residential Red Zone (located on land deemed so badly damaged it was unlikely it could be built on in the short to medium term) and another 9,000 (excluding the Red Zone) were made uninhabitable[6]. Further the Central City was closed in response of the earthquakes due to the level of damage sustained (984 buildings were either partly or fully demolished within the four avenues of the central city by September 2013[7]).

The effects of the earthquakes on land use patterns in Greater Christchurch was unprecedented and resulted in changes to the transport network and travel patterns. The earthquakes gave rise to many temporary and some permanent land use changes including a number of housing areas in the Central City,

[6] https://greaterchristchurch.org.nz/assets/Documents/greaterchristchurch/13-Context-paper.pdf

[7] https://ccc.govt.nz/assets/Documents/Culture-Community/Stats-and-facts-on-Christchurch/CommunityProfile-HagleyFerrymead-ChristchurchCentral.pdf

eastern areas of the city and the Kaiapoi area needing to relocate to new areas of the city (typically outer or western suburbs that suffered less damage and parts of the Selwyn and Waimakariri Districts). Large numbers of businesses relocated from the Central City to the suburbs (many to the west of the city in areas such as Addington and Riccarton). Before the earthquakes the Christchurch Central City was home to approximately 6,000 businesses, employing 50,000 people[8].

By February 2012, the Central City had experienced a 38.4 percent decrease in the number of employees at the same time the year before, whereas employees in the western suburbs of Christchurch rose by 15.9% during the same period[9].

Middleton (located near Riccarton) overtook Christchurch Central as the largest centre of employment in the 2013 census with over 7,500 people giving a workplace address there, compared with just over 2,000 in Christchurch Central. This dispersed pattern of employment can still be seen now, however, there has been strong growth in the number of people working in the centre of the city. In 2021, 45,124[10] people worked in the city centre, up from 14,946 people in 2013 (an approximate 200% increase)[11].

This land use change resulted in shifts to trip origins and destinations and resulted in some dramatic swings in traffic flows, with eastern parts of the city and the Central City typically seeing less traffic, while western parts of the city and the outskirts experienced greater flows (Figure 3-8).

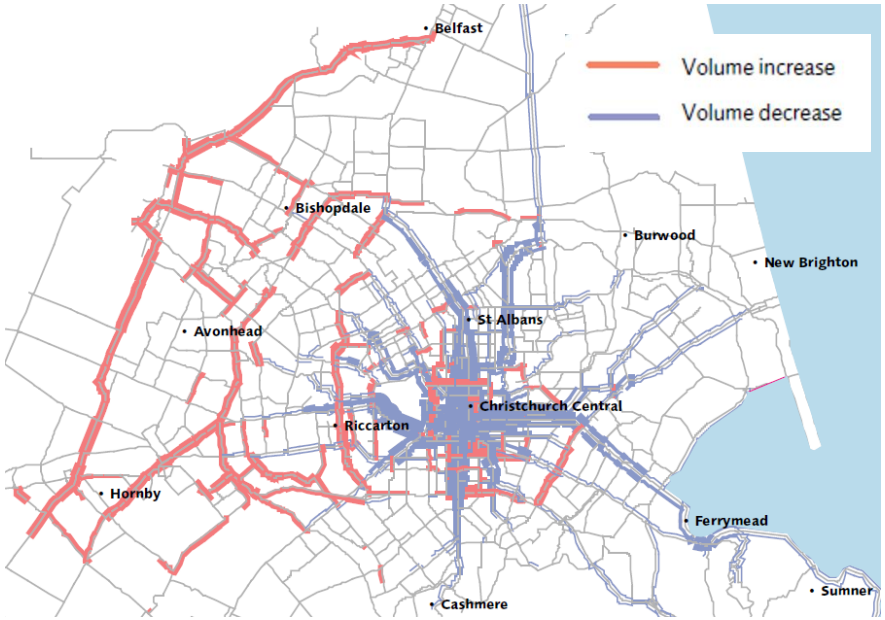


Figure 3-8: Change in Traffic Volume in April 2011 compared with pre-earthquake volumes[12]

Following the earthquakes, some of fastest growing areas of Greater Christchurch are located more than 30 minutes from the city centre (i.e., West Melton, Pegasus, Rolleston, Rangiora and Kaiapoi). Together, since the earthquakes the supporting growth areas of Christchurch have grown at 5.7 per cent per year, almost three times that of other New Zealand growth cities[13].

3.5.3 Land Use Patterns

A large portion of the Greater Christchurch population resides within 10km of the Central City, with growing outer areas dispersed approximately 18km and 24km from the Central City (refer Figure 3-9). When compared to Auckland and Wellington, a much greater percentage of the Greater Christchurch population is located within a 10km radius of the central city (Figure 3-6).

[8] https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10836424
[9] archive.stats.govt.nz/browse_for_stats/businesses/business_characteristics/BusinessDemographyStatistics_HOTPFeb12/Commentary.aspx#gsc.tab=0
[10] CTM Sector 2021 data
[11] https://www.stats.govt.nz/news/newly-released-census-data-shows-christchurch-cbd-bouncing-back
[12] New Zealand Government (2011). Connecting New Zealand: A summary of the government's policy direction for transport. September 2011, p.23
[13] https://www.pwc.co.nz/publications/2019/citiesinstitute/cities-urban-competitivesness-christchurch.pdf

While this trend is anticipated to continue as the city grows in population (Figure 3-9).

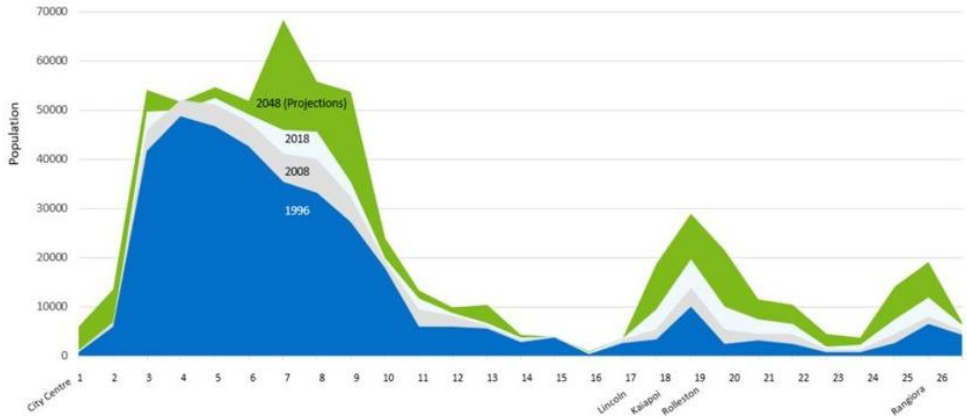


Figure 3-9: Christchurch Population Growth and Distance from the Central City[14]

Within the boundaries of Christchurch City, the proportion of infill development occurring as new development dropped to just above 30% following the Canterbury earthquakes. This is far below the infill development targets outlined in land use policy documentation for Greater Christchurch (Section 3.5.5). However, in recent years that trend has shifted with 60% of net new residential building consents in Christchurch City in 2019/2020 being for Intensification / Infill (representing the highest proportion of infill occurring since the earthquakes). In 2019 a total of 1,447 net new residential units obtained building consent as infill development, the highest number of infill dwellings consented in a single year to date (Figure 3-10).

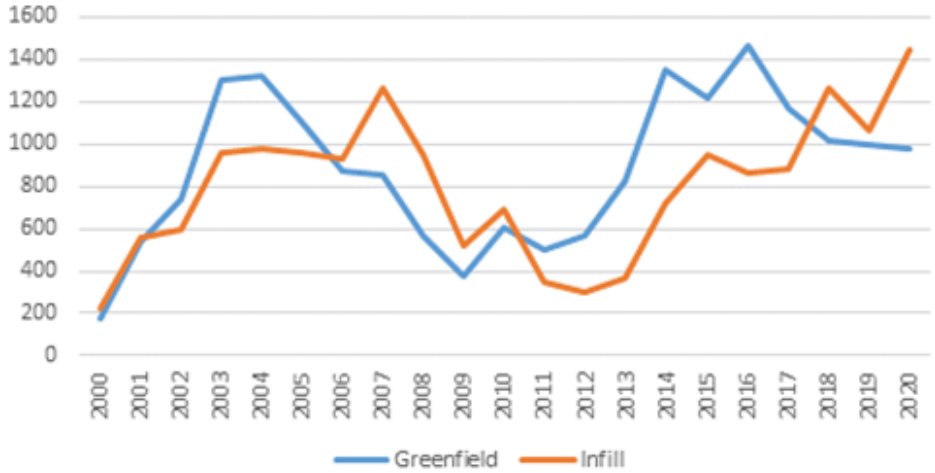


Figure 3-10: Greenfield vs Infill Development - Number of Residential Building Consents in Christchurch City[15]

In terms of recent building consent locations in Christchurch City, the top 30 areas in the 2019/20 financial year are provided in Figure 3-11 and this shows that of the top five areas:

- two are within the Central City (Cathedral Square and Avon Loop),
- two are greenfield development areas (Preston's and Halswell West) and
- one is on the central city fringe (Sydenham).

[14] Figure 2, p. 4. (2018) Greater Christchurch Public Transport: A Case for Investment – Summary of Programme Business Case

[15] Christchurch City Council Residential Building Consents 2000-2020

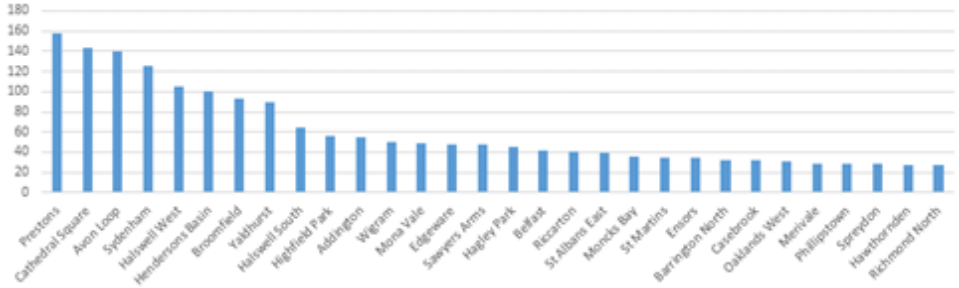


Figure 3-11: Christchurch City Top New Housing Locations 2019/2020[16]

3.5.4 Historic Land Use Policy Influence

The overarching Urban Development Strategy for Greater Christchurch is outlined within Our Space 2018-2048: Greater Christchurch Settlement Pattern Update (Our Space). This Strategy was developed by the Greater Christchurch Partnership and builds on the work of the Urban Development Strategy 2007 (UDS) and the Land Use Recovery Plan 2013 prepared under the Canterbury Earthquake Recovery Act 2011. Land use patterns in Christchurch are quite ingrained, with most development occurring to the north and west of the city (with physical constraints being the Port Hills and the technical land development challenges to the east).

The UDS 2007 was created following a three year-long consultation and development process that sought to provide a guiding vision for development in Greater Christchurch. The UDS sets a vision for Greater Christchurch to have a "vibrant inner city and suburban centres surrounded by thriving rural communities and towns, connected by efficient and sustainable infrastructure". It outlined an urban limit and identified greenfield development areas, and an overall proposed settlement pattern where growth in Greater Christchurch to 2041 would be directed to 71% within Christchurch City, 16% in Selwyn District and 13% in Waimakariri District.

The Land Use Recovery Plan 2013 (LURP) was developed in response to the land use change following the earthquakes and identified several Greenfield Priority Areas agreed by CCC, WDC and SDC for implementation through district planning processes. Under the LURP, significant residential greenfield zones were planned to the south of Christchurch City in Rolleston and Lincoln, to the north of Christchurch City in Kaiapoi and Rangiora and within Christchurch at Hornby, Halswell, Casebrook, and Belfast/Redwood. Consequently, post-earthquake development resulted in growth around the urban fringes of the City and the larger towns in Selwyn and Waimakariri at a faster rate than anticipated by the UDS. It has resulted in additional demand on the existing road network along the western corridor, as well as on the northern and southern approaches to the Central City.

Our Space seeks the same development principles, themes, and strategic goals for Greater Christchurch, including:

- Clear boundaries for urban development that are defined and maintained with the existing urban area consolidated through the redevelopment and intensification of existing urban areas; and
- New urban development is well integrated with existing urban areas.

It also acknowledges the following key growth issues for Greater Christchurch:

- Delivering new dwellings through redevelopment and intensification;
- Meeting housing needs and preferences for current and future residents;
- Recognising post-earthquake trends and anticipating future drivers;
- Integrating land use and transport planning to shape desired urban form; and
- Living with and mitigating climate change impacts.

3.5.5 Land Use Policy and Future Land Use

3.5.5.1 National Direction

Resource Management Act Reform

In February 2021, the Government announced it would repeal the resource management act (RMA) and enact a new legislation based on the recommendations of the Resource Management Review Panel. The proposed new legislation includes three proposed new pieces of legislation to replace the RMA. The proposed Natural and Built Environment Act (NBEA) will be the primary piece of legislation in the reform package supported by the Strategic Planning Act (SPA) and Climate Adaptation Act. An exposure draft of the NBEA was released June 2021.

The fully developed NBEA bill and the SPA Bill were introduced to the house on 15 November 2022. Currently, a final round of public feedback is being undertaken with both bills with the select committee. The Climate Adaptation Bill is expected to follow in 2023. Government intends to have both bills enacted before the end of this parliamentary term.

[16] CCC Building Consent Figures 2019/2020 Financial Year

National Policy Statement on Urban Development 2020

Objective 1 of the NPS-UD sets out: "New Zealand has well-functioning urban environments that enable all people and communities to provide for their social, economic, and cultural wellbeing, and for their health and safety, now and into the future."

In contributing to well-functioning urban environments, Policy 1 requires planning decisions to contribute to a variety of homes to meet the needs of different households including enabling Māori to express their cultural traditions and norms. Planning decisions are also required to contribute to the differing needs of the business sector, provide good accessibility for all people including by way of public and active modes and also support reductions in greenhouse gas emissions and resilience to climate change.

Policies 3 and 4 are particularly relevant to MRT setting out the urban environment outcomes in relation to Tier 1 councils, with specific considerations for the scale and density of development in relation to existing and planned rapid transit. This is explored in more detail throughout this report.

The National Policy Statement on Urban Development 2020 (NPS-UD) provides direction to local authorities to remove all minimum carparking standards from District Plans. It also requires that all Tier 1 urban environments (such as Greater Christchurch – CCC, SDC and WDC) enable minimum 6 storey building heights in metropolitan centres[17] and within a walkable catchment of existing and planned rapid transit stops. Modifications are required to the existing District Plan's to give effect to this with Tier 1 councils required to notify plan changes implementing intensification policies no later than 20 August 2022.

Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021

The Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 (EHS Act 2021) was introduced in 2021 to support greater housing density. Ultimately it seeks to enable three homes of three storeys in height to be built on most residential sites in Tier 1 centres (i.e., the Greater Christchurch area) without the need for resource consent. The Tier 1 District Councils (CCC, SDC and WDC) are required to update their District Plans to give effect to this by August 2022. This will likely lead to a significant increase in zoned housing capacity.

SDC notified their plan change 20 August 2022 and WDC notified their plan change 13 August 2022. CCC failed to notify their plan change within the EHS Act 2021 timeframes, after councillors voted to not to notify the proposed change[18] in September 2022. However, the plan change was since redeveloped, and CCC will notify the alternative Draft Housing and Business Choice Plan Change (PC14) on 17 March 2023.

3.5.5.2 Regional Direction

Our Space

Greater Christchurch's 2021 population of 499,000 is projected to grow to over 655,000 by 2051. Planners have identified proposed locations for future development areas in Christchurch to 2051 (Figure 3-12), seeking to consolidate growth in and around Christchurch City and larger towns in Selwyn and Waimakariri. As such 75% of Greater Christchurch's housing growth through to 2051 is to be met within Christchurch City with the remaining 14% in Selwyn and 11% in Waimakariri.

Our Space proposes that future housing demand will be met by redevelopment of existing urban areas of Christchurch City (45%) and by existing greenfield areas within Greater Christchurch (36%). Just 19% of future housing demand will be met by new greenfield and redevelopment areas in Selwyn and Waimakariri. It identifies the need for additional land in Rolleston, Rangiora and Kaiapoi to meet medium term capacity needs. It is anticipated that the density of future developments in these areas will achieve a minimum net density of 12 households per hectare.

[17] Metropolitan Centres are not defined in the NPS-UD. However **rapid transit service** is defined as any existing or planned frequent, quick, reliable and high-capacity public transport service that operates on a permanent route (road or rail) that is largely separated from other traffic. A **rapid transit stop** means a place where people can enter or exit a rapid transit service, whether existing or planned.

[18] https://newsline.ccc.govt.nz/news/story/christchurch-says-no-to-governments-intensification-direction

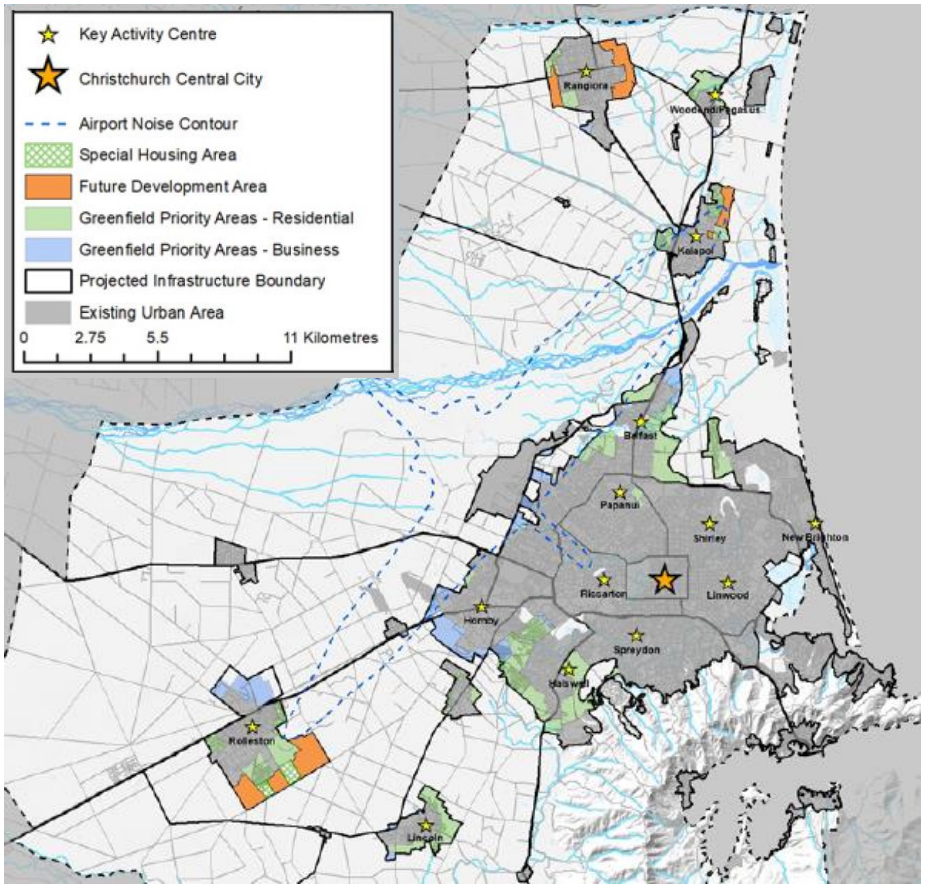


Figure 3-12: Proposed locations of future development areas in Greater Christchurch (indicative only)[19]

The key growth areas identified are:

- **Christchurch City:**
  - Central City residential growth (20,000 people within the central city in new residential developments);
  - Key Activity Centres – new opportunities around Key Activity Centres for land use redevelopment linked to the surrounding neighbourhoods; and
  - Suburbs – new communities in the northern and southwestern parts of the City (i.e., Halswell).
- **Selwyn:**
  - Rolleston – continued principal centre of Selwyn (greenfield development growth); and
  - Lincoln – development within the existing identified greenfield areas.
- **Waimakariri:**
  - Rangiora – remains the principal centre of Waimakariri – regeneration of older housing stock and new greenfield development (largely to the east); and
  - Kaiapoi – regeneration of existing housing stock and new greenfield to the north.

Canterbury Regional Policy Statement

The Minister for the Environment approved Proposed Change 1 to Chapter 6 of the Canterbury Regional Policy Statement (CRPS) under the streamlined planning process in 2021. This change was made operative on 28 July 2021, and updated the CRPS give effect to the future urban housing development areas identified Our Space for Rolleston, Rangiora and Kaiapoi (updating Map A 'Greenfield Priority Areas and Future Development Areas'.

Christchurch District Plan

The operative Christchurch District Plan (CDP) supports and provides for opportunities to redevelop and intensify existing urban areas to meet both housing and business needs. This is focused around the Central City, Key Activity Centres, larger neighbourhood centres and nodes located along core PT corridors (Figure 3-13).

[19] Greater Christchurch Partnership (2019). Our Space 2018-2048: Greater Christchurch Settlement Pattern Update, p.30

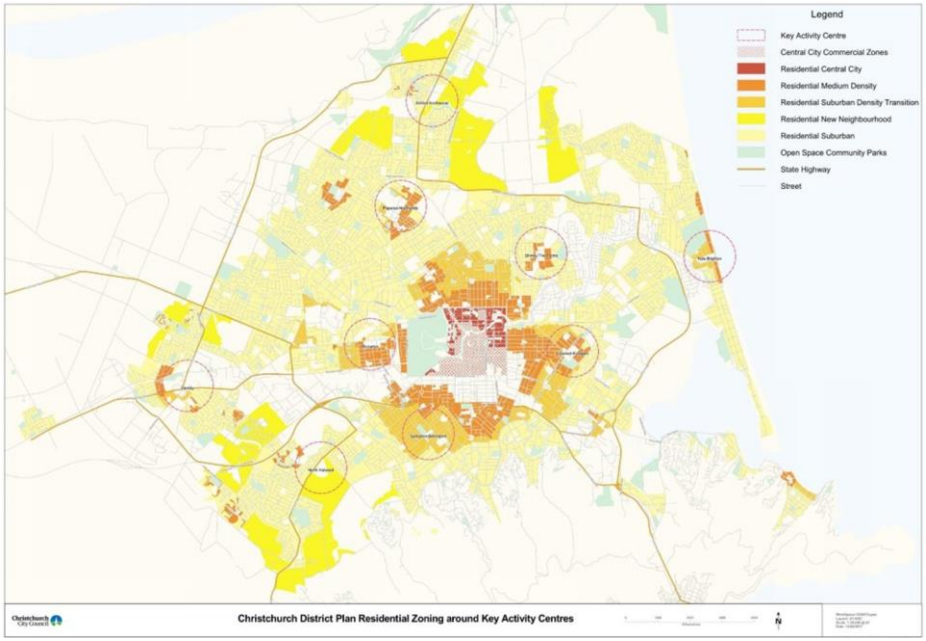


Figure 3-13: Operative CDP Residential Zoning

Changes are currently proposed as part of the draft Housing and Business Choice Plan Change (PC14) to the CDP to enable a greater scale and density of residential and business development in urban areas, provide for continued growth and prosperity and bring the District Plan in line with the NPS-UD and the EHS Act 2021. These changes are subject to a plan change process but are scheduled to come into effect by April 2024. The proposed plan change creates a number of residential and commercial zones in the city, within which different heights of development are enabled for housing.

The principal changes are:

- Enabling a minimum of three residential units up to three storeys high on most properties in residential zones (up to 14m in height), with specific rules that apply to such development;
- Enabling more intensive building development within and around the central city and suburban centres within the proposed high density residential zone, enabling up to 6 storeys or (20m in height), with specific rules that apply to such development; and
- The scale and density of buildings enabled, both in residential zones and within and around centres, is reduced where it can be justified by specific circumstances of sites and areas of the City that meet the criteria to be "qualifying matters". The plan change proposes to limit the intensification of building development that is enabled where a range of "qualifying matters occur.

Increased commercial development will be enabled in the central city and suburban commercial centres, with the proposed new centre zoning outlined by Figure 3-14 and Figure 3-15.

Centre Type	Location	Extent	Enabled Height
Neighbourhood Centre & Local Centre	Addington; Fendalton; Edgeware; Parklands; Woolston; St Martins, etc.	Centre only	MDRS – 12m
'Large' Local Centre	Bishopdale; Barrington; Prestons - only	200m	14m – four storeys
'Significant' Local Centre	Merivale & Sydenham - only	400m	20m – six storeys
Town Centre	Church Corner; Linwood; North Halswell, etc.	400m	20m – six storeys
'Emerging' Metropolitan Centre	Riccarton; Hornby; Papanui - only	600m	20m – six storeys

Figure 3-14: Proposed Centres Zoning

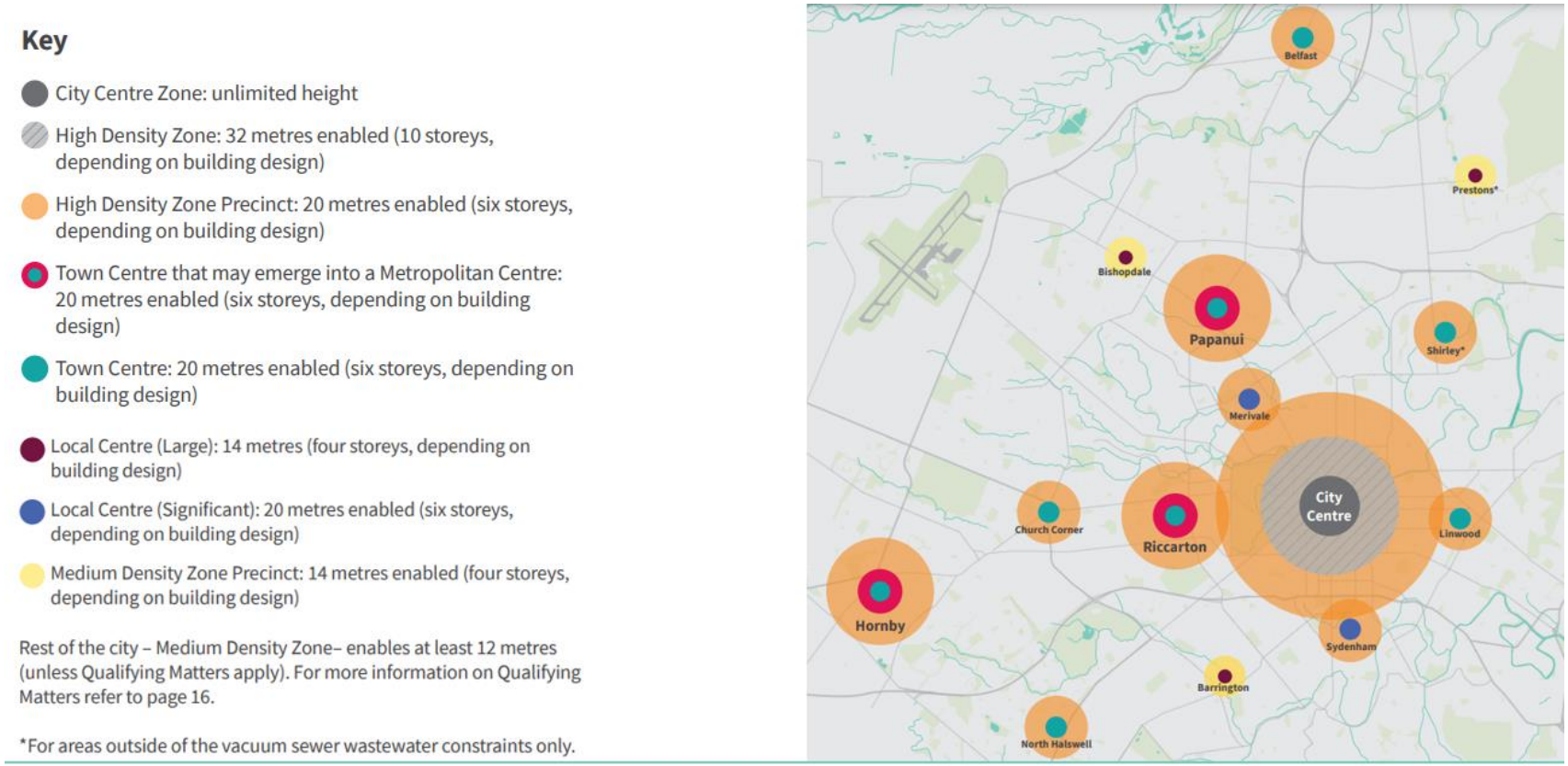


Figure 3-15: Summary of Proposed CDP Centres and Draft Development Provisions

Selwyn District Plan

Selwyn are currently undergoing a District Plan Review Process. The Proposed Selwyn District Plan (pSDP) was publicly notified in October 2020 with the close of submissions 11 December 2020. The Council is currently preparing a variation to the pSDP to give effect to the EHS Act 2021. To enable the variation process to be completed, including the new hearings, there will be a delay on when the Proposed Plan becomes operative. It is now expected that the pSDP is to become operative in early 2024, subject to any appeals.

The scope of the variation to the pSDP covers:

- the introduction of a new Medium Density Residential Zone that will be applied to relevant residential zones in Rolleston, Lincoln and Prebbleton; and
- additional land for residential development in Rolleston, including certain private plan change requests which are currently being processed.

Waimakariri District Plan

Waimakairi is currently undergoing a District Plan Review Process. The proposed Waimakariri District Plan (pWDP) was publicly notified late 2021, with submissions closing November 2021. The notified pWDP sought to give effect to the outcomes sought by Our Space and the NPS-UD but has been delayed while WDC seek to also give effects to the EHS Act 2021. To give effect to the EHS Act 2021, Waimakariri has prepared Variation 1: Housing Intensification, the proposed plan change was notified on 13 August 2022 with submissions closing on 9 September 2022. The scope of the Variation 1 includes the introduction of a new Medium Density Residential Zone that is applied to all relevant residential areas within Rangiora, Kaiapoi, Woodend and Pegasus.

3.5.6 The Greater Christchurch Spatial Plan

The Greater Christchurch Partnership has embarked on the development of the Greater Christchurch Spatial Plan (GCSP). The GCSP will consider how a possible future population of 700,000 can be successfully accommodated in Greater Christchurch (representing 170,000 or 30% more than the current population of Greater Christchurch) by 2050.

The GCSP will build on the strong spatial direction set by the Greater Christchurch Partnership through the UDS 2007 which provided a strong framework for the response following the Canterbury earthquakes, and the subsequent key documents produced by the Partnership over the years (Figure 3-16).

The GCSP will be developed to give effect to relevant national policy direction, including the Urban Growth Agenda; the government policy statements on housing and urban development, and land transport; the NPS-UD; and the emerging Emissions Reduction Plan for Aotearoa New Zealand. It will also be cognisant of the emerging directions from the resource management system reforms, especially from the proposed Strategic Planning Act which, has so far indicated that the development of long -term regional spatial strategies will be required.

Figure 3-16: Greater Christchurch Partnership Key Planning Documents[20]

The GCSP sits within a wider local, regional, and national context. This MRT IBC and the GCSP are strongly interdependent (Figure 3-17), recognising the importance of greater intensification of land use to reduce dependence on car travel, house people more sustainably and affordably, and realise the benefits of economic agglomeration, and the need for intensification to support the feasibility of significant transport infrastructure investments, such as MRT.

The GCSP seeks to prioritise sustainable transport choices to move people and goods in a way that significantly reduces greenhouse gas emissions and enable access to social, cultural, and economic opportunities. It looks to set out how Greater Christchurch provides community wellbeing and prosperity into the future in the context of population growth and climate change.

[20] Agenda of Greater Christchurch Partnership Committee - 14 May 2021 (infocouncil.biz), p.14

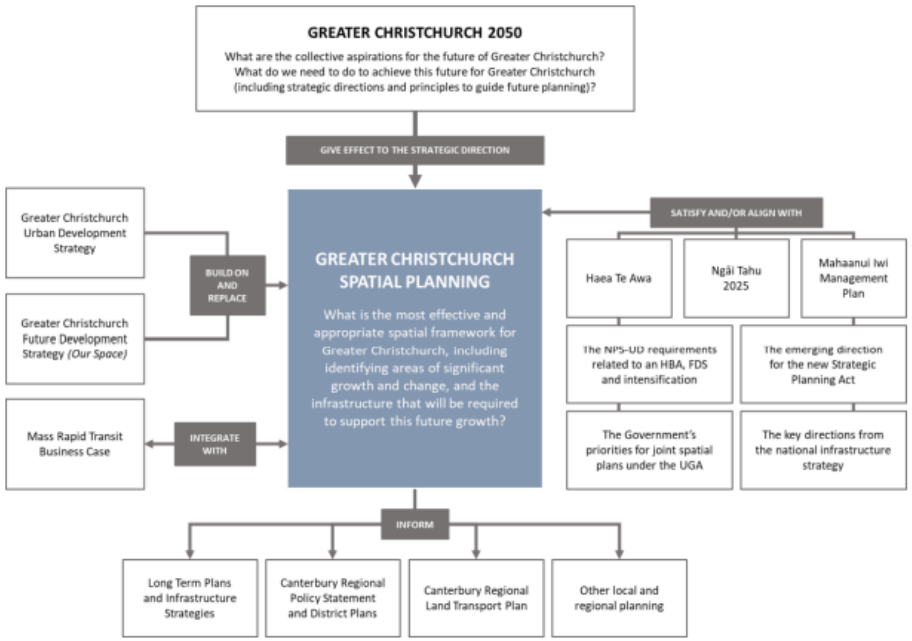


Figure 3-17: GCSP Relationship with Local, Regional and National Planning Documents

The draft GCSP's strategic direction is:

- Intergenerational wellbeing through collective action;
- A sustainable urban form which supports wellbeing;
- A vibrant place that people love;
- Regenerated natural environments;
- A sustainable economy that attracts and grows innovative people and ideas; and
- Empowered people.

To achieve this, the several priorities, challenges and opportunities have been identified, with one priority relating to this IBC specifically being to decarbonise the transport system (Figure 3-18).

Figure 3-18: The GCSP Emerging Strategic Direction

The emerging direction in the plan is that the following urban shifts are required:

- Greater intensification and density of employment and living around centres and along transport corridors, less low density / greenfield development;
- Kāinga nohoanga opportunities are realised;
- Economic agglomeration that leverages our economic strengths and assets and strengths our economic contribution to NZ;
- Accessibility to employment, everyday needs through public and active transport; and
- A blue- green network which provides sustainable habitats and biodiversity and mitigates the effects of climate change

Achieving these shifts would result in most people in Greater Christchurch being able to access services and employment via active or PT modes and PT being a competitive alternative to private car use. The plan also seeks an urban housing shift where more people live in multi-unit developments within easy access using active and PT to services and employment and that there is a greater use of public realm to provide space for recreation and socialising.

The GCSP is evaluating three different urban form/land use scenarios to underpin the emerging form direction of Greater Christchurch (Figure 3-19). Three growth scenarios have been used to understand the implications of

different ways Greater Christchurch may grow and transition over the next 30 years:

- Compact Scenario: This land use scenario provides an urban form focused on greater intensification in centres and along transit corridors. More growth occurs in Christchurch City in a higher proportion of apartments, terraced housing, and townhouses.
- Consolidated Scenario: This reflects an urban form consistent with current policy direction. Growth occurs more evenly across Greater Christchurch, in a mix of housing typologies. Rangiora and Rolleston grow into larger satellite towns.
- Dispersed Scenario: This scenario has less emphasis on intensification. Growth occurs more evenly across Greater Christchurch, predominately in detached housing.

For the purpose of data used in this strategic case, all information has presented showing the 2021-2051 consolidated land use scenario which is the 'do minimum scenario'. It incorporates the programme of currently planned road network and PT service short to medium term improvements as proposed in the Combined Business Case and uses the 2051 GCSP Land Use Scenarios.

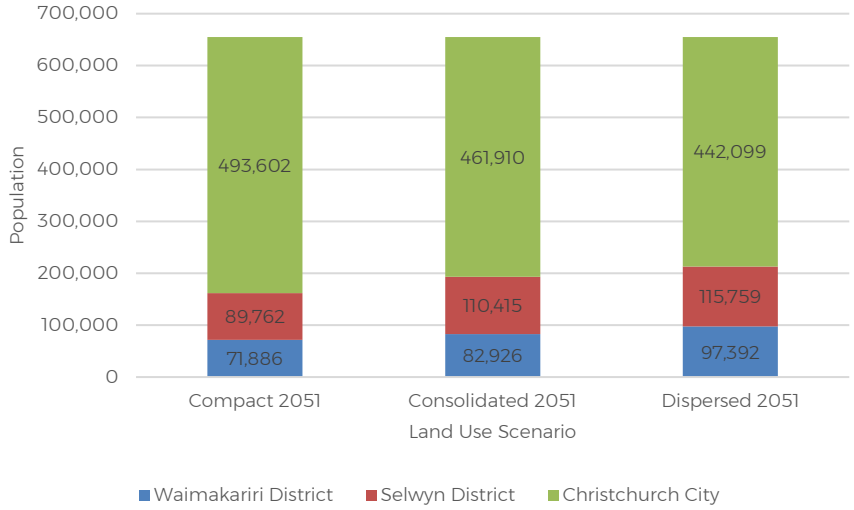


Figure 3-19: Greater Spatial Plan Land Use Scenario Population Distribution Comparison

Overall, the GCSP, in combination with the changes being made to the three District Plans in Greater Christchurch to give effect to the EHS Act 2021 and NPS-UD are anticipated to enhance the likelihood of more intensive urban development in catchments along future transit corridors and reinforce the need to align urban form and MRT outcomes.

3.6 TRANSPORT NETWORK CONTEXT

3.6.1 Transport Network

The Greater Christchurch transport network is currently dominated by cars which comprise 83% of total trip legs in Christchurch (as shown by *Figure 3-20*).

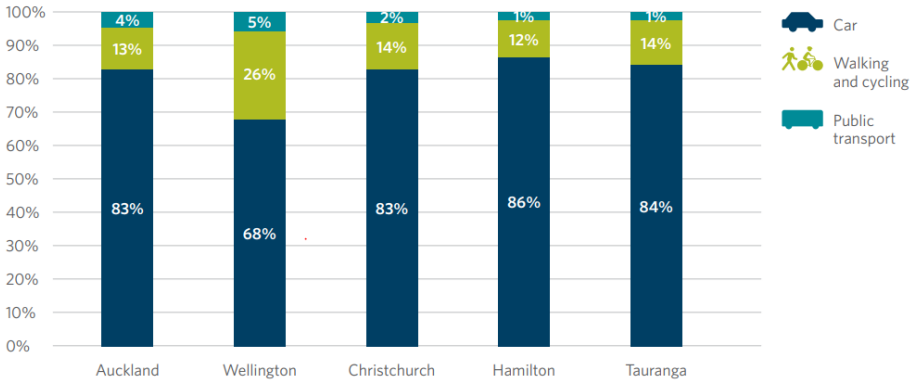


Figure 3-20: Mode share of total trip legs in New Zealand (2014-2018)[21]

In recent years, investment in Greater Christchurch has focused on legacy earthquake repairs, new State Highway capacity (Christchurch Northern and Southern Corridors) and cycling (CCC Major Cycle Routes (MCRs)), with relatively little investment in PT (other than the Christchurch Bus Interchange and establishment of bus lanes). This investment reinforces the existing mode share in which daily trips by private vehicles dominate.

The Christchurch Northern Corridor (12km motorway extension to Cranford Street) opened December 2020, providing a more direct connection to the Waimakariri District. Stage 2 of Christchurch Southern Motorway (Halswell Junction Road to Rolleston) also opened late 2020, providing a more direct connection to Rolleston and Selwyn District. The opening of these two roading programmes, is anticipated to make these corridors more attractive for single

[21] Figure 2, p.10 https://www.nzta.govt.nz/assets/resources/keeping-cities-moving/Keeping-citiesmoving.pdf

occupancy vehicles (SOVs) and freight, however it is noted that the Christchurch Northern Corridor also provides for direct PT services from the Waimakariri District to the Central City.

Pricing mechanisms (i.e., availability and cost of carparking in the Central City and at other key destinations) are not used in Christchurch as they are in other cities such as Auckland and Wellington to deter private vehicle use.

In addition, when compared to Auckland and Wellington respectively the Christchurch transport network has fewer network constraints resulting in less time lost due to driving during rush hour. For example, a normal 30-minute trip in Auckland and Wellington, taken during peak hour would add an additional 20 and 19 minutes to the journey time respectively. In contrast in Christchurch only an additional 12 minutes would be added to a 30-minute trip taken during the morning peak[22].

CCC have invested in cycling through the Major Cycle Routes (MCRs) programme which looks to make active transport a more desirable, and competitive mode choice. The thirteen routes which are at various stages of implementation were developed in response to a community desire for more travel choice and safer cycling options following the 2010 and 2011 Canterbury earthquakes. Cycle trip numbers for the annual count across all of locations with counters in place in Christchurch City have increased 80 per cent since the MCR's began opening in 2016. This increase in cycle trip numbers has continued and from March 2019 to March 2020 cycle numbers at several locations were up nearly 20 percent (2,234 cycle trips in the morning peak in 2020 compared to 1,869 cycle trips in 2019). Christchurch City now has a substantially higher percentage of people using the cycle as their main means to travel to work compared to the rest of New Zealand (Figure 3-21). There remains an opportunity for PT to further support active travel in Christchurch to assist with continued mode shift from private vehicles.

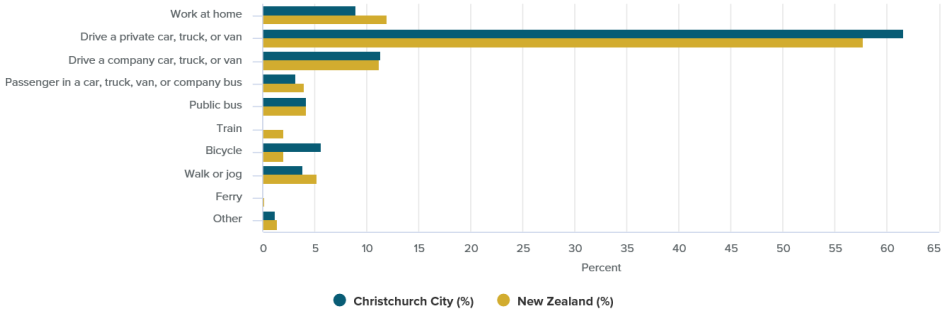


Figure 3-21: Main means of travel to work for people in Christchurch and New Zealand, 2018 Census[23]

Figure 3-22 demonstrates that areas closest to the central city have the highest percentage of population that use active travel (biking and walking) as their mode to travel to work. Further the 2018 census data identifies that active modes of transport were more common than PT for workers in the Christchurch central city, with more than twice as many people walking, cycling, or jogging than catching the bus or ferry[24].

[22] https://www.tomtom.com/en_gb/traffic-index/christchurch-traffic/
[23] https://www.stats.govt.nz/tools/2018-census-place-summaries/christchurch-city#transport
[24] https://www.stats.govt.nz/news/newly-released-census-data-shows-christchurch-cbd-bouncing-back

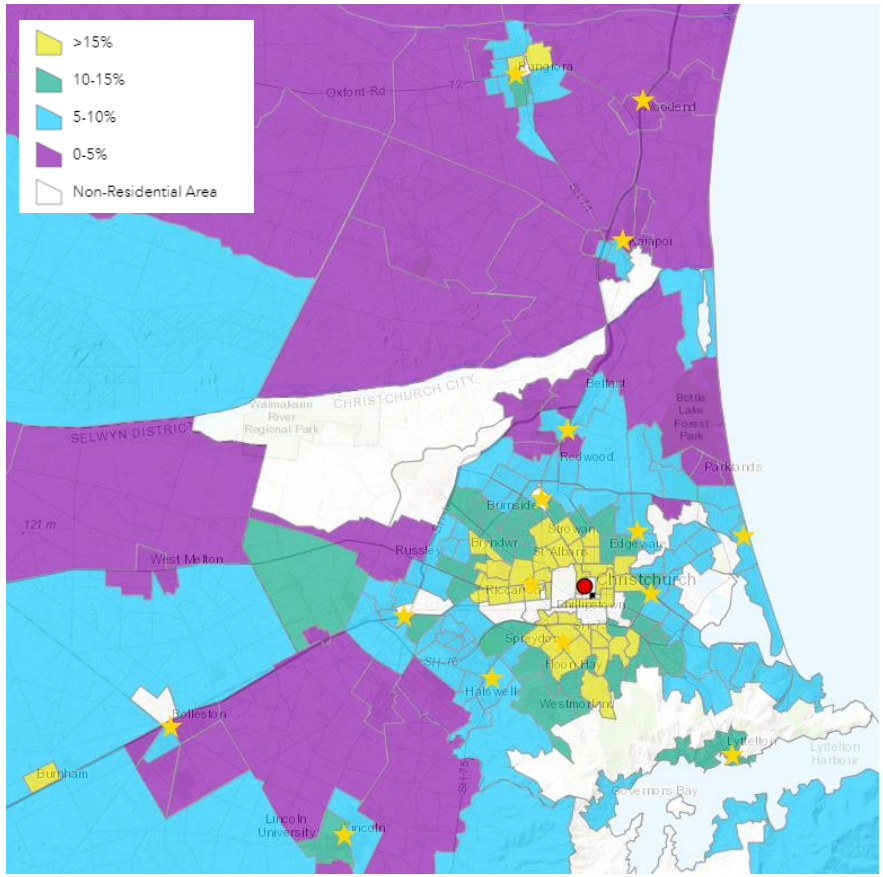


Figure 3-22: Percentage of Workers that Travel to Work by Active Modes - Census 2018 Travel to Work

Figure 3-23 similarly shows percentage of population using the PT network as their mode to travel to work. It outlines that suburbs immediately surrounding the Central City, especially those to the to the east and south, and areas the vicinity of the Riccarton Road/Blenheim Road corridor have the highest PT use.

In summary, active modes are effective for shorter trips (i.e., those to the central city from the surrounding suburbs) and there is good PT uptake in some areas (i.e., South of Riccarton), and in the area immediately south of the Central city. However, despite this, the car continues to dominate all trips in Greater Christchurch.

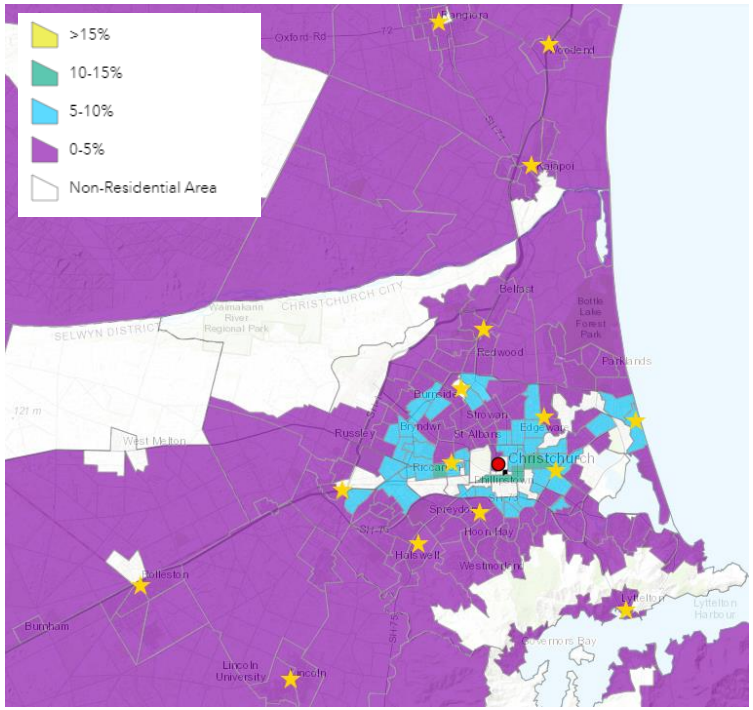


Figure 3-23: Percentage Workers that Travel to Work by the Bus - Census 2018 Travel to Work

3.6.2 Public Transport Network

The PT network consists of 25 bus services that operate as part of a radial network model, with 15 routes travelling to/through the central city and 10 across/around the city.

As at July 2019, the network was operated by 208 buses and one ferry, which made almost 60,000 trips per year. This equated to almost 300,000 km per week and over 15.5 million kilometres per year[7]. There are currently three contracted operators running the network's services (RedBus, Go Bus and Ritchies). These contracts have recently been re-awarded with the new contracts commencing September 28, 2020.

The current bus network currently offers the following types of bus services, described below and shown in Figure 3-24[25].

- **High Frequency Lines** (formerly termed Metro Lines) - Five core routes run along Christchurch's major road corridors, connecting people to significant KACs, destinations and larger towns in Selwyn and Waimakariri including Rangiora, Kaiapoi, Lincoln, Templeton, and Rolleston.
- **City Connectors** (formerly termed Metro City Connectors) allow people to travel from outer suburbs/towns directly to the Christchurch Central City.
- **Suburban Links** (formerly termed Metro Suburban Lines). Suburban links allow people to travel between the inner suburbs while bypassing the Christchurch Central City. People wanting to go to the Christchurch Bus Interchange need to transfer onto another bus at transfer points located throughout Christchurch.
- **Peak Only Services** A number peak only services now operate to the outlying towns, with several of these introduced January 2021 following completion of the Combined Business Case (i.e.. the new Rangiora to City direct and Kaiapoi city direct services).

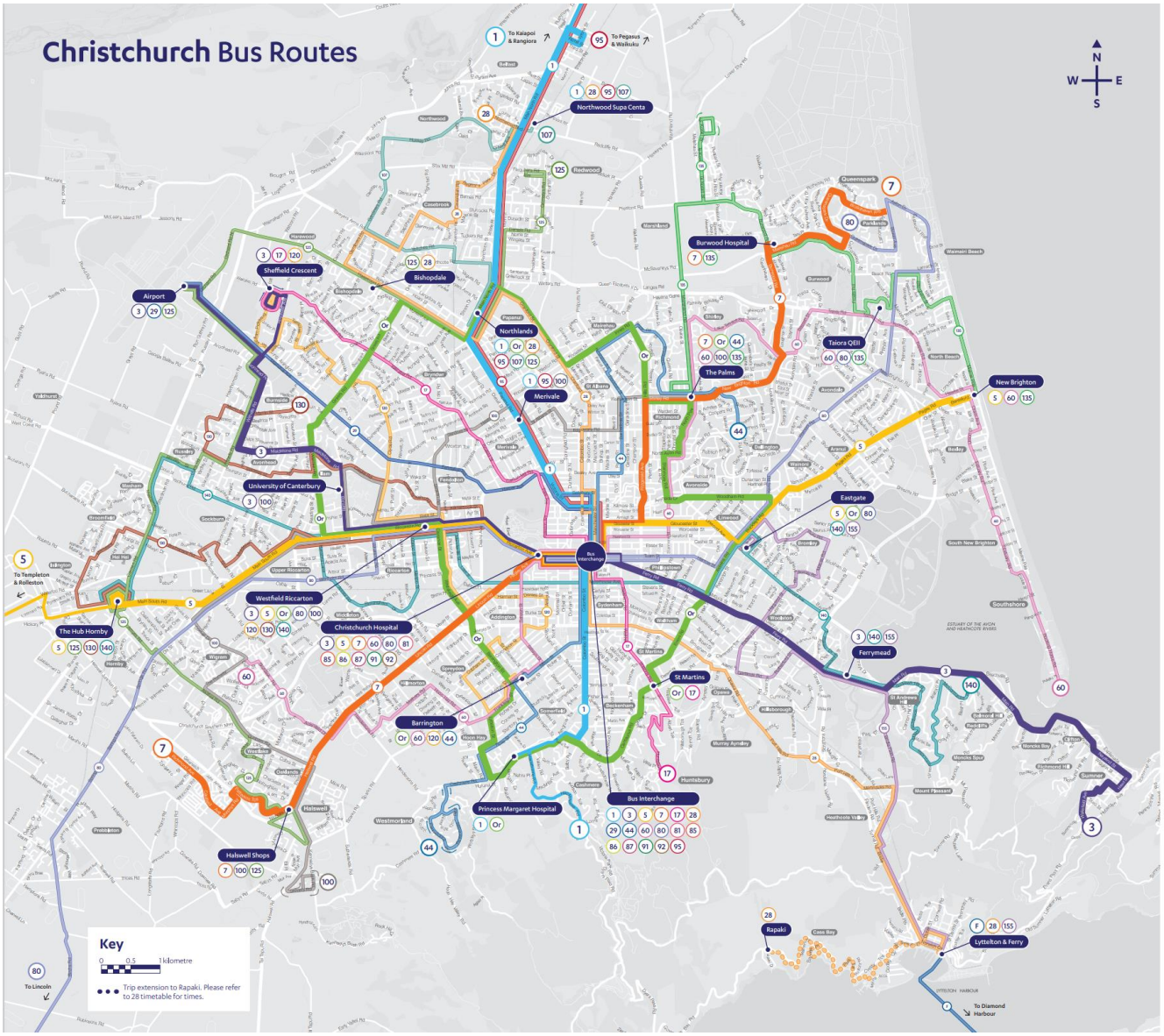
CCC provides bus lanes at some locations (i.e., along sections of Colombo Street south of the Central City, Papanui, and Riccarton Road), which operate during peak commuting hours on some routes. While many of the existing road corridors have enough width to provide for priority bus lanes it is important to note that such changes require extensive public consultation and engagement to alter road prioritisation and for parking removal.

There is no rapid transit provision in Greater Christchurch.

Following the disruption of the Christchurch earthquakes which altered land use, the transport network, and travel patterns, Greater Christchurch experienced increased travel by car and a sharp drop in PT patronage. Since then, PT has experienced some initial recovery patronage, but this has fallen again since 2014. On average, each person in Greater Christchurch makes 26.5 trips on PT per year[26]. Between 2017 and 2019, PT patronage has hovered at just under 14 million trips annually, despite population increases in Greater Christchurch.

[25] Metro (2020). Christchurch Metro Network Map. Retrieved September 2022, from https://www.metroinfo.co.nz/assets/Maps/chch-network-map.pdf

[26] Wilke, Axel (2018). Talking Transport: Lies, damned lies, and patronage statistics. Retrieved 20 March 2020, from https://talkingtransport.com/2018/12/09/lies-damned-lies-and-patronage-statistics/



Our Network

High frequency

- 1 Rangiora – Cashmere (Blue Line)
- 3 Airport & Sheffield Crescent – Sumner (Purple Line)
- 5 Rolleston – New Brighton (Yellow Line)
- 7 Halswell – Queenspark (Orange Line)
- Or The Orbiter

City connectors

- 17 Bryndwr – Huntsbury
- 28 Casebrook – Lyttelton
- 29 Airport – City
- 44 Shirley – Westmorland
- 60 Hillmorton – Southshore
- 80 Lincoln – Parklands
- 95 City – Pegasus & Waikuku

Suburban links

- 97 Rangiora – Pegasus
- 100 Wigram – The Palms via Riccarton
- 107 Styx Mill – Northlands
- 120 Burnside – Spreydon
- 125 Redwood – Westlake
- 130 Hei Hei – Avonhead via Riccarton
- 135 New Brighton – The Palms via Prestons
- 140 Russley – Mt Pleasant
- 155 Lyttelton – Eastgate shopper service
- 820 Lincoln – Burnham via Rolleston
- F Diamond Harbour Ferry

Peak only services

- 81 Lincoln – City direct
- 85 Rolleston – City direct
- 86 Darfield – City
- 87 Southbridge – City
- 91 Rangiora – City direct
- 92 Kaiapoi – City direct

Figure 3-24: Greater Christchurch Metro (bus) Network Map

3.6.2.1 Future Changes to the Network

The endorsed PT Combined Business Case will make a number of improvements to the existing PT network over the next 10 years. This will include:

- A revised bus network that will provide for expanded, frequent network coverage (Figure 3-25).
- Approximately 100 more buses providing more seats to more locations more often.
- 229 more bus shelters providing better waiting facilities;
- 190 more real time display units providing accurate information on bus arrival times.
- On-board audio-visual announcements providing information on upcoming stops and transfers.
- Approximately 22 kilometres of bus lanes making buses more reliable and faster.
- Priority measures for buses at key intersections across the city making journeys more reliable.
- Park and ride facilities at larger towns making it easier to access the bus network.
- Secure bike parking at key stops providing more options with a greater catchment to frequent bus routes.

Figure 3-25: Combined Business Case Future Bus Network

3.6.3 Future Demand for Public Transport Services

Christchurch has driving firmly intrenched as a cultural norm. As at 2018, PT mode share in Greater Christchurch was around 2.3%[27]. Based on Transport Demand Management (TDM) Customer Insight surveys undertaken in May 2019, 69% of the 871 respondents in Christchurch, whose primary mode of transport is car, van, or truck, private or company vehicle, have no intention of changing to use alternative means of transport[28].

PT patronage in Greater Christchurch peaked at 17.2 million trips per year in 2010 before dropping sharply after the earthquakes (Figure 3-26). In 2019 there were 13.5 million passenger trips, but as a result of the Covid-19 pandemic reducing demand this dropped to just 11 million passenger trips in 2021[29].

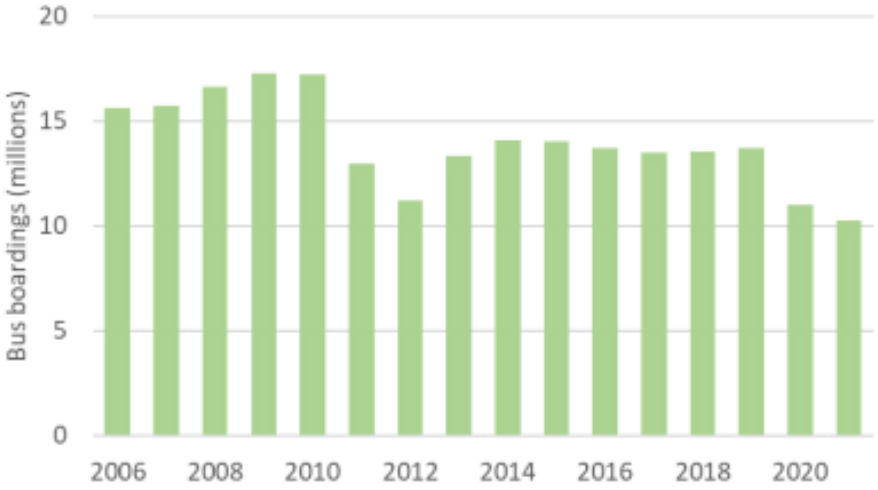


Figure 3-26: PT bus boardings in Greater Christchurch, 2006 -2021[30]

However, Greater Christchurch must achieve greater mode shift changes to ensure the transport network supports anticipated future growth. From 2021 to 2051, the total daily modelled person trips are forecasted to increase by 32%[27]. As demonstrated by Figure *3-27*, majority of this growth is anticipated to be via private vehicle trips, with private vehicle trips forecast (without any improvement to PT) to comprise 95.1% of all daily trips in Greater Christchurch in 2051 (compared to 2.4% for PT and 2.5% by bike).

Figure 3-27: Forecasted daily modelled person trips by mode - private vehicle, PT and bike in Greater Christchurch, 2021-2051[27]

Household transport expenditure has increased by 57% since the earthquakes with the median household spending $83 more per week on transport in 2019 than in 2008[31], likely reflecting the more dispersed residential and employment land use pattern.

[27] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021
[28] Waka Kotahi (May 2019). Travel Demand Management Customer Insight: Qualitative and Quantitative Insights Summary - All Regions, p.16.
[29] Agenda of Whakawhanake Kāinga Committee - Friday, 13 May 2022 (infocouncil.biz), p. 42
[30] Agenda of Whakawhanake Kāinga Committee - Friday, 13 May 2022 (infocouncil.biz), p. 42

[31] https://www.pwc.co.nz/publications/2019/citiesinstitute/cities-urban-competitivesness-christchurch.pdf

3.6.4 Transport Policy

3.6.4.1 Government Policy Statement on Land Transport 2021/2022-2030/2031

The Government Policy Statement on Land Transport 2021/2022-2030/2031 (GPS 2021) sets out how funding should be allocated between activities such as road safety policing, state highway improvements, local and regional roads, and PT, outlining the Government's priorities for the National Land Transport Fund (NLTF). The four strategic priorities of the GPS 2021 are:

- Better travel options:
  - Providing people with better transport options to access social and economic opportunities
  - Seeks to deliver better travel options through the implementation of mode shift plans for key urban areas
- Climate change:
  - Developing a low carbon transport system that supports emission reductions while improving safety and inclusive access
  - Achieving net zero carbon - requires a transition to a low carbon transport system. Measures are in place to reduce transport demand and infrastructure is inter-connected encouraging walking, cycling and the use of PT.
- Safety: Developing a transport system where no-one is killed or seriously injured
- Improving Freight Connections: Improving Freight Connections for economic development

By 2031 the GPS 2021 proposes to deliver the following short to medium term results:

- Improved access to social and economic opportunities;
- PT and active modes are more available and/or accessible;
- Increased share of travel by PT and active modes;
- Reduced greenhouse gas emissions; and
- Reduced air and noise pollution.

Specifically, regarding rapid transit, the GPS-2021 defines rapid transit as a quick frequent, reliable, and high-capacity PT service that on a permanent route (road or rail) that is largely separated from other traffic.

It also notes that high capacity and rapid transit systems and multimodal travel options in urban centres will help to manage road congestion and enable efficient flows of people (and products).

3.6.4.2 Canterbury Regional Public Transport Plan 2021-2031

The vision of the Canterbury Regional Public Transport Plan (CRPTP) is to provide innovative and inclusive PT that sits at the heart of the transport network and supports a healthy, thriving, and liveable Greater Christchurch. One of the CRPTP aims is to provide a catalyst for Central City regeneration, and regional housing and business development, by protecting and investing in rapid transit corridors. The 2021-2031 plan places new emphasis on resilience to extreme events and emissions reduction over its predecessors.

3.6.4.3 Mode Shift Plan

For urban areas to thrive, people need to be able to move around easily and have a range of choices for how they get to work, connect with family and friends and access services. Consequently, a modern transport system with a mix of reliable transport options that help keep people and products safely moving, is required. As a result, Waka Kotahi has developed a national mode shift plan 'Keeping Cities Moving'[32] to deliver on social, environmental, and economic outcomes by growing the share of travel by PT, walking and cycling (activating a mode shift).

Specific direction for this step change is set out in the Agency's mode shift plan 'Keeping Cities Moving'. Keep Cities Moving was developed to deliver on social, environmental, and economic outcomes by growing the share of travel by PT, walking and cycling (activating a mode shift).

The plan outlines 35 interventions that seek to increase the pace of change in cities and ensure that investment is targeted to help provide more transport choice and ultimately reduce car dependency. The plan identifies a need for six area specific mode shift plans to be developed for place-based changes in the six high-growth urban areas with the highest potential to achieve mode shift. Out of this, the Regional Mode Shift Plan Greater Christchurch[33] (GC MSP) was developed by Waka Kotahi and its local partners and endorsed by the Greater Christchurch Partnership in 2020.

Climate change is a key issue, and the GC MSP acknowledges that 41% of greenhouse gas (GHG) emissions for Greater Christchurch are attributed to land

[32] https://www.nzta.govt.nz/assets/resources/keeping-cities-moving/Keeping-cities-moving.pdf

[33] https://www.nzta.govt.nz/assets/resources/keeping-cities-moving/Christchurch-regional-mode-shift-plan.pdf

transport, and that historic land use patterns and investment have resulted in sprawling urban environments as evidenced with the shift of the population to the Selwyn and Waimakariri Districts. Significant investment in transport infrastructure has incentivised private vehicle use over other forms of transport which has made it more difficult to promote other modes like PT The plan recognises these significant challenges but highlights opportunities where mode shift can be initiated through:

- Integrated planning and design with urban form and PT to improve its efficiency and attractiveness;
- Promotion, support and provision for sustainable business, housing and public infrastructure that achieves high connectivity;
- Investment in public and active transport to improve its attractiveness; and
- Initiating behavioural change through education, safety initiatives and enabling ease of use.

Initial priorities for the GC MSP over the next three to six years are implementing the short-term improvements to PT identified in this business case, connecting the gaps in the existing cycleway network, and encouraging behaviour change (through travel demand management activities). The GC MSP acknowledges that the key drivers for mode shift are environmental and safety concerns, with congestion a secondary consideration. The GC MSP outlines that while congestion is not currently a significant issue in Christchurch (compared to Wellington and Auckland), if current travel patterns are continue then congestion (associated adverse effects such as increased emissions) will increase with the high car usage and growth in demand.

Improving urban mobility is also one of several step changes included in the Waka Kotahi 10-year plan Arataki to address key drivers affecting the land transport system. The step change of transforming urban mobility focuses on addressing the causes of car dependency and growing the share of travel by PT, walking, and cycling through:

- Shaping urban form;
- Making shared and active modes more attractive; and
- Influencing travel demand and transport choices.

3.6.4.4 Kaupapa Here Papawaka Central City Parking Policy 2021

CCC adopted a new Central City Parking Policy in August 2021[34]. This seeks to achieve an 85 % occupancy of parking spaces within the central city at peak times, and to support greenhouse reduction targets by supporting parking for sustainable modes. Overall, the policy proposes to manage on-street parking on a case-by-case basis using such measures as time limits and parking charges.

3.6.5 Covid-19 Impact

Waka Kotahi commissioned research on the projected impacts of the Covid-19 pandemic on the transport system[35]. Early indications were that there will be slower population growth in the key metro areas (Greater Christchurch included) as a result to declines in immigration and internal migration.

The Canterbury regional summary for Arataki Version 2 states:

> *'Canterbury has the third largest tourism spend in the country, of which 40% comes from international visitors. The region will be disproportionately impacted by border closures. Christchurch is forecast to be slightly worse off than the rest of the country because of its role as a gateway for international tourists.'*

It states that supporting multi-modal access to Christchurch central city as the primary activity centre remains a priority. In addition. there will be an ongoing need for transport services to support COVID-19 recovery by improving access to employment and essential services for vulnerable communities.

It also identifies that given the high reliance that Canterbury has on net migration for population growth, the reduction in immigration is anticipated to slow growth in and around Christchurch. Under the slower recover scenario (the worst-case scenario), employment levels are not forecast to even return to business-as-usual levels by 2031. The analysis notes that the impacts of the downturn have the potential to be buffered by the scale of the primary sector located in Canterbury.

Despite this impact, no significant changes were expected in the nature, scale, and location of transport demand over the medium to long term, although changes to work patterns for professional services had known potential to see a reduction in peak trips to city centre, because of more people working remotely. Overall, the 10-year outlook remains largely unchanged with it noted that the Covid-19 pandemic is a continuously evolving situation and recommendations within this business case are likely best managed

[34] https://www.ccc.govt.nz/assets/Documents/Transport/Parking/Central-City-Parking-Policy-2021.pdf

[35] https://www.nzta.govt.nz/assets/planning-and-investment/arataki/docs/key-drivers-step-changes-levers-interventions-august-2020.pdf, p. 6

through a dynamic approach to staging and an ongoing review process ahead of major investment decisions.

In April 2021, Waka Kotahi reflected on the economic ramifications of Covid for the first year of the pandemic[36]. This noted that overall New Zealand was faring better than expected. It outlined that Canterbury as a tourism and migrant dependent region could continue to be impacted by Covid but that strong job growth was still forecast for the region between 2002 and 2005 contributing to its anticipated economic bounce back.

3.6.6 The Evolving Role of Technology

There are emerging technologies in the form of autonomous vehicles, access to travel information and the way people can access or purchase travel and mobility. While many of these remain undefined at this time, there is also uncertainty of the effect these technologies will have on the way people travel and the needs people will have from a service and infrastructure perspective. Waka Kotahi have undertaken research on the latest transport technology and data background information as part of informing Arataki[26] and this is particularly relevant to a greenfield growth area as the urban form and transport dynamics may be influenced by these factors. For example:

- Mobility-as-a-service (MaaS) is enabled by smartphone technology and uses apps to allow a person to plan, book and pay for end-to-end journeys. It provides people with better real-time information on transport options, including the ability to purchase and pre-purchase mobility options tying together different modes of travel for single journeys. This can influence ridership patterns and access needs and has the potential to encourage mode shift and reduce congestion. It is seen as having high potential to serve fist mile/last mile options to link with PT offerings
- On-Demand Transport: When On-Demand Transport is provided for PT it can improve accessibility and reduce the number of single occupancy vehicles. It can improve access to PT in areas not serviced by a traditional PT model due to a lack of demand for a large-scale operation. Waka Kotahi note:

  > *On-demand transport may provide a more sustainable public transport service in places where at certain times, demand peaks and is predictable, but at other times, demand is inconsistent or low.*

  Currently MyWay is an on-demand PT service being used in Timaru (it uses minibuses that carry about 12 people and through advance bookings coordinates passengers heading in the same direction).

Further examples of future mobility technologies that may be relevant include:

- Autonomous private vehicles may affect arrival modes at stations, requiring less park and ride space and greater drop off space, or improve the efficiency of the motorway corridor and improving overall transport conditions. There are still numerous uncertainties on the role that automated vehicles will have in the future of the transport network and many regulatory and technology issues to overcome
- Autonomous PT vehicles may increase throughput and efficiency of bus rapid transit operation (recognising that many rail systems are already operating in this mode) or provide first and last-mile transport options and influence ridership as well as interchange and supporting corridor design
- Connected vehicle technologies enable vehicles to communicate with each other, infrastructure and road users using wireless communications which can enable efficiencies to be optimised within the transport network
- Advanced bus technologies, as referred to in the Waka Kotahi Advanced Bus Study, would enhance the ability to deliver greater reliability and capacity through reduced dwell times, higher capacities, and greater control over operations. These technologies include contactless ticketing, off board ticket validation, all door boarding, along with the use of extra-long double-articulated buses

Overall, this IBC for MRT anticipates that these evolving technologies may have the potential to have a significant effect on PT patterns or behaviour given the focus on the longer-term horizon.

[36] https://www.nzta.govt.nz/assets/planning-and-investment/arataki/docs/arataki-covid-19-economic-projections-update-summary-report-may-2021.pdf

3.7 OTHER RELEVANT LAND USE AND TRANSPORT PROJECTS AND INITIATIVES

Table 3-2 is a high-level summary of other projects underway by the Project partners that are of relevance to this business case.

Table 3-2: High Level Summary of Additional Relevant Projects

Project	Relevancy to this IBC
CRPS Airport Noise Review	ECan are currently reviewing revised airport noise contours received from Christchurch International Airport as part of a review of the CRPS[37]. The review is anticipated to be completed by the end of 2022 and has the potential to impact land intensification opportunities within Christchurch. At the time of writing public consultation on the GCSP is being conducted and includes the noise contours.
Te Kaha 'Canterbury Multi-Use Arena) Associated Upgrades	As part of the construction of Te Kaha, several street upgrades are proposed in the vicinity of the Arena (particularly at key intersections on Tuam Street, Barbadoes and Madras Street. In addition, changes are proposed to the Lichfield Street, High Street and Manchester Street Intersection to provide improved pedestrian access between the bus exchange and the arena. Any MRT corridor that runs through the central city should be mindful of these upgrades.
Salisbury and Kilmore Street Upgrades to 2-Way	Both Salisbury Street and Kilmore Streets are proposed to be modified from 1-way streets to 2-way streets as part of the original Accessible City Plan. Kilmore Street will provide for PT provision and Salisbury Street is to provide for cycling. These upgrades are accounted for in the CCC 2021-2031 Long Term Plan. As part of this, CCC are proposing to cul-de-sac Salisbury Street to create a shared space west of Victoria Street, with a new signalised crossing established to provide improved access to Hagley Park (and a new footbridge established over the Avon River).
	Any MRT street running central city alignment needs to be mindful of these alterations.
CCC Tree and Urban Forest Plan	CCC are preparing a Tree and Urban Forest Plan[38] that provides a long-term vision and strategy to maximise the health and sustainability of the city's urban trees and forests and the benefits we receive from them. Broadly it seeks to provide enhanced canopy cover within all Christchurch City Council land parcels (including roads). This is relevant to any street running MRT given the challenge of providing vegetation within the already narrow corridors.
Christchurch Suburban Area Plans	CCC staff are developing bespoke area plans for key areas across the city where integration of land use, urban design, transport, and environmental matters can reflect aspirations for the future at a local level as part of the Ōtautahi Christchurch Plan. Locations for these plans are currently being identified and may include Papanui, Hornby, and Merivale (subject to Executive Team and Councillor approval). Prioritisation and associated resourcing and funding of these plans is yet to be confirmed.

[37] Council reviews airport noise contours | Environment Canterbury (ecan.govt.nz)

[38] https://www.ccc.govt.nz/environment/trees-and-vegetation/tree-and-urban-forest-plan/

3.8 ENVIRONMENTAL CONTEXT

3.8.1 Emissions and Climate Change

The New Zealand Government are committed to reducing emissions and preparing for the opportunities and challenges presented by climate change. On 1 December 2020, the New Zealand government declared a climate emergency and announced their commitment to urgent action for reducing emissions. This followed a series of actions aimed at mitigating greenhouse gas emissions and adapting to climate change including commitment to decarbonise the public sector by 2025 and passing the Climate Change Response (Zero Carbon) Amendment Act 2019 which sets the target of New Zealand having net zero greenhouse gas emissions by 2050, excluding biogenic methane.

3.8.1.1 Te hau mārohi ki anamata: Towards a productive, sustainable, and inclusive economy – Aotearoa New Zealand's First Emissions Reduction Plan

Te hau mārohi ki anamata, the first Emissions Reduction Plan (the ERP) was published in May 2022 as New Zealand's first emissions reduction plan. It is the first statutory plan, under the Climate Change Response Act and sets out the path towards meeting Aotearoa's long-term climate targets. It is a key step in transitioning to a low emissions future. The plan has a considerable focus on reducing transport emissions through transport related interventions that will reduce the quantum of vehicle kilometres travelled (VKT) and encouraging short trips (those 5km or less) to be undertaken by PT or active travel. It seeks a 20% reduction in VKT by 2035 (i.e., a 20% reduction in VKT compared to what would otherwise be expected in 2035 without intervention).

It outlines that the major action in the following years relating to the transport sector will include increasing access to electric vehicles (EVs), beginning the process of decarbonising heavy transport and freight and helping more people to walk, cycle and take PT.

Chapter 10 of the plan specifically relates to the Transport sector, which it acknowledges is responsible for 17% of New Zealand's gross emissions. Key transport actions identified in the plan include:

- Reduce reliance on cars and support people to walk, cycle, and use PT including by;
  - improving the reach, frequency and quality of PT and making it more affordable for low-income New Zealanders;
  - increasing support for walking and cycling, including initiatives to increase the use of e-bikes; and
  - ensuring safer streets and well-planned urban areas.
- Rapidly adopt low-emissions vehicles including by;
  - continuing to incentivise the uptake of low- and zero-emissions vehicles through the Clean Vehicle Discount scheme and consider the future of the road user charge exemption for light electric vehicles beyond 2024; and
  - increasing access to low- and zero-emissions vehicles for low-income households by supporting social leasing schemes and trialling an equity-oriented vehicle scrap-and-replace scheme improving EV-charging infrastructure across Aotearoa to ensure that all New Zealanders can charge when they need to.
- Begin work now to decarbonise heavy transport and freight including by;
  - providing funding to support the freight sector to purchase zero- and low-emissions trucks;
  - requiring only zero-emissions PT buses to be purchased by 2025; and
  - supporting the uptake of low-carbon liquid fuels by implementing a sustainable aviation fuel mandate and a sustainable biofuels obligation.

3.8.1.2 He Pou a Rangi / Climate Change Commission Draft Report

On 31 January 2021, the He Pou a Rangi (the Climate Change Commission) released its Draft Advice for Consultation. The purpose of which is to identify policy necessary to put New Zealand on a "pathway to quickly, significantly and permanently reduce greenhouse gas emissions", and achieve the targets already agreed to. Within the transport section the report identifies that New Zealand needs to almost completely decarbonise land transport including a transition to electric light vehicles and a change to how travels occur (i.e., mode type, distance, and frequency of travel). The report assumes that by implementing change in travel behaviour total household vehicle travel can remain relatively flat (Figure 3-28) despite a growing population. Such changes assumed are:

> *the average household travel distance per person can be reduced by around 7% by 2030, for example through more compact urban form and encouraging remote working;* and *that the share of this distance travelled by walking, cycling and public transport can be increased by 25%, 95% and 120% respectively by 2030*

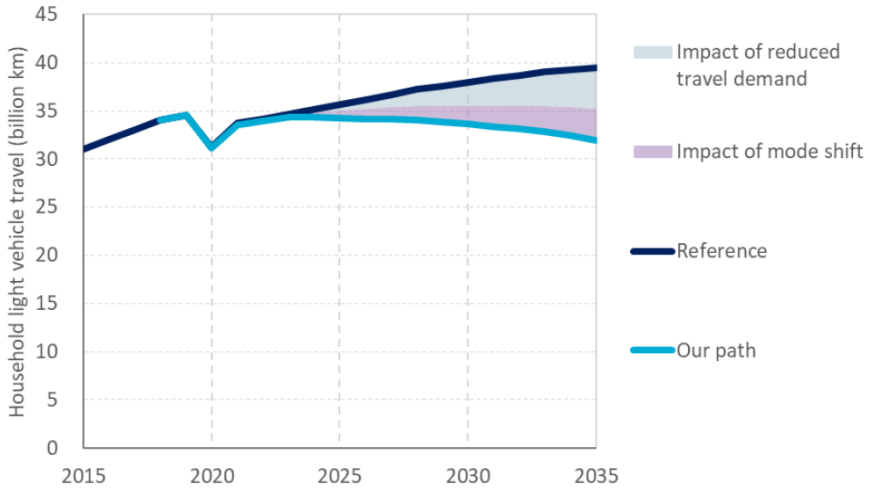


Figure 3-28: Potential Future Household Light Vehicle Travel[39]

3.8.1.3 Local Commitment to Climate Change

At a local level both ECan and CCC declared a climate emergency in May 2019, and CCC has set a target for Christchurch to achieve net zero greenhouse gas emissions, excluding methane, by 2045.

As part of the role of 'Greater Christchurch 2050' an aspiration for carbon emission reduction will be set for Greater Christchurch which will also identify key strategic moves to support transition.

As part of the climate emergency declaration, ECan have committed to robustly and visibly incorporate climate change considerations into Council work programmes and decisions; provide strong local government leadership in the face of climate change, including working with regional partners to ensure a collaborative response; advocate strongly for greater Central Government leadership and action on climate change and lead by example in monitoring and reducing Council's greenhouse gas emissions.

ECan have recently renegotiated its PT contracts, which has accelerated the move to new, low-emission buses[40]. This is projected to reduce the CO2 emissions by 14% within their first year with the introduction of 25 new electric buses and 39 new low-emission Euro 6 buses. This has been incorporated into the Do Minimum scenario.

3.8.2 Social and Recreation

Within Greater Christchurch there are a number of key recreational areas including Hagley Park (the extensive 165 hectares centrally located open space heart of Christchurch city), the Port Hills (numerous walking and cycling tracks, Banks Peninsula, Waterways, the Beach and Coast (including the Christchurch Coastal Pathway), the Adventure Park, the foothills near Oxford, and numerous plains and wetlands (I.e. Bottle Lake, Spencer Park, The Groynes, Riccarton Bush and Travis Wetland). There are also a several key community recreational centres such as the Rolleston Community Centre, the Selwyn Aquatic Centre, and the Kaiapoi Aquatic Centre.

Two additional key recreational facilities proposed for the future are the Parakiore Christchurch Metro Sports Facility (large aquatic and indoor recreation and leisure venue set to open early 2023 in the Central City) and the Te Kaha Canterbury Multi Use Arena (set to open mid 2025).

3.8.3 Geology

The geology of Greater Christchurch comprises a range of conditions.

Christchurch city is located at the coast of the Canterbury Plains, next to the extinct volcanic complex forming Banks Peninsula. Christchurch was mainly swamp, "behind beach dune sand, and estuaries and lagoons, which have now been drained. Two rivers—the Avon and Heathcote which originate from springs in western Christchurch, meander through the city and form the main drainage system"[41].

The Waimakariri River is a large, braided river located north of Christchurch, and directly south of Kaiapoi that flows from the mountains, across the Canterbury Plains to the sea. It is from the alluvial flows from the Southern Alps to the Pacific Coast that the Canterbury Plains are built.

Greater Christchurch enjoys some of best drinking water in New Zealand and the world. To the west and north of Christchurch City is a groundwater recharge area for the series of aquifers under Christchurch City – underground water fed from the Waimakariri River.

In terms of natural disasters, Greater Christchurch is vulnerable to flooding, earthquakes, and tsunami.

3.8.4 Vegetation

The natural vegetation of Christchurch is primarily swampland plants (flax and rushes), drier grasslands with shrubby vegetation (kanuka, matagouri,

[39] 31 January 2021 Draft Advice for Consultation, Climate Change Commission, Figure 3.11, p. 59
[40] https://www.ecan.govt.nz/your-region/your-environment/climate-change/our-environmental-contribution/

[41] L. J. Brown, R. D. Beetham, B. R. Paterson, J. H. Weeber; Geology of Christchurch, New Zealand. Environmental and Engineering Geoscience; I (4): 427–488

ribbonwood and cabbage trees) and patches of true forest, dominated by kahikatea[42].

A large quantity of land on the outskirts of Christchurch City, and within the Selwyn and Waimakariri Districts is used for rural purposes.

3.8.5 Coastal Environment

Key coastal areas in Greater Christchurch are the Akaroa and Lyttleton Harbour in Banks Peninsula, the Avon-Heathcote Estuary (Ihuatai), the Southshore Sand Spit, and the beach (Sumner, New Brighton, and Pines Beach.

3.8.6 Terrestrial and Freshwater environment

Key habitat areas in Greater Christchurch include the Avon-Heathcote Estuary, Riccarton Bush, the Travis Wetlands, and many areas around Banks Peninsula, such as Mt. Herbert.

Greater Christchurch is home to around 400 native plants including 31 species on the nationally threatened plant list. Local natives include the Spotted Skink, Pied Cormorant, Wrybill, Tuna (eel) and Red Admiral Butterfly[43].

The land area of Selwyn District is predominantly rural, interspersed with many small townships. Most of the land in the District has been modified by people's activities, but there are sites and areas that have significant natural or ecological values. Most of these sites are in the less densely settled parts of the Rural zone. Rivers or streams also run through or adjoin townships.

3.8.7 Summary

Several key national strategies and directions have emphasised the important considerations of emissions and climate change in future transport decisions.

In addition, if not appropriately managed, parts of the study area's environment may be subject to potential adverse effects resulting from any future proposed works.

Further environmental assessments specific to the recommended option will be required during the pre-implementation phase to support any future Notice of Requirement (NoR) and/or resource consent applications.

3.9 ECONOMIC AND EMPLOYMENT CONTEXT

3.9.1 Christchurch's Economy

The value of economic output in Greater Christchurch reached around $28.65 billion in 2018, representing 10.1% of New Zealand's nominal gross domestic product. Greater Christchurch's economic success is therefore considered to be not just of critical importance to the Canterbury region and South Island but New Zealand as a whole.

Christchurch Airport received a record 6.93 million passengers in the 2019 financial year, with operating revenue growing 44.2% in the past five years, to $187.4 million[44]. Meanwhile, Lyttelton Port handled 437,413 containers in the 2019 financial year, up 2,9% in 2018 financial year levels[45]. Both are forecast to grow as the population increases which in turn will drive growth in demand for the movement of both people and goods.

The movement of freight plays a critical role for Greater Christchurch's economy in ensuring that goods reach both domestic and international markets. Road freight provides a flexible and dependable mode for freight operators and receivers. The estimated volume and value of freight moved through Greater Christchurch via road was $18.9 billion in 2014 - 31.6% of the total value of freight[46]. It is crucial that Christchurch's strategic road network supports the movement of freight in and around Greater Christchurch.

Journey time reliability has been identified as a key problem impacting not only on private vehicle trips and PT, but also road freight trips. Network congestion and delays on key freight routes and access points impact on the movement of goods and the economic performance of Greater Christchurch. The development of a more efficient and effective PT network would likely release road capacity, assuming it attracts a significant modal transfer. This would have downstream benefits for freight trips on key corridors.

In 2015 the top 5 industries in Greater Christchurch based on employee numbers were in order of greatest employee numbers: Construction (26,800 employees), Health/Social Care, Manufacturing, Retail Trade and Professional, Scientific and Technical Services[47]. Employees in Construction had more than doubled between 2006 and 2015, reflecting the rise in this industry as part of the rebuild.

[42] https://www.ccc.govt.nz/assets/Documents/Culture-Community/Heritage/ChristchurchCityContextualHistoryOverviewFull-docs.pdf, p. 9
[43] https://www.greaterchristchurch.org.nz/background/background-2007/trends/environment
[44] Christchurch Airport (2019). Retrieved 24 March 2020, from https://www.christchurchairport.co.nz/about-us/who-we-are/facts-and-figures/
[45] Lyttelton Port Company (2019). Annual Report 2019, p.11.
[46] Greater Christchurch Partnership (2014). Greater Christchurch Freight Study: Freight Management Directions Statement
[47] Rockefeller Foundation and Greater Christchurch Strategic Partners (2016). Resilient Greater Christchurch, p.18

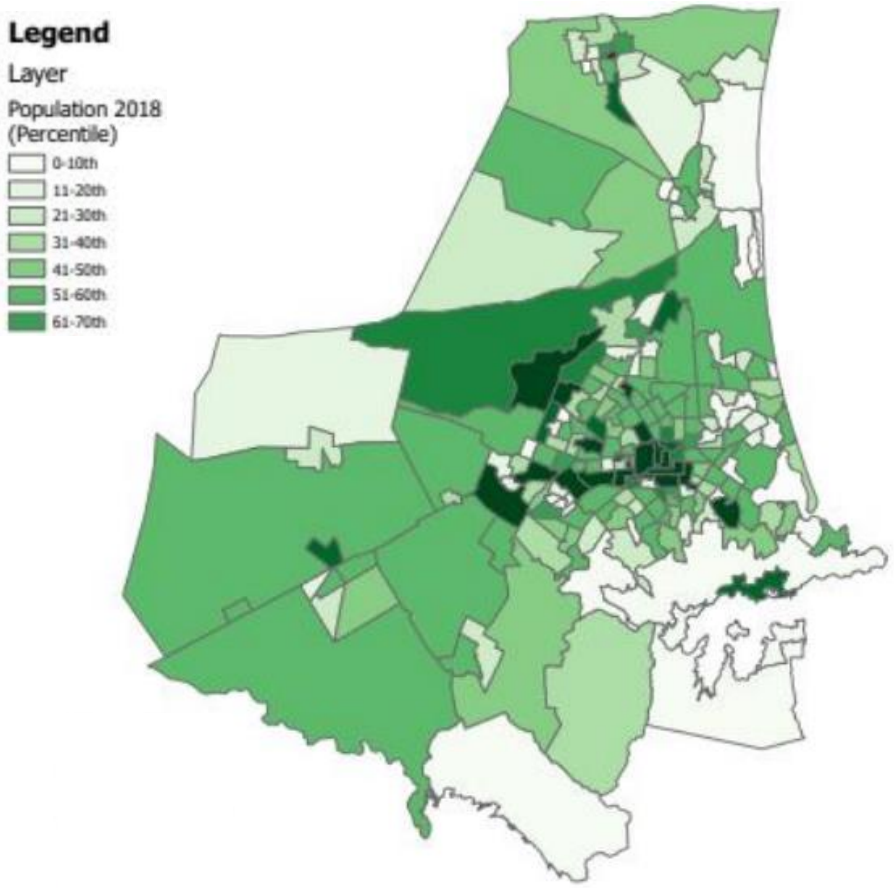


Figure 3-29: Employment Distribution in Greater Christchurch in 2020[48]

The 2018 Census shows that the Christchurch central city is bouncing back after the 2010/2011 earthquakes, with more than 11,000 additional workers in the central city than at the time of the 2013 Census. This can also be demonstrated by the employment distribution shown in Figure 3-29. Whilst more recent census data is not yet available (the next census is scheduled for 2023), the CTM Sector 2021 data estimates that as of 2021 the number of people employed in the centre of the city had increased to 45,124[49].

3.9.2 Future Employment Growth and Distribution

Employment is forecasted to grow by approximately 47% between 2021 and 2051, from 244,450 to 359,068 (Figure 3-30)[59]. In total, an additional 114,618 employment opportunities are projected by 2051, with most of these (71%) within Christchurch City. This will create additional demands for land and floorspace, and opportunities to concentrate new development around PT.

It is noted the number of workers to households; and jobs to households is indicated to decline over time (smaller household sizes and aging population).

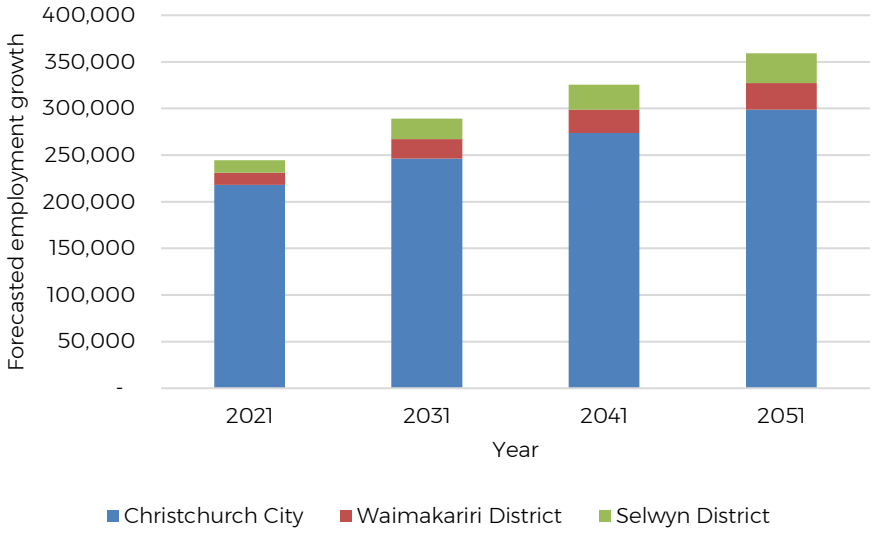


Figure 3-30: Forecasted employment growth in Christchurch City, Waimakariri District and Selwyn District, 2021-2051[50]

By 2051, employment is forecasted to be concentrated predominantly in the Christchurch Central City (22% of total jobs), the southern industrial belt (i.e., Addington, Blenheim Road, and Hornby), with smaller concentrations also in Rolleston and Rangiora, as shown in Figure 3-31.

[48] Greater Christchurch Foundations Report April 2022, p.31
[49] , CTM Sector 2021 data

[50] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

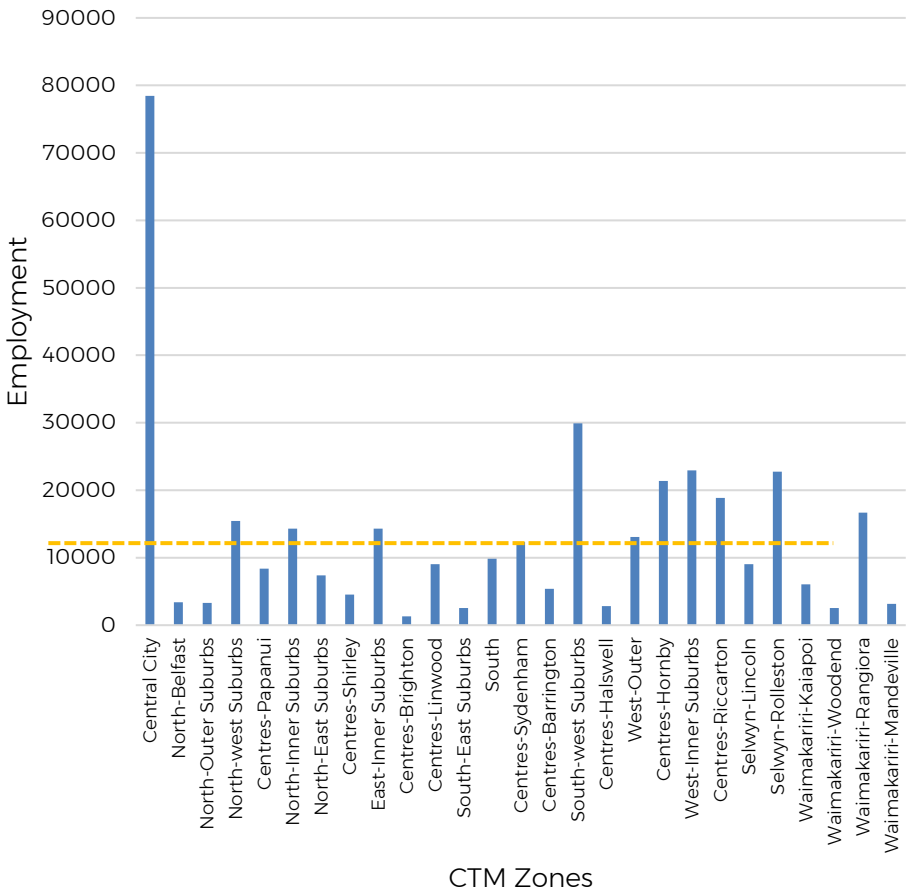


Figure 3-31: Total Employment by CTM Sector by 2051 in Greater Christchurch

Just eight of the CTM sectors will employ more than 15,000 people by 2051 (Central City, North-West Suburbs, South-West Suburbs, Hornby Centre, West Inner Suburbs, Riccarton Centre, Selwyn-Rolleston and Waimakariri - Rangiora) (refer to Figure 3-32).

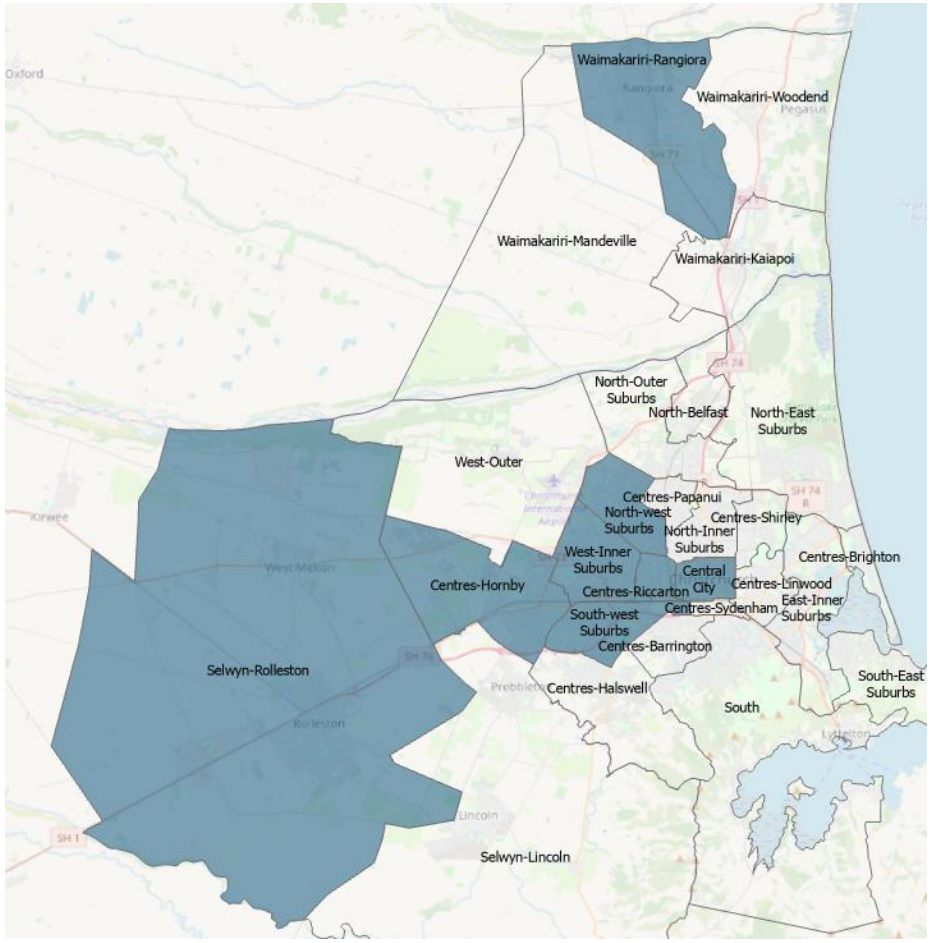


Figure 3-32: CTM Zones with more than 15,000 Employment Opportunities by 2051 (shaded blue)

When considering employment areas by CTM Zone (finer grain detail than the sectors above), the top 15 areas of greater employment in 2051 are outlined in Table below.

Some areas are forecast to lose employment as dispersed activities return to the central city as it is progressively rebuilt. Hospital Corner is expected be the area with the highest employment in 2051. However, the area around Rolleston Town Centre is anticipated to experience the most growth in employment between 2031 and 2051 with an increase of over 6,000 employees.

Table 3-3: Forecast employment growth by CTM zone[51]

Area	CTM Zone	Employment Total per CTM Zone				Description
		2031	2041	2051	Diff 2031 to 2051	
Hospital Corner	66	10329	12964	15360	5032	Hospital Corner
Central City	61	3934	5543	7005	3071	ANZ Centre / The Crossing
Airport and Surrounds	288	5940	6338	6701	761	Sir William Pickering Drive
Selwyn-Rolleston	364	1226	3177	4836	6345	Rolleston Town Centre
Central City	62	4127	5123	6030	1903	The Terraces / Cashel Street
Airport and Surrounds	284	5178	5502	5802	624	Airport
South-west Suburbs	183	3077	3962	4820	5600	Christchurch Arena / Addington Raceway
Waimakariri-Rangiora	6	1751	3865	4644	5359	Rangiora Centre
Waimakariri-Rangiora	1	1701	3470	4443	5328	Southbrook / Lineside Road
Central City	58	2173	3646	4985	2812	New Regent St / Performing Arts Precinct
Selwyn	359	1801	3349	4169	4914	Izone Business Park
Blenheim Road South	220	4051	4250	4435	384	Parkhouse Rd / Treffers Rd
Hornby	242	3742	3983	4206	463	Buchanans Rd / Waterloo Rd
Riccarton	256	3306	3749	4152	846	Westfield Riccarton
University of Canterbury	272	3148	3477	3775	628	UC Campus

3.9.3 Key Activity Centres (KACs) and Key Destinations

There is an ongoing focus on new commercial growth and development within the Central City and KACs, of which there are eight across the Christchurch City (Belfast, New Brighton, Shirley, Linwood, Papanui, Riccarton, Spreydon, Halswell and Hornby), three in Waimakariri (Rangiora, Woodend/Pegasus and Kaiapoi) and two in Selwyn (Lincoln and Rolleston). These centres, as set out in the CRPS and Our Space are identified as focal points for employment (including offices), but also community activities and the transport network and which are suitable for more intensive mixed-use development.

Beyond the Central City, the Riccarton, Papanui/Northlands, and Hornby KACs are the top three highest suburban employment generators with between 2,000 and 4,500 employees and offer a good range of social, community, hospitality, and indoor recreation venues, with each having a shopping mall as a key anchor.

In addition to the Central City and KACs, it is evident from the total employment figures that there are several other key areas or destinations which represent significant employment clusters and where access to PT should be maximised. These include:

- Christchurch Hospital
- Christchurch Airport and surrounds
- Blenheim Road industry
- Wider Hornby area and
- University of Canterbury

3.9.4 Christchurch Economic Development Strategy 2017

The Christchurch Economic Development Strategy 2017 (CEDS), Is owned by the Christchurch City Council and identifies strategic priorities and projects to contribute to economic growth for Christchurch City to 2031. It builds on the recent economic trends which have included the demolition of over 1,300 buildings in the central city post-earthquake, a low unemployment rate (the lowest in New Zealand 2013-2017) (Figure 3-33)), and the completion of a substantial volume of infrastructure works[51]. The strategy predicts that by 2031 there will be 73,500 job vacancies that will not be filled by natural population growth due to an aging population.

The CEDS identifies the key actions as being vital for future prosperity:

- The creation an attractive city for people, business, investments, and visitors;

[51] Christchurch Economic Development Strategy, 2017, p.6.

- The need to realise the potential of Canterbury's rural economy
- A maximisation of the commercial value of innovation
- To regenerate the Central City to ensure a connected, engaging and thriving city; and
- Improve experts, commercialisation and the flow of people, ideas, investment, and intellect into Christchurch.

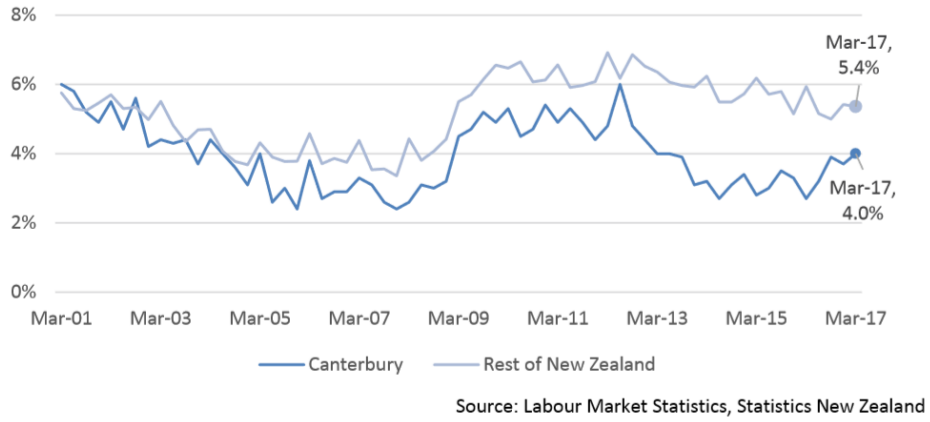


Figure 3-33: Unemployment Rate (actual quarterly rate)[52]

3.9.5 Affordability

Currently Christchurch does not have wage parity with other New Zealand cities (the median weekly earning in Canterbury was $921 in 2017 compared to $983 in Auckland (6.5% more) and $1007 in Wellington (9.4% more))[53]. Despite this the cost of living in Christchurch in 2017 was 12% cheaper than Auckland and 1.7% cheaper than Wellington.

Christchurch also has a median house price lower than the national median house price. Despite this, house prices in Christchurch increased by 48% in the two years to December 2021 (Figure 3-34), with similar increases experienced in Selwyn and Waimakariri[54].

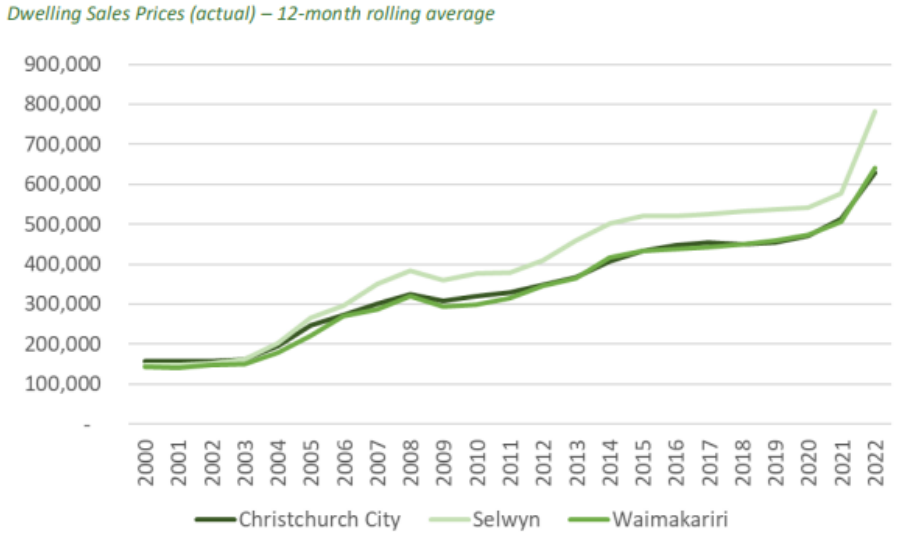


Figure 3-34: Rising House Prices in Greater Christchurch[55]

In addition, since the turn of the century Christchurch incomes have been rising faster than most of New Zealand with real income growth averaging 1.4 per cent since 2000, almost twice as high as Auckland. Median household income in Christchurch was just 87 per cent of Auckland in 2000, and in 2019 the two cities were almost equal[56].

The 16th Annual Dermographia International Housing Affordability Survey 2020 which rates middle-income housing affordability in Australia, Canada, Hong Kong, Ireland, Japan, New Zealand, Singapore, the United Kingdom, and the United States. Christchurch is the most affordable of the three largest cities in New Zealand (Figure 3-35), although this has been declining in recent years (Figure 3-34). In addition, to Auckland and Wellington, the study also considers affordability in Dunedin, Hamilton, Napier-Hastings, Palmerston North, and Tauranga. Christchurch remains the most affordable of urban environments considered for housing based on the median house price and median household income ratio.

[52] https://dpmc.govt.nz/sites/default/files/2017-07/monitoring-greater-christchurch-regeneration-june-2017-report.pdf, p. 12
[53] Christchurch Economic Development Strategy 2017, p. 11
[54] Agenda of Whakawhanake Kāinga Committee - Friday, 13 May 2022 (infocouncil.biz), p.37
[55] Agenda of Whakawhanake Kāinga Committee - Friday, 13 May 2022 (infocouncil.biz), p.37
[56] https://www.pwc.co.nz/publications/2019/citiesinstitute/cities-urban-competitivesness-christchurch.pdf

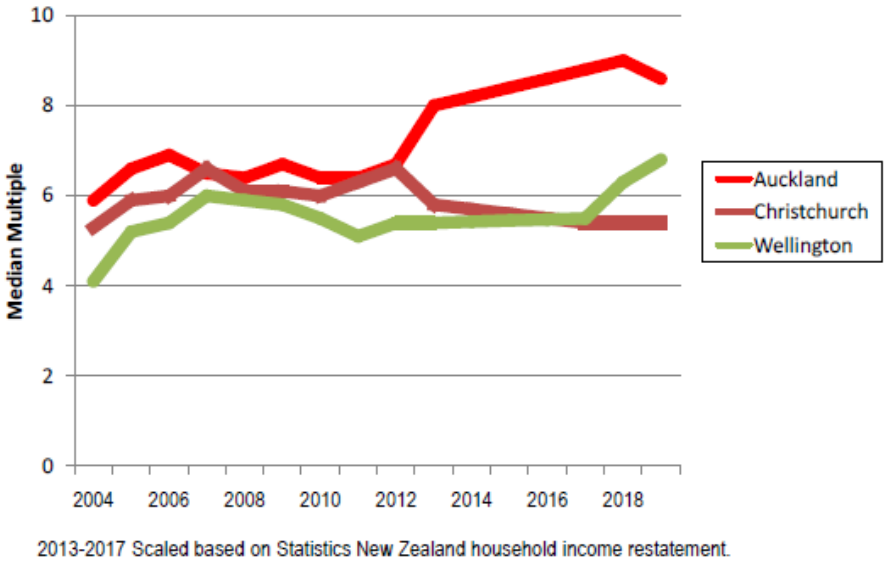


Figure 3-35: New Zealand Middle Income Housing Affordability 2004-2019[57]

Rents in Greater Christchurch have increased faster than incomes over the last two decades; and in the same period house prices have increased 3.4 times faster than incomes in Selwyn, 2.7 times faster in Christchurch City and 2.2 times faster in Waimakariri. Over 10,200 households had social or other housing needs in Greater Christchurch in 2020, with 93% of these households being in Christchurch City[58].

3.10 POPULATION AND DEMOGRAPHIC CONTEXT

3.10.1 Future Population Growth and Distribution

As New Zealand's second-largest and one of the fastest growing regions, Greater Christchurch's 2021 population of 499,000 is projected to grow to over 655,000 by 2051, as illustrated in Figure 3-36[59]. This equates to a population growth rate of around 31% and translates to approximately 64,000 new households in Greater Christchurch by 2051.

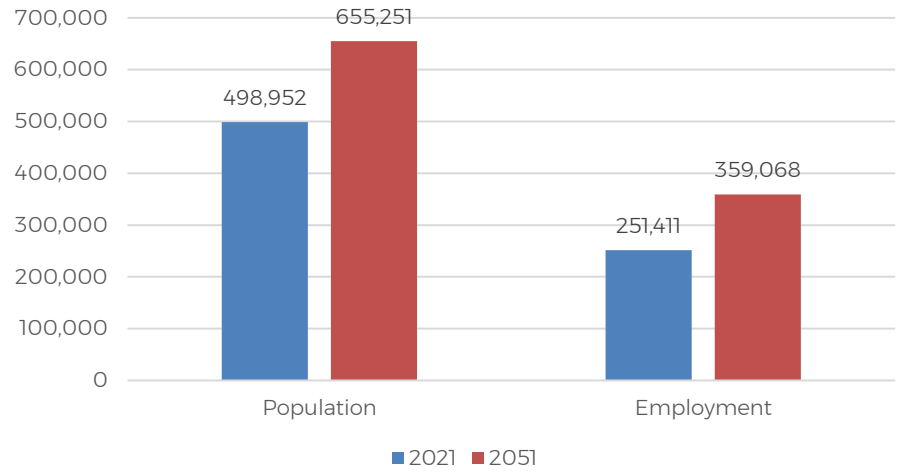


Figure 3-36: Forecasted growth in Greater Christchurch, 2021-2051[59]

44% of all population growth is anticipated to occur in Christchurch City, 36% in Selwyn and 20% in Waimakariri (Figure 3-37)[60]. This growth will inevitably increase travel demand in Greater Christchurch.

The population in Christchurch City is projected to grow by around 70,000 (18%) between 2021 to 2051. The Waimakariri District is projected to grow by around 33,000 (65%), while the Selwyn District is projected to grow by around 57,000 (108%)[59] during the same period.

[57] 16th Annual Demographia International Housing Affordability Survey 2020, Figure 10, p. 22
[58] Agenda of Whakawhanake Kāinga Committee - Friday, 13 May 2022 (infocouncil.biz), p.37
[59] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021
[60] Greater Christchurch Partnership (2019). Our Space 2018-2048: Greater Christchurch Settlement Pattern Update, p.11.

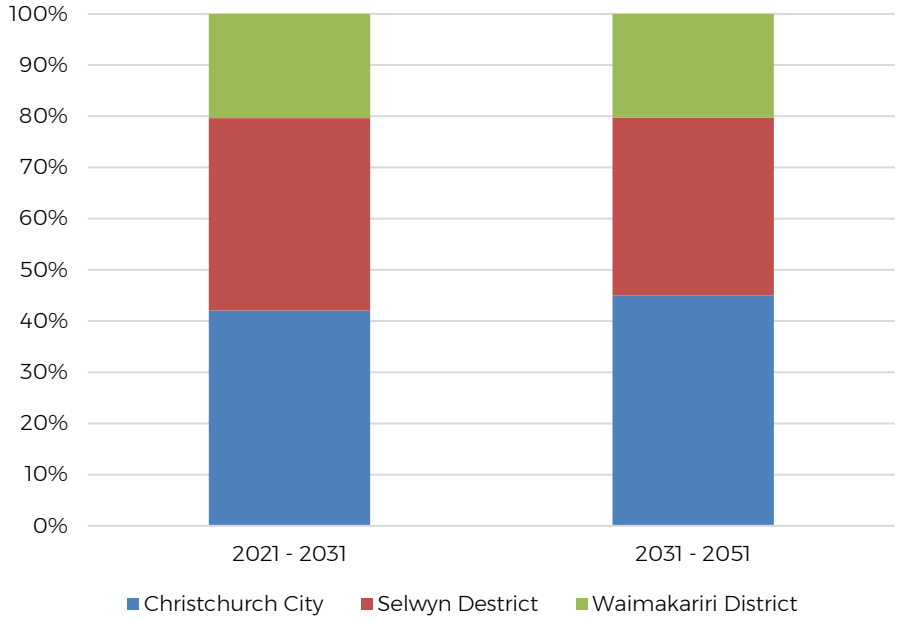


Figure 3-37: Forecasted distribution of population growth in Greater Christchurch, 2021-2051[61]

Residential growth is forecasted to comprise a mixture of greenfield growth on the Christchurch City fringe and intensification in the existing urban area. Figure 3-38 shows that by 2051 residential growth in the Selwyn-Rolleston Zone will become the most populous zone in the region. Nine zones will have more than 30,000 people by 2051 (shown in Figure 3-38 and Figure 3-39) and four zones will have more than 40,000 people by 2051 (these are North-East Suburbs, West-Inner Suburbs, Selwyn/Lincoln and Selwyn/Rolleston).

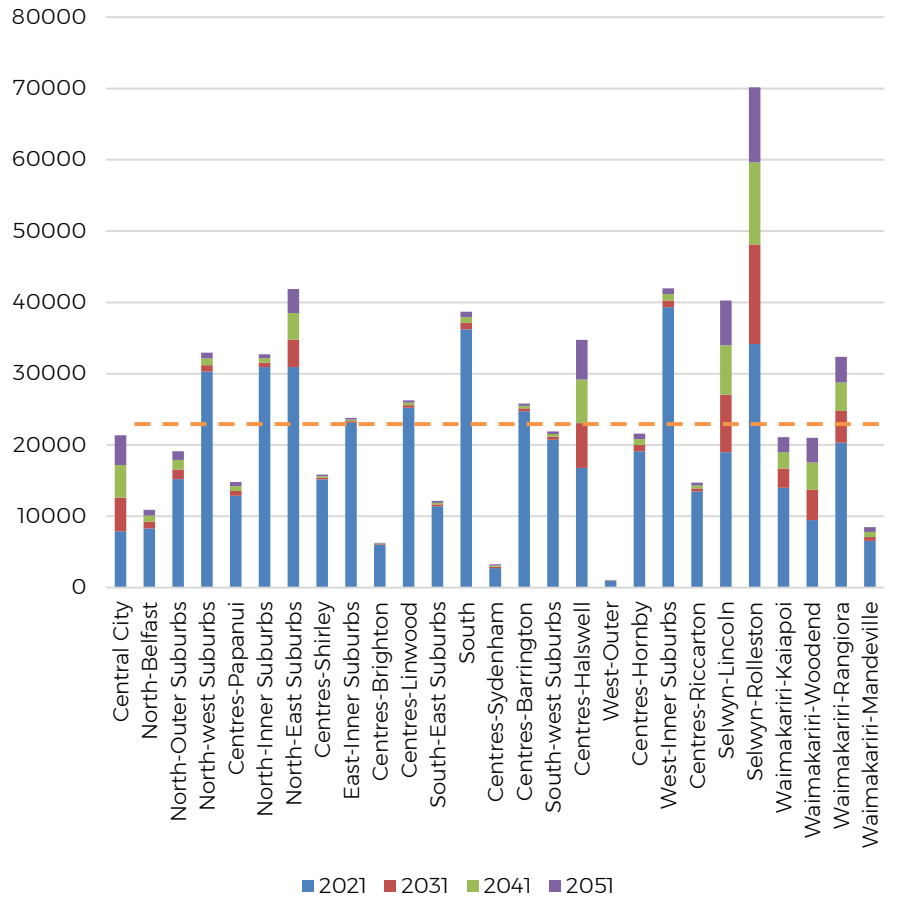


Figure 3-38: Population Growth per Decade 2021-2051 by CTM Zone in Greater Christchurch

[61] Greater Christchurch Partnership (2019). Our Space 2018-2048: Greater Christchurch Settlement Pattern Update, p.23.

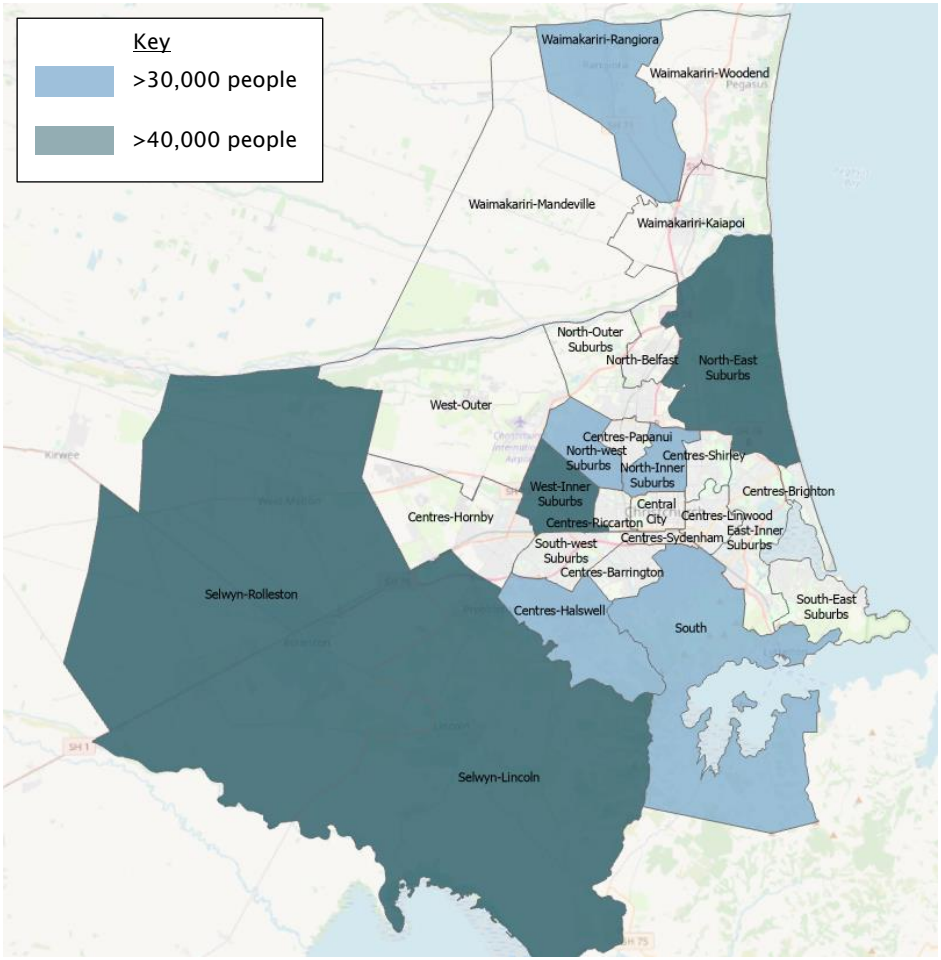


Figure 3-39: CTM Zones that will be most populous by 2051

The areas that will experience the most growth between 2021 and 2051 are Selwyn-Rolleston, Selwyn-Lincoln, Centres-Halswell, and Central City, as shown in Figure 3-40.

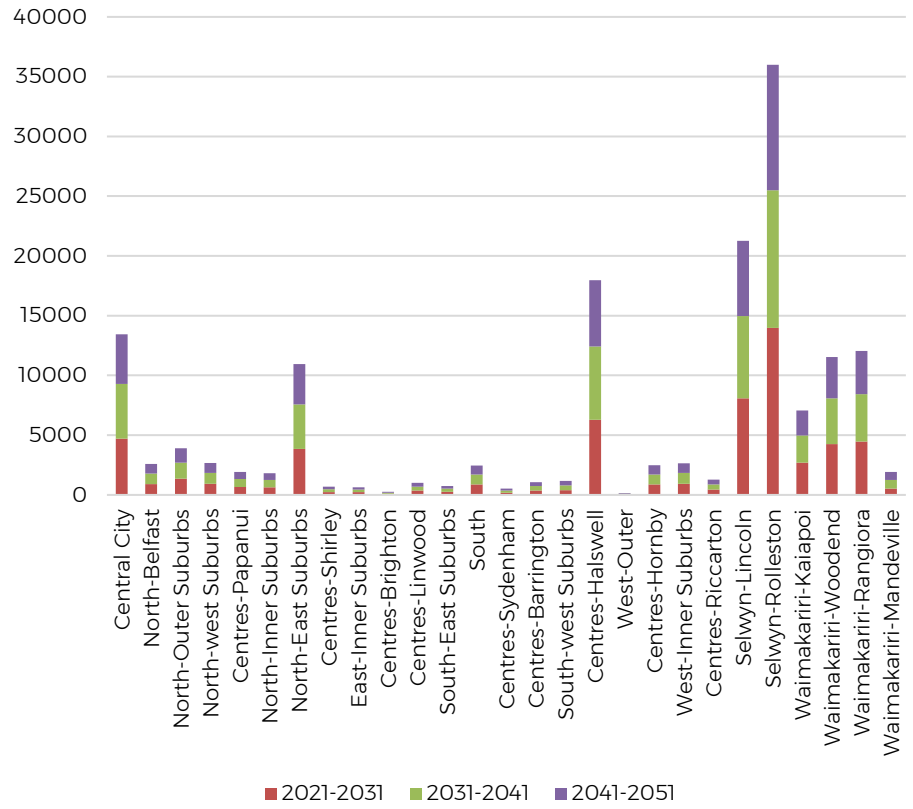


Figure 3-40: Growth in Population by CTM Zone by decade 2021-2051

3.10.2 Growth Challenges

3.10.2.1 Ageing Population

Across New Zealand and in Greater Christchurch the population is ageing as the proportion of those over 65 years grows (Figure 3-41). The population structure is expected to continue to change. From 2018 to 2043 across Greater Christchurch, the percentage of people aged 65 years and over is projected to increase from around 16% of the population to 24%[62]. People aged 65 years and over typically have fewer mode choice options but are currently eligible for free PT during all off-peak Metro bus services. An ageing population has implications for the future of the city with additional pressure anticipated to be placed on health, social care, changing housing and transport needs and a reduction in knowledge and skills in the economy that will only be replaced by migration.

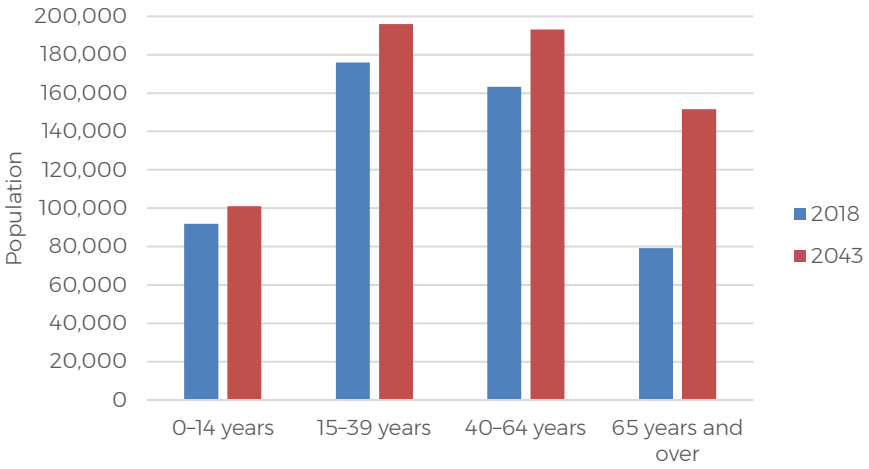


Figure 3-41: Greater Christchurch Population by age group, 2018-2043[63]

3.10.2.2 Deprivation

The New Zealand Index of Multiple Deprivation (IMD) is a set of tools for identifying concentrations of deprivation in New Zealand. Maps of the weighted mean New Zealand IMD values for Greater Christchurch in 2018. This demonstrates that there is a spatial element to deprivation in greater Christchurch with those areas most deprived (values 9 and 10) are located mainly to the east and south-west of the City, while areas with the lowest deprivation (with values 9 and 10) are located on and around the Port Hills and in large parts of the north-west of Christchurch City (Figure 3-42).

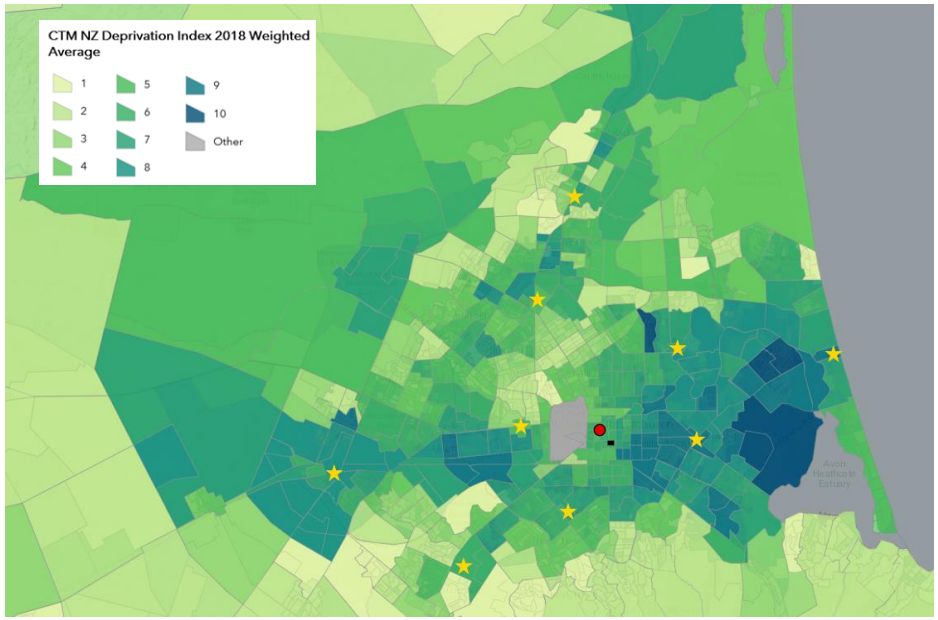


Figure 3-42: Weighted mean New Zealand Index of Deprivation value by CTM Model Zone - Christchurch City, 2018

The most deprived areas in the Waimakariri District (with values 8 to 10) are in a part of central Rangiora, Kairaki Beach/Pines Beach, and a part of eastern Kaiapoi. Areas of least deprivation (with values 1 and 2) include West Eyreton and Ohoka.

In the Selwyn District, a large proportion of the population live in areas of low deprivation values (1 and 2), including Rolleston, West Melton and Prebbleton[64]. There are no areas of high deprivation (with values 9 and 10) in the District.

[62] Statistics New Zealand (2017). Subnational population projections 2013-2043 - Population by broad age group. Retrieved 28 February 2020, from https://figure.nz/table/jVx2x7BNjE3Tta9Z

[63] Statistics New Zealand (2017). Subnational population projections 2013-2043 - Population by broad age group. Retrieved 28 February 2020, from https://figure.nz/table/jVx2x7BNjE3Tta9Z

[64] Department of Public Health, University of Otago, Wellington (2018). NZDep2018 Statistical Area 1 (SA1) data.

3.10.3 Community Aspirations – 'Share an Idea'

Following the earthquakes, the Christchurch City Council conducted a public consultation exercise in which local citizens were invited to share their vision for a rebuilt Christchurch city. Titled 'Share an Idea', the campaign was a ground up way of asking and acknowledging what the community wished to see in the future of their city. Overall, 100,000 ideas were received[65].

The council identified key linking statements to do with common themes amongst the ideas. One recurring statement was that of:

> *Interconnectivity made easy and enjoyable between activities, such as shopping and socialising and the streetscape, and between different locations across the Central City. Integrated affordable transport networks with pedestrians as the priority and including a range of options such as walkways, cycleways and public transport that moves people easily into and around the Central City*

This highlights that a range of transport choice is desired by the community (within 2214 comments received relating to transport modes). Other key themes were the desire for a car free Central City, that has a focus on a pedestrian-centred environment, and for a clean green city.

[65] Christchurch City Council. (2011a). Central City Plan: Draft Central City Recovery Plan For Ministerial Approval December 2011: Technical Appendices 1 of 3. Christchurch: Christchurch City, p. 5.

4 STRATEGIC CASE (ACTIVITY)

4.1 INVESTMENT LOGIC MAP AND PROBLEM STATEMENTS

4.1.1 Investment Logic Map (ILM), Problem Statements and Benefits

The key element of developing the strategic case is securing a consensus amongst investment partners and stakeholders to confirm the Problem Statements, Benefits, and Investment Objectives.

Several workshops were held (two at WSP on 8 and 22 July and the third virtually on 12 August 2020) with representatives from Waka Kotahi, CCC, ECan, SDC, WDC and Christchurch 2050 to develop a series of Problem Statements for the MRT IBC that built on the work previously undertaken in the Foundations and Rest of Network Indicative Business Case (IBC) and presented in the programme business case.

Based on the outcomes of the workshop and post-workshop dialogue between participants and the facilitator, the ILM was developed as follows:

Following the initial workshop which focused on the problem definition there were three key themes identified:

- Prosperity/economy
- Urban form/liveability/community and
- Climate change/environment

Following an additional workshop and email correspondence with representatives, four Problem Statements were developed focusing on:

- Accessibility to the Central City
- Improving travel choice and access to opportunities between Christchurch and growing outer urban areas
- Land Use patterns and transport investment to enable density and critical mass in key locations/transport corridors and
- A perpetuation of high car dependence contributing to worsening environmental outcomes

Figure 4-1: MRT Workshop 2 - 22 July 2020

The four draft problem statements identified (superseded) were:

> *Problem Statement 1- Continuation of future growth patterns and travel demands will constrain efficient transport choices for access to Christchurch's Central City, impacting accessibility to jobs and markets, restricting Greater Christchurch's economic potential, and threatening future investment (25%)*
>
> *Problem Statement 2 - A lack of a viable, competitive public transport between Christchurch and growing outer urban areas will result in poor travel choices and access to opportunities (25%)*
>
> *Problem Statement 3 - Misaligned incentives and signals for land use and transport investment, including provision of access will not enable density and critical mass in key prioritised locations and transport corridors in Greater Christchurch, resulting in a failure to achieve a liveable, vibrant city (25%)*
>
> *Problem Statement 4 - A perpetuation of high car dependence will continue a low mode share for public transport resulting in worsening emissions and environmental outcomes (25%)*

Following a series of meetings and workshops with the Greater Christchurch Partnership Committee in the second half of 2020 (11 September 2020 Committee Workshop, 6 November 2020 meeting and 11 December 2020 meeting), a revised set of problem statements were formerly adopted 11 December 2020 which include more explicit reference to the Greater Christchurch partnership climate change responsibilities. The problem statements have been reduced to three, with abbreviated versions provided for conciseness.

The detailed agreed ILM is attached in Appendix A – Investment Logic Map.

4.1.2 The Problems

Three problem statements have been identified:

Problem Statement 1: Current and forecast residential and business settlement patterns perpetuate high car dependence with more people expected to drive long distances, resulting in increased transport costs to users and the wider community, and a continuation of the low mode share for PT (33%).

Problem Statement 2: The PT system is not sufficiently attractive (in terms of travel time, reliability, convenience, comfort, and cost) to encourage its use in preference to private vehicles, resulting in a continuation of the low mode share for PT and higher congestion, which will constrain access to the central city and other key destinations, increase public and private transport costs and restrict economic growth (33%).

Problem Statement 3: As Greater Christchurch grows, a continuation of the current transport system is not sustainable and fails our climate change mitigation and adaption responsibilities. Higher vehicle use will result in higher levels of embedded carbon, higher greenhouse gas and particulate emissions, and poorer public health outcomes (33%).

These are abbreviated as follows:

PS1: Current and forecast settlement patterns perpetuate high car dependence, resulting in increased transport costs

PS2: The PT system is not sufficiently attractive to compete with private vehicles

PS3: Continuation of the current transport system will fail our climate change responsibilities and lead to poorer public health outcomes

The supporting evidence for each of these problem statements is provided below.

4.2 STATUS OF THE EVIDENCE BASE

The evidence base in support of the problems is strong with the accessibility within Christchurch and travel choice anticipated to be greatly restricted going forward.

A transport model (referred to as the CTM/CAST v21 model) forms a basis of a lot of the evidence provided below. The model enables outputs for future planning years (2041 and 2051) and is used to quantify growth in transport demands. The base population and land use projections (and associated transport modelling) that underpins the modelling undertaken was developed by the Greater Christchurch Partnership (GPC) at the Territorial Local Authority (TLA) level, within the UDS boundary area, in 2021.

These projections/forecasts are reasonably consistent with Statistics NZ (sub-national) population forecasts released in 2017; when applying the Medium Growth projection within Christchurch City and the Medium-High projection to both Waimakariri and Selwyn Districts.

Representatives from each TLA worked with QTP Ltd (who were updating the CTM and CAST regional transport models) to allocate the projected population and employment to Meshblock level (with CCC using its own internally developed land use modelling process). The resulting updated population/land use projections and transport model update are collectively referred to as the CTM/CAST v21 update (referring to the 2021 year that this update was made).

The assumptions made in the CTM/CAST v21 model are outlined in Appendix C – Land Use Inputs to Christchurch Transportation Model.

4.2.1 Problem Statement 1 – Current and forecast settlement patterns perpetuate high car dependence, resulting in increased transport costs

Current and forecast residential and business settlement patterns perpetuate high car dependence with more people expected to drive long distances, resulting in increased transport costs to users and the wider community, and a continuation of the low mode share for PT

4.2.1.1 High Car Dependency

New Zealand cities typically have a high level of car dependency[66] and Christchurch is no exception, with trips by car comprising 83% of total trip legs in Christchurch (as shown by *Figure 3-20* earlier). In contrast, in the same period Wellington had just 68% of total trip legs made by the car.

The 2018 Census data emphasised this further demonstrating that in 2018, 76.1% of people used a car as their main means of travel to work in Christchurch (3% greater than the national average of 73%[67]) (Figure 4-2).

Further a Ministry of Transport Travel Analysis Report released in 2018 showed that "Christchurch residents each spend an average of 221 hours behind the wheel every year, compared with just 10 hours on PT – against the 187 hours driving and 25 hours on PT in Auckland and 134 hours and 34 hours respectively in Wellington"[68].

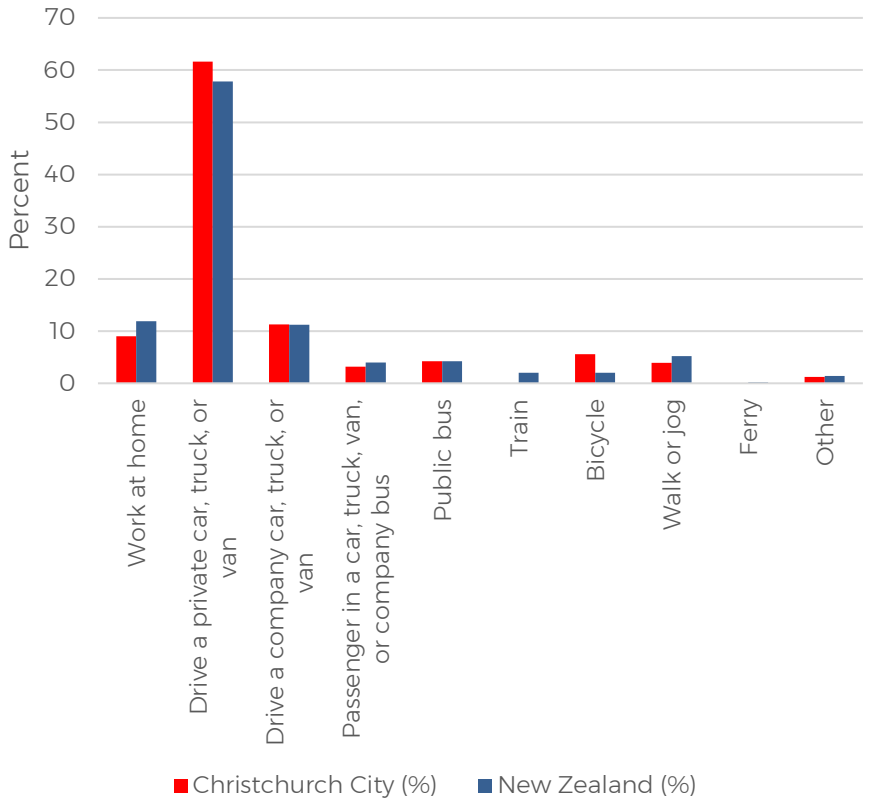


Figure 4-2: Main Means of Travel to Work in Christchurch City and New Zealand - 2018

The high car dependency in Christchurch is also demonstrated by the high levels of car ownership in Canterbury in 2015 compared to the national average (Figure 4-3).

[66] https://www.nzta.govt.nz/assets/resources/keeping-cities-moving/Keeping-cities-moving.pdf , p. 6
[67] https://www.stats.govt.nz/tools/2018-census-place-summaries/christchurch-city#transport
[68] https://www.stuff.co.nz/national/100313398/christchurch-the-countrys-car-capital-as-residents-shun-buses

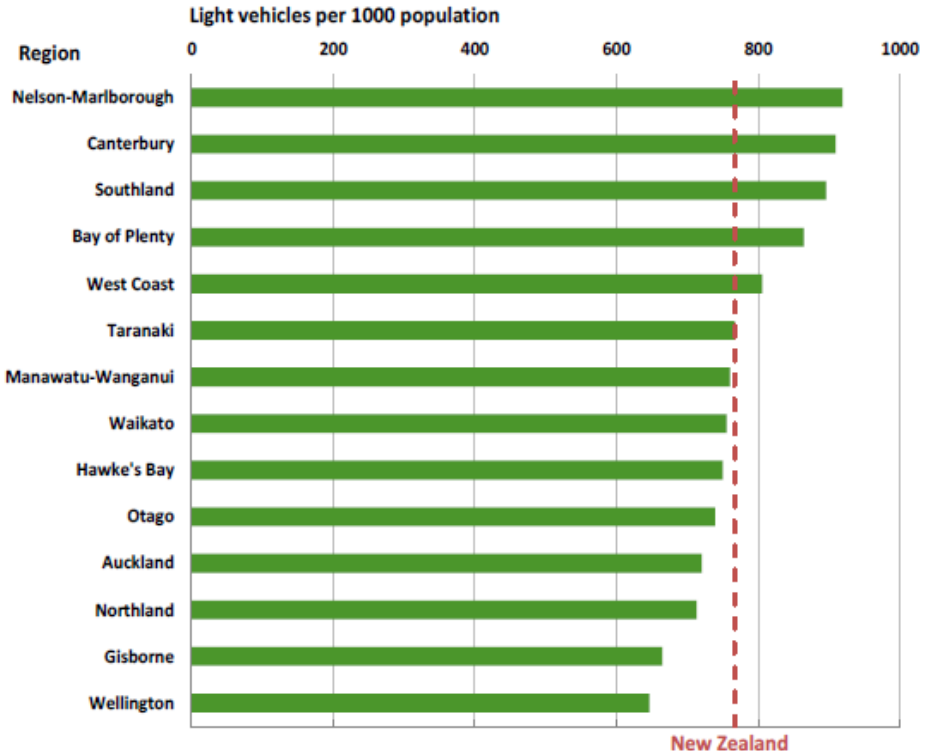


Figure 4-3: Number of light vehicles per 1000 population in New Zealand, by region, 2015[69]

4.2.1.2 Low PT Mode Share

Related to this high car dependency, PT patronage per capita in Greater Christchurch is relatively low compared to Auckland and Greater Wellington. On average, each Wellingtonian makes 74 trips on PT per year, around 2.8 times more than those in Greater Christchurch.

4.2.1.3 The Relationship between Settlement Patterns and Accessibility

Cities that promote a higher density of development experience several benefits particularly in relation to accessibility. Waka Kotahi 'Keeping Cities Moving' outlines the importance of urban form (or settlement patterns) in reducing high car dependency:

> *"Encouraging good quality, compact, mixed-use urban development will result in densities that can support rapid/frequent transit (and vice versa); shorter trips between home and work/education/ leisure; and safe, healthy and attractive urban environments to encourage more walking and cycling"*[70]

It adds that cities which thrive are those where people can move round with ease and have a range of travel choices for getting to work and education, to connect with family and friends and for accessing services.

Further the UK Urban Task Force[71] outlines there is a sound case for greater urban density:

> "*research has shown that real land economy gains are being achieved from increasing densities... [H]igher densities allow a greater number of public amenities and transport facilities to be located within walking distance, thus reducing the need for the car, and contributing to urban sustainability*".

Research has found that low urban density is related to high car dependency. In addition, lower density cities are typically associated with increased average trip lengths which in combination with high levels of private car usage, causes more greenhouse gas emissions (Figure 4-4)[72].

[69] https://www.ehinz.ac.nz/assets/Factsheets/Released-2017/EHI8-9-NumberOfVehiclesInNZ2000-2015-release-201701.pdf, p.3
[70] https://www.nzta.govt.nz/assets/resources/keeping-cities-moving/Keeping-cities-moving.pdf, p.19
[71] UK Urban Task Force (1999)
[72] http://spinlab.vu.nl/wp-content/uploads/2016/09/Research_Project_Lara_Engelfriet.pdf, p.2

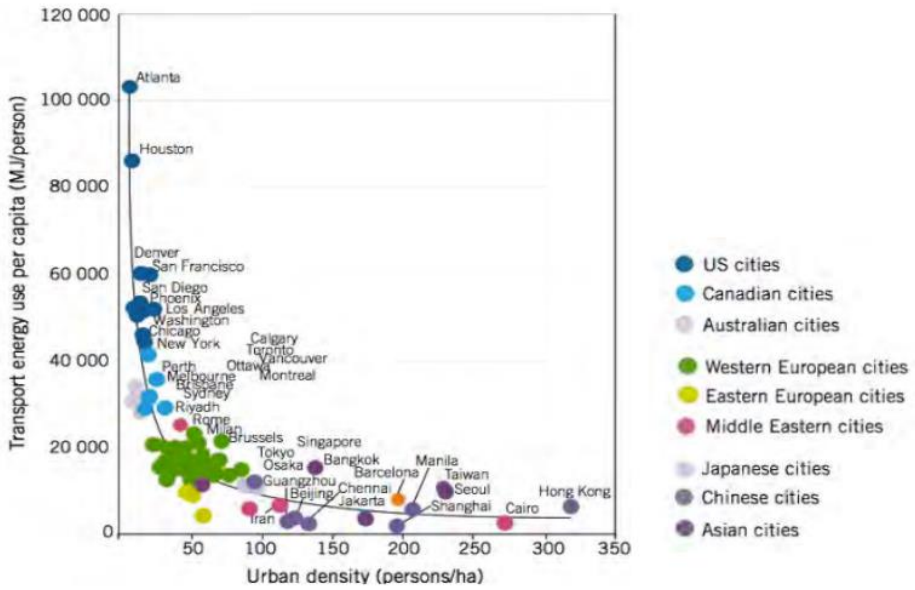


Figure 4-4: Relationship between Urban Density and Transport Energy Use (2011, WHO)[73]

MFE[74] also outline that higher density development in urban areas can result in:

- Cost savings in land, infrastructure, and energy;
- Reduction in economic costs of time spent travelling;
- A concentration of knowledge and innovative activity in the core of the city;
- Lower crime and greater safety;
- A reduction in runoff from vehicles to water, and emissions to the air and atmosphere (though air emissions may be more locally concentrated); and
- Help encourage greater physical activity, with consequent health benefits promote social connectedness and vitality.

Denser living also specifically helps support mode shift and reduce worsening environmental outcomes associated with high car dependency (see Section 4.2.1.4).

4.2.1.4 Current Land Development Patterns

The Greater Christchurch Mode Shift Plan outlines that "past land use and transport investment decisions have encouraged high levels of private car use with consequentially low uptake of PT"[75]. Historic low-density subdivision comprising 'cul-de-sacs and circuitous streets' built away from PT routes, and amenities that could be accessed on foot has reinforced dependency on the private vehicle.

While Christchurch is not shown in Figure 4-5, based on an average household size of 2.4 people per household[76], Christchurch generally falls somewhere between 25 and 45 persons per hectare (assuming a household per hectare density of between 10 and 20). The current target of 10-15 households per hectare for all new residential greenfield development set in the Canterbury Regional Policy Statement (CRPS) (Policy 6.3.7) would equate to an approximate urban density between 24 and 36 persons per hectare.

The CRPS target for intensification within Christchurch City is to achieve an average of 50 household units per hectare for intensification development within the Central City (120 persons per hectare) and 30 household units per hectare for intensification development elsewhere (72 persons per hectare).

Our Space proposes that future housing demand will be met by redevelopment of existing urban areas of Christchurch City (45%) and by existing greenfield areas within Greater Christchurch (36%). Just 19% of future housing demand will be met by new greenfield and redevelopment areas in Selwyn and Waimakariri. It identifies the need for additional land in Rolleston, Rangiora and Kaiapoi to meet medium term capacity needs.

As of 2017, monitoring of the Land Use Recovery Plan (LURP) suggested that actual intensification in Greater Christchurch was broadly running at around half of the desired targets. New urban development areas within all three Council areas were identified as being serviced by the substantial upgrade to the capacities of the northern, western, and southern corridors (CSM2 and CNC)[77].

More recently, there have been some improvements in density at localised infill (refer to Figure 3-10 earlier) in Christchurch City with residential development

[73] http://spinlab.vu.nl/wp-content/uploads/2016/09/Research_Project_Lara_Engelfriet.pdf, Figure 1. p.3).
[74] MFE, Value of Urban Design (June 2005)
[75] https://www.nzta.govt.nz/assets/resources/keeping-cities-moving/Christchurch-regional-mode-shift-plan.pdf, p.4
[76] https://ccc.govt.nz/assets/Documents/Culture-Community/Stats-and-facts-on-Christchurch/fact-packs/FactPack2016.pdf, p.6
[77] https://www.greaterchristchurch.org.nz/assets/Documents/greaterchristchurch/Our-Space-consultation/UDS-Settlement-Pattern-Review-Outcomes-and-Challenges-briefing-paper.pdf p.15

starting to trend away from low density housing stock in the form of greenfield development towards redevelopment and intensification of existing urban areas as supported by the Christchurch District Plan and Our Space. For example, in 2019/2020 60% of net new residential building consents in Christchurch City were Intensification/ Infill.

However, the majority of building consents issued between July 2018 and July 2020 across Greater Christchurch for residential dwellings still demonstrates that the large majority of new residential units consented are houses located in outlying suburbs as opposed to townhouses/flats or apartments located within more centrally located areas (Figure 4-5).

Figure 4-6 demonstrates that residential densities within areas within the central city and to the immediate north (i.e., Richmond/Edgeware) are starting to achieve 40 to 50 households per hectare (hh/ha). However outside of the Central City and immediate fringe (excluding isolated pockets associated with the Riccarton KAC, University of Canterbury, and Sydenham) remain at average residential densities between 10 and 20 households per hectare. The outer suburbs (including the hill suburbs) remain lower than 10 households per hectare. Of note there are no notable corridors of greater density visible in the 2018 density map. Overall, as at 2021 Christchurch continues to present as a low-density city and the majority of the city is at a density of less than 20 hh/ha (a population density of fewer than 25 people per hectare is generally considered 'low density'[78]).

When considering projected development to 2051, provides a direct comparison of anticipated residential densities[79]. This demonstrates increased areas achieving average residential densities between 40-50 hh/ha in the central city fringe and to the immediate south-east and north of the central city along with Addington, pockets of Sydenham and the immediate area surrounding the Riccarton KAC. In addition, many other areas start to achieve a residential density of 30 hh/ha. To the north-west of the (i.e., areas of Fendalton, Bryndwr, Avonhead, and Burnside residential densities are projected to remain low).

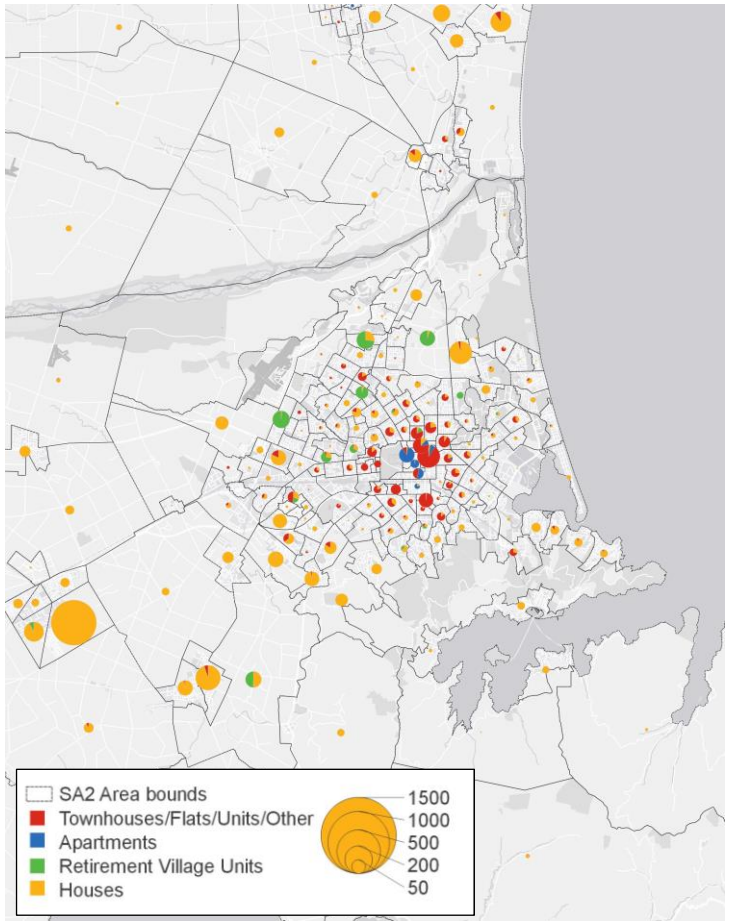


Figure 4-5: Number and type of residential dwellings granted building consent between July 2018 and July 2020 in Greater Christchurch

[78] https://www.greaterauckland.org.nz/wp-content/uploads/2009/06/thesis.pdf

[79] Additional 2018 and 2048 comparison maps are provided at Appendix F – 2021 and 2051 Residential Densities and Key Employment and Tertiary Area Maps demonstrating residential density and employment / tertiary density for Greater Christchurch.

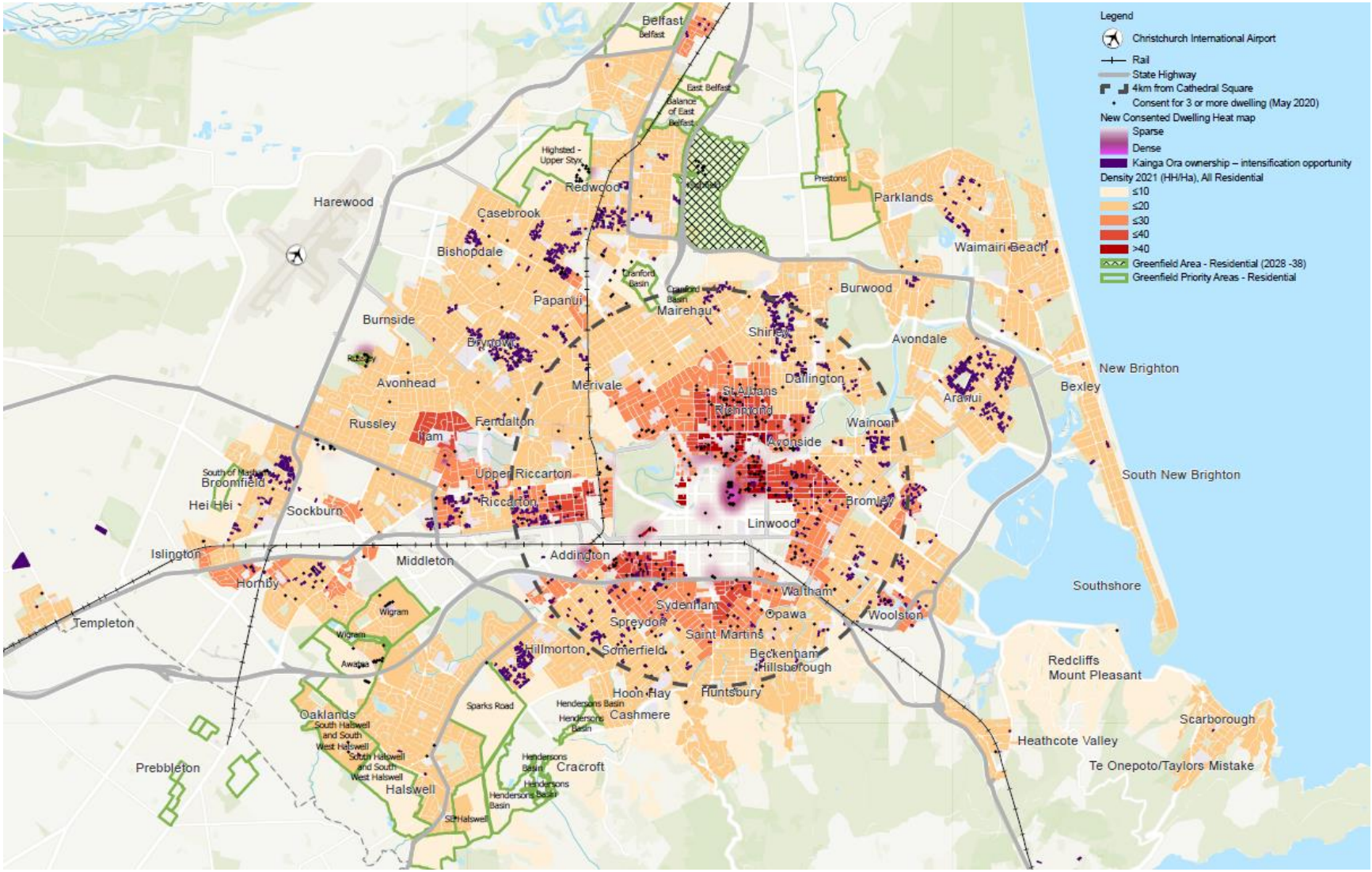


Figure 4-6: Greater Christchurch Residential Density as at 2021

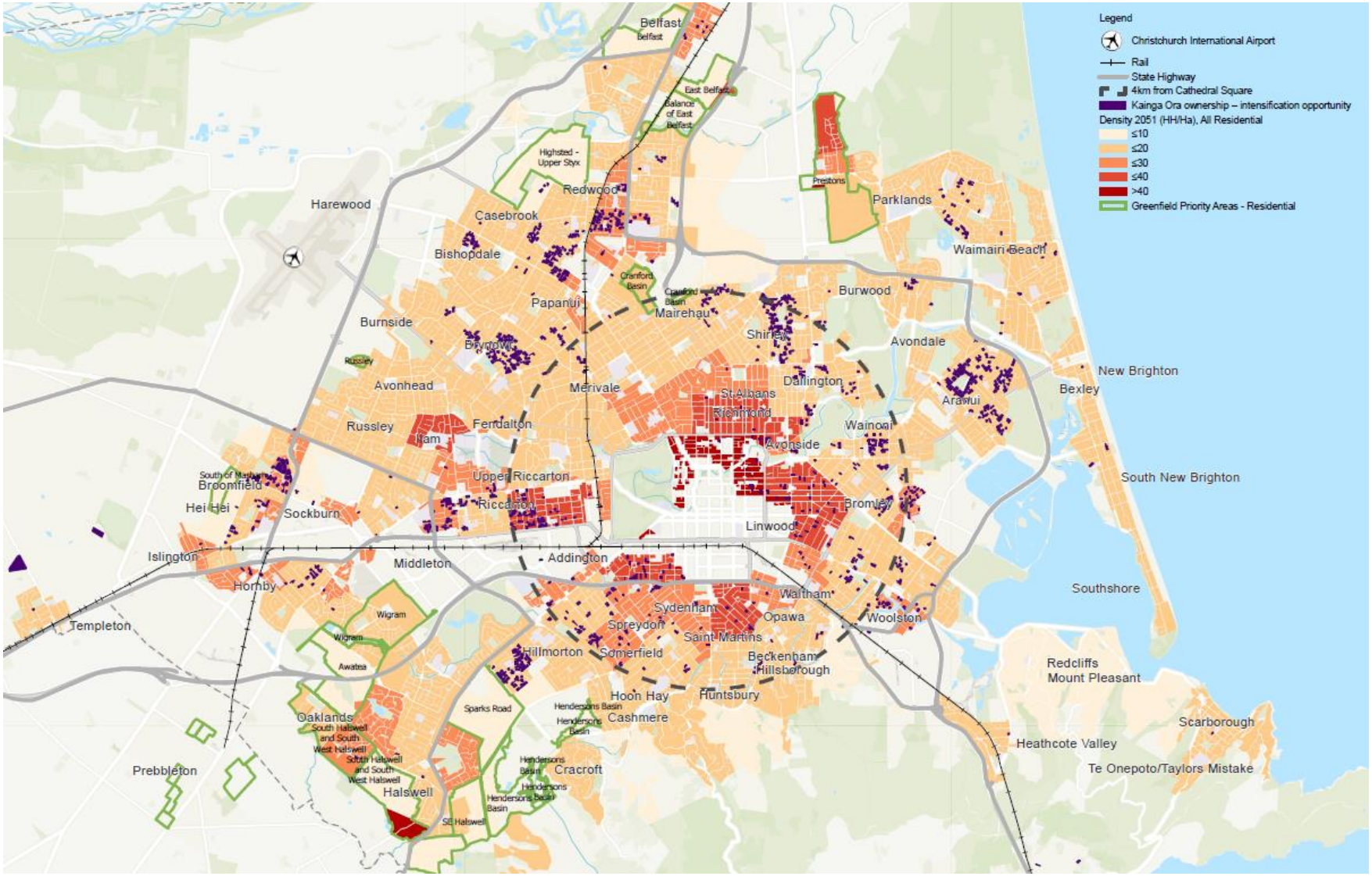


Figure 4-7: Christchurch Projected Residential Density 2051

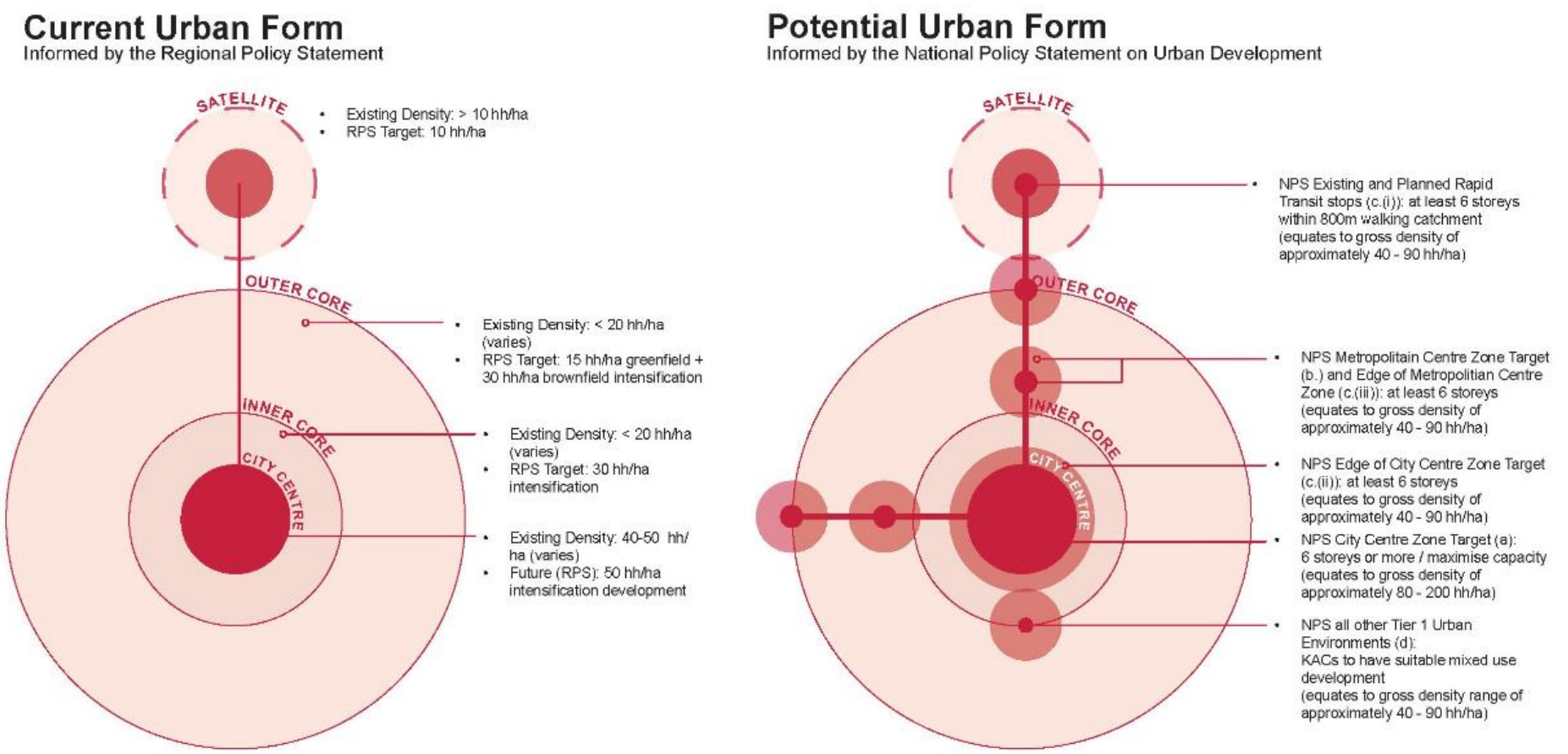


Figure 4-8: Current and Potential Urban Form across Greater Christchurch

Figure 4-8 compares the current densities in Greater Christchurch with those targets anticipated in response to the new directions for greater density in the NPS-UD. It demonstrates that currently while Greater Christchurch is achieving average densities broadly consistent with targets in the RPS, the new NPS-UD directs that substantial density increases are required over that currently being achieved or sought especially within the central city (equates to gross density of approximately 80-200 hh/ha). Further it is important to note that currently density within the various urban areas of Greater Christchurch lacks consistency with sporadic areas of greater density and some of lower density as shown in Figure 4-6 and Figure 4-7. For example, within the Residential New Neighbourhood Zone CCC[80] have had advised that new developments are reasonably achieving density which would equate to a level of 50 hh/ha, however this infill is occurring sporadically, in isolated pockets (50 hh/ha is not being achieved across the whole zone).

[80] Correspondence from a meeting with the CCC Spatial Planning Team – 7 August 2020.

If Greater Christchurch wishes to achieve its aspirations of being a denser, more vibrant, liveable, and competitive city, and to achieve the benefits associated with this urban form (including a reduction in car dependency), then additional consideration is required to what is the appropriate residential density to achieve in each area to utilise land most efficiently.

While a shift to a more compact urban form is identified within 'Our Space' planning document, the current target for redevelopment within established urban areas for Greater Christchurch of 45% is relatively low compared to other NZ urban areas. For example, the Auckland Plan has a target of 60-70% future housing to be developed within existing urban boundaries.

While density is anticipated to increase based on current zoning and land use patterns it is not occurring at the desired rate due to several mixed signals, incentives and investment decisions which are discussed below.

4.2.1.5 Future Land Development Patterns

Christchurch has been identified as a major growth area by both central and local government policy, reflecting the additional 160,000 people anticipated to call Greater Christchurch home by 2051 (bringing the population to a total of 655,000)[81]. This is reflected in several key strategies and partnerships including:

- The National Policy Statement on Urban Development 2020 identifies Greater Christchurch as just one of five Tier 1 urban environments in New Zealand that will be subject to significant intensification[82]; and the
- Waka Kotahi 'Keeping Cities Moving' Mode Shift Plan puts a greater emphasis on the closer integration of transport and land use and benefits of more compact urban form to reduce travel distances and achieve greater mode shift from driving to PT and active modes. It identifies six high-growth areas for New Zealand with Greater Christchurch being one of these.

Greater Christchurch is New Zealand's second largest urban area and currently second-fast growing region. By 2051 Greater Christchurch's 2021 population of 499,000 is projected to grow to over 655,000. This equates to a population growth rate of around 31% and translates to approximately 64,000 new households in Greater Christchurch by 2051.

Additional growth will place increasing demand on land transport networks. For example, currently approximately 20,000 workers commute into Christchurch daily from the Selwyn and Waimakariri districts, largely in private vehicles[83], with further growth predicted in these regions.

Except for the Central City, the areas predicted to experience the largest percentage increase in population growth are all greenfield (and peripheral) locations (Halswell, Lincoln, Rolleston, Wooden and Rangiora). This location of population growth is anticipated to perpetuate high car dependence with more people located in areas where they are expected to drive long distances to access opportunities.

Employment

As outlined in Section 1.9.2, employment in Greater Christchurch is forecasted to grow by approximately 47% between 2021 and 2051, from 244,000 to 359,000. Between 2021-2051 employment growth is projected to occur primarily within the Central City which is anticipated to comprise 22% of all jobs by 2051 as demonstrated by Figure 4-9. This indicates that the Central City is expected to strengthen in its role, have increased employment density and is more likely to attract PT patronage.

[81] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

[82] Policy 3 of the NPS-UD directs regional policy statements and district plans in tier 1 urban environments to enable in city centre zones, building heights and density of urban form to realise as much development capacity as possible, to maximise benefits of intensification, and metropolitan centre zones, building heights and density of urban form to reflect demand for housing and business use in those locations, and in all cases building heights of at least 6 storeys.

[83] https://www.nzta.govt.nz/assets/planning-and-investment/arataki/docs/regional-summary-canterbury.pdf p.130

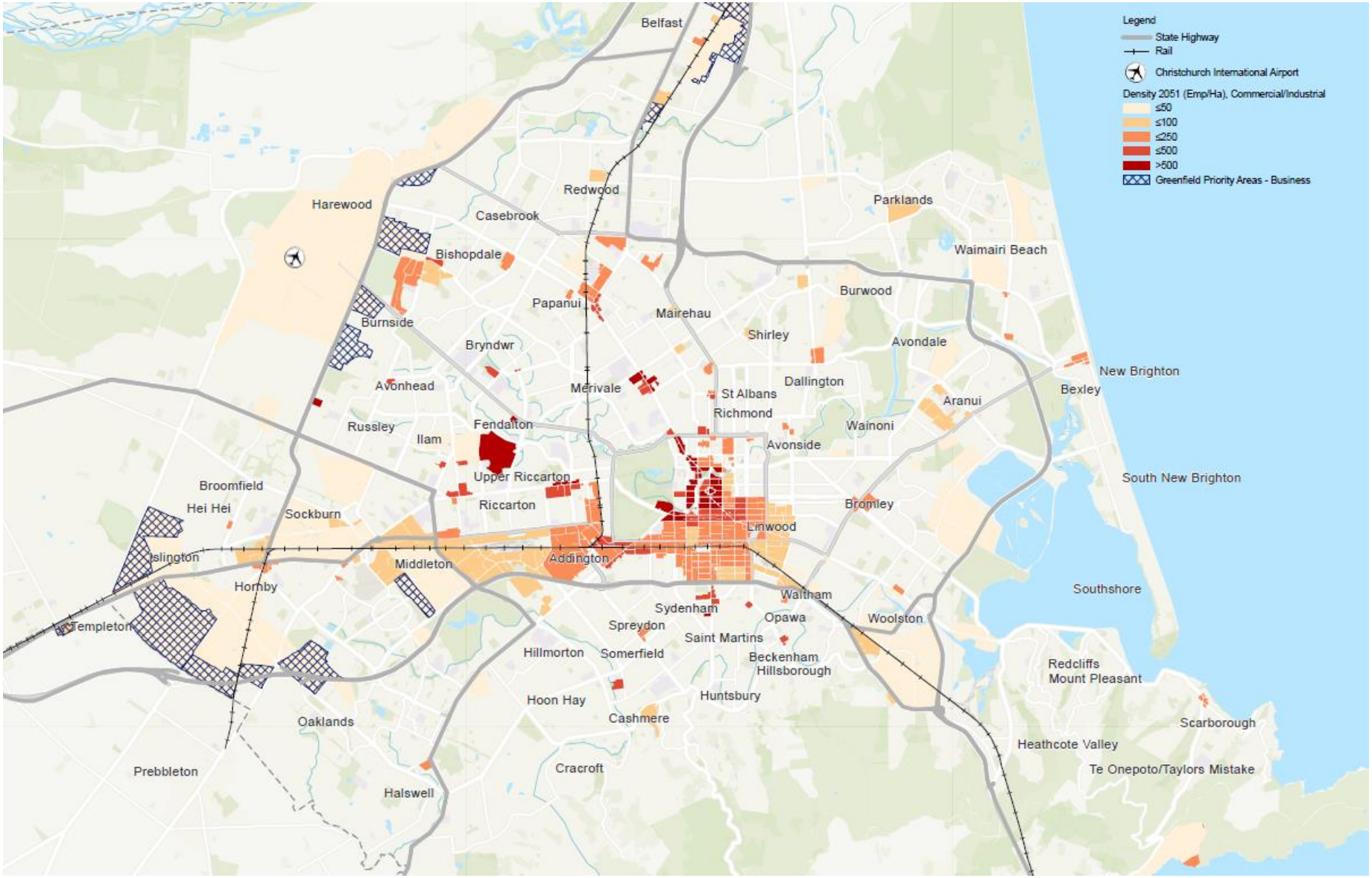


Figure 4-9: Greater Christchurch Employment Distribution 2021-2051

There is smaller, but still significant growth projected in Selwyn-Rolleston, Waimakariri-Kaiapoi, Waimakariri-Woodend, and Waimakariri-Rangiora (Figure 4-10).

The strengthening of the central city is important in a MRT context as MRT lines are typically required to support higher density locations, like the central city as they provide long term, reliable forms of access when supply of parking and road space becomes scarce.

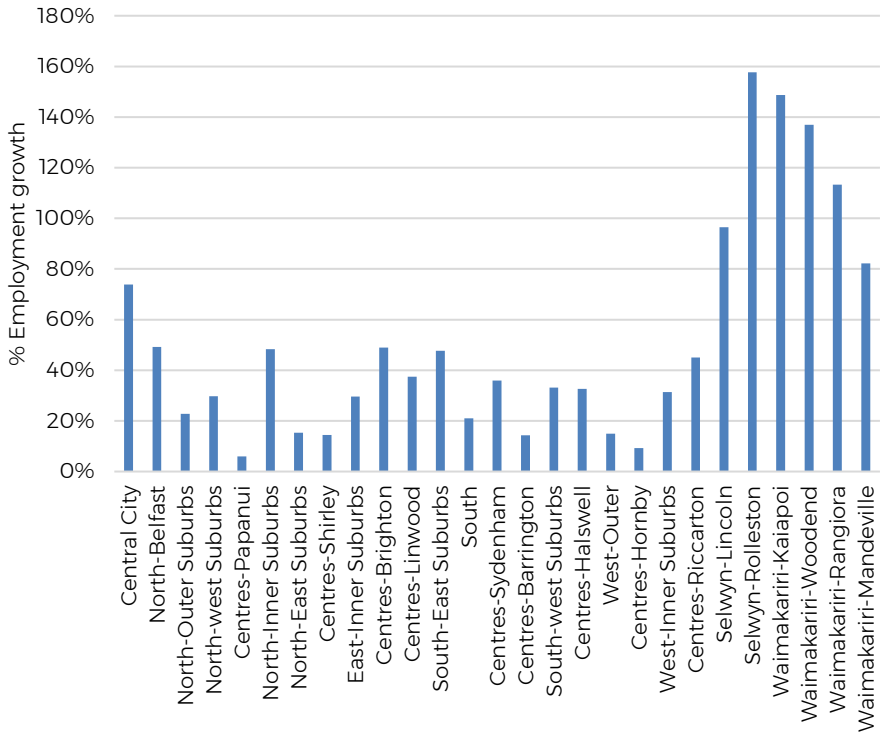


Figure 4-10: Areas of Employment Growth 2021-2051

Spatially, this can be demonstrated by Figure 4-11 and Figure 4-12 which outlines changes to employment density per hectare from 2021 to 2051. These show that by 2051 that large areas of the Central City will achieve a density of 250-500 employment opportunities per hectare along with areas to the north (along Papanui Road also showing densities at this level). This reinforces the importance of access to the central city and along corridors of clearly defined employment nodes.

19% of the population of Greater Christchurch or 49,300 people are anticipated to live in the four main satellite towns in Waimakariri and Selwyn by 2051 (8% in Rolleston, 3% in Lincoln, 5% in Rangiora and 3% in Kaiapoi). In contrast, just 12% of all employment opportunities will be located within these town areas showing a lack of integration between forecast residential and business settlement pattens.

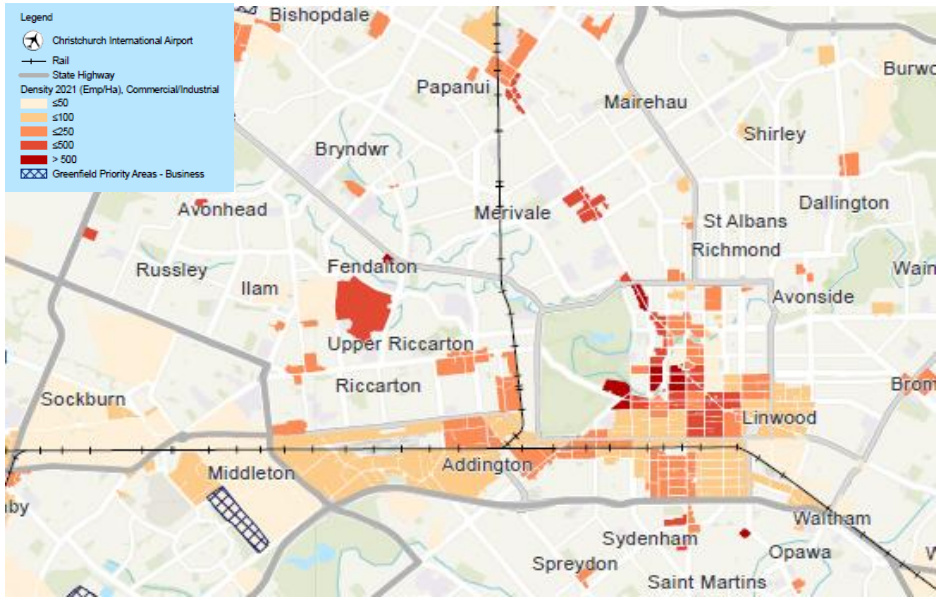


Figure 4-11: Employment and Tertiary Density per Hectare 2021

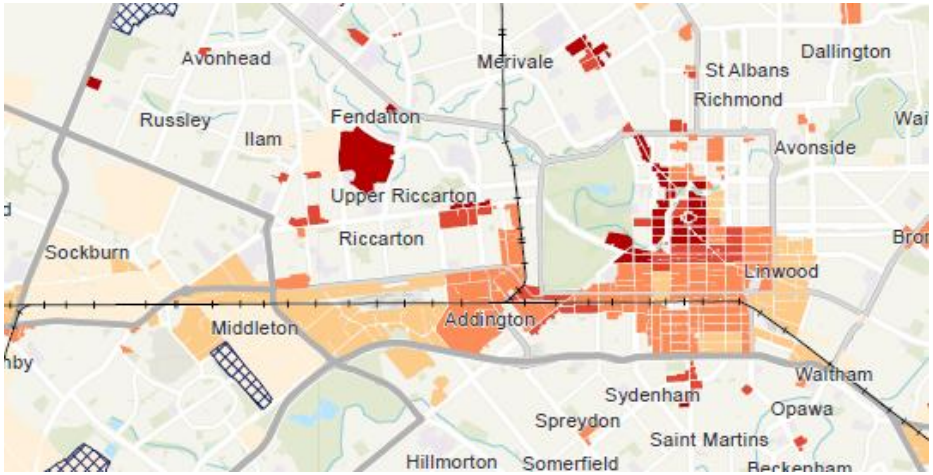


Figure 4-12: Central City and Surrounds - Employment and Tertiary Density per Hectare 2051

4.2.1.6 Background to the Land Development Patterns - Mixed Signals and Investment Decisions

Several incentives and signals for investment are at play in relation to the current and forecast settlement patterns and these often result in conflicting outcomes and a lack of clear direction. They emphasise that consideration beyond zoning provisions is required for Greater Christchurch to achieve 'aspirational' intensification targets and an urban form that supports a reduced car dependency. The following are examples of the mixed signals that have been occurring recently:

Investment in PT

In terms of investment in PT, Wellington, and Auckland both invested significantly more per capita in PT than Christchurch has. Wellington and Auckland have also increased their spending significantly in the last 10 years, while spending in Greater Christchurch has remained relatively flat (Figure 4-13).

However, there have also been some larger signals including the opening of the centrally located $53million Christchurch Bus Interchange in 2015.

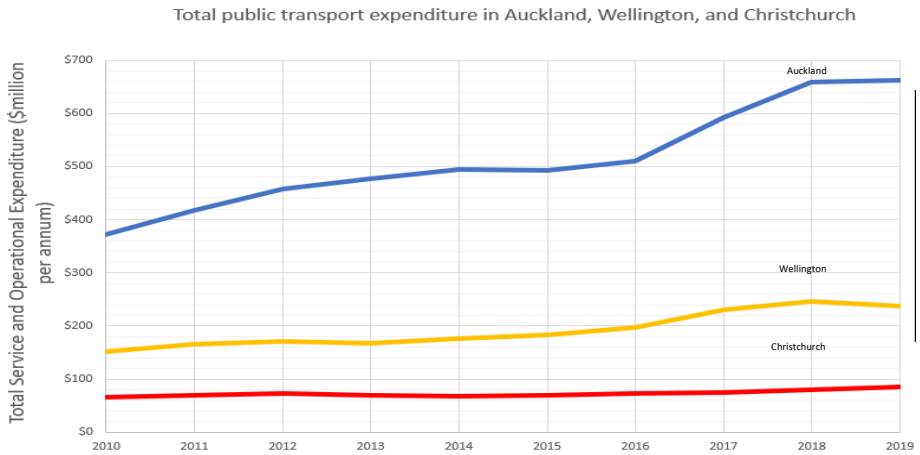


Figure 4-13: Total PT expenditure in Auckland, Greater Wellington, and Greater Christchurch, 2010-2019[84]

Investment in Roads and State Highways

At the same time as a proportionally low spend on PT, Greater Christchurch has had a comparatively high proportion of per capita spend allocated to Local Roads and State Highways, when compared to both Auckland and Wellington. For example, between 2018-2021 Auckland has a per capita spend on PT of approximately $1275, compared to approximately $225 in Canterbury (Figure 4-14).

Major corridor capacity upgrades in a north-west-south arc around the city (including CSM2 and CNC)) are both operational and enabling decentralised and dispersed growth pattern through growth to the west.

[84] Graphed using data from the Waka Kotahi Transport Investment Online (TIO) database

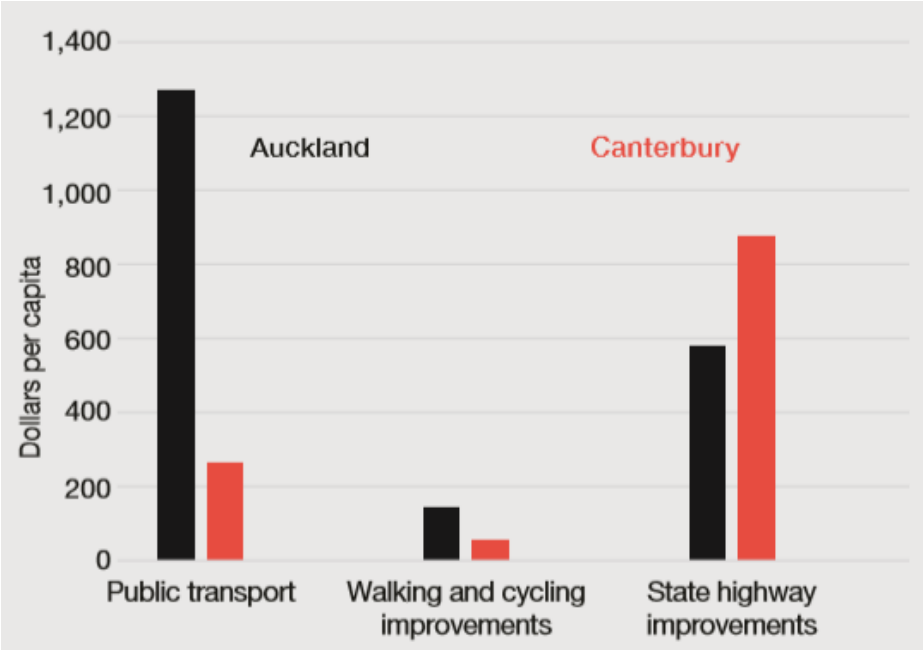


Figure 4-14. Auckland and Canterbury Transport Investment Programme Comparison, 2018-2021[85]

Parking Supply

The CDP currently restricts the establishment of permanent carparking buildings or parking lots where parking is the primary activity on site within the central city (Rule 7.4.2.1 RD8) and places further restrictions on carparking within the Central City Business Zone. Despite these restrictions, Christchurch has a high volume of parking supply, especially in the Central City where many vacant lots following the earthquakes have become temporary gravel parking lots.

As of 2020, approximately 64 hectares of land was used within the Central City for parking (off street and on-street parking)[86], providing a total of approximately 35,000 parking spaces within the Central City (this should be considered in the context of a total of 38,835 jobs within the central city in 2018 and just 7,883 residents[27]). Eighty per cent of the non-residential parking in the central city is on private land, mostly in the form of customer or staff car parking. Part of this oversupply in parking is a result of the 2010 and 2011 earthquake series with more than 200 vacant sites in the continuing to be used as temporary carparking spaces.

Outside the Central City, most suburban areas in Christchurch have an un-restricted on-street parking supply which typically has low occupancy rates[87]. Where occupancy of on-street parking regularly exceeds 75% at peak times CCC are seeking to apply time restrictions to these streets (i.e., P120 signs), with parking remaining free, unless with time restrictions these streets continue to see parking exceeding 75% at peak times.

The provision of substantial parking supply continues to support a perpetuation of high car dependency, making the use of the private vehicle a competitive transport mode (especially when accessing the Central City and KAC's)

Major Cycle Routes

Investment in the establishment of the Major Cycle Routes in Christchurch has seen the number of cyclists increase, especially within areas serviced by newly open cycleways and near the central city. Further investment is proposed with the government confirming 8 August 2020 that a further $125 million of Government funding would go towards six additional sections of cycleway.

The investment and establishment of the Major Cycle Routes indicates support for intensification and infill and an increasing in cycling mode share is directly attributable to this investment. However, the signals to developers and residents remain mixed, with this investment somewhat dwarfed by the scale of investment made in state highway and road improvements recently in Greater Christchurch (Figure 4-14).

Market Signals

Greater Christchurch has a relatively flat land value gradient from an approximate 5km radius from the Central City (Figure 4-15). This means that outside the 5km inner core, developers are less likely to build more intensively given the need to economise on higher land value areas isn't as critical.

[85]https://www.pwc.co.nz/publications/2019/citiesinstitute/cities-urban-competitivesness-christchurch.pdf
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[86]https://newsline.ccc.govt.nz/news/story/too-much-city-centre-parking-or-not-enough?fbclid=IwAR03h5C5M_k13IRvZi6vRCYMEkXyNU4tMdak4CChgKhDhfTd8p8v73nmT2U

[87] https://ccc.govt.nz/assets/Documents/Transport/Parking/Suburban-Parking-Policy.pdf

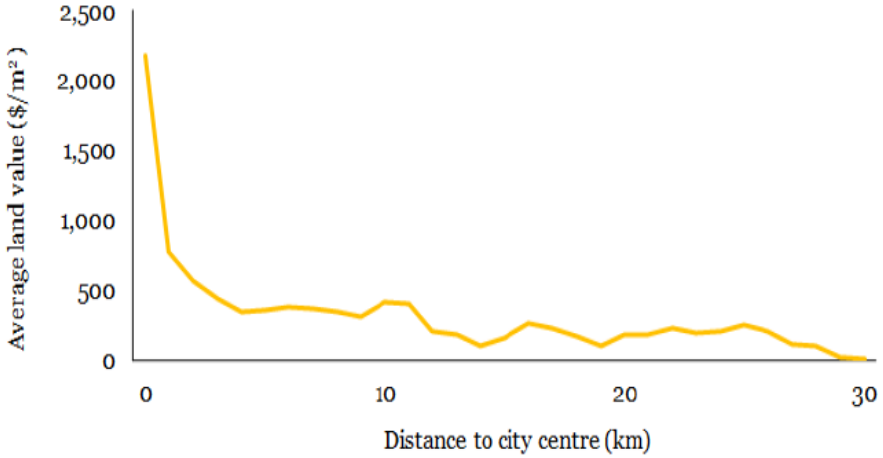

Figure 4-15: Greater Christchurch Land Value Gradient distance from the Central City as at 2019[88]

Land values in Greater Christchurch presented as a percentile of relative land values demonstrate that those areas of highest land values are typically central and to the north-west (Figure 4-16).

In comparison the same image of the Selwyn District shows that land values are typically lower but there are pockets of higher land value located around the key outer towns of Rolleston, Lincoln, Prebbleton and West Melton.

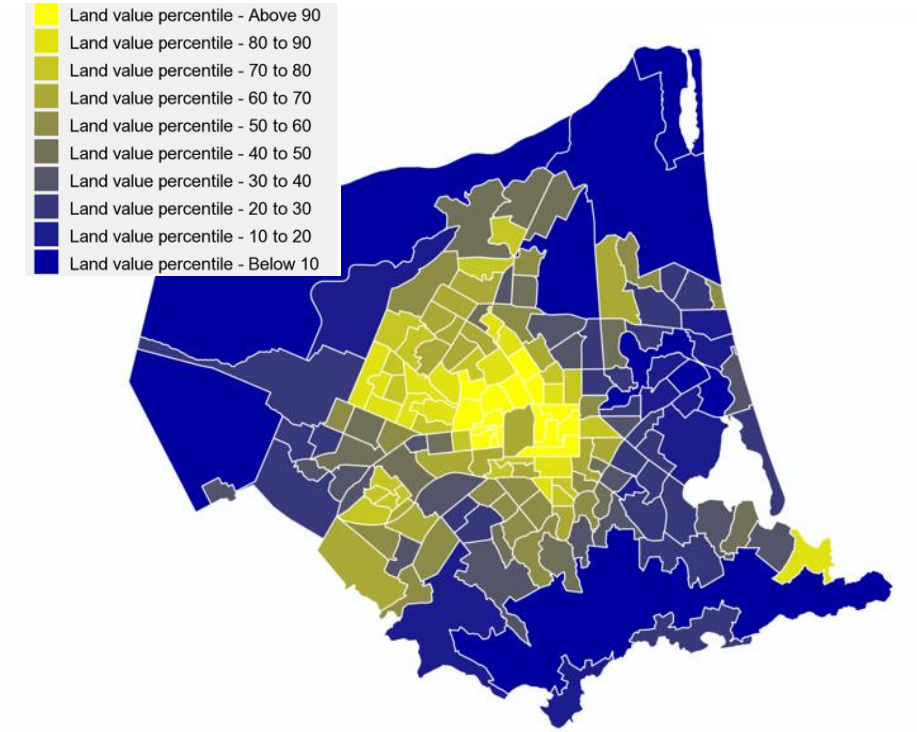

Figure 4-16: Christchurch City Relative Land Values 2019[89]

In terms of capitalisation ratios (the ratio of improvement value per overall capital value), within Christchurch City the areas of highest capitalisation do not coincide with the areas of highest land value, with greater capitalisation ratios occurring to the south and south-west (Figure 4-17).

[88] PWC Analysis

[89] PWC Analysis from 2019 Christchurch City Rating Valuations (Christchurch City percentiles of median SA2 land values)

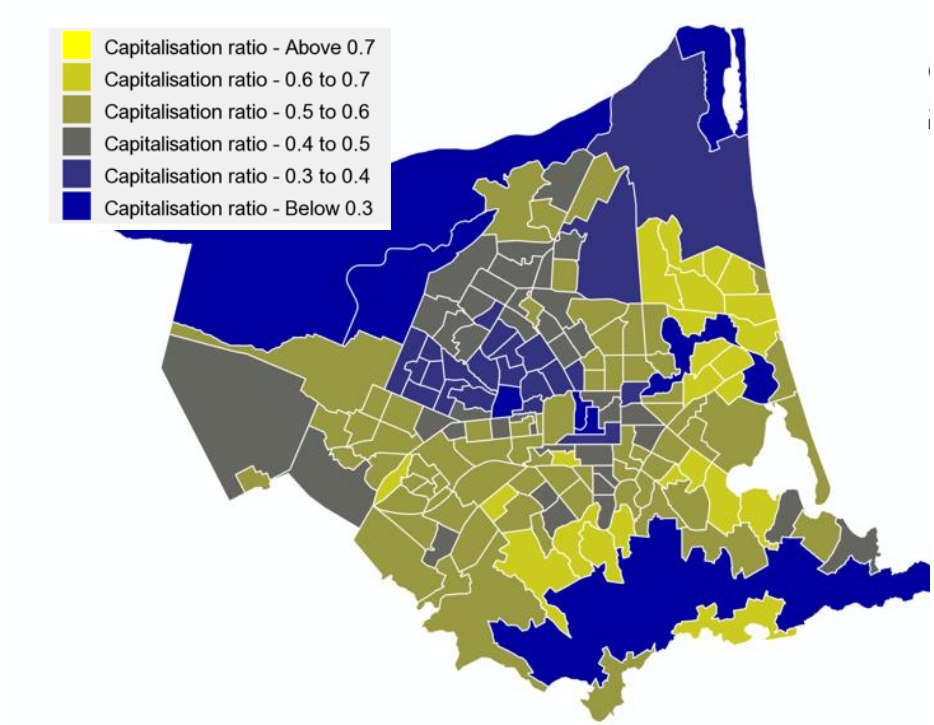

Figure 4-17: Christchurch City Capitalisation Ratio 2019[90]

This demonstrates that some of the high land value and low capitalisation areas could provide opportunities for densification in line with the future growth and spatial strategies for Christchurch. Internationally, there have been evidence of land value uplift following investment in MRT. One of the most comparable examples is the 7.1% increase in land value uplift experienced within 400m of the Light Rapid Transit corridor on the Gold Coast in 2014 (Table 4-1).

Table 4-1: International Examples of MRT Land Value Uplift[91]

Transit Type	Location	Population	System	Authors	Catchment	Uplift %	Year
LRT	Gold Coast, Australia	540,000	GCLR	Australian Government	400m	7.1%	2014
LRT	Missouri, USA	319,000	St. Louis Metrolink LRT	Garrett (2004)	700m	32.0%	2003
LRT	Buffalo, NY	900,000	Buffalo LRT	Hess & Almeida (2007)	400m	4%	1986
Metro	Helsinki, Finland	631,695	Helsinki Metro	Laakso (1992)	250m	4.8%	1982
HSR	Nantes, France	950,000	Nantes HSR	Haynes (1997)	-	20.0 %	1996

Selwyn District typically has a low capitalisation ratio (less than 0.5) corresponding with the large areas of rural land. The key outer towns all have capitalisation ratios above 0.7 (consistent with the central city and fringe areas in Christchurch City).

Accessibility is known to contribute to land values, with those properties most centrally located typically of greater land value than those located further out for MRT to induce land use change.

Zoning and Planning Restrictions

The Christchurch City Council currently provides opportunities for medium density development through the Residential Medium Density Zone which is located within 5km of the central city and immediately adjacent to KAC's. This zone enables maximum heights of 11m or three storeys of residential use. Further, some mid-level density is provided for in the Residential City Centre Zone which enables mid-rise apartments up 14-17m with a minimum density of 1 unit per 200m^2 of site area. Typically, mid-rise apartments are not seen outside of the City Centre, with predominantly 2-3 storey terrace housing being built in the RMD Zone. There are limited provisions in the Selwyn and Waimakariri District Plans to encourage the same level of intensification.

However, that all District Plans are under review and are anticipated to include new provision around intensification and greater housing choice to reflect the

[90] PWC Analysis from 2019 Christchurch City Rating Valuations (SA2 capitalisation ratios)

[91] PWC Analysis - 2020

requirements under the NPS-UD. These provisions are likely to apply to all residential zoned land, enabling the development of up to three residential units up to three storeys in height per site (where qualifying matters do not apply). As noted earlier, Selwyn and Waimakariri District Councils have notified their plan changes, which have legal effect on notification unless qualifying matters apply. Christchurch City Council will notify their proposed plan change on 17 March 2023, but have indicated that there are qualifying matters which apply to all residential zones.

Existing Medium and High-Density Development

There is general discussion that there is currently a lack of good medium and high-density residential apartments in Christchurch, which does not assist with the transition to a denser, more compact urban with reduced reliance on the private motor vehicle. On 10 September 2020 an article was published summarising comments made by mayor Lianne Dalziel that CCC would be prepared to change planning rules in the Christchurch District Plan to prevent over intensification of Christchurch's suburbs despite it being against the Government directive to increase housing density[92].

It followed the completion of a Medium and High-Density Housing Urban Design Review commissioned in 2018 by CCC[93]. The report found many new developments have "monolithic" appearances and "inadequate or poor" design.

These comments and the media articles that surround reports add further confusion regarding a transition towards a denser urban form and achieving critical mass to achieve a more liveable and vibrant city.

Priority Locations for Growth

To date the Greater Christchurch land use planning documents, prioritise several key locations: the Central City, eight KACs across the Christchurch City (Belfast, New Brighton, Shirley, Linwood, Papanui, Riccarton, Spreydon, Halswell and Hornby), three KACs in Waimakariri (Rangiora, Woodend/Pegasus and Kaiapoi) and two KACs in Selwyn (Lincoln and Rolleston). These centres, as set out in the CRPS and Our Space are identified as focal points for employment (including offices), but also community activities and the transport network and which are suitable for more intensive mixed-use development.

In addition to the Central City and the identified KACs there are several other key areas or destinations which represent significant employment clusters including the Christchurch Airport and surrounds; Blenheim Road industry; Wider Hornby area; and University of Canterbury.

The lack of clear prioritisation amongst the extensive number of identified focal point locations is a further mixed signal for investment (in total there are thirteen KAC's and a central city).

MRT being a relatively fixed corridor, inherently prioritises locations in its essential decision making. Consequently, there is a need to identify prioritised locations for MRT in Greater Christchurch as part of future options assessments for this IBC. This prioritisation is in fact key to the potential value uplift as the increase in access relative to other places provided generates an increase in value and potential for density.

Regardless it is noted that the central city is the key priority location within Greater Christchurch due to employment and population density, anticipated growth and the recreational opportunities and city facilities located within the Central City (i.e., anchor projects such as the Convention Centre, Metro Sports, and the Canterbury Multi-Use Arena). In addition, the existing planning framework for Greater Christchurch acknowledges the role of the Selwyn and Waimakariri Districts (namely the principal centres of Rolleston and Rangiora) as key urban areas in Greater Christchurch and for future urban growth. Consequently, these are likely to be of consideration as key prioritised locations.

Summary

In summary, there have been a blend of mixed signals that contribute towards changing land use and transport behaviour. Investment in motorways, an oversupply of parking, along with market forces that support greenfield expansion do not encourage infill development. In contrast, there has been substantial investment in the central city (with the anchor projects such as the opening of the Christchurch Central City Bus Interchange and Te Pae Christchurch Convention Centre) and this is ongoing (i.e. the on-going construction of the Parakiore Metro Sports Facility and the scheduled development of the Te Kaha Canterbury Multi-Use Arena), and the Major Cycle Routes which promote a denser, and more liveable city not dependent on sole occupancy car travel.

4.2.1.7 Growth in Travel Demand and Transport Costs

Future housing growth in greenfield areas including new communities in the northern and southwestern parts of the City (i.e., Halswell), growth in Selwyn at Rolleston and Lincoln and growth in Waimakariri at Rangiora and Kaiapoi will result in increased numbers of people driving longer distances to access

[92] https://www.stuff.co.nz/the-press/news/122714753/council-considers-changing-christchurchs-planning-rules-to-prevent-over-intensification-of-suburbs

[93] CCC Medium and High-Density Housing in Christchurch: Urban Design Review 2020

opportunities. Longer travel distances will result in greater transport costs for both the user and the wider community:

- transport costs for greater distance travelled;
- longer vehicle travel distances and increased numbers of private vehicles will contribute to city wide congestion (bringing associated loss of time efficiency and associated health and environmental effects); and
- increased use of private vehicles will result in ongoing costs associated with dedicating large amounts of land and resources to moving (i.e., roads) and storing private vehicles (i.e., parking).

Table demonstrates the forecast average trip length for private vehicles in 2021 and 2051 and demonstrates a steady increase in average trip length across all measures (i.e., AM, IP, and PM peak). Daily the average trip length for private vehicles will increase from 8.43km in 2021 to 8.84km in 2051. While this may not seem significant (0.41km increase), it is combined with a substantial rise in private vehicle numbers.

Table 4-2: Greater Christchurch Private Vehicle Average Trip Length 2021 - 2051[94]

Period	2021		2051	
	Veh Trips	avg trip (km)	Veh Trips	avg trip (km)
AM 2hr	180,200	9.18	215,800	9.72
IP 7 hr	609,900	7.80	729,300	8.15
PM 2hr	225,600	8.97	274,000	9.53
ON 13hr	294,400	8.89	3,408,200	9.17
Daily	1,310,100	8.43	1,590,700	8.84

Between 2021 and 2051 there is forecast to be a rise in traffic flow generally across the network, but this is particularly pronounced during the PM Peak. Traffic flow on local roads is anticipated to grow at a rate faster than traffic flow growth in the total network. Overall, there is anticipated to be a 60% rise in traffic flow on local roads (typically quieter residential streets in the AM and a 65% rise in traffic flow on local roads in the PM) in the network between 2021 and 2051 as demonstrated by Table 4-3.

[94] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

Table 4-3: Changes in Greater Christchurch Traffic Flow 2021-2051[94]

	2021	2031	2041	2051
Total (All Roads) - AM Peak[95]				
Network km	4,100	4,131	4,145	4,157
Veh.km	919,106	1,029,709	1,147,502	1,254,697
Flow (veh/hr)	224	249	277	302
% increase (cf. 2021)		11%	23%	35%
Local Roads – AM Peak				
Network km	2,222	2,229	2,231	2,231
Veh.km	160,778	191,962	222,494	259,088
Flow (veh/hr)	72	86	100	116
% increase (cf. 2021)		19%	38%	60%
Total (All Roads) – PM Peak[95]				
Network km	4,100	4,131	4,145	4,157
Veh.km	1,124,265	1,274,640	1,420,365	1,568,559
Flow (veh/hr)	274	309	343	377
% increase (cf. 2021)		**13%**	**25%**	**38%**
Local Roads – PM Peak				
Network km	2,222	2,229	2,231	2,231
Veh.km	196,056	241,213	279,344	324,535
Flow (veh/hr)	88	108	125	145
% increase (cf. 2021)		**23%**	**42%**	**65%**

This increased transport demand on local roads is a further transport cost of increasing transport demand and travel distances. The layout of Christchurch makes it very easy for vehicles to find alternative routes using local roads, reducing amenity for residents.

Considering the Central City specifically, substantial growth in trips to the Central City are projected as a result of the future residential and business land development (Figure 4-18). Majority of the demand in travel to the central city originates from the areas immediately surrounding (i.e., North-Inner and West-Inner) and additional substantial growth from the South, Centres-Riccarton, and Centres-Linwood.

[95] AM Peak – 0700 – 0900; PM Peak – 1600-1800.

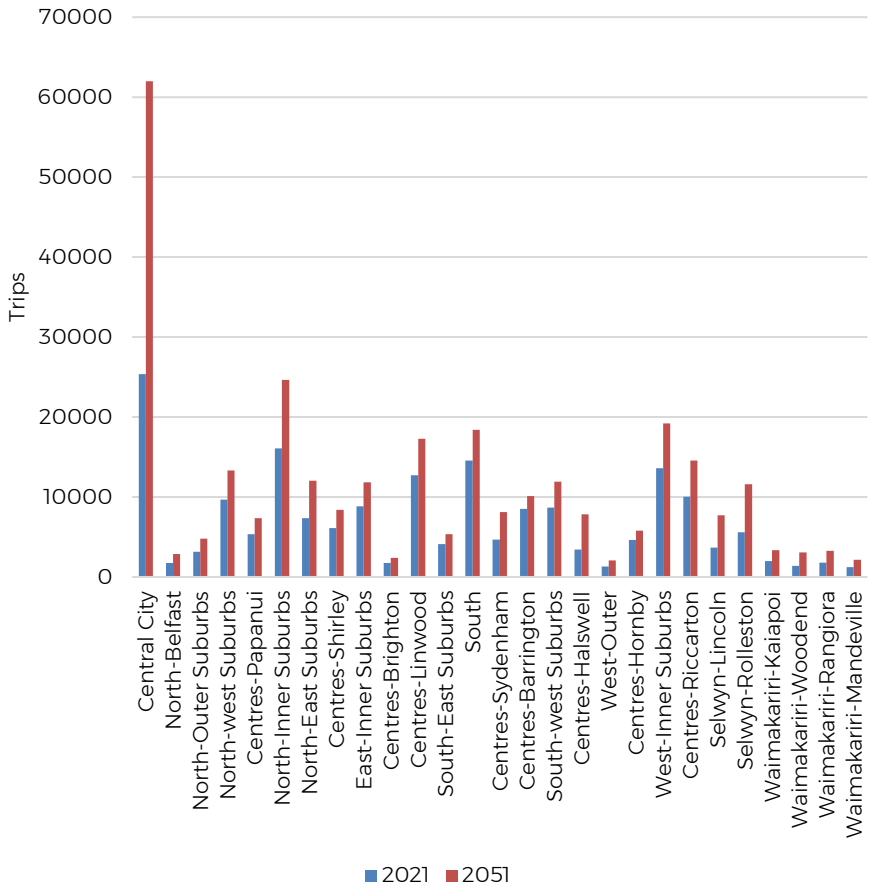

Figure 4-18: Origin of Trips to the Central City 2021-2051[96]

Overall, this will result in an additional 114,000 daily trips to the central city in 2051 than in 2021. If the current central city mode split is retained, then this will result in an additional 108,000 trips taken by cars entering the central city per day.

Further the number of total daily person trips originating from within the northern and south-western corridors to the Central City (based on the adjacent CTM zones from Papanui/Main North Road and Riccarton/Main South Road (Figure 4-19)), is anticipated to comprise approximately 18% of all trips to the central city in 2051 (not accounting for the additional trips that originate outside these corridors that will also use these corridors for travel to the central city). The northern corridor is anticipated to experience more growth in central city trips than the corridor to the south, but that most of this growth will be from within Christchurch City (with only minimal growth from Rangiora) (Figure 4-20).

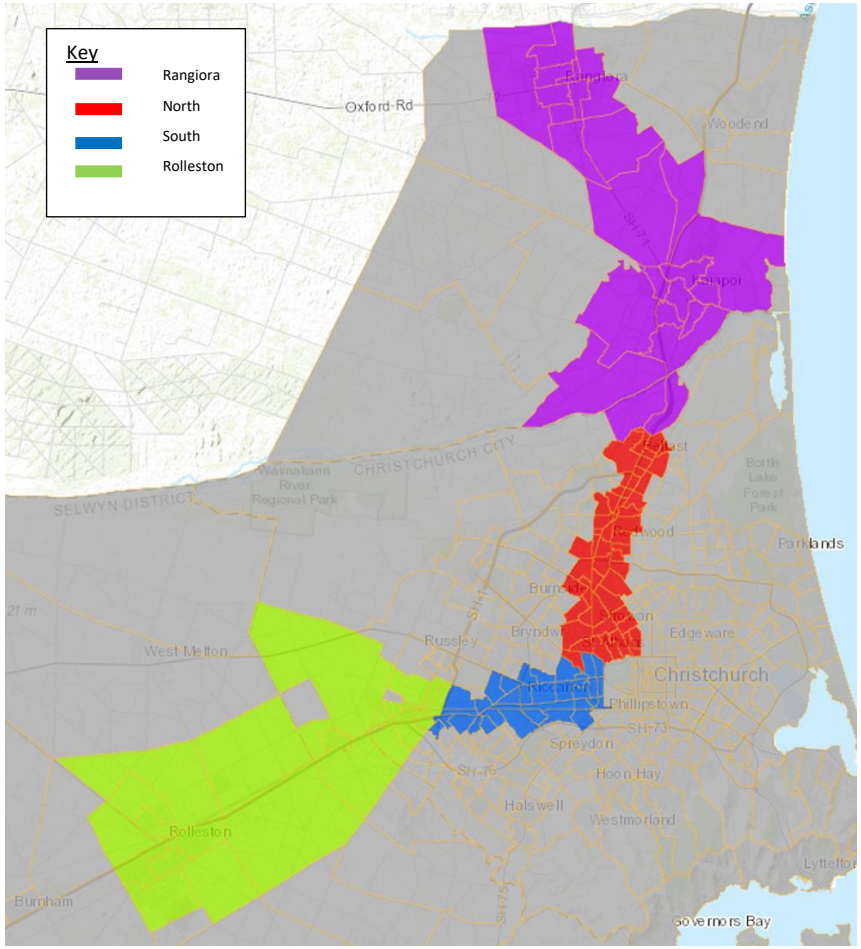

Figure 4-19: North and South Corridor Extents

[96] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

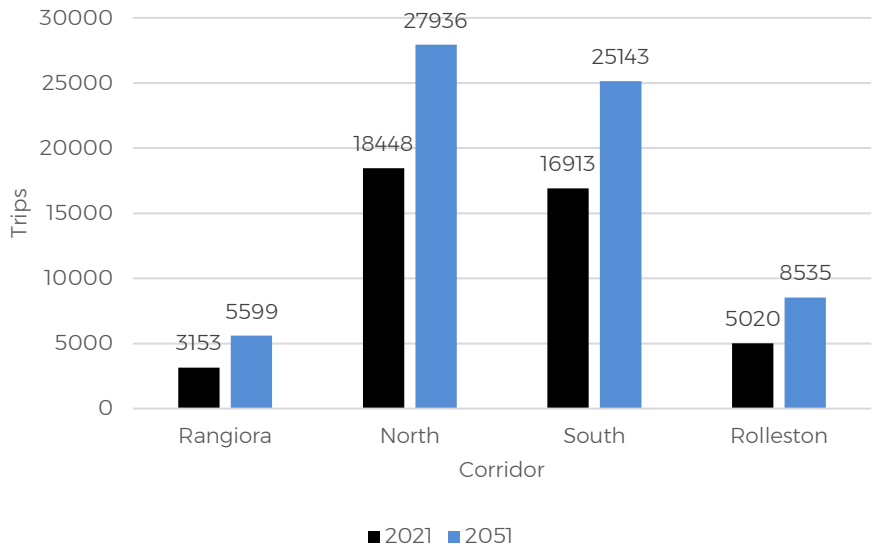

Figure 4-20: Growth in travel originating from within the North and South Corridors

4.2.1.8 Continued Low PT Mode Share

PT now, and in 2051 will not be a viable, competitive PT option in Greater Christchurch when compared to the private vehicle based on current and forecast residential and business settlement patterns, continuing to result in poor travel choices and access to opportunities.

Table outlines the modelled mode share for Greater Christchurch in 2021, 2031, and 2041 and demonstrates that by 2051, PT mode share is forecast to equate to just 2.4% of all daily person trips.

Table 4-4: Forecast Daily Mode Share 2021 - 2051[97]

Mode	Mode Share			
	2021	2031	2041	2051
Private Veh	95.0%	93.6%	93.1%	92.6%
PT	2.4%	3.3%	3.7%	3.9%
Cycle	2.7%	3.1%	3.3%	3.4%
Total Daily Person Trips	**2,163,100**	**2,320,900**	**2,489,700**	**2,688,700**

[97] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

4.2.1.9 Summary

Greater Christchurch is of strategic importance to New Zealand as a whole and projected population and employment volumes and land use patterns will result in an increasingly constrained access as a result of continued high car dependency and increased transport costs to users and the wider community.

MRT has the potential to enable urban intensification and development long the MRT corridor with a focus on high potential job and household growth locations. If developed to align with the Greater Christchurch Spatial Plan the MRT system could unlock urban development and stimulate intensification along the route.

4.2.2 Problem Statement 2 - The PT system is not sufficiently attractive to compete with private vehicles

The PT system is not sufficiently attractive (in terms of travel time, reliability, convenience, comfort, and cost) to encourage its use in preference to private vehicles, resulting in a continuation of the low mode share for PT and higher congestion, which will constrain access to the central city and other key destinations, increase public and private transport costs and restrict economic growth.

4.2.2.1 Continued Low PT Mode Share

As outlined in Section 2.2.1 Greater Christchurch has a low mode share for PT and a continuation of current trends forecasts that this will continue through to 2051.

In addition, to the lack of competitiveness of PT compared to the private vehicle for access to opportunities, PT is currently not well used (patronage is low and flat or declining) and there is a high car mode share. There are reasons for this including that the service is facility to attract new users (even though existing riders appear relatively well-satisfied with the service offering (2019 surveys indicated 96% satisfaction rates)).

Qualitative feedback from people who live in Christchurch has confirmed a long poor public perception of PT in Christchurch. Helen Fitt identified this in her 2015 thesis, in which she interviewed 32 participants on 'social meanings' relating to PT. One of her key conclusions was:

> *"Participants associated bus use with some positive social meanings, but more commonly and consistently buses were described as a stigmatised, low status mode of transport for people with no other options. Although participants commonly argued that negative social meanings did not influence their bus use, there is some evidence to suggest that a deeply embedded habitus led to*

participants not considering buses to be an appropriate option for travel"[56].

The low and flat (or declining) PT Patronage in Christchurch, in contrast to Wellington and Auckland, shows clearly that new users are not being attracted to Christchurch's PT system. Various sources of information indicate that this is due to a range of factors, broadly split into "perception" and "experience".

4.2.2.2 Generalised Cost Analysis

Generalised cost analysis has been undertaken to compare the total monetary and non-monetary cost for a journey taken to the Central City by PT with that of a private vehicle. Generalised Cost is used to sum all components of trip cost using a common units of measure (typically either minutes or dollars), to enable meaning comparisons to be made between modes in terms of relative cost of travel to inform the attractiveness of each mode.

For the purposes of this IBC, Generalised Cost is expressed in units of minutes, meaning trip components such as bus fares, parking charges and vehicle operating costs are converted from dollars to minutes based on a value of time ($/hr).

The Generalised Cost undertaken for this IBC includes cost components outlined in Table 4-5.

Table 4-5: Generalised Cost Components

PT Trip Cost Components	Private Vehicle Cost Components
Walk time Wait time In vehicle time Transfer time (between services) Fare	Terminal time at each end of the trip (walking to/from car) In vehicle time Vehicle operating costs (fuel and maintenance) Parking costs

Consideration has been given to the generalised cost (in minutes) of travel from all CTM zones in Greater Christchurch to the Central City during the AM peak in 2051 for PT (where available from that location) and private vehicle. The analysis demonstrates that on average the generalised cost in minutes of traffic from all zones to the Central City is 16 minutes longer for PT than the car. The effect is most pronounced in Diamond Harbour and Charteris Bay in Banks Peninsula and in the largely rural area between Rangiora and Woodened and Wakuku where the generalised cost in minutes for PT is over 100 minutes longer than for the car. This demonstrates that current the PT system is not sufficiently attractive to encourage its use in preference to private vehicles.

Overall, this demonstrates that PT now, and in 2051 will not be a viable, competitive PT option when compared to the private vehicle and will continue to result in poor travel choices and access to opportunities.

4.2.2.3 Growing Deficiency in Access to the Central City

The Central city is used below an example of growing deficiency in access to the key destinations but is demonstrative of other destinations.

The growth in travel demand to the central city, along with continued perpetuation of high car mode share will result in a growing deficiency of access to the central city. Figure 4-21 and Figure 4-22 show the volume to capacity ratios of roads in 2021 and 2051. These demonstrate that the proportion of roads that are at 70% or more volume to capacity ratio substantially increases around the Central City in the PM peak from 2021 to 2051.

By 2051 the main corridors into the city centre – which are shared by buses and cars are getting to capacity (70-%-90%), which will result in a limitation on access (which left unchecked will only get worse over time). Notably, the PM peak is worse than the AM peak.

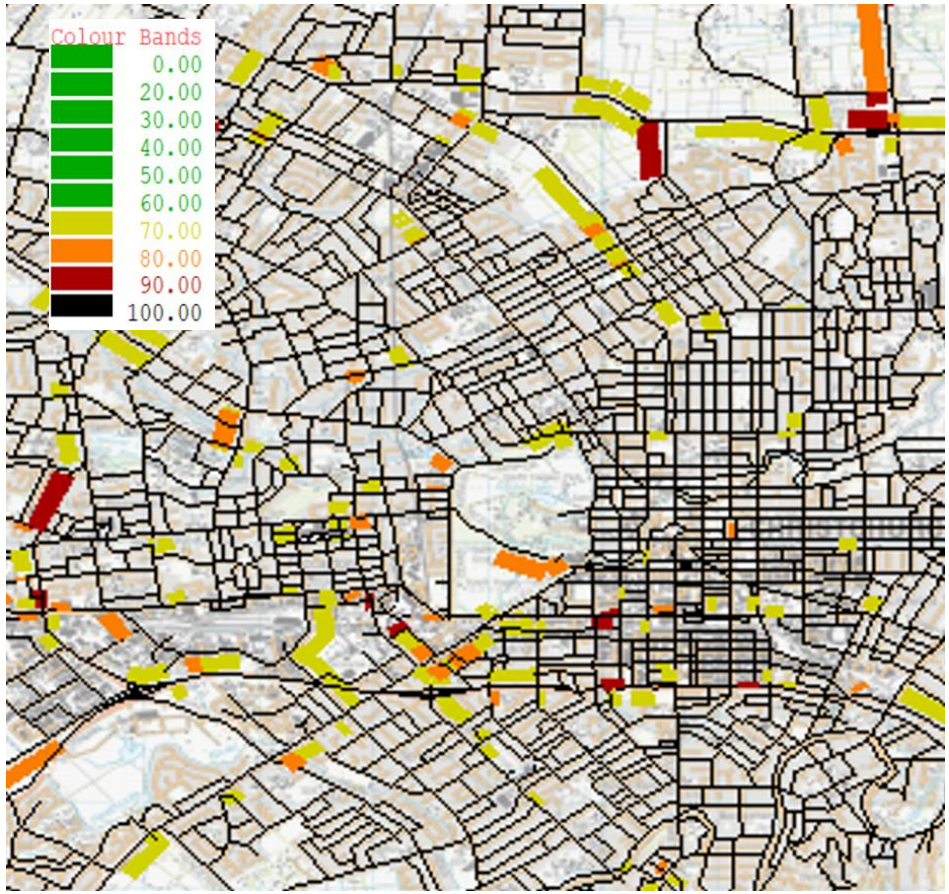

Figure 4-21: 2021 Volume to Capacity Ratio - PM Peak

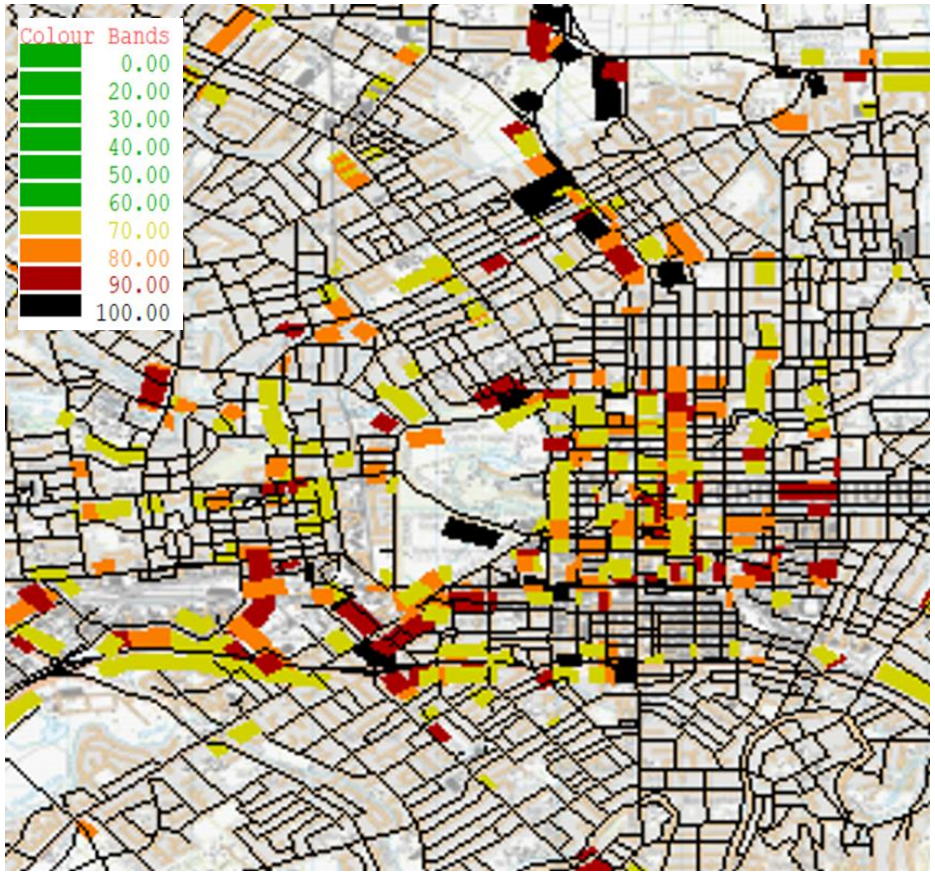

Figure 4-22: 2051 Volume to Capacity Ratio - PM Peak

Further, growing congestion will result in a reduction in the percentage of the population that has access to employment and opportunities in the Central City. Figure 4-23 demonstrates the distance that can be travelled within 30 minutes from the Central City using PT and shows that by 2051 this distance is substantially constrained particularly to the west (only just reaching the Riccarton KAC), even with the improvements proposed to the PT network as part of Foundations ICB) and Rest of Network IBC. In 2021, 29% of all households in Greater Christchurch (57,000 households from a total of 196,900 households) can reach the Central City during the AM peak by PT and by 2051 this remains at 29% (76,000 households from a total of 261,100 households).

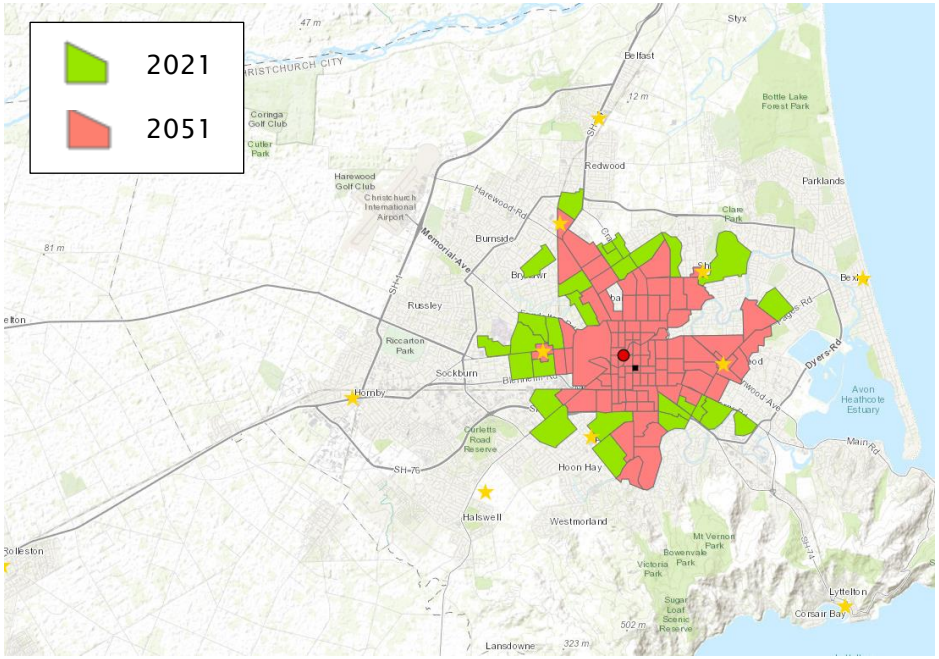

Figure 4-23: PT 30-minute Travel Distance to the Central City - AM Peak 2021-2051[98]

The effect is even more pronounced for the private vehicle. In 2021, a private vehicle can travel to the boundaries of Christchurch City and even as far as Lincoln during the AM peak within 30 minutes (Figure 4-24). However, by 2051 access to the west of the city is particularly restricted with a 30-minute travel time no longer reaching Hornby, and only just reaching as far as Halswell.

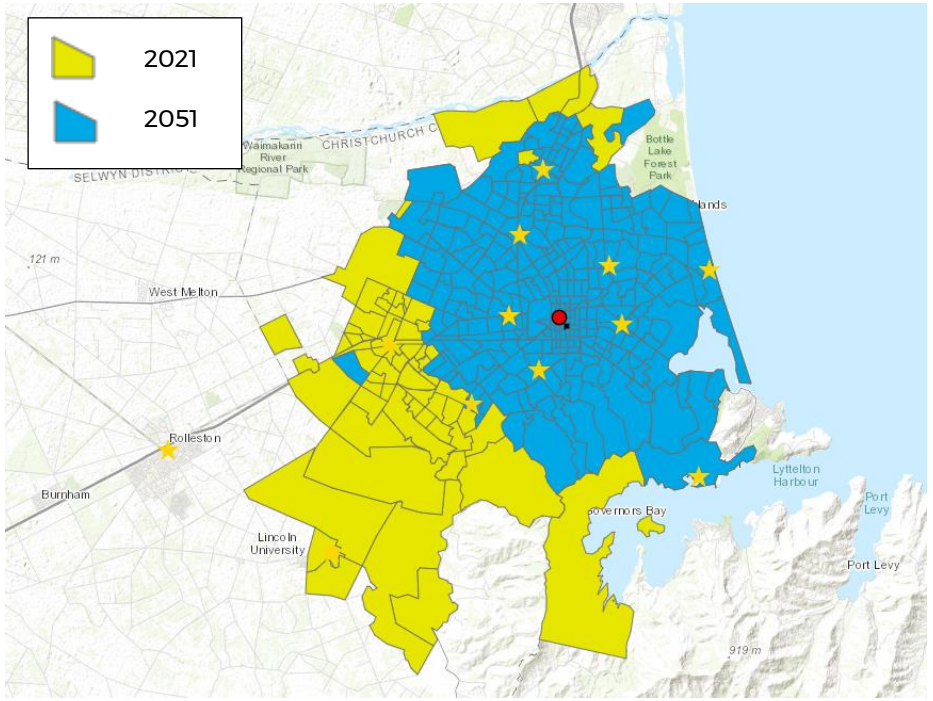

Figure 4-24: Private Vehicle 30-minute Travel Distance to the Central City - AM Peak 2021-2051[99]

This demonstrates that accessibility to the Central City will be constrained and that the proportion of the population that can access this key employment and activity area in an efficient manner by either PT or the private vehicle will be restricted. In 2021, 82% of all households in Greater Christchurch (162,000 of a total 196,900 households) can reach the central city during the AM peak by private vehicle within 30 minutes. By 2051 this reduces to 60% (157,000 from a total of 261,100 households).

Figure 4-23 and Figure 4-24 demonstrate a lack PT priority within Greater Christchurch. While one would expect to see a deterioration in vehicle access to the Central City as population and employment growth results in additional trips on the network (due to the physical inability to add more capacity to the network while retaining urban amenity and active mode provision in an already constrained urban environment within the Central City and surrounding fringe), the reduction in PT accessibility is of significance as it has the potential

[98] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

[99] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

to restrict Christchurch's Central City's potential development and economic performance.

The figures show that the PT network is being impacted by the similar congestion constraints of the wider road network and this is restricting its ability to bring people to the Central City for employment, education, shopping, or recreation. Without investment in a dedicated right of way system for PT, this is anticipated. However, investment in a dedicated right of way system (typical of MRT) would enable PT to be insulated from traffic congestion and retain their access benefits as road congestion worsens.

There is a stark difference in choice in access between private cars and PT with the proportion of residents with a genuine choice to use PT for access to the central city being very low.

4.2.2.4 The Economic Importance of the Christchurch Central City

Christchurch is of crucial economic importance to New Zealand, being the home to over half of the South Island's population. Currently, the Christchurch Central City and fringe area identified in Figure 4-25, contributes $3.7 billion annually to New Zealand's GDP. It is responsible for 14.8% of Greater Christchurch's GDP and 10.5 % of the Canterbury region's GDP, showing it is of regional importance (Figure **4-26**).

Greater Christchurch itself contributes $25 billion annually to the NZ economy, meaning it equates to 70% of all GDP in Canterbury and 37% of the South Island's GDP ($66.75 billion[100]).

Figure 4-25: Christchurch Central City and Fringe Area

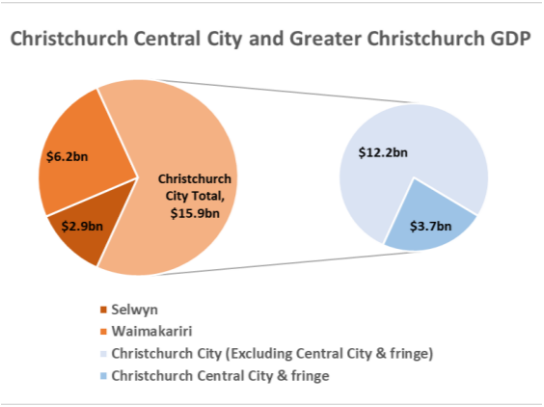

Figure 4-26: Christchurch Central City Contribution to the Greater Christchurch's GDP[101]

Further as at 2021, the Central City (within the four avenues of Moorhouse, Fitzgerald, Bealey and Deans) employed 45,000 people (18% of jobs in Greater Christchurch) and by 2051 this anticipated to have increased to 78,000 people[27] (increasing slightly to 22% of all jobs in Greater Christchurch), demonstrating that the ongoing economic success of the central city is of critical importance to Greater Christchurch (Figure 4-27). The central city has the highest employment density in Greater Christchurch.

[100] https://www.stats.govt.nz/information-releases/regional-gross-domestic-product-year-ended-march-2019

[101] Stats NZ, MBIE, PwC Analysis

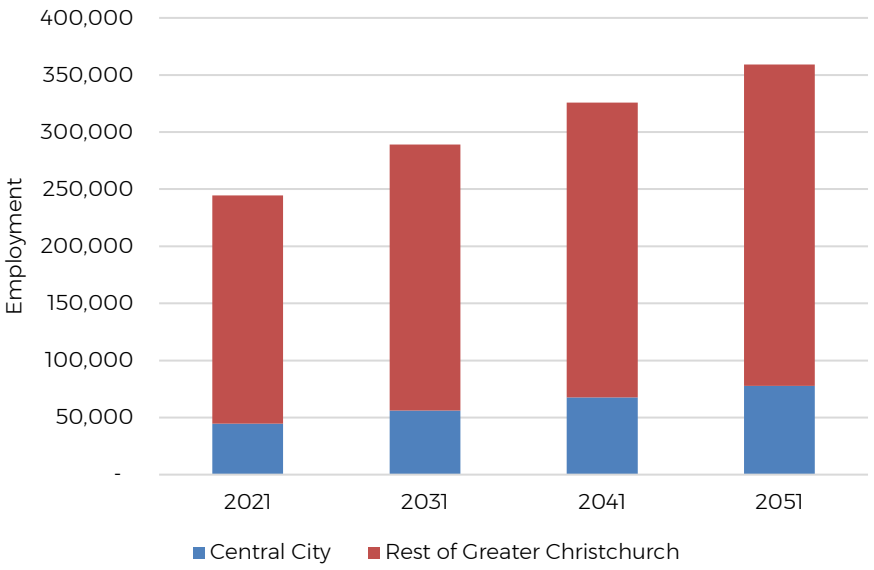

Figure 4-27: Forecast employment growth in the Central City and Greater Christchurch, 2021-2051[102]

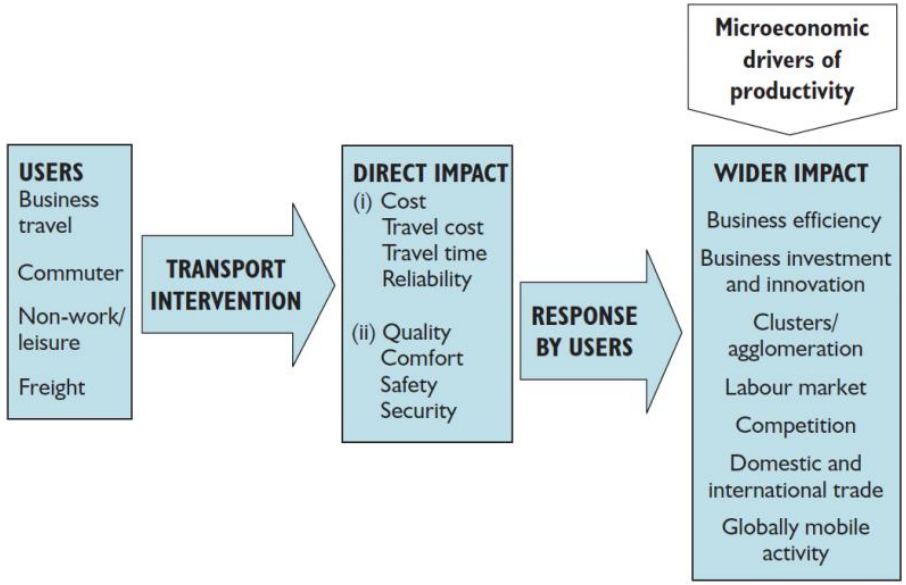

Figure 4-28. Relationship between transport access and economic productivity[104]

Enabling efficient access to the Central City is critical for ensuring that access to jobs and markets does not restrict the economic potential of Greater Christchurch and future investment (Figure 4-28). Constrained access can hamper development activity, given the role that access has in facilitating social and economic interactions.

This is consistent with the Christchurch Economic Development Economic Strategy 2017 'A City of Opportunity'[103] which notes that the establishment of a connected, engaging and thriving central city is critical for attracting people, visitors, and new businesses to the city.

Further the Ministry of Transport notes that "where the potential for economic growth is present and there are capacity constraints, a lack of transport investment can inhibit potential growth. Investment in these circumstances should focus on responding to demand and 'pinch points' which would otherwise constrain growth."[105]

4.2.2.5 Summary

Overall, the evidence demonstrates that the PT system on its own will not be sufficiently attractive to encourage its use over the private vehicle. This lack of attractiveness in terms of travel time, reliability, convenience, comfort, and cost contributes to ongoing low PT mode share and higher congestion associated with high car dependency. A lack of a viable, competitive PT between Christchurch combined with growing outer urban areas such as Rolleston and Rangiora which will result in poor travel choices and access to opportunities and a high car dependency.

[102] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021
[103] https://www.greaterchristchurch.org.nz/assets/Documents/greaterchristchurch/Plans/CEDS.pdf
[104] Eddington Study (2006). (p. 24). As referenced in https://www.transport.govt.nz/assets/Uploads/Our-Work/Documents/03f6cc62af/edt-Contribution-of-transport-to-economic-development.pdf

[105] https://www.transport.govt.nz/assets/Uploads/Our-Work/Documents/03f6cc62af/edt-Contribution-of-transport-to-economic-development.pdf p. 11

Constrained access to the Central City will place at risk the economic performance of the Central City and future investment given the acknowledged role that access has in facilitating social and economic interactions. Given the economic performance of the Central City is of local and national significance due to its employment opportunities and contribution to GDP, along with its leisure, recreation, arts, cultural opportunities and more, constrained access is of concern.

MRT has the potential to play a role in improving access between these communities and key areas of opportunity, through providing a fast, frequent connection to key nodes or locations of high employment and residential density. The speed and directness of an MRT connection has the potential to make trips to some, high priority destinations competitive with private cars. Further it can help optimise the existing high-frequency bus network and provide customers with a premium PT service preferred over the use of the private vehicle that is a more competitive transport choice.

As outlined in Section 2.3 'MRT Characteristics' there is potential for investment in a dedicated right of way system (typical of MRT) to enable PT to be insulated from traffic congestion, helping to address a projected decline in access. A dedicated right of way system ensures that the access benefits of such a system do not deteriorate as road congestion worsens. Given the economic importance of the Central City, retaining a high level of access to it is critical.

MRT is a corridor-based transport and land use planning tool. Given the central city is the key priority location within Greater Christchurch due to employment and population density, anticipated growth and the recreational opportunities and major city facilities located within the Central City (i.e., anchor projects such as the Convention Centre, Metro Sports, and the Canterbury Multi-Use Arena), any MRT solution is anticipated to terminate at the Central City. This would ensure efficient transport access for Christchurch's Central City even as growth patterns and travel demand place additional demand on the road network.

MRT could be used to ensure the accessibility of the city centre to key labour and customer markets along with city wide opportunities in Greater Christchurch is retained, while allowing it to become denser and more productive by providing a greater capacity and a more reliable, and efficient form of transport.

4.2.3 Problem Statement 3 - Continuation of the current transport system will fail our climate change responsibilities and lead to poorer public health outcomes

As Greater Christchurch grows, a continuation of the current transport system is not sustainable and fails our climate change mitigation and adaption responsibilities. Higher vehicle use will result in higher levels of embedded carbon, higher greenhouse gas and particulate emissions, and poorer public health outcomes

4.2.3.1 Aspirations for and Responsibilities to a Low Emissions Future

By 2050 Christchurch is projected to be at risk from a 15-30 cm sea-level rise and be experiencing a 0.5-1.5°C average temperature increase over pre-industrial levels. Greater Christchurch will be hotter, winder and drier[106].

The New Zealand Government and CCC are committed to reducing emissions and preparing for the opportunities and challenges presented by climate change. The Government's Climate Change Response (Zero Carbon) Amendment Act 2019 introduced in late 2019 sets the target of New Zealand having net zero greenhouse gas emissions by 2050, excluding biogenic methane.

In addition, Te hau mārohi ki anamata: Towards a productive, sustainable, and inclusive economy, Aotearoa New Zealand's first emissions reduction plan was released in May 2022. This sets the target of reducing total kilometres travelled by light vehicles by 20% by 2035 through improved urban form and the provision of better travel options, particularly in New Zealand's largest cities.

All Canterbury Councils (except for Kaikōura) and Ngāi Tahu are part of the Regional Climate Change Working Group and both ECan and CCC declared a climate emergency in May 2019.

CCC has agreed to set a target for Christchurch achieving net zero greenhouse gas emissions, excluding methane, by 2045 and as an organisation aspires to be carbon neutral by 2030 for all activities. Currently Greater Christchurch comprises a dispersed urban form and has a relatively high dependency on road and private transport and this will contribute to increased climate change impacts and pose further challenges for transition to lower emissions.

Further in the context of the anticipated growth for Greater Christchurch the Strategic Plans and Policy for Greater Christchurch outline aspirations for a low emissions future for Christchurch as demonstrated below:

- The UDS sets a vision for Greater Christchurch to have a "vibrant inner city and suburban centres surrounded by thriving rural communities and towns, connected by efficient and sustainable infrastructure". It identifies

[106] NIWA Canterbury climate change projections report, Feb 2020

seeks to manage growth in a way that obtains greater efficiencies from transport infrastructure and creates an urban form that minimises the use of energy and water.

- Our Space supports this further identifying that living with, and mitigating climate change impacts is a key growth issue for Greater Christchurch. The settlement pattern proposed seeks to integrate land use and transport planning to ensure safe, accessible, and liveable urban areas are created. It promotes a compact sustainable urban form, supported by efficient transport and development located in a manner that considers climate change. It identifies development targets for 45% of new housing to be met through the 45% redevelopment of existing areas in Christchurch City, 36% through existing greenfield development in Christchurch City, Selwyn and Waimakariri and 19% through new greenfield and redevelopment areas in Selwyn and Waimakariri.
- Canterbury Regional Public Transport Plan 2018-2028 has a vision of providing innovative and inclusive PT that sits at the heart of the transport network and supports a healthy, thriving, and liveable Greater Christchurch. It outlines that by 2028 it wants to improve health and environmental outcomes by delivering a zero emissions fleet.
- Christchurch City Council have identified five key strategic priorities including meeting the challenge of climate change through every means available, outlining they will work with communities to reduce greenhouse gas emissions and respond to the opportunities and challenges presented by climate change[107].

Creating more walkable, well-connected communities will have health benefits not only due to reduced congestion and air pollution, but as mode shifts encourages towards more active travel, and improved wellbeing.

Lastly, the Christchurch mode shift plan looks to encourage people to use more sustainable modes will support transport's contribution to emissions targets and to manage transport congestion associated with the accommodation of Greater Christchurch growth.

4.2.3.2 Christchurch Car Dependency

As covered in for Problem Statement 1, Greater Christchurch is an area of high car dependency. As New Zealand's second largest city Christchurch has a high percentage of people that use a car or company car as their primary mode of travel (80%) as opposed to 54% in Wellington and 75% in Auckland[108].

Residents in Greater Christchurch also have high levels of car ownership but there are spatial patterns to this across the city. In Christchurch City, areas with the highest percentage of households with no motor vehicle (>10-22%) are scattered throughout the City, however concentrations are in the east and south/south-west of the City (Figure 4-29). This data aligns with the City's weighted mean New Zealand IMD values, where areas with the highest deprivation (with values 9 and 10) are located mainly to the east and south-west of the City.

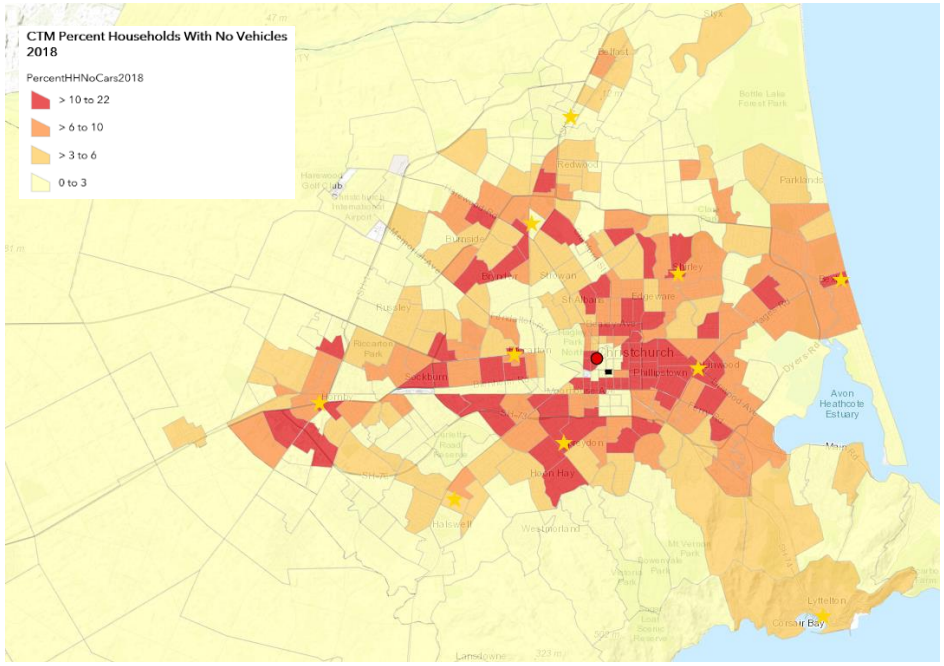

Figure 4-29: Percentage of households with no motor vehicle by CTM Model Zone - Christchurch City, 2018 Census

In the Waimakariri District, the area with the highest percentage of households with no motor vehicle (>10-22%) is the part of central Rangiora that is one of the District's highest weighted mean New Zealand IMD value (value 8).

In the Selwyn District, 0-3% of households in the Selwyn District have no vehicle. This data aligns with the District's weighted mean New Zealand IMD values, where there are no areas of high deprivation (with values 8 and 10).

[107] https://ccc.govt.nz/the-council/how-the-council-works/20182028-vision/strategic-priorities
[108] https://www.nzta.govt.nz/assets/planning-and-investment/arataki/docs/step-changes.pdf,

p. 25

In summary, households in Waimakariri District and Selwyn District are more likely to have higher car dependency, and a greater percentage of households with more than two cars (Figure 4-30).

Figure 4-30: Greater Christchurch Proportion of Households with Two or More Cars

Lastly, not only are there spatial considerations for car usage and their storage but there can be negative impacts on the environment from the construction and operation of roading infrastructure (i.e., harmful effects on water, biodiversity and resource consumption can result from the expansion of roads).

4.2.3.3 Increasing Congestion

Greater Christchurch must achieve greater mode shift changes to ensure the transport network can provide for anticipated growth in the future. The modelling undertaken for the Future Development Strategy shows how the number of 'poor performing intersections' increase across Greater Christchurch over time. However, increasing PT mode share from 2.5% (Do-Minimum) could reverse this trend, as demonstrated in Figure 4-31 to Figure 4-34.

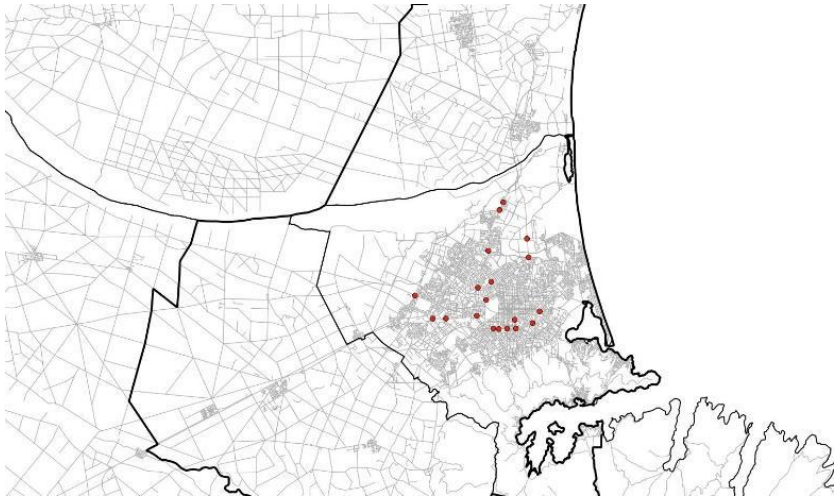

Figure 4-31: Poor performing intersections, 2021

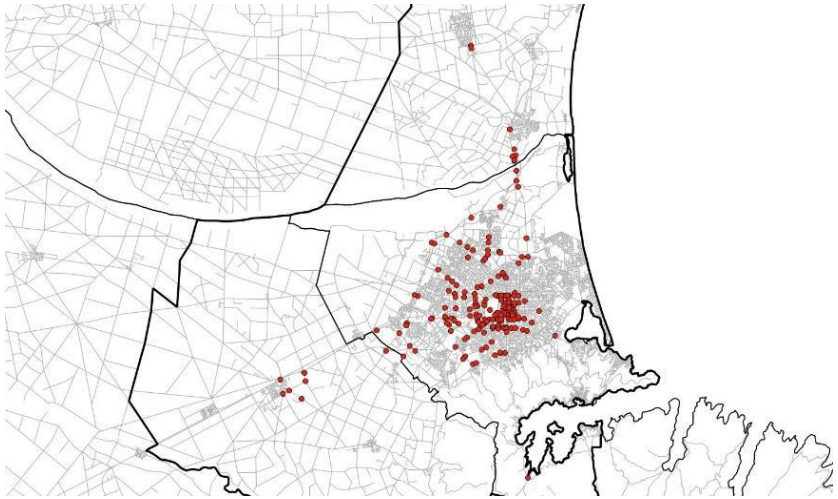

Figure 4-32: Do-Minimum forecasted poor performing intersections, 2051

(2.5% PT mode share)

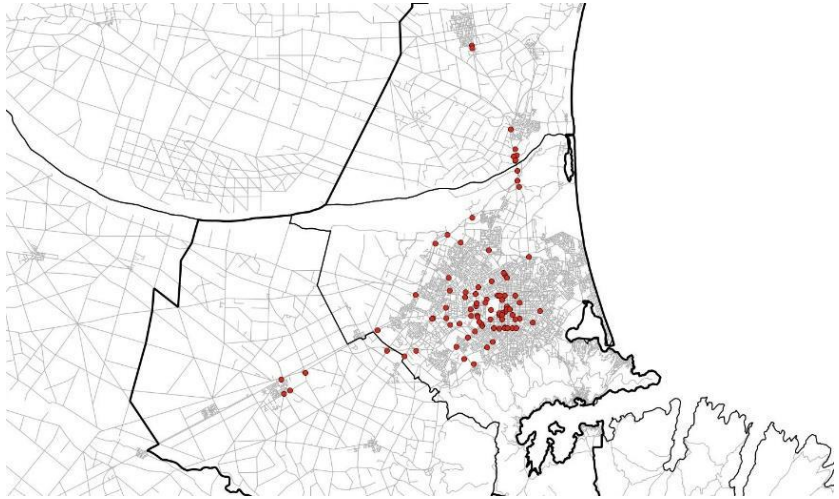

Figure 4-33: Forecasted poor performing intersections, 2051 (10% PT mode share)

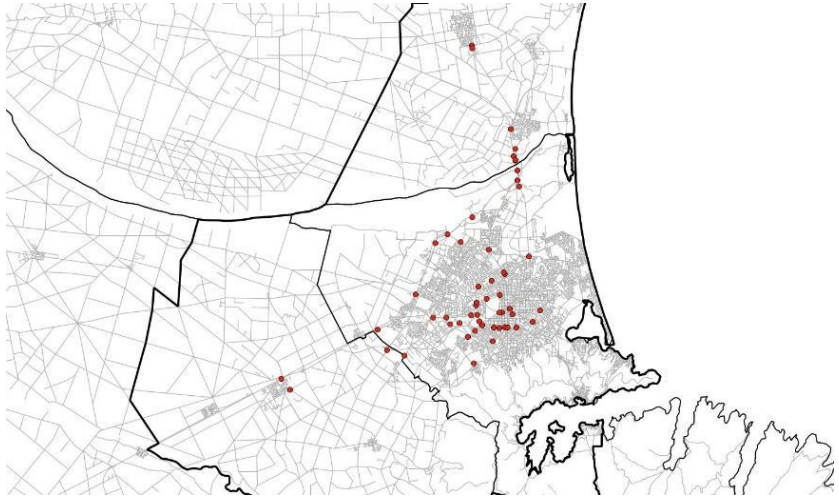

Figure 4-34: Forecasted poor performing intersections, 2051 (15% PT mode share)

The extent of increasing congestion is also demonstrated by the travel isochrones for the Central City in Sections 2.2.2 above. Increasing congestion not only results in lost economic productivity (time lost due to travel) but increases adverse environmental effects.

4.2.3.4 Worsening Environmental Outcomes

Nationally transport is a large contributor of the average New Zealand household carbon footprint, with 47% of carbon dioxide emissions in New

Zealand in 2018 originating from transport (90.7% from road vehicle emissions and 6.7% from domestic aviation)[109](Figure 4-35).

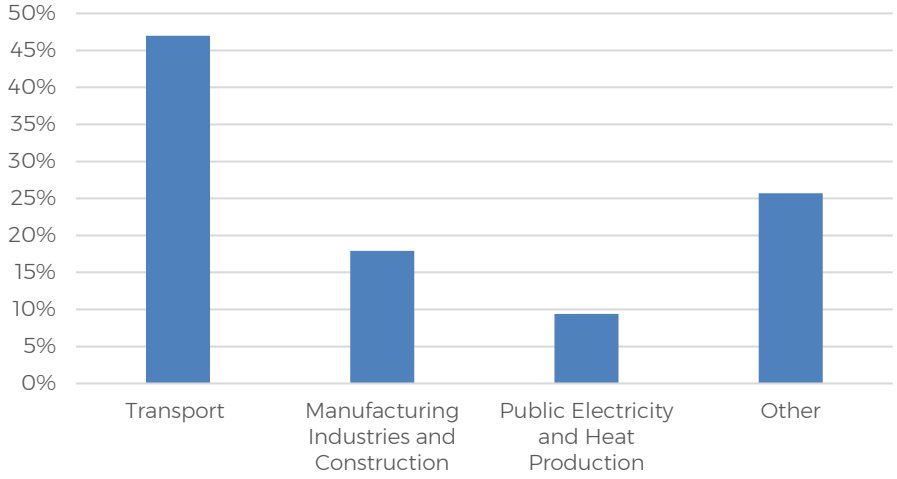

Figure 4-35: Source of New Zealand Carbon Dioxide Emissions in 2018[110]

Land use patterns that do not integrate residential and business land use can contribute to higher CO_2 emissions per commuter. Figure 4-36 demonstrates annual CO_2 emissions per commuter for Auckland, Wellington, and Christchurch in 2013. It shows that Greater Christchurch has comparatively quite low CO_2 emissions per commuter (especially within the more central suburbs) but that these emissions increase with distance from the Central City.

Within Greater Christchurch, transport contributes 53% of Christchurch's emissions (higher than the national contribution of 47%) and is a significant contributor to poor local air quality[111] Increasing growth and a perpetuation of high car dependency, along with increasing transport congestion in the network will only worsen transport emissions in Greater Christchurch.

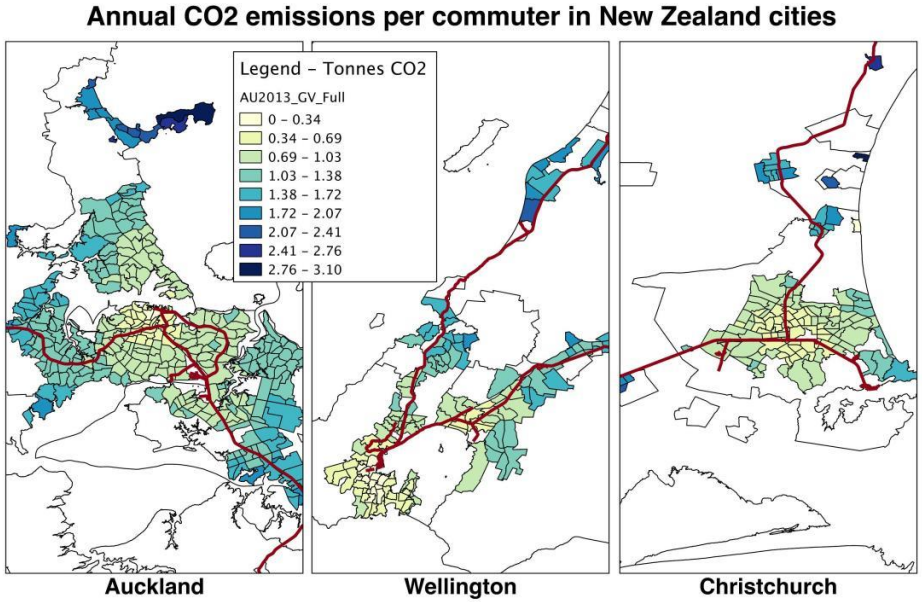

Figure 4-36: Annual CO2 Emissions per Commuter in New Zealand Cities[112]

Emissions are important, especially in Christchurch which has a long history of poor air quality, given its geography which results in a temperature inversion layer which traps pollutants. In 2016, Christchurch had the worst air pollution of any of New Zealand's main centres, at 21 PM10[113] (Figure 4-37).

[109] https://www.stats.govt.nz/indicators/new-zealands-greenhouse-gas-emissions
[110] https://www.mfe.govt.nz/publications/climate-change/new-zealand%E2%80%99s-greenhouse-gas-inventory-1990-2018-snapshot
[111] Canterbury Regional Public Transport Plan 2018-2028, p.13
[112] https://www.greaterauckland.org.nz/2020/11/16/household-emissions-in-nz-part-2-transport/#jp-carousel-32555
[113] https://www.stuff.co.nz/national/health/80120726/why-the-south-island-is-home-to-new-zealands-worst-air-pollution

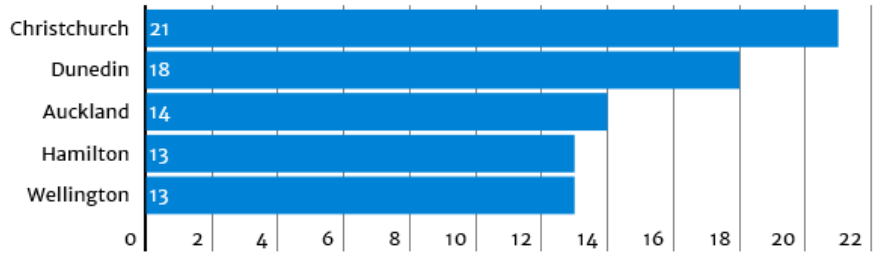

Figure 4-37: Air Pollution in 2016, showing annual mean level of PM10 micrograms per cubic metre[113]

Air quality is tracked against the number of allowable high pollution nights per airshed as determined by the National Environmental Standards for Air Quality which set different targets for different airsheds. Christchurch and Kaiapoi airsheds must experience fewer than three days per year with PM10 over 50 micrograms per cubic metre of air from 1 September 2016 and no more than one day per year from 1 September 2020.NESAQ. Currently this prescribes that Christchurch and Kaiapoi airsheds are allowed 3 high pollution nights per annum, and Rangiora 1 per annum. As of 20 August 2020, Christchurch had experienced 8 high pollution nights in 2020 and Rangiora 4[114] high pollution nights, showing continued difficulty in meeting the prescribed target. A reduction in car mode share in Greater Christchurch will contribute positively towards improved emissions.

Figure 4-38: Car and Bus Emission Comparison[115]

As demonstrated by Figure 4-38, even one diesel bus roughly equates to the same CO^2 emissions as five petrol cars. However, given Environment Canterbury have a strategy to move to an electric fleet (use only zero emission PT vehicles) by 2028[116] in Canterbury, there substantially greater reductions to be had from a reduction in vehicle mode share in Greater Christchurch.

While Figure 4-39 shows general decrease in emissions over time (due to assumed electrification of fleet), it is not sufficient to meet the Government's emission reduction target of net-zero long-lived gases by 2050. By 2051, the forecasted CO_2 is at 1732 tons/day, CO is at 1711 kg/day and NO_x is at 1004 kg/day. It is also noted that with electrification of fleet, the uptake rate in the future is highly uncertain, the life cycle emissions of electric vehicle (especially with battery production and the current inability to recycle) is still significant[117], and electric vehicles still take up space and contribute to congestion on the road network.

[114] https://ecan.govt.nz/your-region/your-environment/air-quality/
[115] Canterbury Regional Public Transport Plan 2018-2028, p.13
[116] Policy 4.3, Canterbury Regional Public Transport Plan 2018-2028, p. 32
[117] https://www.cnbc.com/2021/07/26/lifetime-emissions-of-evs-are-lower-than-gasoline-cars-experts-say.html

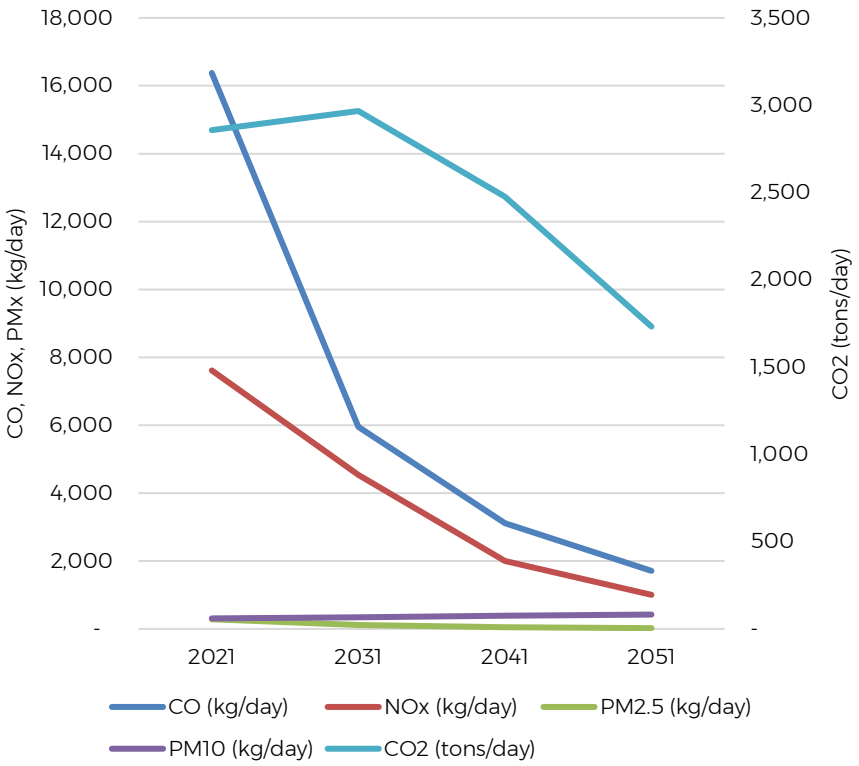

Figure 4-39: Projected Greenhouse Gas Emissions and Increased Air Pollution in Greater Christchurch from car and bus vehicle kilometres travelled[118]

Vehicle kilometres travelled (VKT) is a measure of distance that all road vehicles travelled in an area. The Ministry of Environment uses VKT as a direct indicator of the impact of road network on the environment. Figure 4-40 demonstrates that without significant intervention, a continued perpetuation of the high car mode share in Greater Christchurch will result in significant increase in VKT in the future, especially light fleet, growing from 11 million VKT per day in 2021 to 15 million VKT per day in 2051. This does not align with the Government's emissions reduction target of reducing total VKT travelled by light fleet by 20% by 2035, and further highlights the contribution of Greater Christchurch's road network to worsening climate change and environmental outcomes and the need for significant intervention (such as greatly enhanced PT).

[118] QTP (2021). CTM v21 Update: Greater Christchurch Spatial Plan Land Use, 2021

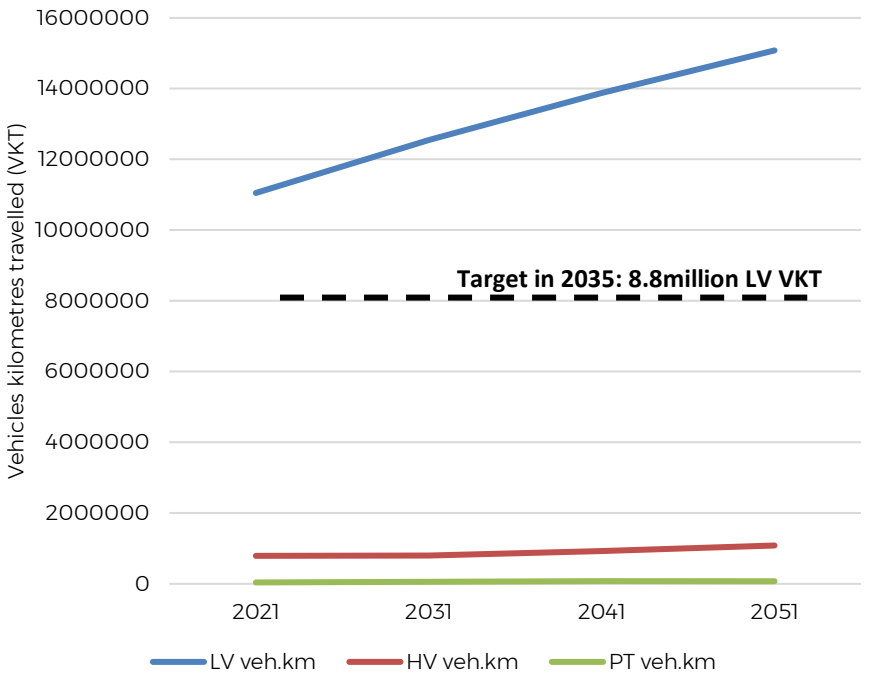

Figure 4-40: Modelled Vehicles Kilometres Travelled per day in Greater Christchurch from light (LV), heavy (HV) and PT (PT) over time

Vehicle emissions include particulates, carbon monoxide, carbon dioxide, nitrogen dioxide, sulphur dioxide and benzene. These emissions are damaging to both people's health and wellbeing, and the environment, with the adverse effects greater in areas with high traffic and congestion rates. A more diversified mode share, with higher PT patronage, lower single user vehicle occupancy and an urban form that requires less travel distance has the potential to be achieved through MRT.

The mode shift benefits framework from 'Keeping Cities Moving' demonstrates the benefits of mode shift including, denser living which leads to a lower emissions city (Figure 4-41)[119].

[119] Waka Kotahi, Keeping Cities Moving, Figure 4, p. 15

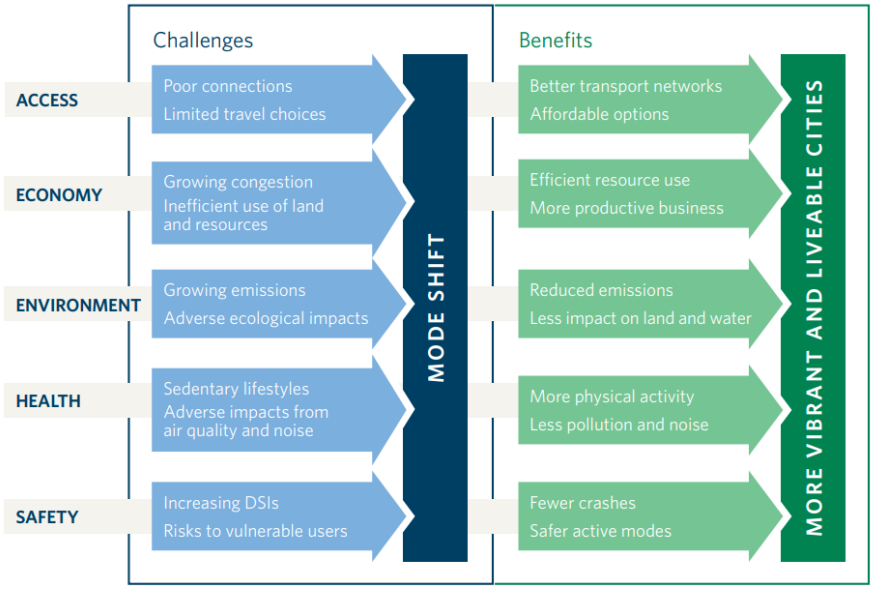

Figure 4-41: A benefits framework for mode shift[119]

Lastly, high car dependency also contributes to negative environmental outcomes through the construction and operation impacts of roading infrastructure. A reduction in car usage and consequently road infrastructure construction and operation will result in fewer harmful effects on water, biodiversity, and resource consumption from expansion of roads[120]. Further the extent of urban area dedicated to moving and storing vehicles is also a poor environmental, social, and urban amenity outcome.

4.2.3.5 Worsening Public Health Outcomes

Transport can impact health because of road traffic injuries and deaths, air pollution, noise pollution, social interactions, and level of physical activity. For example, walking, cycling, and PT encourage greater levels of physical activity in everyday life, which is known to improve health outcomes.

Transport emissions impact poorly on human health. Particulate matter exposure can lead to chronic respiratory and cardiovascular diseases, some cancers and low birthweight, while nitrogen dioxide is associated with acute respiratory effects such as asthma symptoms, especially in children.

In 2012, the EHINZ (Environmental Health Indicators New Zealand' estimated that there were 650 deaths because of road transport (in addition to crashes this includes deaths due to particulate matter (PM10), nitrogen dioxide exposure and noise pollution). A further 40 deaths were estimated to have occurred as a result of the lost opportunity for increased physical activity during transport[121]. Having fewer vehicles on the roads reduces noise and harmful emissions, increasing public health benefits.

Mental health benefits are also associated with transport. A lack of transport options (including PT) can reduce access to opportunities and create social isolation.

More sedentary lifestyles contribute to increasing levels of obesity and chronic diseases, and transport related air pollution and noise that can harm public health. Using PT in comparison to the private vehicle can increase physical activity through the first and last mile journeys which typically require one to walk.

PT is also a very safe way to travel. The NZ Ministry of Transport considers that car drivers are nine times more likely to be injured in a crash than bus passengers, so moving them by bus lowers the overall crash risk per person per kilometre travelled[122].

In summary as outlined by 2010 study on public transportation health benefits:

> *"High quality public transportation (convenient, comfortable, fast rail and bus transport) and transit oriented development (walkable, mixed-use communities located around transit stations) tend to affect travel activity in ways that provide large health benefits, including reduced traffic crashes and pollution emissions, increased physical fitness, improved mental health, improved basic access to medical care and healthy food and increased affordability which reduces financial stress to lower-income households."*[123]

4.2.3.6 Summary

A continued perpetuation of Greater Christchurch's high car dependency will continue to result in a low mode share for PT which will have worsening emissions and environmental outcomes. This will threaten both New Zealand and Greater Christchurch's ability to achieve its desired emissions and climate change targets. MRT has the potential to address this through helping to catalyse a greater density of land development along key corridors that are more walkable and well-connected communities (encouraging greater levels

[120] https://www.nzta.govt.nz/assets/resources/keeping-cities-moving/Keeping-cities-moving.pdf p.9
[121] https://ehinz.ac.nz/indicators/transport/about-transport-and-health/
[122] https://www.nzta.govt.nz/assets/resources/public-transport-information-pack/docs/public-transport-information-pack-no-1.pdf
[123] https://apta.com/wp-content/uploads/Resources/resources/reportsandpublications/Documents/APTA_Health_Benefits_Litman.pdf

of active travel and improved wellbeing), and also given the mode shift to PT will result in reduced emissions, congestion, and air pollution.

4.3 MRT CHARACTERISTICS

MRT would be new to the Christchurch landscape and is the term used to describe the development of a high capacity, high-performance PT capable of moving a large number of people within largely dedicated or exclusive right-of-way route[124]s.

MRT may consist of transport infrastructures suitable for Bus Rapid Transit (BRT), Light Rail Transit (LRT), Metro rail or Commuter Rail technologies. These may perform as stand-alone modes or be integrated with different urban environments and modes.

MRT can have a very wide range of physical and operational outcomes depending on the need and constraints, but typically has the following characteristics:

- Dedicated transport corridors that ensure high-quality, high reliability, premium level transit services
- Provides exclusivity, priority and/or segregation of transit vehicles from private vehicles
- Enables and supports transit oriented urban development through land value uplift that can help implement strategic intensification and place-shaping strategies
- Providing customers with a premium PT service preferred over the use of the private vehicle

Building on the latter point, a key purpose of an MRT system is to achieve mode shift and attract new users, particularly from cars. To achieve this, the service must:

- Provide competitive journey times – particularly compared to alternatives like private cars
- Be reliable and have a narrow range of journey times as well as even headways to provide consistent wait times
- Be legible and easy to understand. This is key to attract new users as well as unfamiliar and infrequent users and should involve a simple service pattern
- Provide a good ride quality for comfort and user experience
- Provide confidence and reassurance to users through information pre and during journeys
- Provide for safety and personal security of customers in journeys to stations, at stations and in transit
- Be easy to access. This can mean a wider range of things but as a minimum should consider:
  - Access to stations by a variety of modes
  - Buying tickets and fares – off vehicle
  - Level boarding
  - All-door boarding

Another key purpose of rapid transit is to help achieve land use objectives by supporting density in high priority locations. This requires:

- Consideration of station locations to align with prioritised land use planning and potential
- Consideration of station precincts and urban form in the detailed location, access modes and facilities provided for and
- Integrated planning and identification of opportunities to enhance land use and transport outcomes

MRT as a city-shaping intervention can help optimise the existing high-frequency bus network and act as a pathway to developing new emerging PT technologies. The system should have the potential to perform within different urban environments, operating conditions and network structures and have different benefits depending on the environment. It can be designed to match the desired travel patterns for people accessing various employment sectors.

The implementation of MRT can result in a range of potential quantifiable and qualitative benefits relating to several characteristics associated with transport, land use, environment, economic and system performance within the city. The extent of the benefits realised will also be dependent on a number contributing factors such as the amenity and quality of residential and mixed-use areas.

4.3.1 Strategic outcomes alignment

The section provides an overview of the strategies and outcomes sought by the investment partners – Waka Kotahi, ECan, CCC, SDC and WDC that are of

[124] Fouracre.P, Dunkerley.C, Mass Rapid transit systems for cities in the developing world, Transport Reviews, 2003,Vol.23,No.3,P299-310

relevance to the proposed PT investment. Strategies identified and reviewed for their context and alignment are included in Figure 4-42.

Overall, there is strong support for the sort of outcomes that MRT can provide in the National policy framework, particularly in the areas of:

- Reducing emissions
- Access to opportunities
- Choice of travel
- Achieving mode choice (including active modes through land use change)
- Supporting compact urban form and reduced car reliance of existing urban form and
- Economic Prosperity - Efficient flow of people and products

Further in the local policy framework there is also strong support:

- There are aspirations to reduce carbon emissions and have a more sustainable urban form. CCC seek to achieve a 50% reduction in greenhouse gas emissions (excluding methane) by 2030
- There is a desire to strengthen the central city
- A strategy to emphasise redevelop and intensify the existing urban area around Key Activity Centres, District Town Centres and along core transport corridors
- Our Space 2018-2048 acknowledges that with significant population growth in Greater Christchurch, there will be challenges for travel unless there is a significant shift in how the region thinks about and approaches transport. The CRLTP supports this further noting that travel time reliability is compromised by a high reliance on single occupancy vehicles; and a lack of supporting infrastructure, network management, and transport alternatives; earthquake damage/post-earthquake recovery activities; and population change, changing land use patterns
- Development along the periphery in greenfield development (northern and south-western parts of the city, and in satellite towns – Rolleston, Lincoln, Rangiora and Kaiapoi);
- A desire to align transport and land use. Acknowledgement that a settlement pattern approach with mixed use nodes that encourages greater urban densities, particularly along key PT corridors provides the greatest opportunity for people to live near proposed new rapid transit routes, increasing the likelihood and attractiveness for people to adopt these transport modes
- Aspiration for greater mode share, reduced requirement for a private vehicle and more competitive performance
- A referenced strategy for MRT corridors and
- Acknowledgement that MRT can be used as a "catalyst" for housing and redevelopment (i.e., Our Space refers to investment in rapid transit as a means for encouraging higher density development along high demand corridors so more people will be able to access jobs, services, recreation, and education without necessarily having to rely on a private vehicle)

It is relevant to note that the desire for corridor development and intensification of the central city core has the potential for conflict given different investment objectives that these present. In addition, achieving the desired densification (infill as opposed to greenfield development) is likely to be challenging due to economics of scale, multiple landowners, existing built form, and infrastructure limitations).

Further details of the relevant goals contained in these strategies are outlined in Table 4-6 and in Appendix E – Key Policies and Objectives Related to MRT.

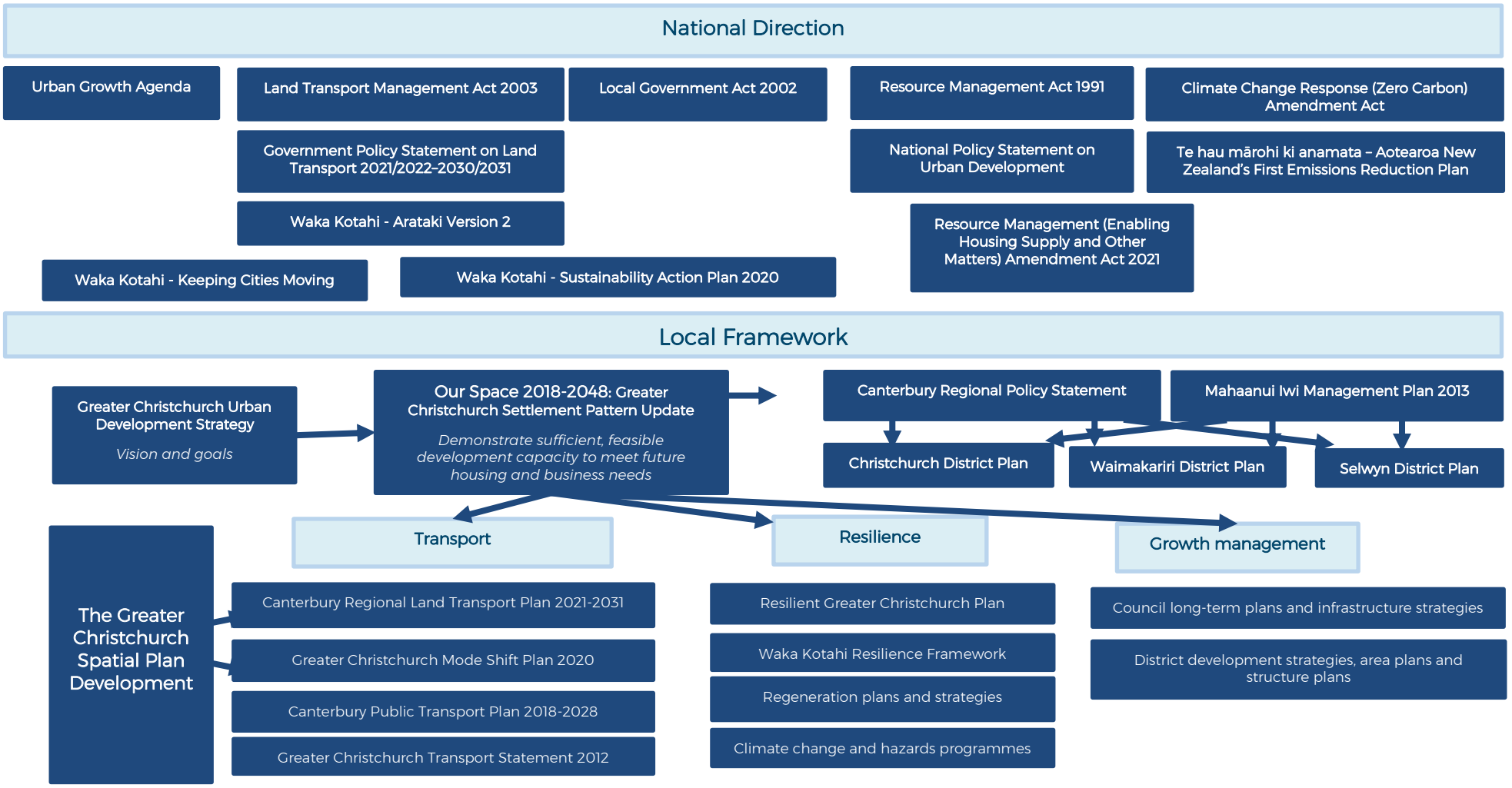

Figure 4-42: Overview of strategic framework

The Government Policy Statement on Land Transport 2021/2022-2030/2031 (GPS) specifically notes that to achieve the desired outcomes sought (which include an increased share of travel by PT and active modes, reduced greenhouse gas emissions, reduced air and noise pollution and more available and accessible PT modes and improved access to social and economic opportunities) that the work underway on developing a PT system in Christchurch needs to continue[125].

Table 4-6: MRT Strategic Outcomes

National / Regional	Strategy/ Plan	Description	MRT Alignment
National	Ministry of Transport Government Policy Statement on Land Transport 2021/2022-2030/2031	The four strategic priorities of the GPS 2021 are: ▪ Better travel options ▪ Safety ▪ Climate change ▪ Improving Freight Connections	Notes that high capacity and rapid transit systems and multimodal travel options in urban centres will help to manage road congestion and enable efficient flows of people (and products).
National	Ministry for the Environment National Policy Statement on Urban Development 2020	The NPS -UD has been developed to recognise the national significance of well-functioning urban environments that enable all people and communities to provide for their social, economic, and cultural well-being, and for their health and safety, now and into the future.	The NPS-UD emphasises the relationship between density and MRT and directs all Tier 1 centres (incl. Christchurch) to establish minimum 6 storey building heights in metropolitan centres[126] and within a walkable catchment of existing and planned rapid transit stops. This is to help meet the objective to provide for intensification so that all urban environments provide for greater intensity in locations of high demand and accessibility.
National	Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021	The Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 (EHS Act 2021) was introduced in 2021 to support greater housing density. Ultimately it seeks to enable three homes of three storeys in height to be built on most residential sites in Tier 1 centres (i.e., the Greater Christchurch area) without the need for resource consent. The Tier 1 District Councils (CCC, SDC and WDC) are required to update their District Plans to give effect to this by August 2022.	The EHS Act will support intensification of the Greater Christchurch urban area by removing and or reducing the need for resource consent to intensify existing residential sites. This will likely lead to a significant increase in zoned housing capacity.

[125] https://www.transport.govt.nz//assets/Uploads/Paper/GPS2021.pdf p.19

[126] Metropolitan Centres are not defined in the NPS-UD. However **rapid transit service** is defined as any existing or planned frequent, quick, reliable and high-capacity public transport service that operates on a permanent route (road or rail) that is largely separated from other traffic. A **rapid transit stop** means a place where people can enter or exit a rapid transit service, whether existing or planned.

National / Regional	Strategy/ Plan	Description	MRT Alignment
National	Ministry for the Environment Climate Change Response (Zero Carbon) Amendment Act	The Climate Change Response (Zero Carbon) Amendment Act 2019 provides a framework by which New Zealand can develop and implement clear and stable climate change policies that contribute to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5° Celsius above pre-industrial levels and allow New Zealand to prepare for, and adapt to, the effects of climate change.	MRT has the potential to help catalyse a greater density of land development along key corridors that are more walkable and well-connected communities (encouraging greater levels of active travel and improved wellbeing), and also given the mode shift to PT will result in reduced emissions, congestion, and air pollution.
National	Te hau mārohi ki anamata: Towards a productive, sustainable, and inclusive economy – Aotearoa New Zealand's First Emissions Reduction Plan 2022	Te hau mārohi ki anamata (the ERP) was published in May 2022 as New Zealand's first emissions reduction plan. It was published by the Minister of Climate Change under section 5ZI of the Climate Change Response Act 2002[127]. It is the first statutory plan, under the Climate Change Response Act, to require the Government to act to reduce emissions right across the economy and support all New Zealanders to make the most of the transition and seize the opportunity to lower the cost of living and improve living standards. It outlines that major actions planned to reduce emissions, including increasing access to electric vehicles (EVs), beginning the process of decarbonising heavy transport and freight, and helping more people to walk, cycle and take PT.	Specifically, the ERP seeks to reduce reliance on cars and support people to walk, cycle and use PT including by improving the reach, frequency and quality of PT and making it more affordable for low-income New Zealanders.
Regional	Land Use Recovery Plan 2013 (LURP)	The Land Use Recovery Plan 2013 is a statutory document prepared under the Canterbury Earthquake Recovery Act 2011 in response to the 2010 and 2011 Canterbury earthquakes as a way forward for Greater Christchurch's recovery from the earthquakes	The LURP identifies that changing travel patterns since the earthquake have placed significant stress on transport infrastructure. Making it easy for people to walk, cycle and use PT also supports a compact urban form, which supports safe, walkable communities which also have positive health and social outcomes".
Regional	Greater Christchurch Spatial Plan	The Greater Christchurch Partnership has embarked on the development of the Greater Christchurch Spatial Plan (GCSP). While not yet finalised, the GCSP will consider how	The GCSP sits within a wider local, regional, and national context. This MRT IBC and the GCSP are strongly interdependent, recognising the importance of greater

[127] https://environment.govt.nz/assets/publications/Aotearoa-New-Zealands-first-emissions-reduction-plan.pdf

National / Regional	Strategy/ Plan	Description	MRT Alignment
		a possible future population of 700,000 can be successfully accommodated in Greater Christchurch (representing 170,000 or 30% more than the current population of Greater Christchurch) by 2050. The GCSP will be developed to give effect to relevant national policy direction, including the Urban Growth Agenda; the government policy statements on housing and urban development, and land transport; the NPS-UD; and the emerging Emissions Reduction Plan for Aotearoa New Zealand. It will also be cognisant of the emerging directions from the resource management system reforms, especially from the proposed Strategic Planning Act which, has so far indicated that the development of long -term regional spatial strategies will be required. The GCSP seeks to prioritise sustainable transport choices to move people and goods in a way that significantly reduces greenhouse gas emissions and enable access to social, cultural, and economic opportunities. It looks to set out how Greater Christchurch provides community wellbeing and prosperity into the future in the context of population growth and climate change.	intensification of land use to reduce dependence on car travel, house people more sustainably and affordably, and realise the benefits of economic agglomeration, and the need for intensification to support the feasibility of significant transport infrastructure investments, such as MRT.
Regional	Our Space 2018-2048: Greater Christchurch Settlement Pattern Update	Our Space is owned by the Greater Christchurch Partnership. It represents a cohesive plan update to the Urban Development Strategy that charts Christchurch's future as it grows to a projected 640,000 people by 2048.	Our Space identifies that population growth will start to constrain the current freedom and independence enjoyed by Cantabrians across the Greater Christchurch area during travel. It supports investment to achieve an enhanced PT system and improvements along key transport corridors. It acknowledges that half of all the jobs in Christchurch are and will likely continue to be located in the corridor between the Central City and Hornby, and nearby suburbs suggesting that the provision of rapid transit (busways or light rail) along this corridor would make it easier for people to reach these employment opportunities and also catalyse housing development, so more people can have the opportunity to live closer to where they work.

National / Regional	Strategy/ Plan	Description	MRT Alignment
Regional	Canterbury Regional Land Transport Plan 2021-2031	The CRLTP outlines the current state of our regional transportation network and the challenges we face now and in the future. It outlines seven key strategic objectives to help support the 30-year strategic vision of providing "*all transport users with sustainable options that move people and freight around and through our region in a safe and efficient way that enables us to be responsive to future challenges.*" The seven strategic objectives are - improved advocacy; - better freight transport options; - reduced harm; - mode shift; - shared prosperity; - reliable and consistent journeys; and - resilience.	The CRLTP refers to the PT Future programme in which this MRT IBC sits as a consideration for what further investments should be made for PT in Greater Christchurch. It outlines that the MRT package of work in the programme is a "*transformational package that lays the foundation for significant urban development and land use changes and transformation in transport accessibility. In 2021, work is underway to identify and protect the corridors and to enable policy changes that support intensification and regeneration in key areas. The implementation of MRT is currently mode agnostic and it is anticipated that the MRT business case will determine the timing and methodology for MRT implementation.*"
Regional	Greater Christchurch Transport Statement 2012	The Greater Christchurch Transport Statement (GCTS) 2012 provides an overarching framework to enable a consistent, integrated approach to planning, prioritising, implementing, and managing the transport network and services in the Greater Christchurch area.	The GCTS recognises that people need to travel for business, work, education, shopping, and social purposes. They want to do this safely and efficiently, with choices across a range of modes. It identifies PT as being one of the five most pressing strategic transport issues needing partnership action in the short-term and identifies the investigation and protection of future PT options as part of this. CCC publicly released a draft of the Christchurch Transport Plan 2022 in August 2022 which will replace the 2012 plan. Community consultation on this plan is scheduled for the first half of 2023. Whilst still in a very early stage this will include actions to support the creation of a safer transport system, aligning with the national Road to Zero strategy, and providing policy direction on how our transport system can support sustainable urban growth.
Regional	Canterbury Regional Public Transport Plan 2018-2028	The vision of the CRPTP is to provide innovative and inclusive PT that sits at the heart of the transport network	One of the CRPTP aims is to provide a catalyst for Central City regeneration, and regional housing and business

National / Regional	Strategy/ Plan	Description	MRT Alignment
		and supports a healthy, thriving, and liveable Greater Christchurch.	development, by protecting and investing in rapid transit corridors.
Regional	Greater Christchurch Mode Shift Plan	The Greater Christchurch Mode Shift Plan responds to a request from the Government for all high-growth urban areas to produce regional mode shift plans to describe how an integrated and cohesive approach to delivering mode shift can be achieved.	MRT has the potential to help support mode shift in Greater Christchurch.

4.4 BENEFITS AND INVESTMENT OBJECTIVES

4.4.1 Benefits

The benefits of solving the problem statements correspond to the benefit statements identified in the ILM:

- Greater PT capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)
- Improved access to jobs, education, and social opportunities (33%).
- Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)

The benefits of solving the problems are broadly summarised below:

4.4.1.1 Health Benefits

Creating more walkable, well-connected communities will have health benefits not only due to reduced congestion and air pollution, but as mode shifts encourages towards more active travel, and improved wellbeing. Further support towards a more compact, dense, urban form will reduce low density residential sprawl, with low density urban form and sprawl identified as prominent environmental influencer of obesity and poor health[128][129]. MRT provides an opportunity to catalyse a new form of urban development that would create a denser urban form.

4.4.1.2 Environmental Benefits

A reduction in private vehicle mode share and a higher density urban form (reduced trip distance between residential areas and opportunities) will provide benefits in terms of reduced emissions, and reduced congestion contributing to poor urban environments and amenity.

MRT enables shift away from single occupant car use into lower-carbon transport options, reducing emissions.

4.4.1.3 Liveable and Vibrant Communities

There are health and wellbeing benefits associated with improving the liveability of places. Liveability is broadly defined but urban liveability is generally associated with communities that are safe, attractive, connected, convenient, provide good accessibility choice to opportunities (education, employment, social and recreational), and high levels of health, recreation, and community services.

4.4.1.4 Transport and Access

Better access to opportunities (education, employment, services, and recreation) has the potential to be achieved through reduced road network congestion, and additional transport mode choice.

MRT enables greater PT capacity in a corridor that makes room for growth and supports high density development around key nodes. This will afford more people the opportunity to access key economic and social opportunities without the need to drive.

[128] Congdon, Peter (2019) Obesity and urban environments. Int Jnl Environ Res Public Health, 16(3), 464
[129] Nayha, Simo, et al (2013) Body mass index and overweight in relation to residence distance and population density: experience from the Northern Finland birth cohort 1966. BMC Public Health, 13, 938

4.4.1.5 Economic Benefits

Improving accessibility to employment opportunities and reducing time lost due to travel (i.e., stuck in congestion) will contribute positively to productivity, labour force participation, and competition. Further changes to a more urban form will result in agglomeration benefits and MRT has potential for land value impacts (the scale of which would be associated with transit mode and proximity to any stations/stops)[130].

MRT has potential to be a faster, more reliable transport option, appealing to more users. It can enable more residents to access jobs, education, and social opportunities, particularly within the central city, thereby improving the economic performance of Greater Christchurch.

4.4.1.6 Enhanced Customer Experience

One of the benefits of improving PT through the provision of MRT will be an improved and enhanced customer experience on PT. A dedicated right of way network for MRT would enable PT to be insulated from traffic congestion and provide an enhanced customer experience through a reliable service that is independent from the adverse effects associated with worsening road congestion.

MRT has a role in solving the problems outlined in Section 2 and in identifying the benefits outlined above. Implementation of MRT can result in a range of potential quantifiable and qualitative benefits relating to several characteristics associated with transport, land use, environment, economic and system performance within the city.

MRT is a recognisable mode differentiated as either rubber tyre or fixed rail technology and would be integrated into and/or alongside the existing urban form and PT network structure of Christchurch. It can provide a dedicated transport corridor as a 'backbone' for high-quality, premium level transit services that provides exclusivity, priority, and segregation of transit vehicles from private vehicles ensuring a higher level of reliability.

MRT as a city-shaping intervention can act as a catalyst for urban development and land value uplift, aligning land use planning with population growth in regions to support higher density urban regeneration in key locations. Support towards a more dense, compact, and connected urban form will result in a healthier form.

MRT can also help optimise the existing bus network, providing genuine travel choices for people living in high priority corridors and areas of density.

Lastly, MRT can have positive health benefits through encouraging passengers to mode shift from private vehicles to PT (reducing emissions and air pollution) and also encouraging a more compact urban form that supports active transport.

4.4.2 Investment objectives

The Project Team developed Investment Objectives that built from the Investment Logic agreed for the project. The investment objectives, their relationship to the agreed problems and benefits and their relative weighting are shown in Table 4-7.

- Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051;
- Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051; and
- Reduce emissions from transport movements across Greater Christchurch by 2051.

4.4.3 Key performance indicators (KPIs)

Table 4-8 outlines a set of KPIs, which have been developed to align with the Investment Objectives confirmed through the ILM. The KPIs can be used to assess the extent to which each objective could be realised. They should also be used to evaluate the success of the recommended package once it has been implemented.

The measures will need to be refined through the options development phase. It is noted that the areas which will be referred to as key prioritised locations and/or corridors within the KPI's are yet to be agreed upon with all stakeholders.

[130] Waka Kotahi. Emerging Technologies for Rapid Transit – Review of Emerging Technologies: Evaluation of integrated delivery models for rapid transit and housing. Figure 4

Table 4-7: Problem Statements, Benefits, and Investment Objectives

Problem Statements		Benefits	Investment Objectives
1	Current and forecast settlement patterns perpetuate high car dependence, resulting in increased transport costs (33%)	Greater PT capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)
2	The PT system is not sufficiently attractive to compete with private vehicles (33%)	Improved access to jobs, education, and social opportunities (33 %)	Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)
3	Continuation of the current transport system will fail our climate change responsibilities and lead to poorer public health outcomes (33%)	Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)

Table 4-8: Key Performance Indicators (KPIs)

	Investment Objective	Key Performance Indicator	
1	Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051	KPI 1	Change in accessibility to and from the Central City
		KPI 2	Change in access to opportunities from prioritised locations
		KPI 3	Change in development potential
2	Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051	KPI 2	Change in access to opportunities from prioritised locations
		KPI 4	Shift in trips to PT and active modes
		KPI 5	Change in journey times and reliability by PT and private vehicles
		KPI 6	Ability to integrate efficiently and effectively with wider PT
3	Reduce emissions from transport movements across Greater Christchurch by 2051	KPI 7	Change in emissions from transport and improved environmental outcomes

4.6 OPPORTUNITIES, ISSUES AND CONSTRAINTS

4.6.1 Opportunities

Opportunities for further investigation with the investment and project partners and stakeholders are:

- Sustainability across different stages of the project: there are opportunities to explore a greater sustainability focus in the options development and assessment process, which may consider broad environmental outcomes, climate change, transport carbon emission reduction, sustainable transport, and technologies
- Behaviour change: there are opportunities to promote and incentivise behaviour change at an accelerated rate to aid mode shift
- Catalyse urban form and development: there are opportunities for various MRT routes and modes to act as a catalyst for development of denser urban living along certain corridors
- Support intensification and high-density development: there is an opportunity to revise and further increase the aspirational residential densities (hh/ha) sought across various zones in Greater Christchurch. There is provision to aspire to greater residential densities in key locations and along key corridors, that are supported by good access
- There are opportunities for improved urban amenity in the street scape and public realm in proximity to rapid transit stops and/or stations
- Walking and cycling facilities: the provision of walking and cycling facilities to increase connectivity to, from and within the study area will complement any investment in higher standard PT
- Future proofing: There are opportunities to identify land/corridors to support an MRT system prior to the transport demand triggering the need for an MRT. This provides an opportunity to inform future land development and urban form now in anticipation of investment and purchase land now rather than waiting till investment becomes time critical.
- Scalable: MRT can be designed to be fit for purpose for the Christchurch context. The mode and the nature of any MRT corridor proposed needs to be refined to reflect the specific local constraints and benefits sought. For example, even within bus rapid transit there is a broad subset transit, ranging from what is commonly termed "BRT-lite", with prioritisation of road space for bus services and predetermined stops, to more permanent systems with exclusive right-of-way, high-capacity buses, fare collection prior to boarding and platform-like stops at fixed locations[131].
- Prioritisation: There is an opportunity to confirm prioritisation of key locations and corridors for Greater Christchurch to provide clearer guidance on key locations (there are currently 14 priority locations considering the Central city and 13 KAC's) in promoting a connected network of key destinations. Criteria can be developed in conjunction with the MRT IBC, Greater Christchurch 2050 and the CCC Spatial Planning work. This is likely to include consideration of redevelopment opportunities, density of employment, extent of crown own land and Kāinga Ora land, land capitalisation ratios, hazards and resilience, consideration of connected nodes/communities and existing and potential amenity value.
- Enhancing public transport linkages to MR873.

4.6.2 Issues and Constraints

The following sections describe economic, financial, political, social, environmental, transport, cultural, stakeholder and other issues and constraints which could influence the scope of the project outcomes and outputs.

Issues are uncertainties / risks that may not be resolved during the business case development stage, while constraints are limiting factors such as time, cost, resources etc.

4.6.2.1 Issues

Table 4-9 describes issues and uncertainties that may influence the outcomes of this IBC. The uncertainty log aims to address risk and demonstrates the need for close monitoring and management.

[131] The Joint Modelling Application Centre Board, FINAL REPORT AT Emerging Technologies for Rapid Transit - Part One: Part One, p. 19

Table 4-9: Issues/Uncertainty Log

Factor	Timing	Uncertainty	Impact	Comments
Factors affecting demand				
Degree of travel time reliability across all modes	Ongoing	More than likely	Significant	Impacts the level of confidence customers have in the reliability of the transport network which will impact the uptake of PT services.
Desired population growth targets and spatial direction for intensification	Ongoing	More than likely	Significant	The nature of any new urban growth strategy identified by Christchurch 2050 will influence the anticipated growth and travel projections within Greater Christchurch. This requires careful monitoring to ensure the projected demand on the transport network and change in land use patterns is met by enough capacity.
Factors affecting supply				
New legislation and policy direction enforce the pace of travel behaviour change	Political timeframes – ongoing	Certain –	High	Central or local government policy may cause changes in infrastructure investment. In February 2021, the Government announced it would repeal the resource management act (RMA) and enact a new legislation based on the recommendations of the Resource Management Review Panel. The proposed new legislation includes three proposed new pieces of legislation to replace the RMA. The proposed Natural and Built Environment Act (NBEA) will be the primary piece of legislation in the reform package supported by the Strategic Planning Act (SPA) and Climate Adaptation Act. An exposure draft of the NBEA was released June 2021 with submissions closing August 2021. The fully developed bill is to be introduced to the house in 2023 with a final round of public feedback occurring shortly after that. The SPA will be introduced to parliament at the same time. Government intends to have both bills enacted before the end of this parliamentary term.

There remain many uncertainties that should be monitored over the progression of this business case including the impact of COVID-19 on working from home and travel demand, the scale and growth of population and employment in Greater Christchurch and potential shifts in government transport priorities.

4.6.2.2 Constraints

Identification and Agreement of Key Priority Locations

The current land use planning framework identifies a large number of key priority locations within Greater Christchurch and MRT by its nature will prioritise some of these further through the nature of any selected corridor chosen. The investment partners are aware that MRT will identify some 'winners' for further development and investment and are working together to minimise any challenges associated with this.

NPS -UD Policy 3 Implications

It is noted that the NPS-UD 'Policy 3' now directs that within Greater Christchurch building heights of at least six stories should be enabled within the walking catchment from any existing or planned rapid transit stop. Given this could substantially change the built form within key locations in Christchurch from their current landform and character there may be public opposition to the concept of planned MRT. For example, this Policy would direct SDC to enable six storey building heights within the walking catchment of any potential planned MRT stop.

Misalignment with Other Projects

There is the potential for misalignment of the direction and timing of this IBC and other projects in the study area (e.g., the outcomes of GCSP). Interface issues may arise if the timing and staging of any proposed works do not integrate with the planning for the other projects, for example the growth aspirations and urban spatial form sought by Christchurch 2050 needs to be consistent with any development that would be catalysed by investment in an MRT corridor.

There is currently a high level of uncertainty around the timing for various investigations, funding and delivery of projects led by the investment partners. The investment partners are, however, aware of the challenges and are working together to minimise them.

Manawhenua Position

The Mahaanui Kurataiao (March 2023) report sets outs the interests in, and position of, manawhenua on the route options.

Any form of public transport service, including MRT, that involves the need to widen the Woodend-Rangiora Road, creates the potential for taking of Māori Land. MRT also has the potential to reduce accessibility between MR873 and the wider transport network by removing local road connections. For these reasons it is fundamentally opposed by manawhenua.

MRT is also potentially a factor supporting the expansion of further urban development over wāhi tapu and encroachment on ngā wai in the Woodend/Ravenswood locality. Given this fundamental opposition, the options for MRT are limited in this locality. Noting that Māori Reserves are identified as Priority Development Areas in the Greater Christchurch Spatial Plan, the challenge is to support future development of and access to Māori Land whilst ensuring it is not reduced in area by the taking of land for public infrastructure purposes.

Covid 19

The unprecedented global impact of the once in a hundred-year COVID-19 pandemic has been considered by Waka Kotahi in relation to the effects that the pandemic has had to date on PT, and its projected long-term effects. Across all geographies, PT has declined the most of all modes during the pandemic. In international examples, rapid transit demand has recovered faster than overall PT demand; contrarily, in Auckland in June 2020 rapid transit recovery had been slower.

A report has been undertaken providing an evidence-based view of the likely recovery of demand for rapid transit in Auckland, given the importance of rapid transit in the Government Policy Statement on Land Transport 2018/19 – 2027/28.

It notes that in Auckland, employment forecasts by PWC suggest there will be no change in employment numbers in the city centre. Instead, the Working From Home (WFH) trend is expected to result in a long-term shift in the mix of industries concentrated in the city centre as remote working makes way for firms that were previously priced out of city centre office space (with total trips remaining constant over time)[132].

The report concludes that during the initial stages of recovery, PT mode share is projected to fall due to increased use of private vehicles and active modes, public anxiety associated with using PT and lower numbers of city centre commuters. However, as activity in urban centres increases and public anxiety wanes, private vehicle mode share is expected to decrease over time, active mode share is expected to continue to grow and RTN patronage recovery is expected to be marginally slower than the rest of the PT network. RTN share of PT is expected to recover to pre-COVID levels by 2021 in the central case[133]. While this study is Auckland focused, it demonstrates that COVID-19 is not anticipated to have lasting effects on PT (or MRT) patronage in Auckland.

[132]https://www.nzta.govt.nz/assets/planning-and-investment/arataki/docs/waka-kotahi-rapid-transit-covid-19-scenarios-summary.pdf

[133]https://www.nzta.govt.nz/assets/planning-and-investment/arataki/docs/waka-kotahi-rapid-transit-covid-19-scenarios-full-report.pdf

ECONOMIC CASE

WSP | Aurecon | Boffa Miskell |QTP

5 DEVELOPMENT AND ASSESSMENT METHODOLOGY

Christchurch aspires to be a low-carbon city with transport viable choices, good urban amenity, strong economic performance, particularly of the central city. Public transport has a key role to play in realising these outcomes.

Hence, following a Programme Business Case (PBC) completed in 2018, the Greater Christchurch Partnership (GCP) agreed to the development of two further business cases to explore an investment programme aimed at increasing the mode share of the public transport network in Greater Christchurch.

The first business case (Greater Christchurch Public Transport Combined Business Case) recommended a programme of improvements to increase the uptake of public transport over the next decade.

The second business case (this MRT IBC) has a longer-term focus, with an outlook to 2051 in line with the planning horizon set by the Greater Christchurch Spatial Plan (GCSP) work, considering the role of rapid transit in the Greater Christchurch area. The MRT IBC has been developed in modules, with hold points at critical points to ensure alignment and a fit for purpose approach. This process is illustrated in (Figure 5-1) and outlined below.

Strategic Case: The strategic case was with a hold point at its conclusion. This provided the opportunity to check for alignment on the problems, benefits and objectives between project partners and key stakeholders. It also provided a clear direction and case for change prior to launching into scoping and undertaking the subsequent sections of the IBC. As time has progressed the Strategic Case has been updated to reflect emerging growth patterns for Greater Christchurch and other policy changes.

MRT Interim Report: Greater Christchurch Public Transport Futures MRT Interim Repot (Interim Report), as attached in Appendix G – Greater Christchurch Public Transport Futures MRT Interim Report, was completed in June 2021. It was developed after the strategic case, in advance of commencing the full IBC (i.e., this IBC). The purpose of the interim report was to test the suitability of the selected investment objectives and associated KPIs, drafted in the strategic case, to adequately inform decision makers on the impact that MRT might have against wider policy direction for the region. The interim report developed and analysed three high level corridor scenarios, but it was not intended to identify a preferred solution investment. One of the conclusions of the Interim Report was that the outcomes were highly sensitive to land use forecasts and hence further work beyond this needed to be developed in close unison with GCSP. The approach and results of the Interim Report is summarised in Section 7 of this report.

Economic/Commercial/Financial/Management Cases: The third part of the overarching process was developing the work undertaken in the Interim Report further to better understand the options in more detail, undertake a comprehensive option assessment and confirm a preferred option. In addition, developing a Commercial, Financial and Management Cases in relation to the preferred option. This work was undertaken in coordination with the emerging direction of the GCSP. The option development and assessment process is described in more detail in the following section.

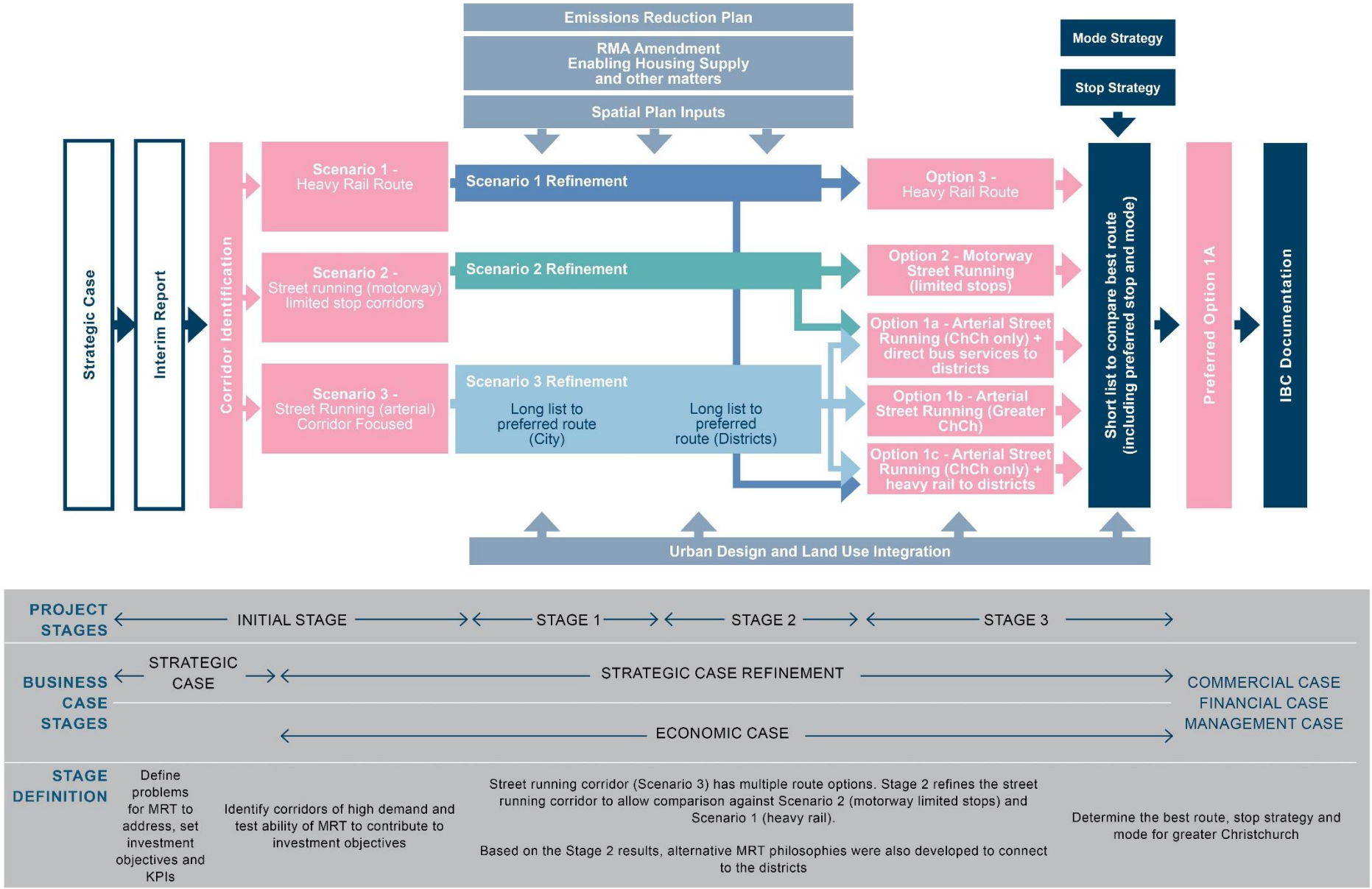

Figure 5-1: Approach for MRT Development

5.1 IBC ASSESSMENT STAGES

The option development and assessment process was broken into a number of stages as outlined in the previous figure and described below.

5.1.1 Initial Stage – Interim Report

The MRT Interim Report considers growth potential across Greater Christchurch to inform the likely corridors to best support the initial implementation of MRT. Within the selected corridors (northern and south-western corridors of Greater City) three rapid transit route scenarios are considered further:

Scenario 1: A heavy rail scenario – with limited stop opportunities but competitive travel times.

Scenario 2: A street running scenario with limited stops focused on competitive travel times that generally follows the motorway corridors.

Scenario 3: A street running scenario (corridor focused) with more frequent stops generally following arterial corridors, focusing on placing more households within the walk-up catchment, at the expense of travel time competitiveness.

The interim work indicated that the street running corridor scenario (Scenario 3) would have the highest public transport ridership. However, this scenario also had the most route considerations to consider (compared to Scenario 1 and 2 where the route option is limited in general to following existing rail and motorway corridors). Hence, the initial stages of the IBC (stages 1 and 2) focus on considering further the route complexities, associated with Scenario 3.

All three Scenarios are developed throughout this IBC to a similar level of detail to inform the Stage 3 (Short List Assessment) of this IBC. This includes consideration of alternative MRT philosophies, including alternative district connections and mode combinations.

5.1.2 Urban Design and Land Use Integration Assessment

During the development stages of the IBC, the GCP have been progressing the GCSP work. Inputs from this work, in particular an emerging urban form and growth strategy were integrated into the Urban Design and Land Use Integration Assessment stages and refined throughout based on the emerging spatial plan recommendations.

The Urban Design and Land Use Integration Assessment specific to MRT considered future land use integration opportunities related to relevant policy, strategic direction and the GCSP. Integration opportunities looked to align with the Greater Christchurch Partnership and Christchurch City, Waimakariri and Selwyn Councils centres hierarchy to deliver transport supportive urban form and quality public realm outcomes.

Overall, land use integration is fundamental alongside improved urban mobility to achieve strong urban form relationships within the city. Closely matching the two will create opportunities that are 'greater than the sum of the parts'. It is anticipated that MRT will require land use planning change to provide the necessary ridership numbers to make rapid transit viable in Greater Christchurch. Higher densities of land use in key areas for example will have spinoff benefits in increasing PT mode share but also in promoting active travel modes and wider sustainability objectives.

5.1.3 Long List Assessment

The long list assessment process for MRT focuses on route options. The long list process effectively commenced back at the Interim Report stage but was further picked up within the IBC to bridge the Interim Report with the short list.

Scenario 3

Stages 1 and 2 were specific to Scenario 3, developing the street running scenario further, given the number of alternative routing options available, so it could be fairly compared to Scenarios 1 and 2.

Stage 1: Stage 1 of the IBC focuses on the identification of a preferred route in the northern and south-western directions within Christchurch City (i.e., between Hornby and Belfast only) under the street running scenario (Scenario 3).

Stage 2: Stage 2 explores the potential extension of the street running scenario (Scenario 3) to Waimakariri and Selwyn Districts (herein called the districts). These extension options also included sections of motorway running MRT. The outcomes of the Stage 2 assessment led to further consideration of alternative MRT philosophies to connect the districts by way of complementary Motorway and Heavy Rail routes.

Scenario 2

Scenario 2, the street running scenario which follows the motorway corridor, has limited alternative route options given the limited motorway corridor options connecting Greater Christchurch. However, there were some connection options available to the north which were considered further, refining the route option prior to the short list assessment (as detailed in Section 12.2.4 of this IBC).

In addition, sections of motorway routes were also considered as part of Scenario 3 when considering routing options to connect to the districts as part of the Stage 2 assessment outlined above.

Scenario 1

Scenario 1, the heavy rail scenario follows the existing heavy rail route, hence the route options for this scenario were also limited. However, refinement and alternative rail options were considered further prior to the short list assessment. The rail optioneering is detailed further in the Supporting Assessments section of this IBC, (Section 11.3) as it was a significant piece of work undertaken to inform the short list options.

Alternative MRT philosophies

As part of the long list process, further route combination options were also developed. This considers both limited motorway bus services (direct bus services) and a limited heavy rail scenario to connect the districts in lieu of extending a street running MRT system. (as detailed in Section 10.5 of this IBC).

5.1.4 Supporting Assessments

Stop and Mode Strategy

The long list assessment investigated options from an overarching corridor route approach, hence stop locations were not included in the assessment and the options were mode agnostic. Prior to proceeding to the Short List Assessment, additional detail was undertaken to inform each option's stop and mode strategies.

Heavy Rail Strategy

Route and services based on Scenario 1 (Heavy Rail) were studied prior to the Shortlist process to define and select Heavy Rail MRT Options that could leverage on the existing rail network to best deliver of the IBC's investment objectives.

5.1.5 Short List Assessment

Stage 3

The stage 3 assessment investigates the refined scenarios 1 (Heavy Rail), 2 (Motorway Corridor) and 3 (Arterial Street Running) alongside two further MRT philosophies (e.g., direct motorway bus services or limited heavy rail). The stage 3 assessment considers all options in more detail considering routes, stops and mode and includes deeper quantitative analysis across all the KPIs informing the Investment Objectives.

5.2 MANAWHENUA

The Mahaanui Kurataiao (March 2023) report sets outs the interests in, and position of, manawhenua on the route options.

In summary, the report advises that manawhenua support the transport objectives to reduce transport omissions and improve public transport. Manawhenua are supportive of the preferred MRT route within the City and the concept of an enhanced public transport service to Rolleston and to Rangiora, although it is noted that no priority has been identified for public transport to connect with or support Tuahiwi Marae or MR873.

Fundamental opposition is however articulated to any form of public transport service that involves the need to widen the Woodend-Rangiora Road, risking the loss of Māori Land and reducing accessibility between MR873 and the wider transport network. There is also the potential for MRT to support expansion of further urban development over wāhi tapu and encroach on ngā wai in the Woodend/Ravenswood locality.

5.3 PARTNER COLLABORATION AND STAKEHOLDER ENGAGEMENT

5.3.1 Project Partners

The Greater Christchurch Partnership (GCP) Committee enable a co-ordinated approach to urban planning and joint investment in transport across the Greater Christchurch region. This partnership includes local government, manawhenua and Waka Kotahi. In 2022 the Whakawhanake Kāinga Komiti (WKK), an urban growth partnership was formed to strengthen the GCP Committee's partnership with local government, central government (the Crown) and manawhenua. The MRT Project is a key project for the Whakawhanake Kāinga Komiti and this partnership arrangement has been utilised to discuss the progression of the IBC. This has included regular briefings and workshops with both committees.

5.3.2 Key Stakeholder Engagement

Throughout the development of the IBC ongoing engagement by Waka Kotahi has been held with key stakeholder organisations, providing updates on the project progress, option development and the emerging results:

- Christchurch City Council
- Environment Canterbury
- Selwyn District Council
- Waimakariri District Council
- Kāinga Ora
- Ministry of Housing and Urban Development
- Ministry of Transport
- Greater Christchurch Spatial Plan team

The regular MRT Stakeholder Workshops, were important forums in which key results of the MCA analysis were shared with the participants, during each stage of analysis with feedback incorporated into the final MCA as appropriate.

Sub-group collaboration sessions have also been held with smaller groups, in particular, Christchurch City Council, Selwyn District Council and Waimakariri District Council, to address specific issues apparent to each district.

A more complete list of the meetings held across the various stakeholder groups is provided in Appendix O – Summary of Partner and Stakeholder Briefings and Meetings.

5.3.3 Wider Stakeholder Communication and Community Engagement

In October 2022, the Project commenced community engagement under the Greater Christchurch Urban Growth Work-Programme. The engagement phases for the programme are shown in Figure 5-2 and included engagement on the Greater Christchurch Spatial Plan and Mass Rapid Transit Indicative Business case.

Figure 5-2: Communication and Engagement Phases.

Phase 1: Pre-engagement was conducted in October 2022, the Project held one Focus Group and a Charrette session to test the appetite for a future investment in MRT in Greater Christchurch. The research tested key themes, such as the route, mode, and transit malls, to understand opinions from different users. This step informed the refinement of the preferred MRT option and clarified key messaging for the community engagement.

Phase 2: In February 2023, the engagement team for MRT and the Greater Christchurch Spatial Plan (Huihui Mai Greater Christchurch) commenced Phase 2: Public Engagement. This phase held three workshops, a webinar, youth workshops and four community events.

Throughout February and March feedback responses were also received via an online public survey. Initial feedback has indicated general support from the community for the preferred route and Project principles, as summarised further in Section 0 of this IBC.

Phase 3: To date, this Project and the GCSP have aligned engagement timelines that has allowed for a single engagement plan. However, at Phase 3, the two programmes of work will have different engagement objectives. It is recommended that at the earliest stage possible in the DBC that a stakeholder engagement plan is developed and implemented. The DBC phase of the Project will focus on opportunities to 'consult' and involve' communities and stakeholders.

6 THE BASE CASE – DO MINIMUM

The Do-Minimum (base case) included a number of assumptions as outlined below and incorporated into the modelling. These are described in further detail in Appendix T – Stage 1 – Transport Modelling Technical Note.

The modelling assumptions were largely consistent with those agreed for the PT Futures Combined Business Case. Different assumptions were only used for MRT where specifically required. External challenge sessions were organised to discuss and agree the underlying future year modelling assumptions.

Land Use Growth: The land use growth has been based on projections prepared by the Greater Christchurch Partnership as part of the GCSP work.

The GCSP evaluated three different urban form/land use scenarios to underpin the emerging urban form for Greater Christchurch. Three growth scenarios have been used to understand the implications of different ways Greater Christchurch may grow and transition over the next 30 years:

Compact Scenario: Promotes more growth in the city and around key centres/corridors, including within the townships. It also promotes more intensification and limits greenfield growth.

Consolidated Scenario: Provides for intensification and apportionment as per NPS-UD / Housing Capacity Assessment. It includes some greenfield areas but at higher density than current levels. It recognises the changes from the Resource Management (Enabling Housing Supply and Other matters) Amendment Act.

Dispersed Scenario: Enables and grows the district townships, with more growth into the districts that is focused around existing townships. These densities either align with, or exceed, market demands. There is increased greenfield allocation and less intensification within the City.

The do minimum option (base case) uses the GCSP Consolidated Scenario.

Network Infrastructure: Road network infrastructure improvements included within Territorial Local Authorities (TLAs) Long Term Plans (and the Waka Kotahi National Land Transport Programme) and other identified projects likely to achieve funding, as agreed for the CTM/CAST v21 model update have been utilised. For further detail refer to Appendix T – Stage 1 – Transport Modelling Technical Note.

Public Transport Improvements: The do minimum option also incorporates the programme of currently planned PT infrastructure and service improvements as proposed in the Greater Christchurch Public Transport Combined Business Case. This programme of works is detailed further in Appendix D – Public Transport Futures Non-Technical Summary. However, some key relevant elements are outlined below:

- Increased frequency 7.5-minute peak and 10 minute off-peak on the five inner core routes:
  - 5 Rolleston/New Brighton (yellow)
  - 7 Halswell/Queenspark (orange)
  - 3 Airport Sumner (purple)
  - 1 Rangiora Cashmere (blue)
  - Orbiter (green).
- Branch the core routes to the outer suburbs with 15-minute frequencies (peak and off peak) on each branch.
- Additional infrastructure improvements to provide continuous priority bus lanes on the five Inner Core routes, as identified in the PT Futures Combined Business Case.
- Increased frequency and route modification to improve directness is also proposed on other routes.
- All day 'direct' services to and from satellite centres (Rangiora via Kaiapoi, Rolleston and Lincoln) with 15-minute peak and 30-minute off-peak frequencies (using motorways and with limited stops and vehicle HOV lanes)
- Utilisation of existing and proposed Park and Ride in the districts.

Figure 6-1: Branching proposal for core route corridors from GC PT Combined Business Case

The do minimum offerings to the districts, including further detail on Park and Ride assumptions are outlined further in Section 13.4.1 of this IBC.

Parking: The cost of parking within the Central City will increase in proportion to land use development (increase in employment) within the Central City. As such, parking related costs are assumed to increase to 2051, as detailed further in Appendix T – Stage 1 – Transport Modelling Technical Note.

7 INITITAL STAGE – INTERIM REPORT

A separate Interim Report is included as Appendix G – Greater Christchurch Public Transport Futures MRT Interim Report. This report was presented to the GCPC at a meeting held on 9 July 2021, where the following resolutions were minuted:

That the Greater Christchurch Partnership Committee:

- *Receives the report and the attached MRT Interim Report.*
- *Refers the Mass Rapid Transit Interim Report to the partner Councils and Waka Kotahi Board.*
- *Notes the next steps and the proposed programme outlined in this report.*
- *Endorses the proposal to incorporate the next phase of the Mass Rapid Transit business case into the Greater Christchurch Spatial Plan work programme and request staff to bring back a plan on how we can accelerate the enhanced status quo option.*

Stage 3 of this IBC refines and retests the analysis of each of the interim scenarios and hence it is not the intention of this IBC to re-detail the analysis undertaken in this initial stage work. Background to the option development process however is summarised below as this is the entry point developed, for the option scenarios considered within this IBC. Note the Interim Report builds upon the initial point of entry point of the 2018 PBC and the subsequent 2020 PT Futures Combined Business Case.

7.1 CORRIDOR SELECTION

The Interim Report was developed prior to the GCSP work and hence considered land use data assumed in the CTM/CAST v18 model, forecast to 2028, 2038 and 2048. A range of broad MRT corridor options were considered with respect to these population forecasts and potential for travel demand to Christchurch central city (Noting, as outlined in the strategic case, 22% of jobs are expected to be concentrated in Christchurch Central City, making this the predominate employment hub across Greater Christchurch).

A person demand of 3000 passengers in the peak hour was used as an initial viability threshold for warranting further exploration of higher capacity modes. This proxy target was compared across various corridor options. The corridor extents tested are outlined in Figure 7-1 and the resulting person demand shown in Figure 7-2.

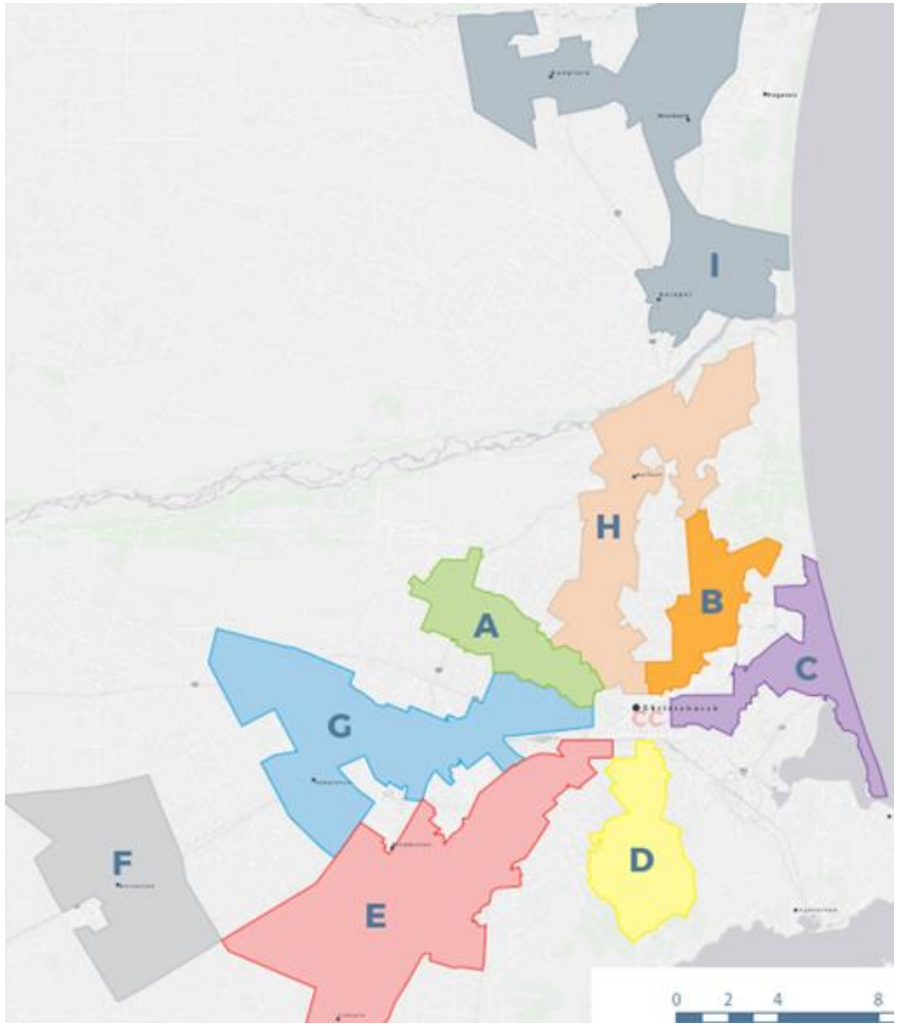

Figure 7-1: Interim Report - potential broad corridor locations

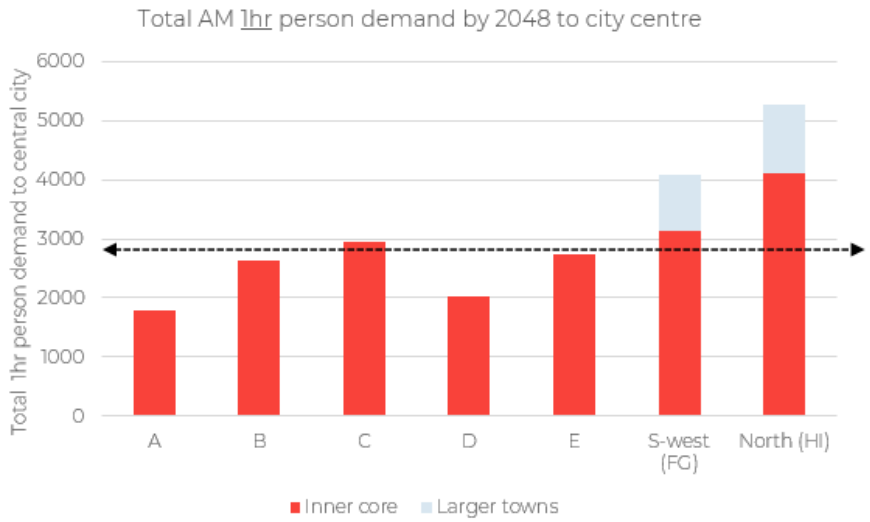

Figure 7-2: Interim Report - potential person demand by corridor

The analysis indicated that only corridors C (east), G (west) and H (north) have the potential to uplift person trips to at least 3000. Of these corridors, two of these (G-west and H-north) also provide the additional benefit of extension potential to the districts (Referred to as larger towns in Figure 7-2.) Combining the northern corridors (HI) and south-western corridors (FG), result in the only corridors to have the potential to generate peak hourly demands of more than 3,000 people.

In summary, the northern corridor (HI) and south-western corridor (FG) were selected as the corridors to further explore MRT given:

They accommodate a significant proportion of Greater Christchurch's growth with the population within these corridors forecast to grow from 147,000 in 2018 to 220,000 by 2048. (+50% increase). By 2048 one third of Greater Christchurch's population will live within these corridors.

These corridors are also already well served by frequent public transport with selected bus priority and target direct services to the central city.

The existing high demand and forecast growth show demand for travel from these corridors to the central city area to be the highest of all the corridors within the Greater Christchurch.

They are the only corridors that generate hourly demands of more than 3,000 people per hour during the peak to the central city, an initial threshold warranting further exploration for higher capacity modes.

It is worth noting that the identified preferred corridor, extending north and south-west, is generally consistent with the vision set out in the 2018 Programme Business Case (PBC) and Our Space 2018-2048. (Figure 7-3).

In addition, in selecting these corridors it does not preclude other corridors (e.g., to the east or south) having MRT at some point in future. If just focuses the initial investment in MRT into the corridors with the highest likelihood of success.

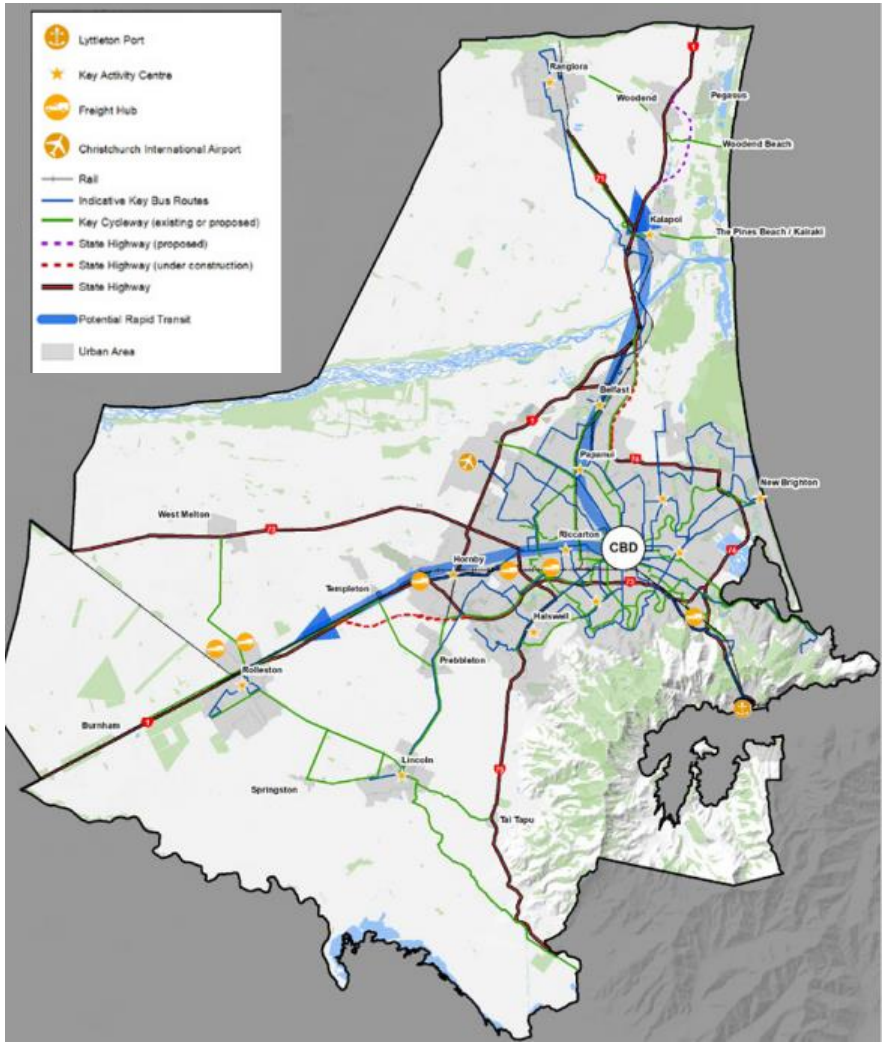

Figure 7-3: Our Space 2018 -2048 Greater Christchurch Transport Network

7.2 CORRIDOR SCENARIOS

Three rapid transit scenarios were explored within the two broad northern and south-western corridors. These scenarios were selected to test how speed, frequency and access to the rapid transit could influence urban form; improve the attractiveness of the public transport system and contribute to the city's climate change responsibilities.

The three scenarios tested in the Interim Report were:

Scenario 1: Heavy rail route: This scenario utilises and upgrades the existing heavy rail corridor and aims to reduce journey times for customers on the rapid transit system and therefore stop less often (approximately every 3.2km). It envisages through running services from Rangiora to Rolleston with a scheduled transfer from rail to a high-quality connector service to link rail with central city.

Scenario 2: Street running limited stop route: This scenario follows existing roads, but with an aim to follow those parts where higher speeds can be achieved, it generally follows the motorway corridors. The scenario aims to reduce journey times for customers on the rapid transit system and stop less often (approximately every 3.2km).

Scenario 3: Street running corridor focus route: This scenario follows existing arterial routes and aims to maximise access to the rapid transit system, passing through key activity centres and stop approximately every 1.6km through the Christchurch City section of the route.

The routes and stop locations assumed for the Interim Report are overlayed in Figure 7-4. These are further refined as part of Stages 1, 2 and 3 of the IBC process.

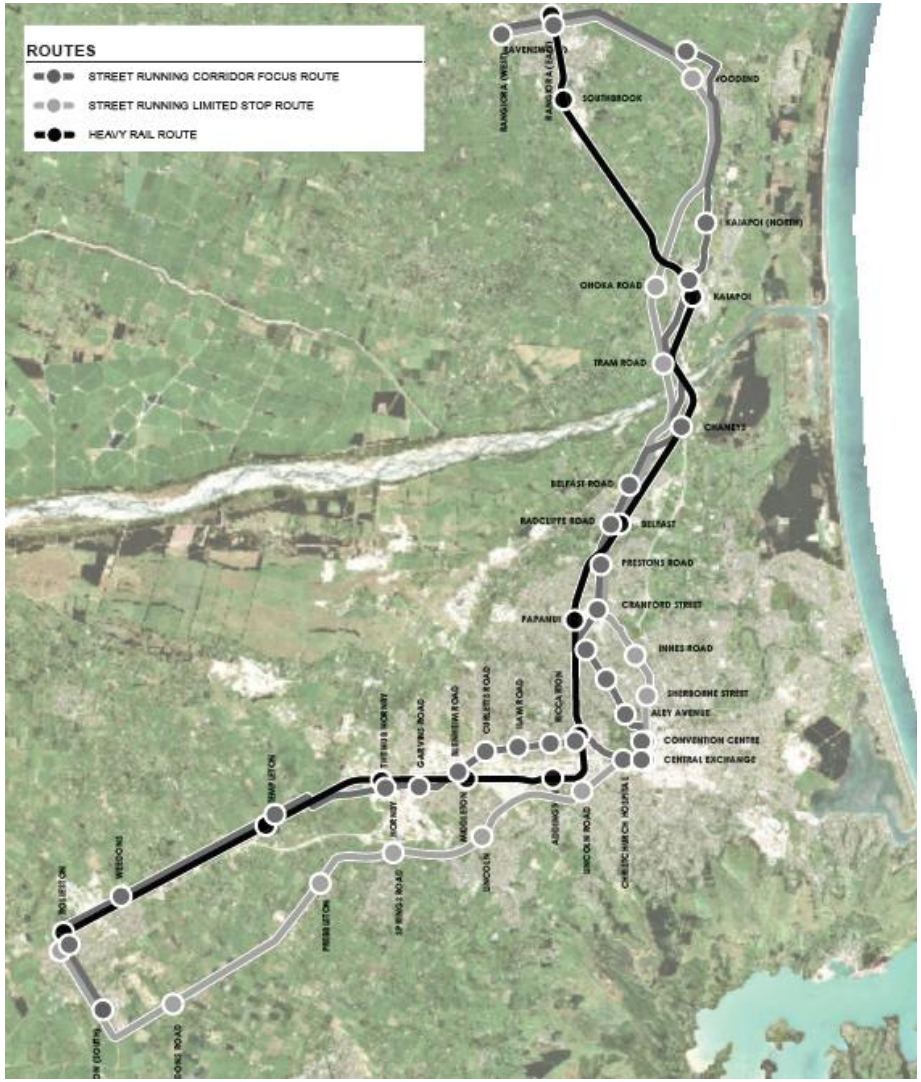

Figure 7-4: Interim Report Route Scenarios

7.3 SUMMARY OF FINDINGS

The intention of the Interim Report was to develop an understanding of the outcomes with respect to the Investment Objectives and the potential for the three corridor scenarios to provide an opportunity for growth at a scale that would support MRT.

Whilst a full MCA was not scored, the scenarios were tested against a range of selected quantitative measures relating to the Investment Objectives and drafted KPIs. These initial transport outcomes are outlined in the following table.

The results indicated that for each of the three potential routes there is an opportunity for significant growth at a scale that is supportive of MRT.

It also indicated that the street running corridor scenario (Scenario 3) would have the highest forecast use in public transport ridership, directly connecting existing Key Activity Centres (Riccarton Road and Papanui Road), as highlighted by the following table.

However, Scenario 3 also presented the most variety in terms of routing, given Scenario 1 would generally follow the existing heavy rail corridor and Scenario 2 the existing motorway corridor. Hence further investigation of the preferred route for Scenario 3 would be required to enable a fair comparison to Scenarios 1 and 2.

Furthermore, sensitivity testing showed significantly higher ridership on MRT in response to land-use assumptions. This indicated the importance of land-use within the station catchments and the need to closely align MRT work with the ongoing GSCP work to inform land use assumptions.

Table 7-1: Interim Report: Initial Transport Outcomes (Phase D results)

Investment Objective	Criteria	KPI	Outcomes		
			Heavy Rail	Street Running Limited Stops	Street Running Corridor Focused
Investment objective 1: Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2048	Housing and employment growth	Increased number of households and jobs within 800 m of high frequency public transport	+50,000 extra residents + 33,000 jobs	+ 160,000 extra residents + 123,000 extra jobs	+280,000 extra residents +173,000 extra jobs
	Ability to support high quality integrated community	Growth impact based on land value uplift	Not calculated	Not calculated	Not calculated
	Increased access to opportunities	Population able to access the Christchurch City centre within 30 minutes using the PT system	14% (16,830) decrease from 117,740 to 100,910	47% (54,840) increase from 117,740 to 172,580	17% (19,490) increase from 117,740 to 137,230
		Change in PT mode share for trips to the Central City from Greater Christchurch	5% increase from 36% to 41%	10% increase from 36% to 46%	11% increase from 36% to 47%
		Number of jobs accessible from satellite towns within 30 minutes by PT	220% (101,100) increase from 45,900 to 147,000	148% (67,780) increase from 45,900 to 113,680	85% (38,990) increase from 45,900 to 84,890
Investment objective 2: Improved journey time and reliability of	Increased share of travel unaffected by congestion	Change in private vehicle trips along the rapid transit corridor(s) to Greater Christchurch	2% (1,358) decrease from 70,100 to 68,742	3% (3,732) decrease from 108,523 to 104,791	3% decrease from 119,375 to 115,208

Investment Objective	Criteria	KPI		Outcomes		
				Heavy Rail	Street Running Limited Stops	Street Running Corridor Focused
PT services relative to private vehicles within Greater Christchurch by 2048;		Proportion of trips made by PT along rapid transit corridor(s) to the central city		19% increase from 39% to 58%	26% increase from 31% to 57%	17% increase from 32% to 59%
		More competitive journey times between PT and private vehicles for residents living along the corridor	CC to Rangiora (car vs RT)	26-45 min vs 35 min	26-45 min vs 53 min	26-45 min vs 1hr
			CC to Kaiapoi (car vs RT)	20-35 min vs 24 min	20-35 min vs 37 min	20-35 min vs 41 min
			CC to Hornby (car vs RT)	16-45 min vs 16 min		16-45 min vs 29 min
			CC to Rolleston (car vs RT)	22-40 min vs 29 min	22-40 min vs 42 min	22-40 min vs 43 min
	Ability to integrate efficiently and effectively with wider public transport network	Daily ridership on the rapid transit system		51,650 boardings	94,835 boardings	108,727 boardings
		Overall public transport mode share in Greater Christchurch		9%	10%	11%
Investment objective 3: Reduce emissions from transport movements across Greater Christchurch by 2048.	Impact on climate change	Change in private VKT/capita for households along the rapid transit corridor(s)		5% (833,781) decrease from 17,567,475 to 16,733,694	5% (924,314) decrease from 17,567,475 to 16,643,161	4% (737,018) decrease from 17,567,475 to 16,830,457
		Change in greenhouse gas emissions (tonnes of CO2 and HC) from transport sources along transit corridor(s)		10% (10,208) decrease from 98,101 to 87,893	15% (14,601) decrease from 98,101 to 83,500	13% (13,138) decrease from 98,101 to 84,963
		Change in greenhouse gas emissions (tonnes of CO2 and HC) from transport sources within Greater Christchurch		5% (14,056) decrease from 296,125 to 282,069	4% (12,425) decrease from 296,125 to 283,700	5% (15,582) decrease from 296,125 to 280,543
		Change in air quality and public health outcomes for households along the transit corridor(s)*		4% (4) decrease from 92 to 88	4% (4) decrease from 92 to 88	5% (5) decrease from 92 to 87

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7.4 NEXT STEPS

The IBC tests and develops further the value proposition of **all three scenarios** as presented in the Interim report and illustrated below.

The initial focus of the IBC (Stages 1 and 2) investigates further the route options associated with Scenario 3[1], including potential route combinations with the other two Scenarios. It also refines the route, stop and mode details across all options, prior to proceeding to the short list assessment.

Scenario 1: Heavy Rail Route	**Scenario 2: Street Running (Motorway Limited Stops)**	**Scenario 3: Street Running Corridor Focused**
Rolleston – Hornby – Addington - Central City – Riccarton -Papanui – Kaiapoi – Rangiora (Approx 55km rail corridor with 17 stations)	Rolleston – Aidanfield – Addington - Central city – St Albans - Kaiapoi - Woodend - Rangiora (Approx 60km road corridor with 20 stations)	Rolleston – Hornby – Riccarton – Central City – Papanui - Kaiapoi - Woodend - Rangiora (Approx 62km road corridor with 25 stations)

Figure 7-5: Scenarios 1, 2 and 3

[1] Manawhenua have expressed fundamental opposition to the establishment of an MRT route via Kaiapoi and Woodend that would require road widening and the potential that this would involve acquisition taking of Māori Land.

8 URBAN DESIGN AND LAND USE INTEGRATION ASSESSMENT

8.1 GREATER CHRISTCHURCH SPATIAL PLAN

When this IBC was initiated, the GCSP was evaluating three different urban form/land use scenarios to inform urban form for Greater Christchurch. These were:

- **Consolidated Scenario:** Provides for intensification and apportionment as per the National Policy Statement on Urban Development (NPS-UD) / Housing Capacity Assessment. It includes some greenfield areas but at higher density than current levels. It recognises the changes from the Resource Management (Enabling Housing Supply and Other matters) Amendment Act.
- **Compact Scenario:** Promotes more growth in the city and around key centres/corridors, including within the townships. It also promotes more intensification and limits greenfield growth.
- **Dispersed Scenario:** Enables and grows the district townships, with more growth into the districts that is focused around existing townships. These densities either align with, or exceed, market demands. There is increased greenfield allocation and less intensification within the city.

The Compact Scenario was taken forward into the land use scenario testing, as further outlined in the following section.

8.2 TESTING LAND USE SCENARIOS

As part of developing this IBC, investigations were undertaken to understand both the likelihood of development occurring along the corridor and growth implications on MRT feasibility. This work sought to inform the potential land use scenario assumptions that should be used when evaluating MRT options. This work is detailed in Appendix M – Urban Design and Land Use Integration report.

In summary, three Land Use Growth Scenarios were tested within the corridor, considering the impact on MRT feasibility (in terms of likely patronage) through both anticipated growth and plan-enabled capacity (Figure 8-1).

Analysis highlighted that there is too much residential capacity within Greater Christchurch, and it is an unrealistic proposition to assign all the growth to the corridor. Hence, Land Use Scenario 3 aimed to represent a tailored or staged approach which adopts a 'relative' growth strategy at key stations along the corridor through to 2051. Land Use Scenario 3 assumed the split of growth in each district (Christchurch City, Selwyn District and Waimakariri District) is retained as proposed under the compact growth scenario. However, within Christchurch City, growth was reallocated into the walkable catchments around key centres on the MRT corridor. It assumes an additional 29,000 households in the corridor by 2051, representing 50% of all CCC growth located along the corridor within walk up catchments.

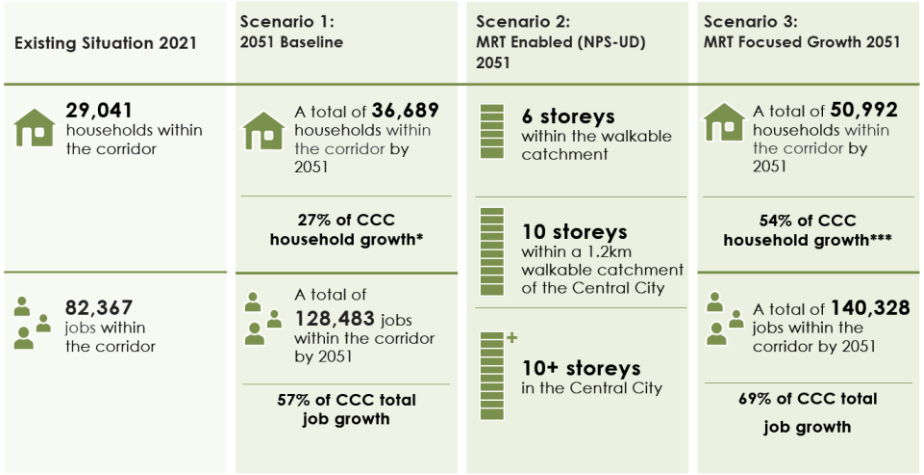

Figure 8-1: Overview of Land Use Growth Scenarios

8.3 GROWTH ASSUMPTIONS FOR OPTIONS

To inform option testing in the following growth assumptions were applied:

- Do-minimum (base case) – This used the GCSP consolidated scenario.
- For the long list assessment Stage 1 (Christchurch City) and Stage 2 (District Extensions), which investigates further the arterial street running corridor (Scenario 1), the modified compact scenario (Land Use Scenario 3) was applied. This was considered appropriate since land use is expected to be further intensified, particularly around stations on the arterial corridor within the existing urban centres under MRT.
- For the short list (stage 3) assessment Land Use Scenario 3 is continued to be applied to all options.

9 LONG LIST: ROUTE ASSESSMENT – STAGE 1

9.1 ASSESSMENT OVERVIEW

Stage 1 of the IBC focuses on the identification of a preferred route in a northern and south-western direction within Christchurch City (i.e., between Hornby and Belfast only) under the arterial street running scenario.

Stage 1 route assessment was sequentially undertaken in four sections as outlined below and illustrated in Figure 9-1:

- Section A: Central City
- Section B: Southwest corridor (Central City to Hornby)
- Section C: North corridor (Central City to Belfast)
- Section D: Airport Link

Manawhenua have reviewed the preferred MRT route (as part of the Stage 1 assessment phase) and have provided a final report setting out their position that informs the IBC (see Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case). Their position specific to each Stage 1 Section (i.e., Stage 1 Sections A-D) is provided in the following sections of this report.

Appendix H – Stage 1 Route Assessment outlines in detail the route assessment undertaken for the street running option within Christchurch City, including the multicriteria assessment undertaken against each KPI. Scoring of the MCA was undertaken by the core consultant project team, with subject matter experts to provide input where required such as consenting, operational and constructability aspects. Key results were shared with key stakeholders at the regular MRT Stakeholder Workshops, with feedback incorporated into the final MCA as appropriate.

The following sub-sections summarises this work, outlining the options assessed and providing a high-level assessment of the option assessment against the Investment Objectives.

Figure 9-1: Stage 1 Option Development Sections A to D

9.2 STAGE 1 SECTION A OPTIONS AND ASSESSMENT

9.2.1 Section A Option Descriptions

Eleven options were considered in Section A Central City Assessment as outlined below in Figure 9-2.

Option 1	Option 2	Option 2A	Option 3
			
Option 4	**Option 5**	**Option 5A**	**Option 5B**
			
Option 6	**Option 7**	**Option 8**	
			

Figure 9-2: Section A Central City Assessment Option Descriptions

9.2.2 Section A Options Assessment

MCA was undertaken across the eleven options. The results are summarised in Table 9-5, overleaf. The following paragraphs highlight option performance against the investment objectives and technical and feasibility criteria.

Investment Objective 1: *increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051.*

Table 9-1: Section A (Central City) MCA scores for Investment Objective 1

KPI	City Centre Option										
	1	2	2A	3	4	5	5A	5B	6	7	8
KPI 1: *Change in accessibility to and from the Central City* **KPI 2:** *Change in access to opportunities from prioritised locations* **KPI 3:** *Change in development potential*	1	1	1	1	1	2	2	2	2	1	2

Although all options scored positively, Options 5, 5A, 5B, 6 and 8 scored the highest. This reflected the good connectivity these routes have to residential and employment opportunities, along with their ability to contribute to high quality public realm outcomes.

Investment Objective 2: *improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051.*

Table 9-2: Section A (Central City) MCA scores for Investment Objective 2

KPI	City Centre Option										
	1	2	2A	3	4	5	5A	5B	6	7	8
KPI 2: *Change in access to opportunities from prioritised locations* **KPI 5:** *Change in journey times and reliability by public transport and private vehicles* **KPI 6:** *Ability to integrate efficiently and effectively with wider public transport*	1	1	1	1	1	2	2	1	1	1	1

All options also scored positively. However, Options 5 and 5A scored the highest, mainly due to these options being the most direct (including having the lowest number of right hand turns that would conflict with oncoming traffic or pedestrian flows (Option 1A)), serving key city centre destinations, and being well integrated with the existing and future public transport network and its associated facilities.

Investment Objective 3: *reduce emissions from transport movements across Greater Christchurch by 2051.*

Table 9-3: Section A (Central City) MCA scores for Investment Objective 3

KPI	City Centre Option										
	1	2	2A	3	4	5	5A	5B	6	7	8
KPI 7: *Change in emissions from transport and improved environmental outcomes*	1	1	1	1	1	1	1	1	1	1	1

For investment objective 3, there was no discernible variation in performance and scoring across any of the eleven options considered.

Technical and feasibility criteria:

Table 9-4: Section A (Central City) MCA scores for technical and feasibility criteria

Description	City Centre Option										
	1	2	2A	3	4	5	5A	5B	6	7	8
Technical and feasibility criteria	-1.4	-0.8	-0.8	-1.2	-1.0	-0.6	-0.6	-1.0	-0.6	-1.2	-1.4

From a technical and feasibility perspective, Options 5, 5A and 6 scored the highest. Generally, this was because they were considered to achieve better integration with the wider transport network, having less consentability and environmental risks, and having more positive social and community impacts.

Summary

Overall, two options emerged as the preferred route options within the city centre (Option 5 and Option 5A). Both utilised the Tuam and Manchester Street corridors, with a variant to deviate from Manchester on Kilmore and Victoria Streets as opposed to exiting the Central City to Bealey Avenue via Manchester Street.

Following the stakeholder workshop held on the 15 July 2022, it was confirmed that the preferred route was Option 5 which exits the Central City via Kilmore and Victoria Streets given this would connect better with central city destinations including the Town Hall, north Hagley Park, and the retail and commercial area of Victoria Street.

Table 9-5: Summary of Section A - Central City MCA

PT Futures Mass Rapid Transit IBC MCA (Long List - Stage 1: Street Running Corridor Route Assessment - Central City)				Do minimum	Central City Options										
					1	2	2a	3	4	5	5a	5b	6	7	8
Benefit	**Investment Objective**	**KPI**	**Measure**	**Score**	**Score**										
Greater public transport capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	**1. Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)**	Change in accessibility to and from the Central City	Total households per kilometre along the route corridor within 500m	0	1	1	3	1	1	2	2	1	1	1	2
			Total existing employment numbers within 500m of the corridor	0	2	2	1	2	2	3	2	3	2	2	2
		Change in access to opportunities from prioritised locations	Household growth (2021-2051) within 500m of the corridor	0	2	2	2	2	2	3	2	3	1	2	2
			Increase in the number of jobs within 500m of the corridor	0	3	3	1	3	3	3	3	3	2	3	3
		Change in development potential	Enables high quality public realm outcomes	0	-3	-1	-1	-3	-2	2	2	2	2	1	1
			Available total feasible capacity of land development within 500m of the corridor.	0	1	1	1	1	1	1	1	1	1	1	1
			Capitalisation Ratio – likelihood of development within 500m of the corridor.	0	2	2	2	2	2	2	2	2	2	2	2
			Contribution and alignment with strategic policy objectives in relation to land use integration, public realm and urban design.	0	1	1	1	-1	-1	2	1	1	1	-1	-1
Improved access to jobs, education and social opportunities (33%)	**2. Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)**	Change in access to opportunities from prioritised locations	Number of key destinations and strategic land uses within 500m walk up catchment.	0	2	2	1	2	2	3	2	2	1	2	2
			Change in accessibility to comprehensive development sites within 500m walk up of the corridor.	0	2	2	2	2	2	2	2	2	1	2	2
		Shift in trips to public transport and active modes	*No MCA measure – this required modelling outputs which were not undertaken at this stage of the assessment across all the options. This KPI was assessed as part of the short list assessment.*												
		Change in journey times and reliability by PT and private vehicles	Directness of the MRT route relative to the most likely car route (qualitative)	0	1	1	2	1	1	1	2	1	2	1	1
			Number of right turns conflicting with oncoming traffic or pedestrian flows (at grade)	0	-2	-2	-1	-2	-2	-2	-1	-3	-1	-3	-3
		Ability to integrate efficiently and effectively with wider public transport	Extent of integration with strategic PT routes /facilities	0	2	2	1	2	2	3	3	3	1	2	2
			Extent of integration with strategic active mode facilities.	0	-2	-1	-1	-1	-2	0	0	0	0	-1	-1
Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	**3. Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)**	Change in emissions from transport movements and improved environmental outcomes	Number of destinations and opportunities along the corridor that would encourage mode shift.	0	1	1	1	1	1	1	1	1	1	1	1

Technical/Feasibility Assessment		Score	Score										
Costs	Costs of the option (Capex, Property and Opex)	0	*No route MCA measure – was assessed as part of the mode considerations and short list assessment*										
Constructability	Assessment of constructability / complexity of the option	0	-2	-2	-1	-2	-2	-2	-2	-3	-2	-2	-2
Operational Implications	Assessment of how well the option will integrate with the wider transport network	0	-2	-2	-2	-2	-2	-2	-1	-2	-1	-2	-2
Property Requirements	Scale and magnitude of the property impact along the corridor	0	-1	0	0	0	0	0	0	0	0	-2	-1
Consenting and Environmental Impacts	Assessment of the level of consenting complexity/difficulty and the likelihood of obtaining approvals for the proposal and qualitative assessment of key environmental risks	0	-3	-2	-2	-3	-2	-1	-1	-1	-1	-1	-3
Social and Community Impacts	Assessment of the impact on community access and cohesion including consideration of the number of sensitive receivers (schools / hospitals / day cares / etc.)	0	1	2	1	1	1	2	1	1	1	1	1
Overall score (weighted)		0	**-0.5**	**-0.1**	**-0.1**	**-0.4**	**-0.3**	**0.3**	**0.3**	**-0.1**	**0.1**	**-0.4**	**-0.4**

9.2.3Section A Preferred Option

Central City Option 5 is the preferred route in Section A. The route is approximately 4.7km in length, entering the city through Victoria Street and Riccarton Ave, and travels along Tuam Street, Manchester Street and Kilmore Street. The route is presented below along with its key pros and cons in Figure 9-3.

The Mahaanui Kurataiao (March 2023) report (see Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case) sets out that the Option 5 route can be supported on the basis that it avoids disruption to known wāhi tapu and wāhi taonga, provides an efficient circulation route around the perimeter of the Central City (noting further work is required to consider the best way to access the Bus Exchange) and provides for accessibility to the Hospital.

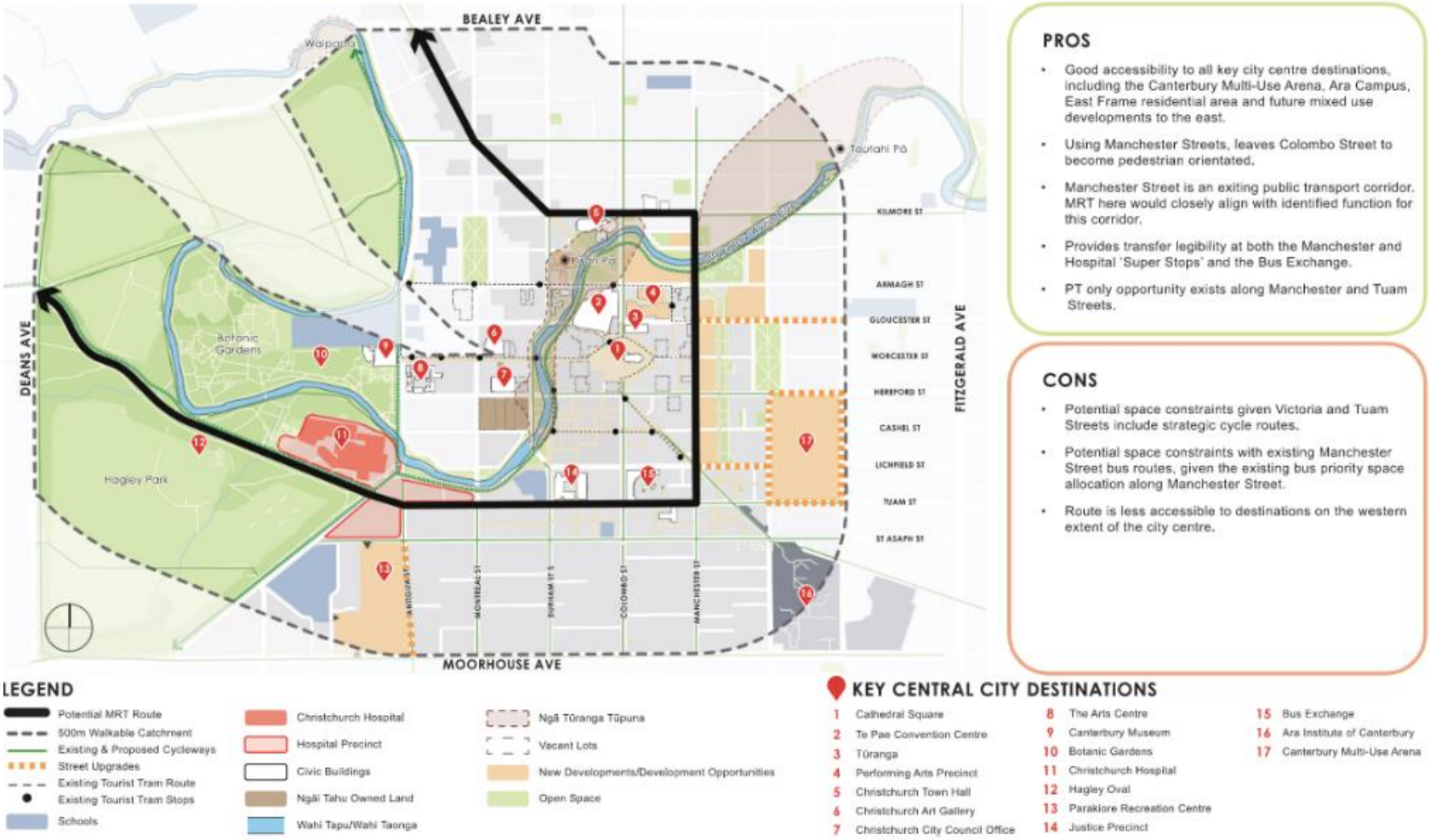

Figure 9-3: Central City Option 5 Location, Key Destinations and Identified Pros and Cons

9.3 STAGE 1 SECTION B OPTIONS AND ASSESSMENT

9.3.1 Section B Option Descriptions

Eight options we considered In Section B Southwest Assessment as outlined below in Figure 9-4.

Option 1

Option 2

Option 3

Option 3A

Option 4

Option 5

Option 6

Option 6A

Figure 9-4: Section B Assessment Option descriptions

9.3.2 Section B Options Assessment

MCA was undertaken across the eight options, the results of which are outlined in Table 9-10. The following paragraphs highlight option performance against the investment objectives and technical and feasibility criteria.

Investment Objective 1: *increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051.*

Table 9-6: Section B (Southwest Corridor) MCA scores for Investment Objective 1

KPI	Southwest Corridor Option							
	1	2	3	3a	4	5	6	6a
KPI 1: *Change in accessibility to and from the Central City* **KPI 2:** *Change in access to opportunities from prioritised locations* **KPI 3:** *Change in development potential*	1	1	2	2	2	2	2	2

Options 3-6a all scored the highest. These routes generally had the highest numbers of household and employment growth within 500m of the proposed corridor, provided access to the greater feasible land development capacity and enabled high quality public realm options. The remaining two options scored the same given their similar alignments.

Investment Objective 2: *improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051.*

Table 9-7: Section B (Southwest Corridor) MCA scores for Investment Objective 2

KPI	Southwest Corridor Option							
	1	2	3	3a	4	5	6	6a
KPI 2: *Change in access to opportunities from prioritised locations* **KPI 5:** *Change in journey times and reliability by public transport and private vehicles* **KPI 6:** *Ability to integrate efficiently and effectively with wider public transport*	1	1	1	1	2	1	1	1

Option 4 scored the highest primarily given it is well aligned with the three centres (Hornby, Church Corner and Riccarton) and strategic land uses along the corridor. In addition, it services a greater number of clusters of Kainga Ora land and is a direct route between its origin and destination. All other options scored the same.

Investment Objective 3: *reduce emissions from transport movements across Greater Christchurch by 2051.*

Table 9-8: Section B (Southwest Corridor) MCA scores for Investment Objective 3

KPI	Southwest Corridor Option							
	1	2	3	3a	4	5	6	6a
KPI 7: *Change in emissions from transport and improved environmental outcomes*	0	0	1	2	2	2	2	2

Options 3a to 6a scored the highest, on the basis that they were better connected to key destinations that would encourage mode shift and hence emission reductions.

Technical and feasibility criteria:

Table 9-9: Section B (Southwest Corridor) MCA scores for technical and feasibility criteria

Description	Southwest Corridor Option							
	1	2	3	3a	4	5	6	6a
Technical and feasibility criteria	-1.0	-1.0	-1.2	-1.0	-1.0	-1.0	-1.2	-1.4

From a technical and feasibility perspective, there was limited variation in the scoring, except for Option 6A which was notably lower than the other options, reflecting the greater consenting complexity, private property acquisition required and the operational and construction impacts.

Summary

Overall, Option 4 was identified as the preferred option for the Southwest Corridor, which uses Main South Road and Riccarton Road corridor.

Table 9-10: Summary of Section B – Southwestern Corridor MCA

PT Futures Mass Rapid Transit IBC MCA (Long List - Stage 1: Street Running Corridor Route Assessment - South Western Corridor)				Do minimum	South West Corridor Options							
					1	2	3	3a	4	5	6	6a
Benefit	**Investment Objective**	**KPI**	**Measure**	**Score**	**Score**							
Greater public transport capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	**1. Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)**	Change in accessibility to and from the Central City	Total households per kilometre along the route corridor within 500m	0	1	1	2	2	3	2	3	3
			Total existing employment numbers within 500m of the corridor	0	3	3	2	2	1	2	1	1
		Change in access to opportunities from prioritised locations	Household growth (2021-2051) within 500m of the corridor	0	1	1	2	2	2	2	3	3
			Increase in the number of jobs within 500m of the corridor	0	1	1	1	2	2	2	1	1
		Change in development potential	Enables high quality public realm outcomes	0	1	1	2	2	3	2	1	2
			Available total feasible capacity of land development within 500m of the corridor.	0	1	1	2	2	2	2	2	2
			Capitalisation Ratio – likelihood of development within 500m of the corridor.	0	1	1	1	1	1	1	1	1
			Contribution and alignment with strategic policy objectives in relation to land use integration, public realm and urban design.	0	1	1	2	2	2	2	1	2
Improved access to jobs, education and social opportunities (33%)	**2. Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)**	Change in access to opportunities from prioritised locations	Number of key destinations and strategic land uses within 500m walk up catchment.	0	1	1	2	2	3	3	3	3
			Change in accessibility to comprehensive development sites within 500m walk up of the corridor.	0	1	1	2	3	3	2	2	1
		Shift in trips to public transport and active modes	*No MCA measure – this required modelling outputs which were not undertaken at this stage of the assessment across all the options. This KPI was assessed as part of the short list assessment.*									
		Change in journey times and reliability by PT and private vehicles	Directness of the MRT route relative to the most likely car route (qualitative)	0	3	3	1	1	3	2	0	0
			Number of right turns conflicting with oncoming traffic or pedestrian flows (at grade)	0	-1	-1	-2	-2	-1	-2	-1	-1
		Ability to integrate efficiently and effectively with wider public transport	Extent of integration with strategic PT routes /facilities	0	0	0	1	2	3	2	0	0
			Extent of integration with strategic active mode facilities.	0	3	3	3	2	1	1	2	3
Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	**3. Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)**	Change in emissions from transport movements and improved environmental outcomes	Number of destinations and opportunities along the corridor that would encourage mode shift.	0	0	0	1	2	2	2	2	2

Technical/Feasibility Assessment		Score	Score							
Costs	Costs of the option (Capex, Property and Opex)	*No route MCA measure – was assessed as part of the mode considerations and short list assessment*							
Constructability	Assessment of constructability / complexity of the option	0	-1	-1	-2	-2	-2	-2	-2	-2
Operational Implications	Assessment of how well the option will integrate with the wider transport network	0	-1	-1	-2	-2	-2	-2	-2	-2
Property Requirements	Scale and magnitude of the property impact along the corridor	0	0	0	-1	-1	-1	-1	-1	-2
Consenting and Environmental Impacts	Assessment of the level of consenting complexity/difficulty and the likelihood of obtaining approvals for the proposal and qualitative assessment of key environmental risks	0	-2	-2	-2	-2	-2	-2	-2	-3
Social and Community Impacts	Assessment of the impact on community access and cohesion including consideration of the number of sensitive receivers (schools / hospitals / day cares / etc.)	0	-1	-1	1	2	2	2	1	2
Overall score (weighted)		0	-0.4	-0.4	-0.3	0.0	0.1	0.0	-0.1	-0.3

9.3.3 Section B Preferred Option

Southwest Option 4 is the preferred route in Section B. The route is approximately 7.5km in length, connecting Hornby with the city centre via Riccarton Road and Main South Road. It enters the city centre from the south from Riccarton Road. The route is presented below along with its key pros and cons in Figure 9-5.

The Mahaanui Kurataiao (March 2023) report (see Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case) sets out that Option 4 using Main South Road and Riccarton Road at a strategic level can be supported noting that the station location at Hornby requires further development.

PROS

- The route aligns with the Riccarton and Hornby emerging metropolitan centres, Church Corner town centre and a number of schools and libraries.
- Shortest length to connect Hornby and Riccarton Centres within one route.
- Opportunity for a portion of Riccarton Road aligning with the centre to become a Transit Mall promoting mode-shift.
- The route enables a multi-modal transfer/ connection to the university.
- Established mixed land use along the corridor with a high portion of residential area within the catchment.
- Some light industrial areas provide opportunities for large scale, mixed-use transit orientated development.
- Light industrial areas along the route might provide opportunity for a depot.
- The route aligns with several pockets of Kāinga Ora ownership unlocking potential for accessible comprehensive redevelopment.
- The Riccarton Road section passes through an area with high redevelopment feasibility and potential for higher intensification
- Already a high use bus corridor with a significant section of bus lane along the route.
- Existing bridge structure along Blenheim Road that can be used to cross the railway.
- Route alignment has the simplest geometry.

CONS

- Potential operational complexity given MRT and Orbiter bus route overlap on Riccarton Road.
- Main South/Shands Road is a rail level crossing and might require grade separation.
- Riccarton Road crosses the railway at grade so might require a grade separation.

LEGEND

- Potential MRT Route
- 500m Walkable Catchment
- Key Activity Centres
- Town Centres
- Local Centres
- Railway
- Airport Noise Contour
- Kāinga Ora Owned Land
- CCC Owned Housing
- Ngāi Tahu Owned Land
- Ngā Tūranga Tūpuna
- Schools
- Universities/Tertiary Institutes
- Open Space
- Core Bus Routes
- Cycleways

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23

Figure 9-5 Southwest Corridor Option 4 Location, Key Destinations and Identified Pros and Cons

9.4 STAGE 1 SECTION C OPTIONS AND ASSESSMENT

Section C Option Descriptions

Two options we considered In Section C Northern corridor assessment as outlined below in Figure 9-6.

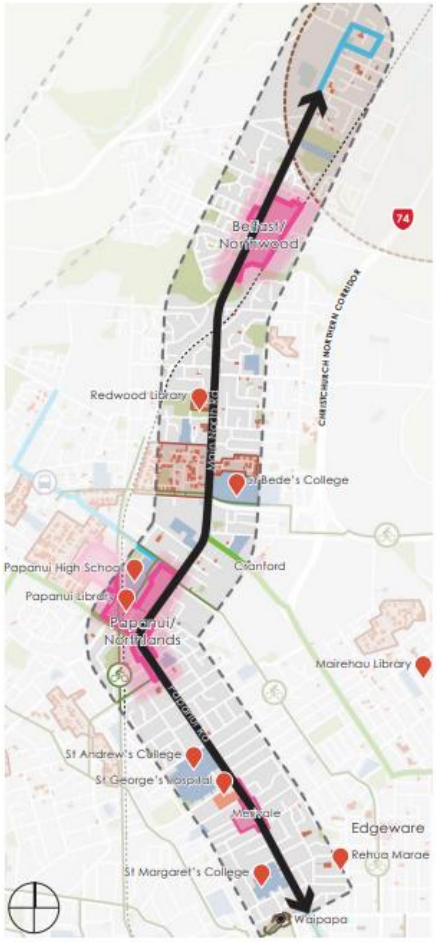
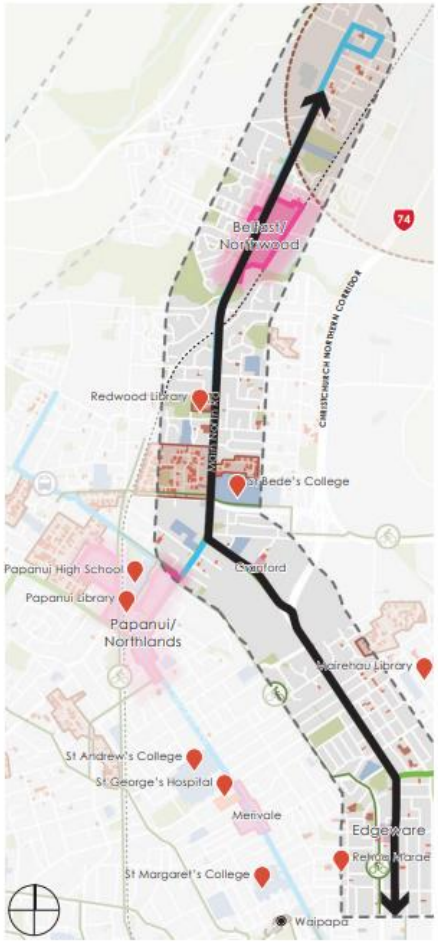
Option 1	Option 2
	

Figure 9-6: Section C Assessment Option Descriptions

9.4.1 Section C Options Assessment

MCA was undertaken across the two options, the results of which are outlined in Table 9-15. The following paragraphs highlight option performance against the investment objectives and technical and feasibility criteria.

Investment Objective 1: *increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051.*

Table 9-11: Section C (Northern Corridor) MCA scores - Investment Objective 1

KPI	North Corridor Option	
	1	2
KPI 1: *Change in accessibility to and from the Central City* **KPI 2:** *Change in access to opportunities from prioritised locations* **KPI 3:** *Change in development potential*	2	1

Option 1 scored the highest, reflecting that this option accesses more households and employment opportunities within 500m of the corridor and aligns the best with strategic policy objectives, including key centres.

Investment Objective 2: *improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051.*

Table 9-12: Section C (Northern Corridor) MCA scores - Investment Objective 2

KPI	North Corridor Option	
	1	2
KPI 2: *Change in access to opportunities from prioritised locations* **KPI 5:** *Change in journey times and reliability by public transport and private vehicles* **KPI 6:** *Ability to integrate efficiently and effectively with wider public transport*	3	2

Option 1 also scored higher than Option 2 for Investment Objective 2, a result of the greater number of destinations that this corridor would provide access to and the alignment with three Kainga Ora land clusters.

Investment Objective 3: *reduce emissions from transport movements across Greater Christchurch by 2051*

Table 9-13: Section C (Northern Corridor) MCA scores - Investment Objective 3

KPI	North Corridor Option	
	1	2
KPI 7: *Change in emissions from transport and improved environmental outcomes*	2	1

Again, Option 1 scored higher than Option 2 given it has the higher number of opportunities and destinations to encourage mode shift.

Technical and feasibility criteria:

Table 9-14: Section C (Northern Corridor) MCA scores – technical and feasibility criteria

Description	North Corridor Option	
	1	2
Technical and feasibility criteria	-0.8	-1.0

Overall, from a technical and feasibility perspective, there was limited variation in the scoring, but again Option 1 scored better than Option 2. While the construction of Option 1 is anticipated to be more challenging (a reflection of the multiple sensitive receivers along the route and the complex construction site associated with the Papanui centre / Northlands Mall), from a consentability and environmental perspective this route avoids the Cranford Street designation and results in greater community access and cohesion.

Summary

Overall, Option 1 emerged as the preferred option and utilises Papanui Road and Main North Road. This aligns best with the central city option that utilises Victoria Street and therefore informs final route section within the city centre. Refer to for a summary of the MCA for Section A – Northern Corridor.

Table 9-15: Summary of Section C - Northern Corridor MCA

PT Futures Mass Rapid Transit IBC MCA (Long List - Stage 1: Street Running Corridor Route Assessment - Northern Corridor)				Do minimum	Northern Corridor Options	
					1	2
Benefit	**Investment Objective**	**KPI**	**Measure**	**Score**	**Score**	
Greater public transport capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	**1. Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)**	Change in accessibility to and from the Central City	Total households per kilometre along the route corridor within 500m	0	3	3
			Total existing employment numbers within 500m of the corridor	0	2	1
		Change in access to opportunities from prioritised locations	Household growth (2021-2051) within 500m of the corridor	0	2	1
			Increase in the number of jobs within 500m of the corridor	0	2	1
		Change in development potential	Enables high quality public realm outcomes	0	2	1
			Available total feasible capacity of land development within 500m of the corridor.	0	2	1
			Capitalisation Ratio – likelihood of development within 500m of the corridor.	0	1	1
			Contribution and alignment with strategic policy objectives in relation to land use integration, public realm and urban design.	0	3	1
Improved access to jobs, education and social opportunities (33%)	**2. Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)**	Change in access to opportunities from prioritised locations	Number of key destinations and strategic land uses within 500m walk up catchment.	0	3	1
			Change in accessibility to comprehensive development sites within 500m walk up of the corridor.	0	1	1
		Shift in trips to public transport and active modes	*No MCA measure – this required modelling outputs which were not undertaken at this stage of the assessment across all the options. This KPI was assessed as part of the short list assessment.*			
		Change in journey times and reliability by PT and private vehicles	Directness of the MRT route relative to the most likely car route (qualitative)	0	3	3
			Number of right turns conflicting with oncoming traffic or pedestrian flows (at grade)	0	3	2
		Ability to integrate efficiently and effectively with wider public transport	Extent of integration with strategic PT routes /facilities	0	3	3
			Extent of integration with strategic active mode facilities.	0	2	2
Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	**3. Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)**	Change in emissions from transport movements and improved environmental outcomes	Number of destinations and opportunities along the corridor that would encourage mode shift.	0	2	1
Technical/Feasibility Assessment				**Score**	**Score**	
Costs	Costs of the option (Capex, Property and Opex)			*No route MCA measure – was assessed as part of the mode considerations and short list assessment*		
Constructability	Assessment of constructability / complexity of the option			0	-2	-1
Operational Implications	Assessment of how well the option will integrate with the wider transport network			0	-2	-2
Property Requirements	Scale and magnitude of the property impact along the corridor			0	-1	-1
Consenting and Environmental Impacts	Assessment of the level of consenting complexity/difficulty and the likelihood of obtaining approvals for the proposal and qualitative assessment of key environmental risks			0	-1	-2
Social and Community Impacts	Assessment of the impact on community access and cohesion including consideration of the number of sensitive receivers (schools / hospitals / day cares / etc.)			0	2	1
Overall score (weighted)				0	0.4	-0.1

9.4.2Section C Preferred Option

Northern Option 1 is the preferred route in Section C. The route is approximately 9.4km in length, connecting Belfast / Northwood with the city centre via the Papanui Road and Main North Road corridor. It enters the city centre from via Victoria Street. The route is presented below along with its key pros and cons in Figure 9-7.

The Mahaanui Kurataiao (March 2023) report (refer to Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case) sets out that Option 1 using Papanui Road and Main South Road can be supported at a strategic level.

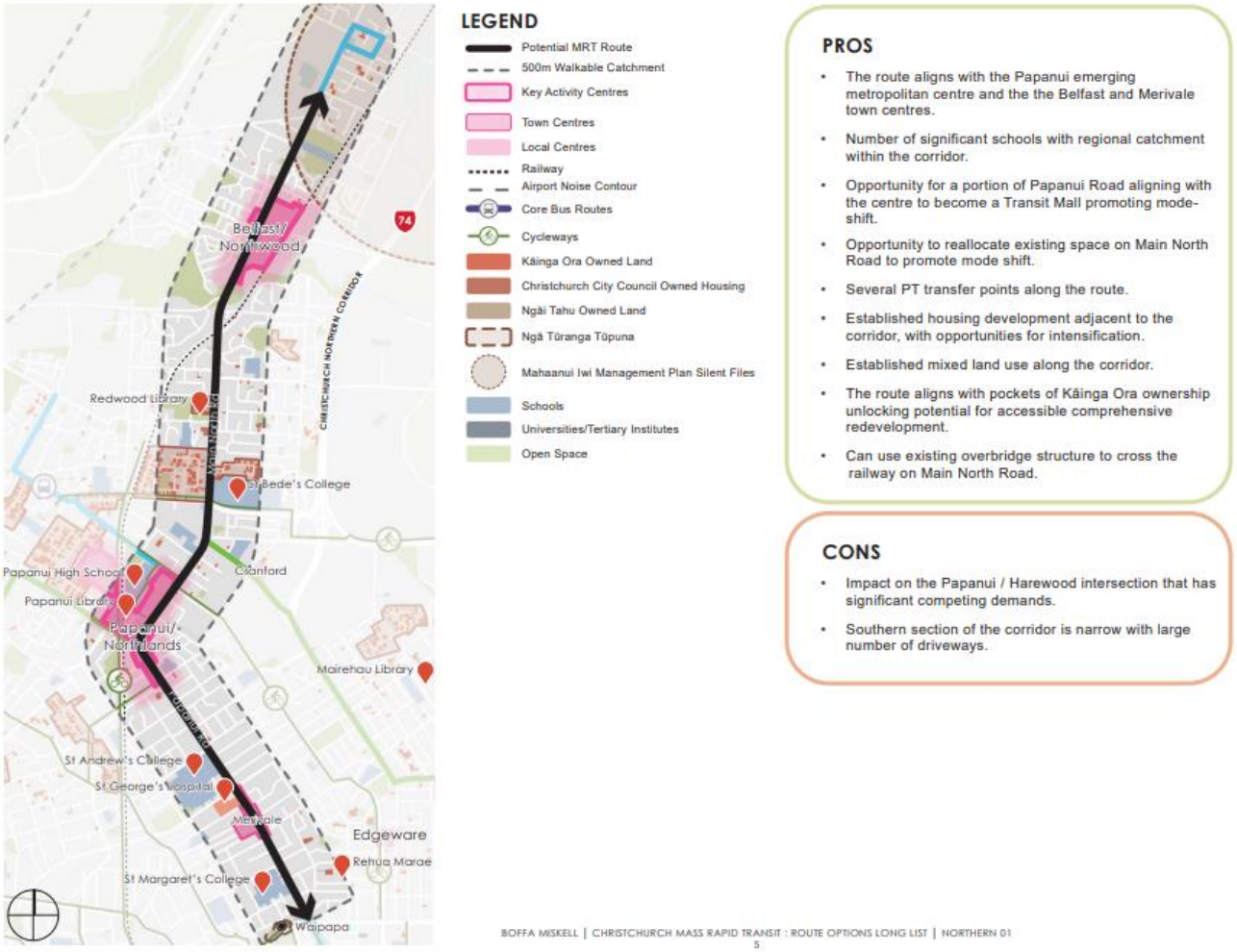


Figure 9-7. Northern Corridor Option 1 Location, Key Destinations and Identified Pros and Cons

9.5 STAGE 1 SECTION D OPTIONS AND ASSESSMENT

9.5.1 Section D Option Descriptions

Eight options we considered In Section D Airport Link assessment (Figure 9-8).

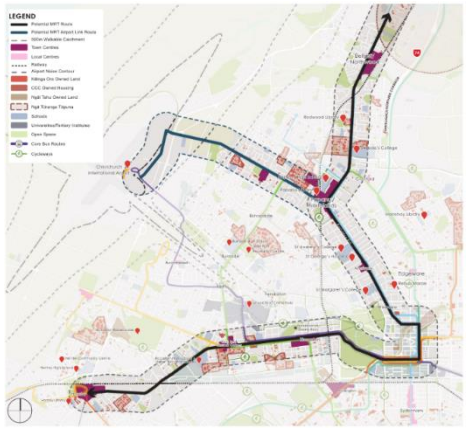
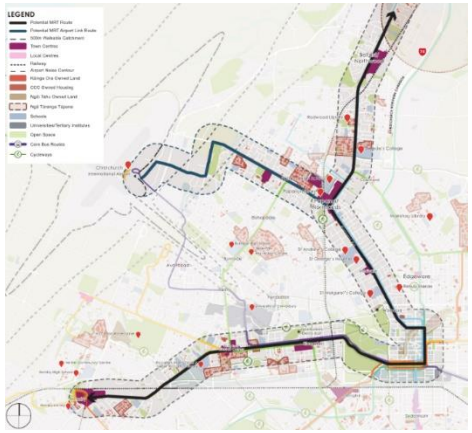
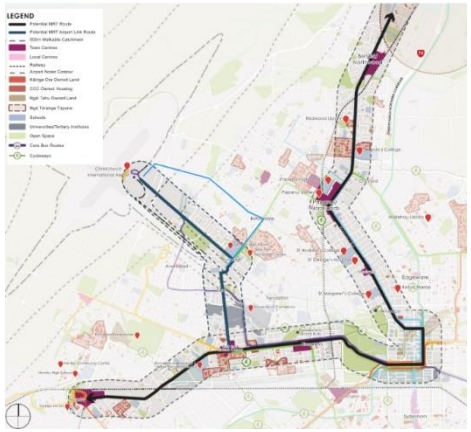
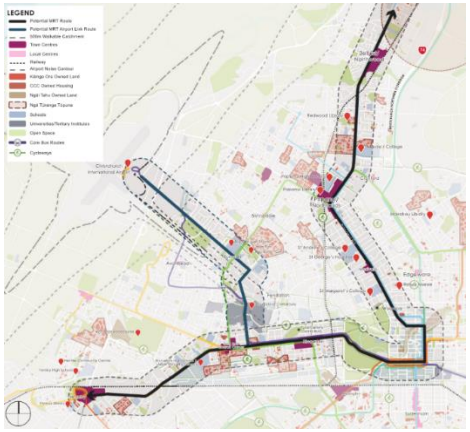
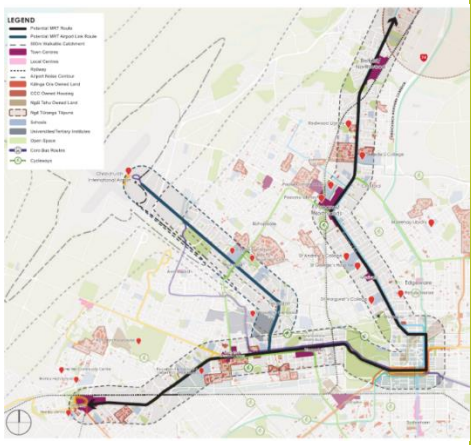
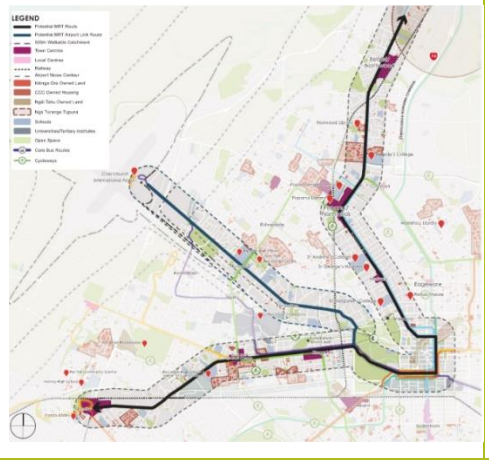
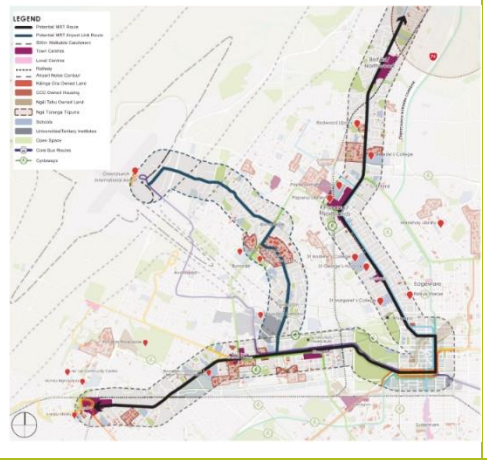
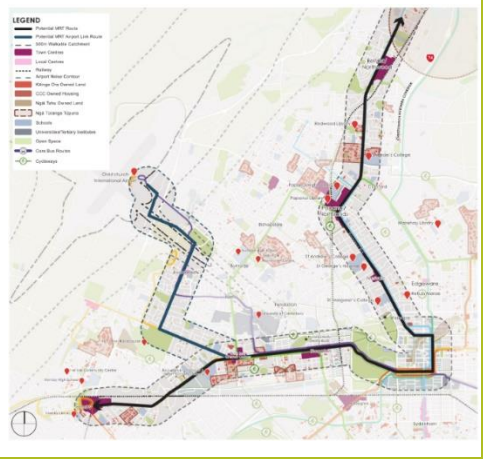
Option 1	Option 2	Option 3	Option 4
			
Option 5	**Option 6**	**Option 7**	**Option 8**
			

Figure 9-8: Section D Assessment Option Descriptions

9.5.2Section D Options Assessment

MCA was undertaken across the eight options, the results of which are outlined in Table 9-20. The following paragraphs highlight the options performance against the investment objectives and technical and feasibility criteria.

Investment Objective 1: increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051.

Table 9-16: Section D (Airport Link) MCA scores - Investment Objective 1

KPI	Airport Link Option							
	1	2	3	4	5	6	7	8
KPI 1: *Change in accessibility to and from the Central City* **KPI 2:** *Change in access to opportunities from prioritised locations* **KPI 3:** *Change in development potential*	1	2	2	2	2	2	2	1

For investment objective 1, Options 1 and 8 were scored lower on the basis that they do not connect to as many households and or employment numbers along the corridor. There was no discernible difference between the remaining options.

Investment Objective 2: improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051.

Table 9-17: Section D (Airport Link) MCA scores - Investment Objective 2

KPI	Airport Link Option							
	1	2	3	4	5	6	7	8
KPI 2: *Change in access to opportunities from prioritised locations* **KPI 5:** *Change in journey times and reliability by public transport and private vehicles* **KPI 6:** *Ability to integrate efficiently and effectively with wider public transport*	0	0	1	1	1	1	1	0

For investment objective 2, Option 1, 2 and 8 scored the lowest. These were all the least direct routes, and also had the highest numbers of right turns across oncoming traffic. The remaining five options all performed similarly.

Investment Objective 3: *reduce emissions from transport movements across Greater Christchurch by 2051.*

Table 9-18: Section D (Airport Link Corridor) MCA scores - Investment Objective 3

KPI	Airport Link Option							
	1	2	3	4	5	6	7	8
KPI 7: *Change in emissions from transport and improved environmental outcomes*	1	2	1	2	2	1	2	1

For investment objective 3, Options 2, 4, 5 and 7 all had the highest potential for encouraging mode shift so scored the highest. The remaining options had lower potential for mode shift as they did not connect to as many key destinations.

Technical and feasibility criteria:

Table 9-19: Section D (Airport Link) MCA scores – technical and feasibility criteria

Description	Airport Link Option							
	1	2	3	4	5	6	7	8
Technical and feasibility criteria	-1.0	-1.0	-1.0	-1.2	-1.2	-1.2	-0.8	-1.4

All options scored similarly against the technical and feasibility criteria, with the exception of Option 7 and 8. Option 7 scored the highest as it provides the most opportunity to improve community access and cohesion (e.g., through Bishopdale town centre and the University). Option 8 scored the worst due to limitations on connections to community and social services, and lower accessibility to employment.

Table 9-20: Summary of Section D – Airport MCA

PT Futures Mass Rapid Transit IBC MCA (Long List - Stage 1: Street Running Corridor Route Assessment - Airport Link Corridor)				Do minimum	Airport Link Corridor Options							
					1	2	3	4	5	6	7	8
Benefit	**Investment Objective**	**KPI**	**Measure**	**Score**	**Score**							
Greater public transport capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	**1. Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)**	Change in accessibility to and from the Central City	Total households per kilometre along the route corridor within 500m	0	2	2	3	2	2	2	2	2
			Total existing employment numbers within 500m of the corridor	0	1	2	1	2	1	1	3	0
		Change in access to opportunities from prioritised locations	Household growth (2021-2051) within 500m of the corridor	0	2	2	1	1	1	2	3	1
			Increase in the number of jobs within 500m of the corridor	0	1	2	3	3	2	2	3	1
		Change in development potential	Enables high quality public realm outcomes	0	1	1	1	2	1	1	1	1
			Available total feasible capacity of land development within 500m of the corridor.	0	1	1	0	0	2	1	2	0
			Capitalisation Ratio – likelihood of development within 500m of the corridor.	0	1	1	2	2	2	2	2	2
			Contribution and alignment with strategic policy objectives in relation to land use integration, public realm and urban design.	0	2	2	2	2	1	2	2	1
Improved access to jobs, education and social opportunities (33%)	**2. Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)**	Change in access to opportunities from prioritised locations	Number of key destinations and strategic land uses within 500m walk up catchment.	0	1	1	2	2	2	1	2	1
			Change in accessibility to comprehensive development sites within 500m walk up of the corridor.	0	2	2	0	0	0	0	1	0
		Shift in trips to public transport and active modes	*No MCA measure – this required modelling outputs which were not undertaken at this stage of the assessment across all the options. This KPI was assessed as part of the short list assessment.*									
		Change in journey times and reliability by PT and private vehicles	Directness of the MRT route relative to the most likely car route (qualitative)	0	1	1	1	1	2	3	0	0
			Number of right turns conflicting with oncoming traffic or pedestrian flows (at grade)	0	-2	-3	-1	-1	-1	-1	-3	-3
		Ability to integrate efficiently and effectively with wider public transport	Extent of integration with strategic PT routes /facilities	0	0	0	2	1	0	0	0	0
			Extent of integration with strategic active mode facilities.	0	0	0	3	0	3	3	3	3
Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	**3. Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)**	Change in emissions from transport movements and improved environmental outcomes	Number of destinations and opportunities along the corridor that would encourage mode shift.	0	1	2	1	2	2	1	2	1
Technical/Feasibility Assessment				**Score**	**Score**							
Costs	Costs of the option (Capex, Property and Opex)			*No route MCA measure – was assessed as part of the mode considerations and short list assessment*								
Constructability	Assessment of constructability / complexity of the option			0	-2	-2	-1	-2	-2	-2	-2	-2
Operational Implications	Assessment of how well the option will integrate with the wider transport network			0	-1	-1	-2	-2	-2	-1	-1	-1
Property Requirements	Scale and magnitude of the property impact along the corridor			0	-1	-1	-1	-1	-1	-1	-1	-1
Consenting and Environmental Impacts	Assessment of the level of consenting complexity/difficulty and the likelihood of obtaining approvals for the proposal and qualitative assessment of key environmental risks			0	-2	-2	-1	-1	-1	-2	-2	-2
Social and Community Impacts	Assessment of the impact on community access and cohesion including consideration of the number of sensitive receivers (schools / hospitals / day cares / etc.)			0	1	1	0	0	0	0	2	-1
Overall score (weighted)				0	-0.4	-0.1	-0.1	-0.1	-0.1	-0.3	0.1	-0.6

9.5.3Section D Preferred Option

In summary, although Option 7 – Clyde Road to Wairakei Road resulted in the best overall MCA score, the results were highly sensitive to weightings, with various options providing different connectivity benefits, such as stimulating intensification, connecting MRT with key locations (such as the university) and providing directness to the city centre. None of the options were considered to provide overwhelmingly support across the investment objectives.

The Mahaanui Kurataiao (March 2023) report (refer to Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case) sets out that manawhenua have not considered the Airport link in detail and do not hold any position or opinions on the merits or otherwise on an Airport link.

The findings of the MCA process were discussed at a workshop with Waka Kotahi, Christchurch City Council, Environment Canterbury, Selwyn District Council, Waimakariri District Council, Kāinga Ora, Ministry of Housing and Urban Development, Ministry of Transport, Let's Get Wellington Moving, and Greater Christchurch Spatial Plan representatives on the 15 July 2022. A lack of an identified preferred option for an Airport link was discussed in context of the following:

- How to best stimulate intensification and development in the area surrounding the corridor given restrictions associated with airport noise contours;
- The Airport is not anticipated to be classified as a commercial centre under the NPS-UD and as such will not be subject to revised planning provisions supportive of greater intensification in the area surrounding;
- The Airport is well serviced by existing and future committed public transport routes; and
- The University of Canterbury is within walking distance from the proposed south-western MRT corridor (and is well-serviced by other public transport options).

It was concluded that an Airport Link is not be investigated further as part of this IBC. However, this does not preclude it from being considered in the future, in context of problems, benefits and objectives related to an MRT expansion to the Airport.

9.6 STAGE 1 CONCLUSIONS AND RECOMMENDATIONS

The assessment process identified the emerging preferred street running corridor as being the Central City Option 5, Southwest Corridor Option 4, and the Northern Corridor Option 1. When combined (from south to north) the emerging preferred street running corridor extends along:

- Main South Road; Riccarton Road; Riccarton Avenue; Tuam Street; Manchester Street; Kilmore Street; Victoria Street; Papanui Road; and Main North Road.
- This preferred Stage 1 route (Figure 9-9), provided the basis for Stage 2 analysis, which considered extending this street running corridor option to the districts. There are, however, a number of constraints associated with this option (and were common across all Stage 1 options) which will require further consideration going forward:
- How to navigate the bus interchange (i.e., the Tuam Street, Manchester St, Colombo Street, Lichfield Street block); and
- The location of the corridor through the Hornby Town Centre, including the location that the Stage 1 MRT corridor should terminate.

These constraints are considered further in Section 13.4.2 of this IBC.

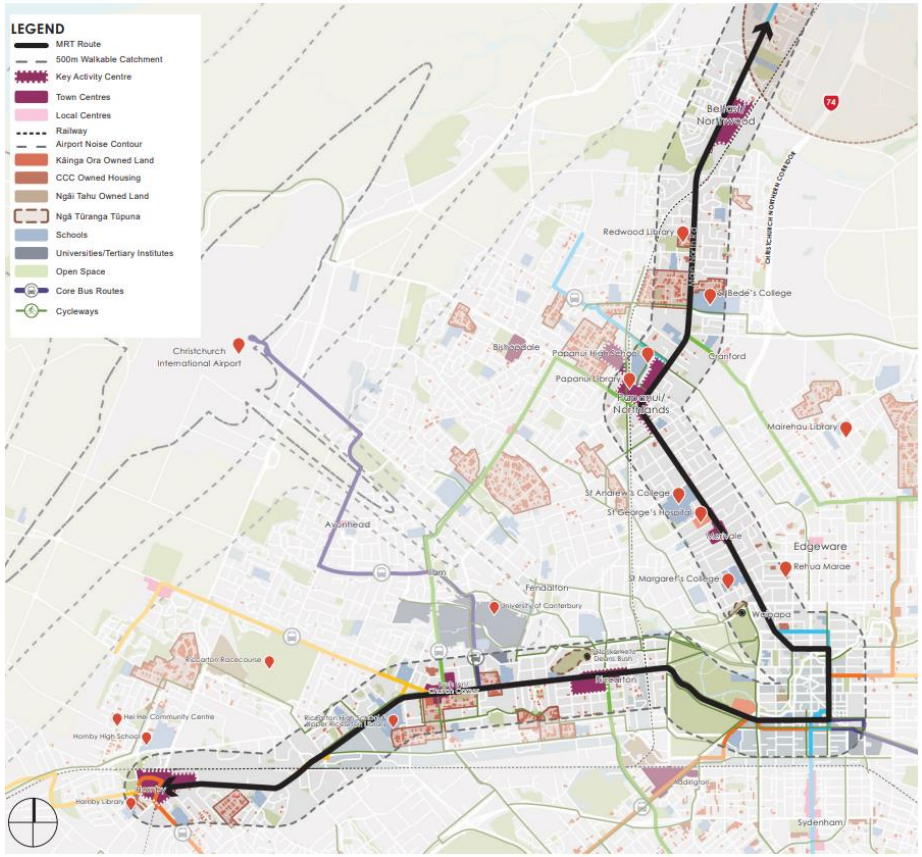


Figure 9-9: Stage 1 Preferred Corridor

10 LONG LIST: ROUTE ASSESSMENT - STAGE 2

10.1 ASSESSMENT OVERVIEW

Stage 2 assessed options for extending street running corridors to the Waimakariri and Selwyn Districts (Figure 10-1):

- North Corridor route extension from Belfast to Waimakariri District
- Southwest route extension from Hornby to Selwyn District

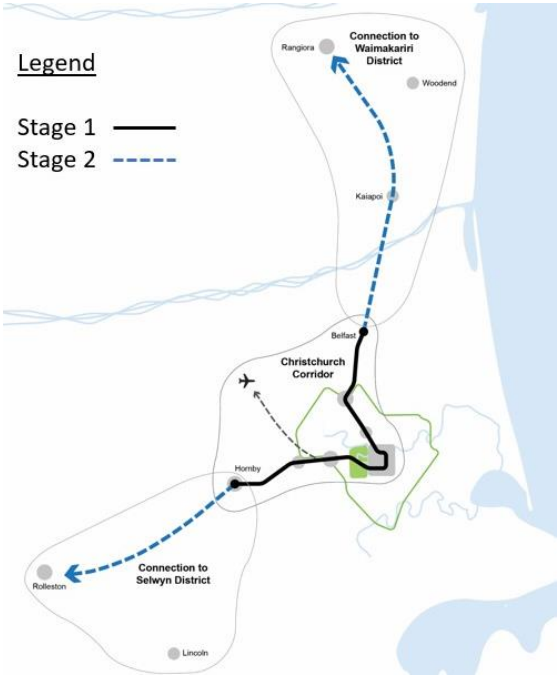


Figure 10-1: Stage 2 Option development

Manawhenua have reviewed the preferred MRT route (as part of the Stage 2 assessment phase) and have provided a final report setting out their position that informs the IBC (see Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case).

Appendix J Stage 2 Route Assessment outlines in detail the route assessment undertaken for the street running extension options, including the multicriteria assessment undertaken against each KPI. Scoring of the MCA was undertaken by the core consultant project team, with subject matter experts to provide input where required such as consenting, operational and constructability aspects. Key results were shared with key stakeholders at the regular MRT Stakeholder Workshops, with feedback incorporated into the final MCA as appropriate.

The following sub-sections summarises this work, outlining the options assessed and providing a high-level summary of the option assessment against the Investment Objectives.

Overall, six options were considered for the Waimakariri District extension and three options for Selwyn District. As summarised by the following two figures and These options are outlined further in the following subsequent sections.

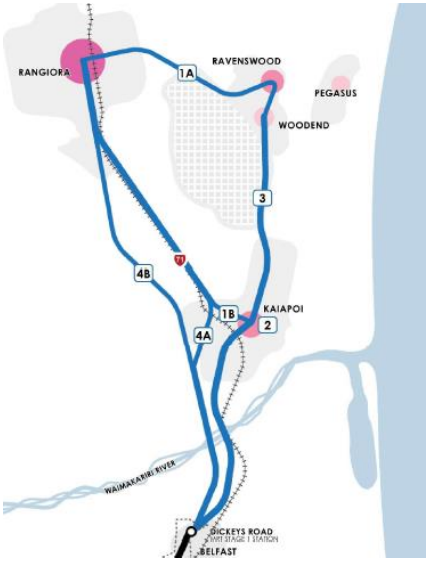


Figure 10-2: Route extension options to the Waimakariri District

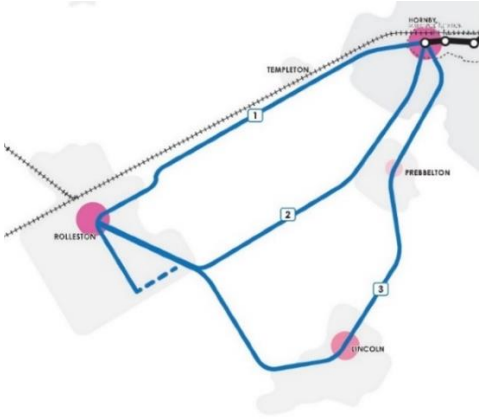


Figure 10-3: Route extension options to the Selwyn District

10.2 STAGE 2 WAIMAKARIRI OPTIONS AND ASSESSMENT

10.2.1 Waimakariri District Option Descriptions

Six options were considered for the Waimakariri District Extension as outlined below in Figure 10-4.

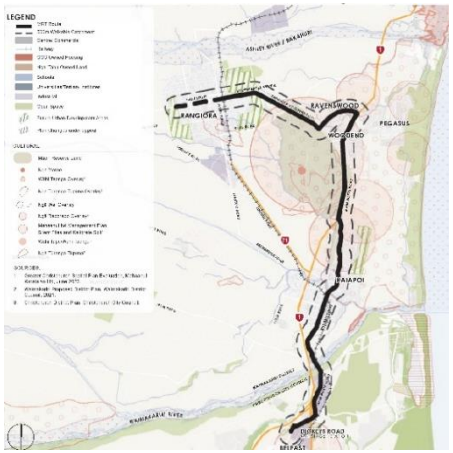
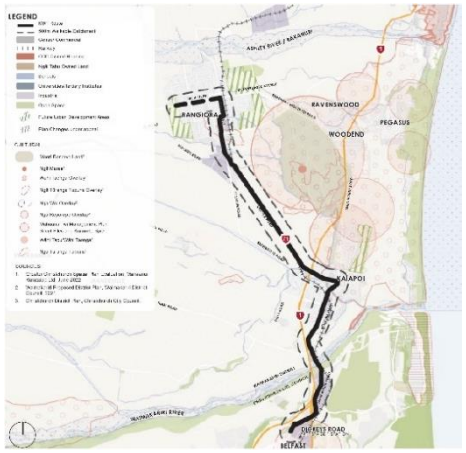
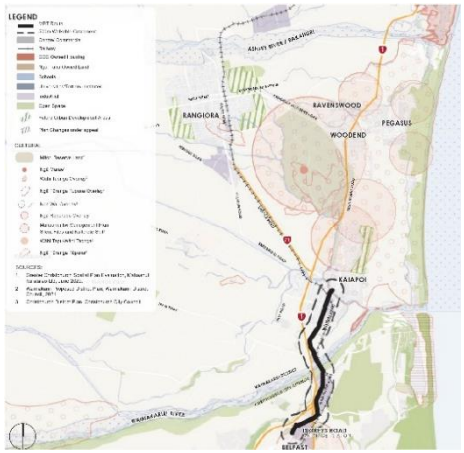
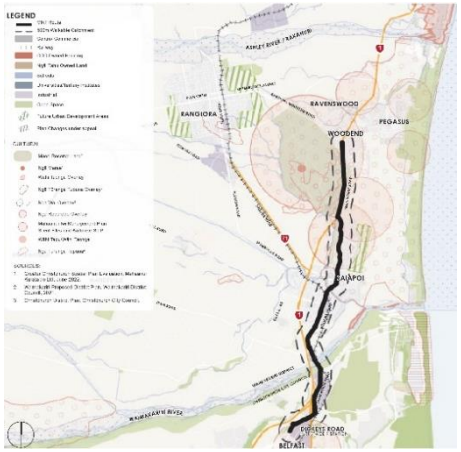
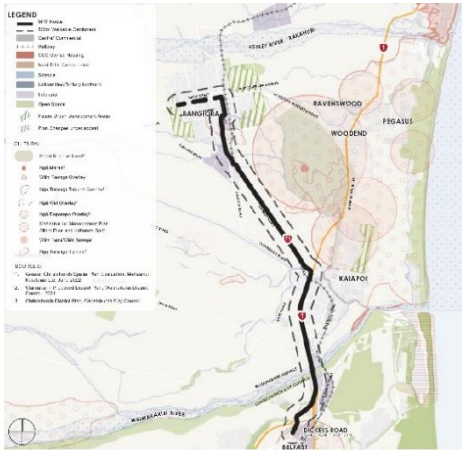
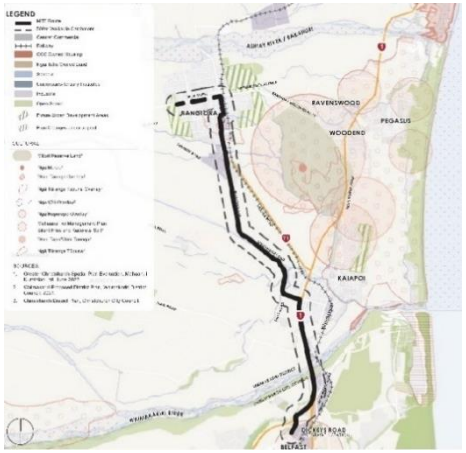
Option 1A	Option 1B	Option 2
		
Option 3	**Option 4A**	**Option 4B**
		

Figure 10-4: Waimakariri Assessment Option Descriptions

10.2.2 Waimakariri District Option Assessment

MCA was undertaken across the six options, the results of which are outlined in Table 10-5 for the Waimakariri District extension. The following paragraphs provide a summary of the results against the investment objectives and technical and feasibility criteria.

As agreed with manawhenua, the impacts on Te Ao Māori criteria identified in the Waka Kotahi Multi-Criteria Analysis User Guidance have not been assessed separately. District plan cultural overlays have been considered when assessing the consentability and environmental impacts.

Given that some of the routes traverse and adjoin Māori Reserve 873, any widening of the road corridor would fundamentally be opposed by Te Ngāi Tūāhuriri Rūnanga (refer to Mahaanui Kurataiao Report at Appendix 2 for further commentary).

For Investment Objective 1: *increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051*:

Table 10-1: Waimakariri District MCA scores for Investment Objective 1

KPI	Waimakariri Option					
	1a	1b	2	3	4a	4b
KPI 1: Change in accessibility to and from the Central City ***KPI 2:*** Change in access to opportunities from prioritised locations ***KPI 3:*** Change in development potential	2	2	0	1	2	2

- Options 1a, 1b, 4a and 4b all scored equally on this investment objective. This reflected the higher numbers of households and employment opportunities captured along these routes, including the forecasted growth along the corridors.
- Option 2 performed the worst of the six assessed options. This option terminates at Kaiapoi, so does not capture populations and employments further north, and hence was scored lower. It also does not contribute or align so strongly with many strategic policy objectives in relation to land-use integration and urban design.
- Similarly, Option 3 terminates at Woodend and does not extend further west to connect with the Rangiora township. This limits the population and employment numbers serviced by MRT. However, it still performs better than Option 2 as it extends further north.

For Investment Objective 2: *improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051*:

Table 10-2: Waimakariri District MCA scores for Investment Objective 2

KPI	Waimakariri Option					
	1a	1b	2	3	4a	4b
KPI 2: Change in access to opportunities from prioritised locations ***KPI 5:*** Change in journey times and reliability by public transport and private vehicles ***KPI 6:*** Ability to integrate efficiently and effectively with wider public transport	1	1	1	1	1	1

- While equal scores were applied across the options, each option performed differently on each measure underpinning this investment objective. For example, Option 1a (extension to Rangiora via Woodend and Ravenswood), captured some of the highest numbers of key destinations and development sites. However, it is a longer, less direct route. On balance, equal scores were applied to reflect no discernible difference against this investment objective.

For Investment Objective 3: *reduce emissions from transport movements across Greater Christchurch by 2051*:

Table 10-3: Waimakariri District MCA scores for Investment Objective 3

KPI	Waimakariri Option					
	1a	1b	2	3	4a	4b
KPI 7: Change in emissions from transport and improved environmental outcomes	2	2	1	1	2	2

- All options were considered beneficial against investment objective 3, where MRT along each of these alignments is anticipated to reduce emissions by reducing the numbers of private vehicles on the route and encourage mode shift.
- Options 1a, 1b, 4a and 4b were scored the highest given they reach more growth areas and hence a higher potential to improve mode shift. However, no discernible score separation was applied to these four options.

This reflects the high-level assessment that was undertaken of the emissions at this stage of the project.

Technical and feasibility criteria:

Table 10-4: Waimakariri District MCA scores - technical and feasibility criteria

Description	Waimakariri Option					
	1a	1b	2	3	4a	4b
Technical and feasibility criteria	-1.8	-1.4	-1.2	-1.8	-1.6	-1.2

- From a technical and feasibility perspective, Option 2 and 4b scored the highest. Options 2 and 4b were assessed as having the fewest challenges and constraints associated with constructability. Option 2 was also considered to have slightly fewer consenting environmental risks, attributed to its shorter alignment terminating in Kaiapoi.
- Option 1b performed moderately well against the social and community impacts. From a technical perspective, this alignment was considered the least challenging and was scored the next best.
- The remaining Options 1a, 3 and 4a performed the worst. These were all considered the most challenging from a consentability and environmental, and constructability perspective, as well as property considerations.

Summary:

Overall, Option 2 (MRT extension from the city centre terminating in Kaiapoi) and 3 (terminating in Woodend) scored the worst in achieving the Investment Objectives, because the implementation of MRT is not as fully optimised compared to the other options out to the Waimakariri district. They are also the two worst scoring options overall (accounting for investment objectives and technical/feasibility criteria). Hence, Options 2 and 3 were not recommended as feasible routes to pursue further in terms of MRT extension options to Waimakariri districts.

All the remaining routes: Option 1a, 1b, 4a and 4b, (which all extend of Rangiora), emerged as potentially viable options. They all scored the same against the Investment Objectives, and hence are more closely aligned with addressing the problems statements and achieving the investment objectives underpinning this assessment. However, these options performed quite differently against technical and feasibility criteria along with variable impacts or risks to Māori Land.

Hence, overall, the total scores do vary across these four options (Option 1a, 1b, 4a and 4). In conclusion, further investigation of these four options would be recommended for a preferred route to be selected with greater confidence.

Table 10-5: Waimakariri District MCA Summary

PT Futures Mass Rapid Transit IBC MCA (Long List - Stage 2: Street Running Corridor Route Assessment - Waimakariri District Extension)				Do minimum	Waimakariri District Options					
					1a	1b	2	3	4a	4b
Benefit	**Investment Objective**	**KPI**	**Measure**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Greater public transport capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	**1: Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)**	**KPI 1: Change in accessibility to and from the Central City**	Total households per kilometre along the route corridor within 500m	0	1	1	1	1	1	1
			Total existing employment numbers within 500 m of the corridor	0	2	3	0	0	2	2
		KPI 2: Change in access to opportunities from prioritised locations	Household growth (2021-2051) within 500 m of the corridor	0	3	2	0	2	2	2
			Increase in the number of jobs within 500 m of the corridor	0	2	3	0	0	2	2
		KPI 3: Change in development potential	Enables high quality public realm outcomes	0	2	1	0	1	2	1
			Contribution and alignment with strategic policy objectives in relation to land-use integration and urban design	0	2	2	0	1	1	1
Improved access to jobs, education and social opportunities (33%)	**2: Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)**	**KPI 2: Change in access to opportunities from prioritised locations**	Number of key destinations and strategic land uses within 500 m walk up catchment	0	2	1	0	1	0	1
			Change in accessibility to comprehensive development sites within 500 m walk up of the corridor	0	2	1	0	1	1	1
		KPI 4: Shift in trips to public transport and active modes	No MCA measure – this required modelling outputs which were not undertaken at this stage of the assessment across all the options. This KPI was assessed as part of the short list assessment.							
		KPI 5: Change in journey times and reliability by PT and private vehicles	Directness of the MRT route relative to the most likely car route	0	0	1	2	2	3	2
			Number of right turns conflicting with oncoming traffic or pedestrian flows (at grade)	0	-3	-2	-1	-2	-1	-2
		KPI 6: Ability to integrate efficiently and effectively with wider public transport	Extent of integration with strategic PT routes/facilities	0	3	3	3	3	2	0
			Extent of integration with strategic active mode facilities	0	2	2	1	2	2	2
Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	**3: Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)**	**KPI 7: Change in emissions from transport movements and improved environmental outcomes**	Number of destinations and opportunities along the corridor that would encourage mode shift	0	2	2	1	1	2	2
Investment Objectives Sub-total (weighted scores)				0	2	2	1	1	2	2
Technical/Feasibility Assessment				**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Costs	Costs of the option (Capex, Property and Opex)			0	No route MCA measure – was assessed as part of the mode considerations and short list assessment					
Constructability	Assessment of constructability / complexity of the option			0	-3	-2	-1	-2	-2	-1
Operational Implications	Assessment of how well the option will integrate with the wider transport network			0	-2	-2	-2	-2	-2	-2
Property Requirements	Scale and magnitude of the property impact along the corridor			0	-3	-2	-2	-3	-2	-2
Consenting and Environmental Impacts	Assessment of the level of consenting complexity/difficulty and the likelihood of obtaining approvals for the proposal and qualitative assessment of key environmental risks			0	-3	-3	-2	-3	-3	-3
Social and Community Impacts	Assessment of the impact on community access and cohesion including consideration of the number of sensitive receivers (schools / hospitals / day cares / etc.)			0	2	2	1	1	1	2
Technical/Feasibility Assessment Sub-total (weighted scores)				0	-2	-1	-1	-2	-2	-1
Overall score (weighted)				**0**	**-0.5**	**-0.3**	**-0.5**	**-0.8**	**-0.4**	**-0.1**

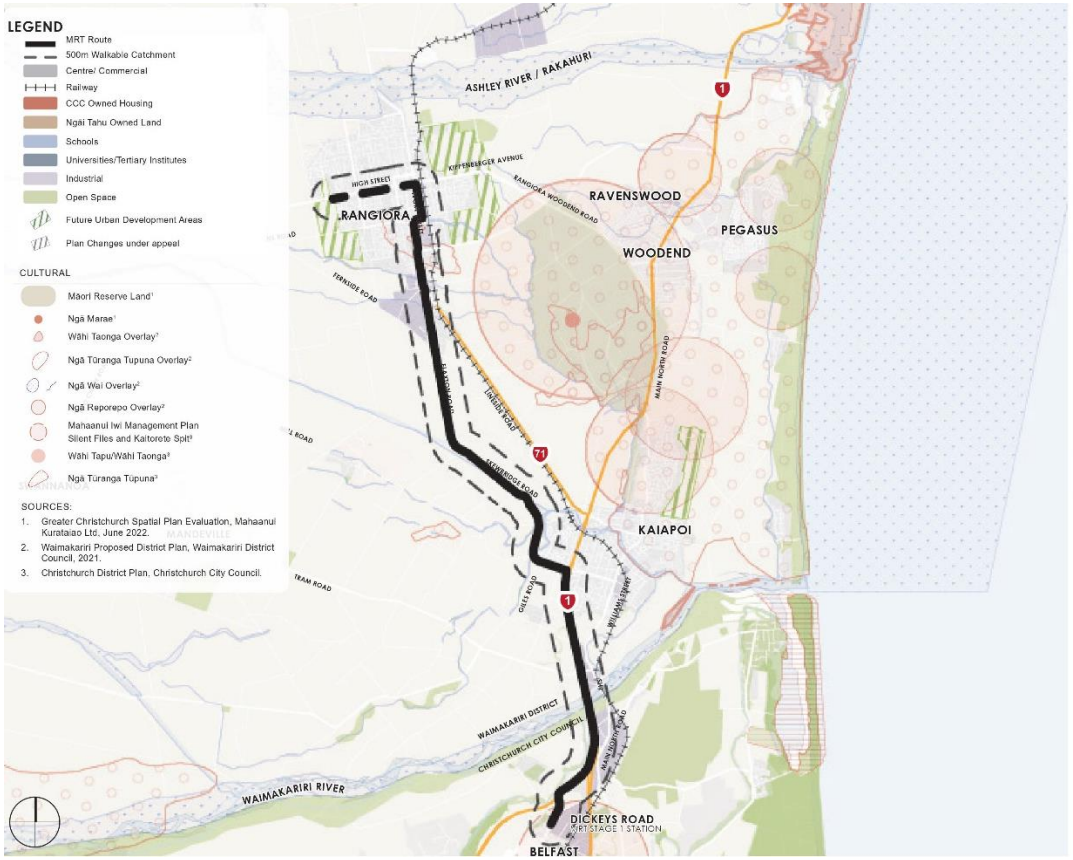
10.2.3 Waimakariri District Preferred Option

In conclusion, further investigation of the four options (Option 1a, 1b, 4a and 4b) would be recommended for a preferred route to be selected with greater confidence. However, to inform Stage 3 analysis, one option was taken forward. This was **Option 4b: Connection to Rangiora more directly via Flaxton Road** as it provided the highest overall weighted score and as per below is does not raise critical concerns from manawhenua.

Option 4b is approximately 19.5km in length, as outlined in Figure 10-5. It extends along SH1 between Belfast and Silverstream and along Skewbridge Road and Flaxton Road to Rangiora. There is the potential to extend west of Rangiora centre to connect to emerging growth areas in the west (as shown by the dashed line). The route is presented below along with its key pros and cons.

If it was found that this Scenario 3 alignment came out as the preferred overall option during the Stage 3 assessment, then it was expected that this preferred route would then have been looped back into the Stage 2 analysis, to reconfirm the route extension details..

The Mahaanui Kurataiao (March 2023) report sets outs the position held by manawhenua in relation to the Waimakariri District route options. Of critical concern is the establishment of an MRT route via Kaiapoi and Woodend requiring widening of the existing road corridor. A route following the Woodend Rangiora Road directly adjoins Māori Land and cuts through the original extents of MR873, with Māori Land located on either side. Any proposal which may require the future taking of Māori land for the purposes of creating a wider road corridor is fundamentally opposed by manawhenua.



PROS

- Services Rangiora centre and surrounding urban area and serves Silverstream neighbourhood.
- Rangiora identified as an 'emerging metropolitan' centre with opportunity for mixed-use redevelopment and intensification.
- Largely avoids Maori reserve land and wider land holdings.
- More direct route between the city and Rangiora - approximately 19kms in length.

CONS

- Route does not align with Kaiapoi, Ravenswood or Woodend centres.
- MRT utilises Flaxton Road, which passes through a low lying area that is prone to flooding

Figure 10-5: Option 4 B Route alignment, Context and Identified Pros and Cons

10.3 STAGE 2 SELWYN OPTIONS AND ASSESSMENT

10.3.1 Selwyn District Option Descriptions

Three options were considered for the Selwyn District Extension as outlined below in Figure 10-6.

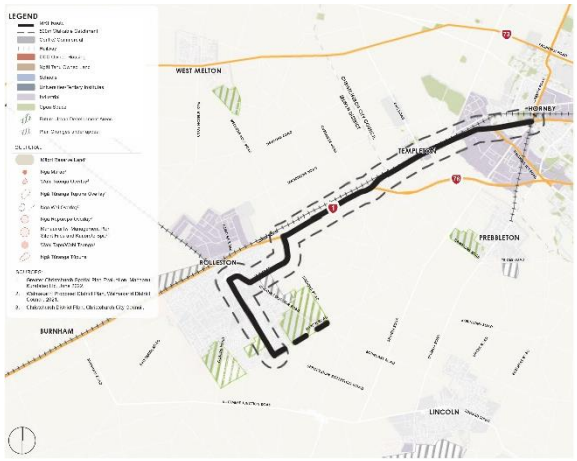
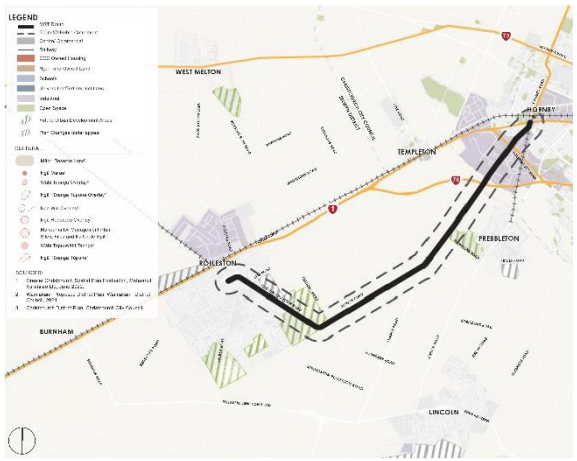
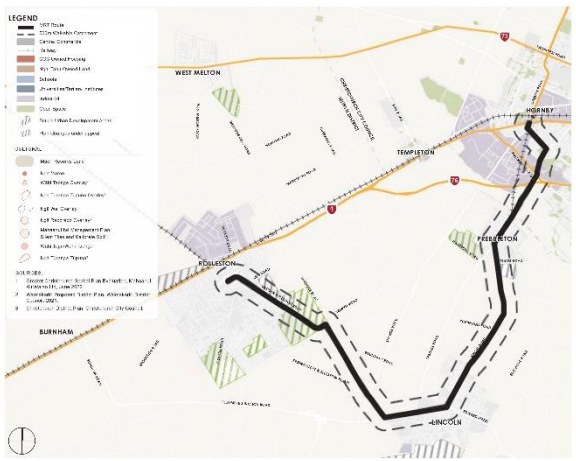
Option 1	Option 2	Option 3
		

Figure 10-6: Selwyn Assessment Option Descriptions

10.3.2 Selwyn District Option Assessment

MCA was undertaken across the three options, the results of which are outlined in Table 10-10. The following paragraphs provide a further summary of the results against the investment objectives and technical and feasibility criteria.

Investment Objective 1: i*ncreased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051*):

Table 10-6: Selwyn District MCA scores – Investment Objective 1

KPI	Selwyn Option		
	1	2	3
KPI 1: Change in accessibility to and from the Central City ***KPI 2:*** Change in access to opportunities from prioritised locations ***KPI 3:*** Change in development potential	2	1	2

- All options were scored positively, which reflects that all were considered to improve access to jobs and employment and contribute to strategic policy objectives.
- Options 1 and 3 scored the highest of the three. This reflected the higher number of households and employment opportunities captured along these routes, including the forecasted growth along the corridors. While there are more public realm opportunities associated with the rural townships in Option 3, the number of households captured (within 500 m of the corridor) in Option 1 is highest, resulting in equal scorings between these two options on balance.
- Option 2 (which passes along Shands Road) scored the lowest. This reflects that there are limited public realm opportunities due to the rural nature of the alignment (that, unlike Option 3 that is also rural, does not pass through as many main centres). Option 2 also the lowest numbers of households and employment, including household and employment growth, of the three options.

Investment Objective 2: *improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051*:

Table 10-7: Selwyn District MCA scores – Investment Objective 2

KPI	Selwyn Option		
	1	2	3
KPI 2: Change in access to opportunities from prioritised locations ***KPI 5:*** Change in journey times and reliability by public transport and private vehicles ***KPI 6:*** Ability to integrate efficiently and effectively with wider public transport	1	1	1

- All options were scored positively as there were expected journey time improvements and positive integration with PT routes.
- Further, all options were scored equally. While each option performed better against certain measures within the assessment, on balance there was no discernible net benefit of one option over the other for this investment objective.
- For example, Option 3 passes through more rural areas within the Selwyn district and is therefore a longer route with more intersections requiring navigating. However, it was assessed as being better integrated with strategic PT routes and hence scored higher in this criterion, resulting in a net score equal to the other two options that have their own strengths and drawbacks.

Investment Objective 3: *reduce emissions from transport movements across Greater Christchurch by 2051:*

Table 10-8: Selwyn District MCA scores – Investment Objective 3

KPI	Selwyn Option		
	1	2	3
KPI 7: Change in emissions from transport and improved environmental outcomes	2	2	1

- All options were considered beneficial against investment objective 3, where MRT along each of these alignments is anticipated to reduce emissions by reducing the numbers of private vehicles on the route and encourage mode shift. Hence, all options were scored positive.
- Options 1 and 2 scored the highest as they both connect to the sub-regional centre of Rolleston with Hornby and the MRT corridor within Christchurch.
- Option 3 scored the lowest, as it provides a less direct connection with the sub-regional centre of Rolleston, which is identified to have the highest population with, therefore, the most potential mode shift.

Technical and feasibility criteria:

Table 10-9: Selwyn District MCA scores - technical and feasibility criteria

Description	Selwyn Option		
	1	2	3
Technical and feasibility criteria	-0.8	-1.2	-1.4

- From a technical and feasibility perspective, Option 3 has the most challenges associated with constructability and property, largely attributed to its rural alignment with narrow roads, passing several sensitive receivers.
- Option 1 scored the highest with the fewest property requirements and anticipated consenting and environmental issues.
- Option 2 performed well against the consentability and environmental impacts measure, but also had disadvantages associated with property requirements so scored mid-range.

Summary

Option 1 (MRT extension from the city centre terminating in Rolleston via Templeton) scored strongly against investment objectives 1 and 3. This reflects the more urban alignment of Option 1 that passes within 500 m of the most numbers of households. It also reflects that this option is the most direct, passing via Templeton on its way to Rolleston.

Option 2 (MRT extension from the city centre terminating in Rolleston via north Prebbleton) performed strongest against investment objective 3, which also reflects the relatively direct nature of this route. However, it did not perform so well against the investment objectives 1 or 2.

Option 3 (MRT extension from the city centre terminating in Rolleston via Prebbleton and Lincoln) performed strongest against investment objective 1. However, it is more rurally routed and less direct, so is unfavourable against investment objectives 2 and 3.

When analysing each technical assessment, each option is sensitive to particular constraints and vary in performance when considering different feasibility/technical assessment criteria.

Therefore, in summary, further investigation of these three options would be recommended for a preferred route to be selected with greater confidence.

Table 10-10: Selwyn District MCA summary

PT Futures Mass Rapid Transit IBC MCA (Long List - Stage 2: Street Running Corridor Route Assessment - Selwyn District Extension)				Do minimum	Selwyn District Options		
					1	2	3
Benefit	**Investment Objective**	**KPI**	**Measure**	**Score**	**Score**	**Score**	**Score**
Greater public transport capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	**1: Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)**	**KPI 1: Change in accessibility to and from the Central City**	Total households per kilometre along the route corridor within 500m	0	2	1	1
			Total existing employment numbers within 500 m of the corridor	0	2	2	2
		KPI 2: Change in access to opportunities from prioritised locations	Household growth (2021-2051) within 500 m of the corridor	0	2	1	2
			Increase in the number of jobs within 500 m of the corridor	0	3	1	3
		KPI 3: Change in development potential	Enables high quality public realm outcomes	0	1	0	2
			Contribution and alignment with strategic policy objectives in relation to land-use integration and urban design	0	1	1	2
Improved access to jobs, education and social opportunities (33%)	**2: Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)**	**KPI 2: Change in access to opportunities from prioritised locations**	Number of key destinations and strategic land uses within 500 m walk up catchment	0	1	1	2
			Change in accessibility to comprehensive development sites within 500 m walk up of the corridor	0	1	1	2
		KPI 4: Shift in trips to public transport and active modes	No MCA measure – this required modelling outputs which were not undertaken at this stage of the assessment across all the options. This KPI was assessed as part of the short list assessment.				
		KPI 5: Change in journey times and reliability by PT and private vehicles	Directness of the MRT route relative to the most likely car route	0	3	2	0
			Number of right turns conflicting with oncoming traffic or pedestrian flows (at grade)	0	-2	-1	-3
		KPI 6: Ability to integrate efficiently and effectively with wider public transport	Extent of integration with strategic PT routes/facilities	0	2	1	3
			Extent of integration with strategic active mode facilities	0	1	1	2
Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	**3: Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)**	**KPI 7: Change in emissions from transport movements and improved environmental outcomes**	Number of destinations and opportunities along the corridor that would encourage mode shift	0	2	2	1
Investment Objectives Sub-total (weighted scores)				0	2	1	1
Technical/Feasibility Assessment				**Score**	**Score**	**Score**	**Score**
Costs	Costs of the option (Capex, Property and Opex)			0	No route MCA measure – was assessed as part of the mode considerations and short list assessment		
Constructability	Assessment of constructability / complexity of the option			0	-2	-2	-3
Operational Implications	Assessment of how well the option will integrate with the wider transport network			0	-2	-2	-2
Property Requirements	Scale and magnitude of the property impact along the corridor			0	-1	-3	-3
Consenting and Environmental Impacts	Assessment of the level of consenting complexity/difficulty and the likelihood of obtaining approvals for the proposal and qualitative assessment of key environmental risks			0	-1	-1	-2
Social and Community Impacts	Assessment of the impact on community access and cohesion including consideration of the number of sensitive receivers (schools / hospitals / day cares / etc.)			0	2	2	3
Technical/Feasibility Assessment Sub-total (weighted scores)				0	-1	-1	-1
Overall score (weighted)				**0**	**0.1**	**-0.3**	**-0.4**

10.3.3 Selwyn District Preferred Option

In conclusion, further investigation of all three options would be recommended for a preferred route to be selected with greater confidence. However, to inform the Stage 3 analysis, one option was taken forward. This was **Option 1: Hornby to Rolleston via Templeton**.

Option 1 is approximately 17.2km in length, as outlined in Figure 10-7. It extends along SH1 between Hornby and Rolleston and utilises Weedons Road and Levi Road into Rangiora. The route may extend further from Springston Rolleston Road along Selwyn Road (as shown by the dashed line).

The Mahaanui Kurataiao (March 2023) report (see Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case) identifies that the options for the Selwyn District extension have little potential impact on specific cultural values or significant sites and areas. The report recognises that the option connecting Prebbleton and Lincoln provides access to those employment and education hubs, which may benefit whānau living and working in those townships. It is acknowledged that the preferred option in relation to the Business Case objectives is the option from Hornby to Rolleston via Templeton. Manawhenua do not hold any position or opinions on the merits or otherwise of these options.

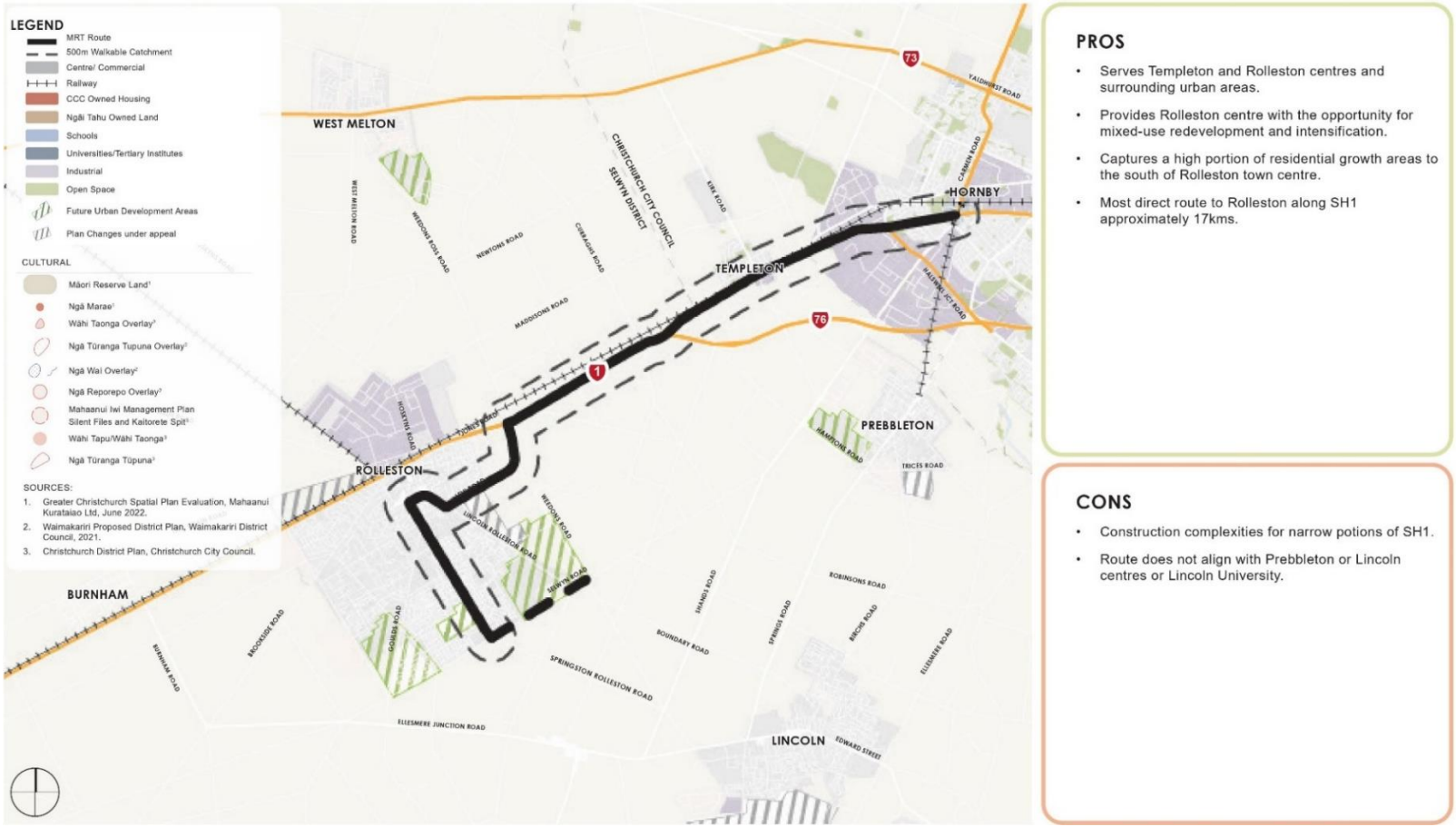


Figure 10-7: Option 1 Route alignment, Context and Identified Pros and Cons

10.4 LAND USE SCENARIOS FOR DISTRICT EXTENSIONS

Carrying through the land use integration 'Scenario 3' MRT Focused Growth from Stage 1, the analysis of the Waimakariri and Selwyn Districts utilised the same 'compact' growth model. Testing what densities could be achieved when a more public transport supportive urban form has involved reallocating greenfield growth to varying degrees within the district centres and station catchment (see Figure 10-8)

In order to fully realise and justify the benefits of investment in public transport infrastructure, the current urban form and development patterns within the Selwyn and Waimakariri Districts needs to move away from a predominantly dispersed, urban edge greenfield development approach to a model which provides higher density residential development within the existing priority centres.

The analysis has indicated that current urban development patterns and densities within Selwyn and Waimakariri Districts are unlikely to generate the level of user demand or patronage to support the significant investment required to provide an MRT service in these locations. In order to fully realise the benefits of this level of infrastructure investment, a significant change in urban development and density patterns will be required. As such, both Waimakariri and Selwyn districts will need to investigate a range of regulatory and non-regulatory tools and incentives beyond zoning to drive a change in intensification and land use patterns to support investment in public transport.

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	Existing Situation 2021	Scenario 3:	Scenario 3a:	Scenario 3b:	Scenario 3c:
		2051 Compact Growth	50% of greenfield growth into the centre	100% of greenfield growth into the centre	100% of greenfield growth into the MRT station catchment.
Rangiora	Town 12 HH/Ha (average)	Town 17 HH/Ha (average)	Centre 20 HH/Ha (average) Urban Area 15 HH/Ha (average)	Centre 24 HH/Ha (average) Urban Area 12 HH/Ha (average)	Centre 57 HH/Ha (average) Urban Area 12 HH/Ha (average)
Rolleston	Town 8 HH/Ha (average)	Town 16 HH/Ha (average)	Centre 19 HH/Ha (average) Urban Area 14 HH/Ha (average)	Centre 39 HH/Ha (average) Urban Area 8 HH/Ha (average)	Centre 97 HH/Ha (average) Urban Area 8 HH/Ha (average)

Figure 10-8: Land Use Scenario Summary for District Extensions

10.5 ALTERNATIVE MRT PHILOSOPHIES

Stage 1 and 2 assessments resulted in a refined Scenario 3, street running (arterial) corridor focused option. This work revised and updated the corridor initially established in the interim Report.

Prior to progressing this option to the Stage 3 (Short List) assessment, the option was 'tested' in the transport model. Of particular interest was the daily patronage (of the full PT network) potential in extending MRT to the Waimakariri and Selwyn Districts. The results shown in the following figure indicate the following:

- Scenario 3, Stage 1, which is 22 km in length, solely within Christchurch City, would potentially uplift 20,000 passengers per day;
- Extensions (approx. 20 km in each direction) to the districts in Scenario 3, Stage 1 + 2 (SDC & WDC Extension) would provide a further 7,000 uplift per day.

This result raised consideration as to whether there were alternative combinations of Stage 1 within Christchurch City and a complementary minimal solution to the Waimakariri and Selwyn Districts. Two further options were therefore developed:

- Stage 1 'street running (arterial) corridor focused' in Christchurch + complementary motorway based direct bus services to the districts;
- Stage 1 'street running (arterial) corridor focused' in Christchurch + complementary heavy rail to the districts.

These options are referred to as Option 1A and 1C respectively herein and are described in further detail in Section 12.2 of this report.

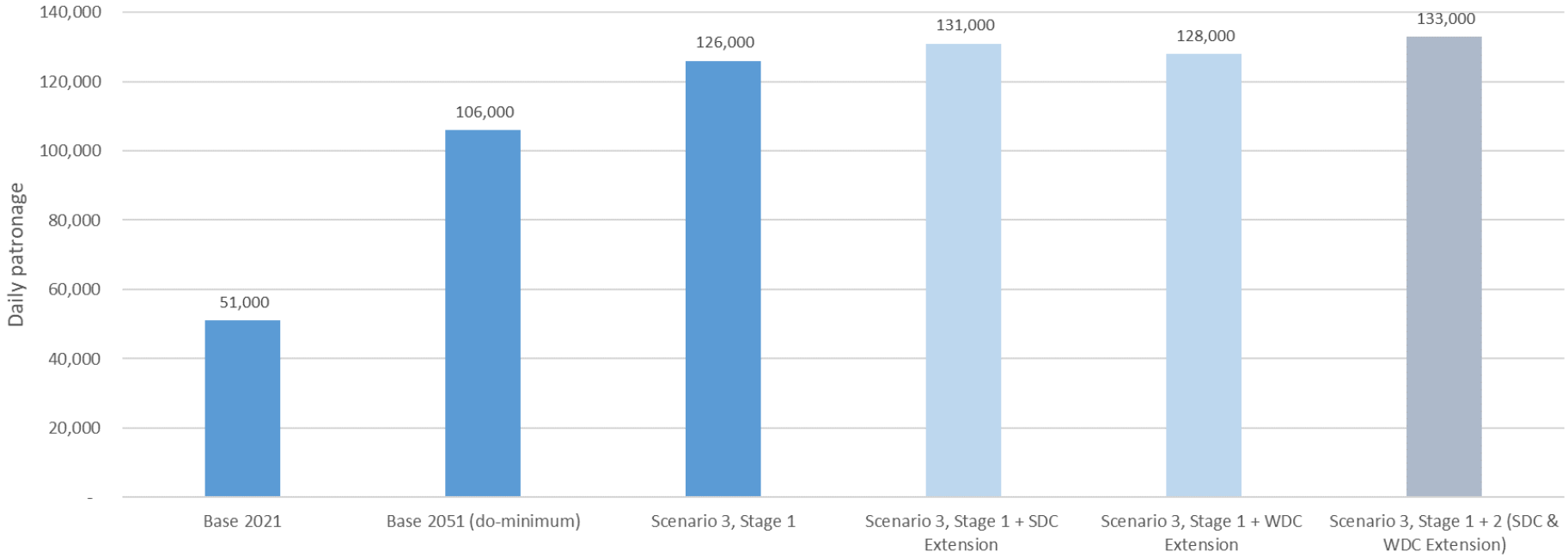


Figure 10-9: Daily Patronage of Scenario 3 District Extensions

11 SUPPORTING ASSESSMENTS

11.1 MODE ASSESSMENT

11.1.1 Assessment Overview

Appendix I – Mode Assessment Paper outlines in detail the mode assessment undertaken for the street running options. Mode assessment was not required for heavy rail, as this would be developed within the existing KiwiRail corridor and hence is assumed to be Suburban Heavy Rail technology.

The following sub-sections summarises the two-stage assessment undertaken to identify the preferred mode for the street running options::

- **Screening**: A sieving process undertaken to identify any options that do not align with the strategic outcomes and direction sought by the IBC or to remove any options that have fatal flaws.
- **Long List Multi-Criteria Analysis (MCA):** An MCA assessment undertaken on the mode options retained through the long list screening.

11.1.2 Mode Option Descriptions

Nine mode options were considered in long list screening process:

Rubber Tyre Vehicle Type			
Option 1: Standard Bus	Option 2: Double Decker Bus	Option 3: Articulated or Bi-Articulated	Option 4: Trackless Tram
 Christchurch (Business as usual)	 Auckland Busway	 Brisbane Metro bi-articulated bus	 CRRC Trackless Tram, China

Tracked – Light	Tracked – Grade Separated			Aerial
Option 5: Light Rail	Option 6: Light Metro	Option 8: Suburban Rail	Option 9: Monorail	Option 10: Gondolas
 Melbourne Tram	 Dockland Light Rail (UK)	 Auckland Heavy Rail	 Kuala Lumpur (monorail)	 Medellin, Colombia

Figure 11-1: Mode options by Vehicle Type

11.1.3 Mode Option Assessment

Mode Screening Assessment

The screening process provided a high-level sieving of mode options, focused on the strategic alignment of each option and affordability and achievability criteria. A summarised Long List Screening table for the mode assessment is provided in Table 11-1

This assessment identified two technologies that were not suitable for street running corridor options. These are Option 8 Suburban Rail (Heavy Rail) and Option 10 Gondolas (Aerial Modes), for the reasons as outlined below.

Heavy Rail: The long list screening has highlighted major risks is the feasibility of delivering heavy rail technology on a street running corridor. This option has been discarded due to the narrow width of the corridor and the ability to retro fit for a heavy rail mode.

Note: This assessment does not conclude that heavy rail is not suitable for Greater Christchurch, but rather that it Is not suited for street running.

Aerial: Aerial modes such as gondolas are typically used where terrain is a constraint such as mountainous areas or large bodies of water. Whilst there are examples of gondolas that are used as part of a public transport system, such as London Air Line or Medellin, Columbia. These systems tend to operate point to point rather than serve a corridor of great length. Gondolas are typically slow, with maximum speeds of 30-45 km/h, which would not make this mode suitable for our preferred corridor that has a length of 22km. This mode will fail to meet the investment objective of competitive travel time with a private vehicle.

There is uncertainty if this would drive mode shift and in turn emission reductions. Consequentially, the gondola was discarded from further investigation as it is not a suitable mode for our corridor.

All other technologies are considered to have characteristics potentially suitable for a street running option and hence progressed to the next stage of assessment.

Table 11-1: Mode Selection Sieve Waimakariri District Options

PT Futures Mass Rapid Transit IBC MCA (Mode Selection Sieve)		Waimakariri District Options								
		Option 1 - Standard Bus	Option 2 - Double Decker Bus	Option 3 - Articulated or Bi-articulated	Option 4 - Trackless Tram	Option 5 - Light Rail	Option 6 - Light Metro (above)	Option 8 - Suburban Rail	Option 9 - Monorail Suspended Rail	Option 10 - Gondola
Criteria	**Measure**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Investment Objective 1	Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051	Unknown	Pass	Pass	Pass	Pass	Unknown	Unknown	Unknown	Fail
Investment Objective 2	Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Fail
Investment Objective 3	Reduce emissions from transport movements across Greater Christchurch by 2051	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Unknown
Potential Affordability	What is the potential achievability of the option (i.e., consentability and constructability)	Pass	Pass	Pass	Pass	Unknown	Unknown	Fail	Unknown	Pass
Potential Achievability	Does the cost of this option fit within the likely funding available or offer a value for money solution?	Pass	Pass	Pass	Unknown	Pass	Unknown	Fail	Unknown	Unknown
Total		**Proceed to MCA**	**Proceed to MCA**	**Proceed to MCA**	**Proceed to MCA**	**Proceed to MCA**	**Proceed to MCA**	**Discard**	**Proceed to MCA**	**Discard**

Mode MCA Assessment

The remaining seven mode options proceeded through full MCA assessment, based on assessing measures relating to the IBC Investment Objectives and Technical/Feasibility Criteria as outline in Table 11-2.

The emerging preferred option for a street running scenario, is either Option 3 Bi-articulated Bus or Option 5 Light Rail, as these two technologies performed well against the investment objectives and significantly outweigh the other technologies.

The standard bus (option 1) and double decker (option 2) have low implementation risks but are not expected to achieve the investment objectives to the same extent as Options 3 and 5.

Light Metro (option 6) and Monorail (option 9) score unfavourably due to the risks and cost of implementing these modes in Greater Christchurch. The capacity delivered by these two technologies will greatly exceed the demand forecast by 2051.

Appendix I – Mode Assessment Paper, considers these options in more detail. This includes a sensitivity assessment against Investment Objectives, Cost and Risk, as outlined in Section 5.5 of Appendix I.

Table 11-2: Mode Selection Sieve Mode Options

PT Futures Mass Rapid Transit IBC MCA (Mode Selection Sieve)			Mode Options						
			Option 1 - Standard Bus	Option 2 - Double Decker Bus	Option 3 - Articulated or Bi-articulated	Option 4 - Trackless Tram	Option 5 - Light Rail	Option 6 - Light Metro (above)	Option 9 - Monorail Suspended Rail
Criteria		Measure	Score	Score	Score	Score	Score	Score	Score
Investment Objective Criteria	Capacity	Capacity: If the hourly capacity is satisfied with the demand of 1940 persons by 2051.	0	1	3	3	3	-1	-1
	Stimulate growth	Assessment of the land value uplift and the city's attraction uplift	0	0	1	1	2	1	1
	Travel Time	Assessment of the type of dedication (grade separated versus in-traffic lane) and priority at the intersection to provide a reliable service	1	2	2	2	2	3	3
	Attracts new customers	Assessment of the humanised design of vehicles' appearance, convenience; comfortability	1	1	1	1	2	3	3
Technical/Feasibility Criteria	Costs	High level qualitative assessment of the costs of capital costs and physical works (CAPEX) High level qualitative assessment of the operational costs including infrastructure maintenance (OPEX)	-1	-1	-1	-2	-2	-3	-3
	Resilience & adaptability	Assessment of vulnerability to natural hazards (earthquakes or flooding) or other operational interruptions (i.e., power outages)	-1	-1	-1	-2	-2	-3	-3
	Complexity	Assessment of the modes risk and complexity of the infrastructure construction. This includes the considerations of a mode depot.	-1	-1	-1	-3	-2	-3	-3
Total			-1	1	4	0	3	-3	-3

11.1.4 Mode Technology Conclusions

With Bi-articulated Bus and Light Rail emerging as the two preferred mode options, sensitivity analysis was undertaken to test transparently potential differentiating scenarios and identify the significance/materiality of different criterion. The sensitivity testing confirmed that Light Rail outperforms the Bi-articulated Bus when considering the investment objectives. However, the Bi-articulated Bus preforms better when all factors are considered equal or there is a focus on risk and affordability. The sensitivity tests reinforce that both Light Rail or Bi-articulated Bus could be appropriate for a street running option MRT option. Capacity, attractivity and complexity may become differentiators between these two modes during more detailed analysis carried out at a DBC.

Arterial Street Running: It was decided that further assessment to identify the preferred corridor for Arterial Street running options would be mode agnostic between Light Rail and Bi-articulated bus, with the final mode technology decision deferred to work beyond the IBC.

Motorway Street Running: For the Motorway Street running option, the assumed mode is limited to Bi-articulated bus. This is considered more appropriate for a motorway scenario given rubber tyred vehicles can be designed in exceptional cases for higher (up to 100km/hr) speed environment. Higher speed LRT could be considered but its increased price and technicality would make it less advantageous, thus removing its usefulness in our optioneering process.

Heavy Rail: The rail scenario would be developed within the existing KiwiRail corridor and hence is assumed to be Suburban Heavy Rail technology.

Table 11-3: Short List: Mode Technology Vehicle Category

National or Global Examples		Assumptions	
Rubber Tyred: Articulated or Bi-Articulated	 Brisbane Metro "Light Tram" – 24.5 bi-articulated bus.	▪ Nominal Speed: 70-90 km/h, Lane Width Required: 3.2 - 3.5m ▪ Capacity (passengers): Higher capacity than a conventional or single articulated bus. (150-170 total) Approx. 60 seated ▪ Shared running possible: Yes ▪ At Grade / Separated: At Grade	▪ Infrastructure: The length of the units may require longer station platforms. No specifically designed tracks (except for dedicated bus lanes). Pavement strengthening may be required due to the axle load for battery powered versions. Dedicated depot and charging facilities may be required.
Tracked – Light: Light Rail	 Melbourne Tram  Bordeaux Light Rail	▪ Nominal Speed: 70km/h, Lane Width Required: 3.4m ▪ Capacity (passengers): 210 per 33m unit 64 seats / 420 per 66m unit 128 seats. ▪ Shared running possible: Yes ▪ At Grade / Separated: At Grade (except where it crosses heavy rail lines). Assume it can cross tram tracks at-grade.	▪ Infrastructure: Tracks required, track slab, additional drainage, and power supply (dependant on battery technology).

11.2 STOP ASSESSMENT

11.2.1 Assessment Overview

The station locations were initially identified across all three scenarios (Heavy Rail Scenario; Motorway Street Running and Arterial Street Running) as part of the Interim Report. Station locations were generally based on unlocking opportunities and building a public transport supportive urban form. An 800 m catchment for stations has been applied to the more detail stop assessment. This walkable catchment zone is consistent with Waka Kotahi guidance to use 800 m (10-minute walk-up catchment) for high frequency public transport stops[23].

The principles used to identify the stop locations were: (Figure 11-2)

- Stations as gateways – key origin and destination points.
- Legible hierarchy – by prioritising high opportunity areas.
- Land use integration – aligning with highest density of residential and employment.
- Enhancing accessibility – though network integration – include walkable catchments.

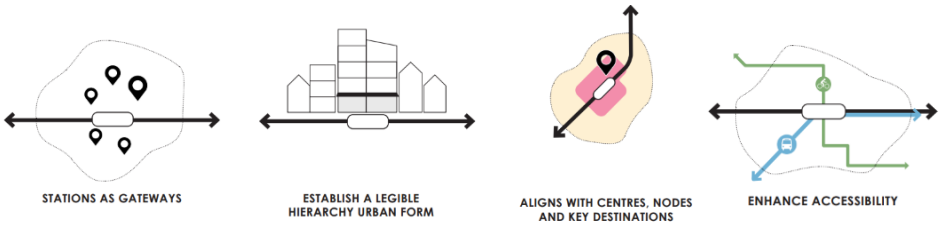


Figure 11-2: Principles used to Identify the Stop Locations

Arterial Street Running

Station stop locations have been identified based on the following priorities:

- First: Locate stations at major demand destinations such as Key Activity Centres (KACs) and City centre.
- Second: Locate stations at nodes with high clusters of economic focus and/or every-day need activities such as schools, basic community facilities, supermarkets. Intersecting main streets with existing bus routes and proposed new routes, connections to public transport corridors, main cycle corridors.
- Third: Consider the need for additional stations for intermediate residential coverage.

Stop locations ideally satisfied all three priorities, by being situated in dense area of activity with existing PT and/or cycle links and surrounding residential development, however the spacing of KACs within Christchurch means this will be unlikely.

Potential stop locations that did not meet all priorities, were assessed on their proximity to key employment and education nodes, as well their ability to connect with bus and cycle routes that intercept the proposed MRT route.

Coverage gaps, based on catchment analysis of 800m outside the Central City and 400m in the Central City, are then assessed to determine whether additional stops are required.

Motorway Street Running

The motorway street running option (a refined form of Scenario 2 in the Interim Report) provided limited stop locations based on logical opportunities where the motorway aligned with destinations, key public and active transport connections, and locations that could be accessed by wider residential catchments. Consideration was given to under and over passes. This would provide opportunities for vertical interchanges, which would increase accessibility to stations and reduce severance.

Heavy Rail

The heavy rail option (a refined form of Scenario 1 in the Interim Report) provided stations in proximity to existing centres, maximising intensification, and urban integration opportunities. Station consideration was also given to strategic interchange opportunities based on the wider public transport network and stop locations already defined by the existing rail corridor.

[2] https://www.nzta.govt.nz/walking-cycling-and-public-transport/public-transport/public-transport-design-guidance/getting-to-and-from-public-transport/walking/

[3] https://nzta.govt.nz/assets/resources/aotearoa-urban-street-planning-and-design-guide/aotearoa-urban-street-guide-section-4-creating-good-urban-streets.pdf

11.2.2 Stop Location Conclusions

Initial station stop locations were assumed in the Interim Report. Analysis indicated that potential PT uplift was sensitive to the location and number of stops. Prior to the short list assessment, the station stop locations were refined as outlined below, with the refined stop locations and 800m catchment boundaries illustrated in Figure 11-3.

Arterial Street Running – Station stops associated with Scenario 3 from the Interim Report, were refined to reflect the finalised stage 1 and 2 route.

Motorway Street Running – Station stops relating to Scenario 2 from the Interim Report were refined as follows:

- Stops shifted to Prestons and Belfast roads, as a result of the route being adjusted to use SH74 instead of Main North Road.
- An additional stop at Ravenswood, based on the route extending here from Woodend, based on more recent understanding of growth potential in this area.

Heavy Rail - Station stops relating to Scenario 1 from the Interim Report were refined to remove the station at Chaneys due to the indicative low boardings

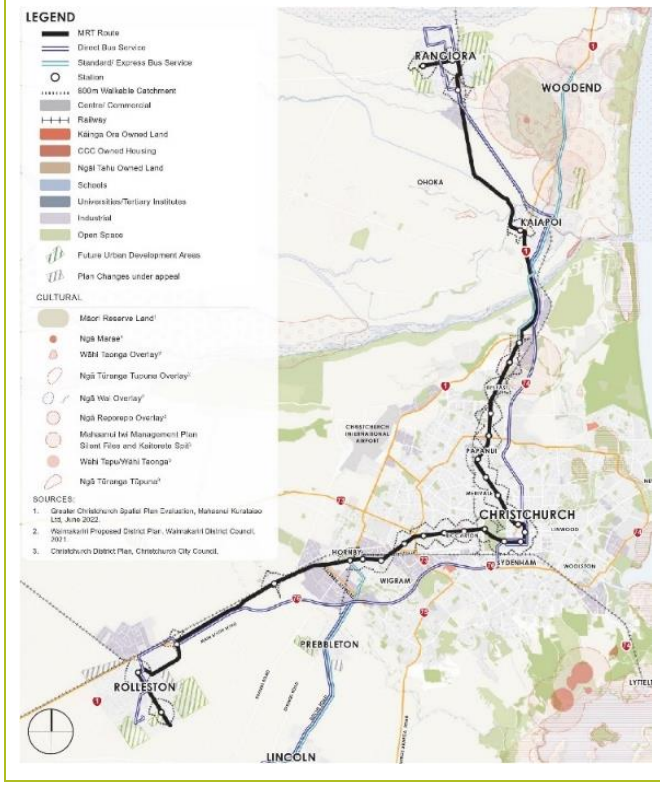
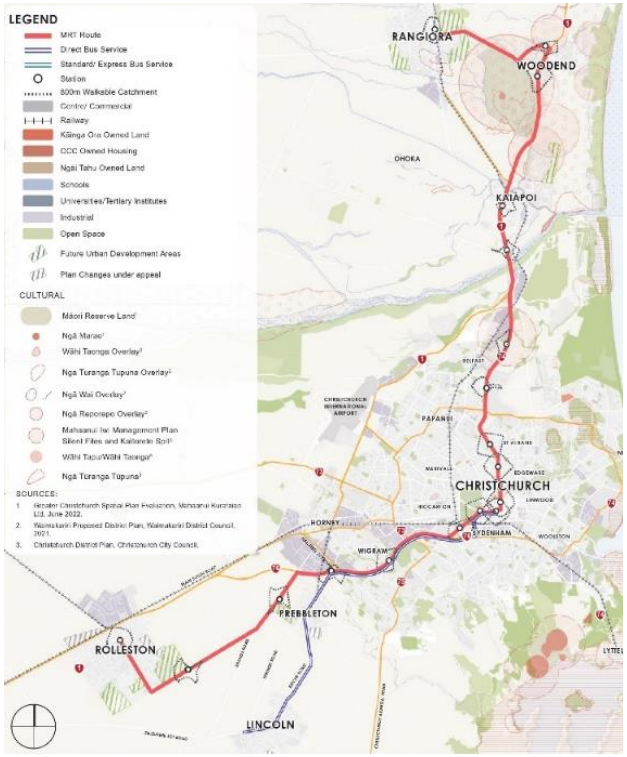
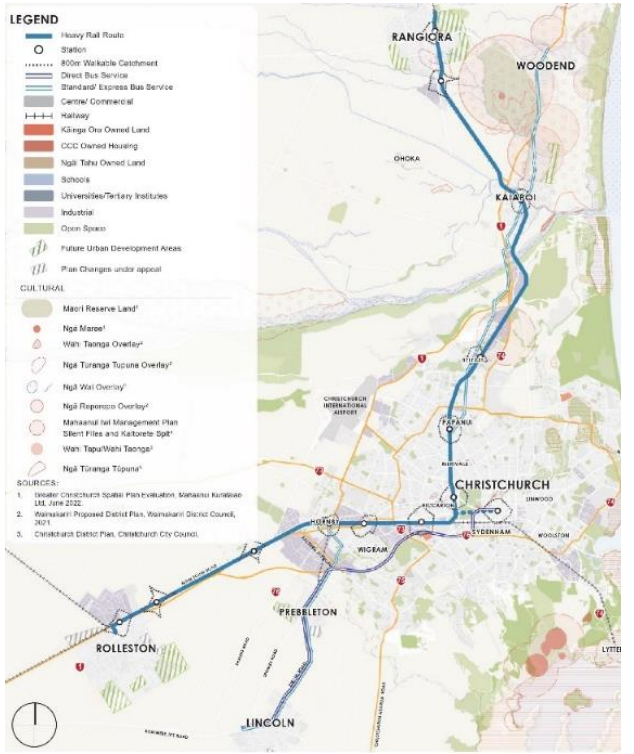
Arterial Street Running (29 stops)	Motorway Street Running (17 stops)	Heavy Rail (13 stops)
		

Figure 11-3: Stop Location

11.3 HEAVY RAIL ASSESSMENT

11.3.1 Assessment Overview

The Heavy Rail option developed in the Interim Report (Scenario 3) was further refined prior to undertaking the short list assessment. This section summarises refinement of the rail option, supported by further detail in Appendix Y – Mass Rapid Transit Rail Options.

While the 'route' was generally fixed based on the existing heavy rail lines, the scoping requirements relating to service patterns, infrastructure, fleet, and energy were further investigated to establish one or more plausible option for consideration in the short list MCA.

To inform rail options(s), suitable for delivering solutions to the identified problem statements for MRT, scope requirements were defined as outlined in Table 11-4 below.

Table 11-4: Descriptions of heavy rail components

Component	Description
Level Of Service	Quick, frequent, reliable, and high-capacity public transport service that operates on a permanent route largely separated from other traffic. Able to provide an integrated customer experience with PT Futures planned enhancements.
Alignment	Aligned as much as possible to the most advantageous corridor, defined by the north and southwest corridor envelopes, servicing the city centre, and connecting to the districts.
Fleet, Technology	Attractive level of service comparable with modern Light Rail or Bus Rapid Transit 'trackless' trams. Able to provide an integrated customer experience with PT Futures planned enhancements. Able to support decarbonisation targets
Facilities	Number and Location of stations that support the level of service and connectivity described above
Network integration	Separated corridor that allows high frequency services while removing safety issues and consequential network impact

11.3.2 Option Descriptions

As a result of the option development and refinement process developed through the IBC, two options were put forward for the shortlist which meet the requirements outlined in the scope above.

Option 3

- Option 3 is a refined version of Scenario 1 – Heavy Rail, initially developed in the Interim Report. It connects Rolleston with Rangiora via Christchurch Central City along the existing heavy rail route. This option includes an additional rail connection to the Central City as a 'spur' from the main line.
- This option aims to make use of existing rail infrastructure, with improvements to optimise the requirements defined in the scoping table to advantageously deliver on the MRT IBC Investment Objectives.
- This option can be defined as a full or heavy investment rail option. It instinctively comes across as requiring an investment commensurate to the provision of 50km of suburban and urban high level of service metro rail. It also appears that most of the rail corridor and associate stations are currently eastern to the most advantageous corridor, aligning to spatial planning and resulting land use. Option 3 is, therefore likely to require a high capital investment and return benefits that may be lower than an alignment on the optimal corridor.

Option 1c

- Option 1c provides a 'cheaper' rail investment solution that combines:
  - a short street running MRT corridor to capture higher benefits by following a route that aligns better with the optimum corridor.
  - a do-minimum heavy rail link to districts, to provide the benefits from converting longer trips from the districts to MRT.
- This option evolved as a result of early analysis suggesting a lower capital investment rail solution, could be a superior option to a street running MRT solution extending all the way to the districts.
- Option 1c was, therefore, defined to provide a 'cheaper' rail investment solution that combines with a short street running MRT corridor to capture higher benefits by following a route that aligns better with the optimum corridor and links to districts.
- It is accepted that many other start-up service, and interim fleet solutions could be viable projects in their own right, however these were not considered suitable to deliver a solution fitting to the long-term horizon defined by this IBC.

11.3.3 Option Development

Option 3: Heavy Rail MRT

In detailing this option, the services and frequencies, runtime estimations, indicative timetable and network analysis was developed in consultation with KiwiRail. The network timetable was overlaid against the existing track and signalling infrastructure, allowing for an assessment of what infrastructure upgrades would be required to support the envisaged passenger service.

Tracks schematics were developed to illustrate a realistic set of minimal network interventions. The choices made to define these were based on institutional knowledge of the network confirmed by interaction with KiwiRail at a national level, and as represented in the OpenTrack model. Full network simulations have not been undertaken for this level of analysis. However, the interventions required, particularly in terms of the degree to which double tracking and junction upgrades are required, can be estimated with a reasonable degree of confidence based on knowledge of current KiwiRail network development policy and capacity planning, as applied across New Zealand's urban and sub-urban networks.

To determine suitable service patterns associated with the heavy rail options, the design process included an iterative processes that refined assumptions leading to plausible options that realistically represented the likely most advantageous ratio of benefits over costs within the boundaries of the options requirements. Alternatives that quite obviously led to higher costs without additional benefits were naturally discarded. Similarly, lower costs alternatives that cannot support the Mass Rapid Transit level of services envisaged were discarded. For option 3 these notably included:

- A surface corridor to connect the existing network to new city centre stations. This was considered as a lower capital alternative to an underground or aerial spur. It was discarded because its consequential effect on other modes presented irreconcilable operational and safety conflicts. We noted that when refined to mitigate these issues, the options' capital requirements increased to reach that of an underground spur.
- The use of passing loops to minimise the need for double tracking and minimise bridge works. This approach was considered along the option's alignment and while it may be realistic in places, it builds in constraints to the operation of the network that are not compatible with the levels of frequency and reliability required of an MRT solution. The analysis that led us to this conclusion is based on our team's experience of the level of track utilisation commonly achieved on the Wellington and Auckland networks. These networks represent a good indication of a true urban mixed service network and applying more optimistic track utilisation assumptions to the design of Option 3 would make it implausible.

A summarised description of this option, along with key overarching assumptions, is outlined in Section 12.2.5.

Option 1c: Arterial Street Running MRT (Christchurch only) + heavy rail to districts

In detailing this option, an indicative timetable was developed and input to a network analysis showing the interaction of the services envisaged for the option and other traffic on the rail network. Assumptions underlying the use of the network by Tourist services and Freight were taken as conservative and in accordance with our consultation with KiwiRail.

Integrating a high frequency mass passenger service within a low frequency freight operation necessarily creates conflicts that will require significant organisational alignment. Questions of freight priorities and detailed aspects of Network Access Agreements that constrain passenger operation were conservatively assumed as resolved to reach a reasonable indicative operational pattern and avoid the risk of landing on an overly designed solution.

A summarised description of this option, along with key overarching assumptions, is outlined in Section 12.2.3.

12 SHORT LIST: STAGE 3 ASSESSMENT

12.1 ASSESSMENT OVERVIEW

The Stage 3 assessment considers a range of options initially developed from the Interim Report and refined and added to throughout subsequent stages of this IBC. The options considered within Stage 3 incorporate the preferred mode technologies and stop patterns previously identified.

Scoring of the MCA was undertaken by the core consultant project team, with subject matter experts to provide input where required such as consenting, operational and constructability aspects. Key results were shared with key stakeholders at the regular MRT Stakeholder Workshops, with feedback incorporated into the final MCA as appropriate. In particular, progress on the Stage 2 and 3 results were shared at the MRT Stakeholder Workshop on the 16 February 2023.

Appendix N – Stage 3 Short List Route Assessment outlines in detail the route assessment undertaken for each shortlisted option, including the multicriteria assessment undertaken against each KPI. This report also provides a summary of the data behind the MCA, including all the quantitative results and overview comments against each of the qualitative measures. Annex 3 of this Appendix provides commentary across all the quantitative and qualitative data used in the MCA. This is also supported by Appendix P – KPI Assessment Report, which further outlines the quantitative assessments.

As agreed with manawhenua, the impacts on Te Ao Māori have not been included with the MCA but are considered in parallel criteria identified in the Waka Kotahi Multi-Criteria Analysis User Guidance. This guidance has not been assessed separately. On behalf of manawhenua, Mahaanui Kurataiao has reviewed the Stage 3 assessment and have provided a report that informs the IBC in respect of manawhenua priorities and values (see Appendix B – Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case).

The development of each of the five options considered in the Short List (Stage 3) is summarised below, with the options and development progression illustrated in Figure 12-1.

Option 1: Three sub options are considered under Option 1, each are street running (arterial) corridor focused options, refined from Scenario 3.

- **Option 1A: Arterial Street Running MRT (Christchurch only) + direct buses to districts:** This option takes Scenario 3 Stage 1 preferred route which extends from Hornby through the city centre, to Belfast and combines it with direct bus services to the districts. This is effectively a combination of Scenario 3 Stage 1 preferred route and a minimised motorway (Scenario 2) option. Note high frequency direct bus services to the districts and associated park and rides are already assumed under the PT Futures business case and hence in the do-minimum option.
- **Option 1B: Arterial Street Running MRT (Greater Christchurch):** This option is the result of the Stage 1 and Stage 2 assessment. It combines the preferred alignments for extension from the Central City to the Waimakariri District and Selwyn District. Note although this option was primarily derived from Scenario 3, as part of the Stage 2 district extensions assessment, it also considers portions of the route that were also motorway running, hence was also derived from aspects of Scenario 2.
- **Option 1C:** Arterial Street Running MRT (Christchurch only) + heavy rail to districts: This option takes the Scenario 3 Stage 1 preferred route which extends from Hornby through the city centre, to Belfast and combines it with heavy rail to the districts. The heavy rail service assumes utilisation of the existing rail infrastructure provisions with minimal upgrades. This option is effectively a combination of Scenario 3 Stage 1 preferred route and a minimised heavy rail (Scenario 1) option.

Option 2: Motorway Street Running (limited stops): This reflects Scenario 2 from the interim report. This option comprises MRT between Rolleston and Rangiora via Christchurch City, generally using the existing motorway along the length of the alignment. Prior to the short list assessment this option was further developed and refined from the Interim Report, as outlined further in this section under the Option Descriptions.

Option 3: Heavy rail: This reflects Scenario 1 from the interim report. This option comprises heavy rail MRT between Rolleston and Rangiora via Christchurch City. The route follows the alignment of the existing rail infrastructure with a spur proposed to connect to central Christchurch. Prior to the short list assessment this option was further developed and refined from the Interim Report, as detailed in Section 11.3, and summarised below under the Option Descriptions.

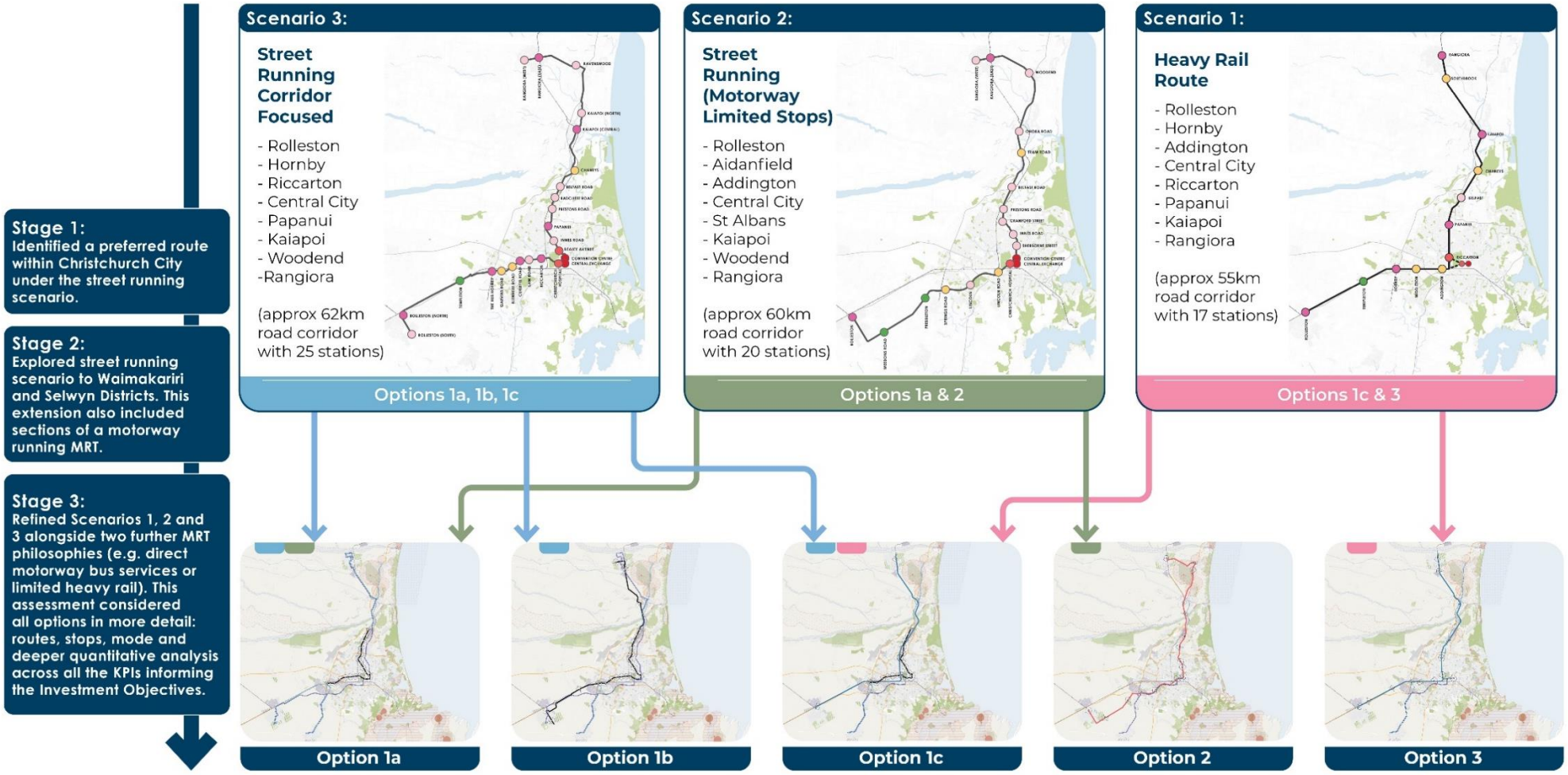


Figure 12-1: Stage 3 Route Options

12.1.1 Option Development Methodology

To ensure that all options are comparable to inform the multicriteria analysis at the short list stage, all option details were developed to a similar level of scope whereby:

- The route was confidently confirmed;
- Concept station locations and hierarchies were established, including growth predictions in collaboration with GCSP.
- Services were defined by way of headway (frequencies) and capacities.
- Reasonable assumptions were made in terms on network integration, across the arterial, motorway and rail networks, noting regardless of the outcome all options would need greater resolution in regard to this, to be developed through the DBC.
- All options required a level of assumption in terms of operational impacts and infrastructure requirements associated with this:
  - For the street running arterial options this related to left in – left out restrictions and integration at intersections, the freight network, the PT network.
  - For the motorway running this also affected left in and left out restrictions and the extent to which U-turns were available along the network.
  - For the heavy rail this extended to impact on rail freight, level crossings and connection to the city.

To provide confidence around the various assumptions made, sensitivity tests were undertaken across a number of elements including network and operational implications (Sensitivity test 2) and Economics (Sensitivity test 4) as outlined further in Section 12.4 of this IBC.

Descriptions of each of the options along with some key assumptions are outlined in the following subsection, with further detail provided in the relevant supporting appendices.

12.2 OPTION DESCRIPTIONS

12.2.1 Option 1 A - Arterial Street Running MRT (Christchurch only) + direct bus services

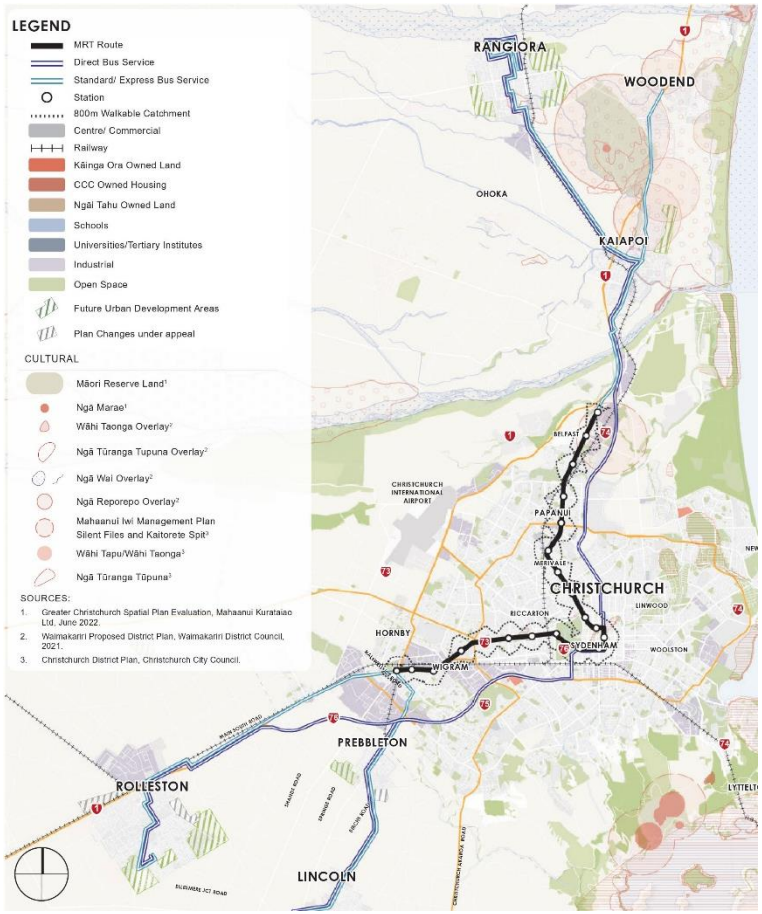


Figure 12-2: Option 1A Arterial Street Running MRT (Christchurch only) + direct bus services

Length: Approximately 22km

Mode: BRT or LRT

Stations: 21 stops

Utilises the preferred Stage 1 arterial street running MRT for Christchurch City, extending between Hornby and Belfast.

Direct bus services, proposed under PT Futures (and provide in the do minimum base) are utilised to provide a direct PT connection from Christchurch City centre to Kaiapoi and Rangiora in the north and Lincoln and Rolleston in the southwest.

If this option is preferred then potential upgrades to the direct bus services/infrastructure will need further consideration.

Key Assumptions:

- Headway of 5 minutes during morning and evening peak periods and 10 minutes at other times.
- The current direct bus services connect the districts direct to Christchurch City Centre via the fastest route available, which tends to be the motorway routes. These frequencies of these bus services will be increased to an all-day service, with a headway of 15-20 minutes as recommended in PT Futures.
- The current standard bus services (including the express services in the peak periods) will be modified to connect into the MRT network at Hornby and Belfast.
- There would be mode separation of LRT and heavy rail at any interface points.
- No large-scale corridor widening would occur and there may be strategic land acquisitions required to deliver the project outcomes near stations and major intersections.
- There will be 'Park and Ride' at the Belfast terminus stations and one to be investigated near Hornby.

12.2.2 Option 1 B - Arterial Street Running MRT (Greater Christchurch)

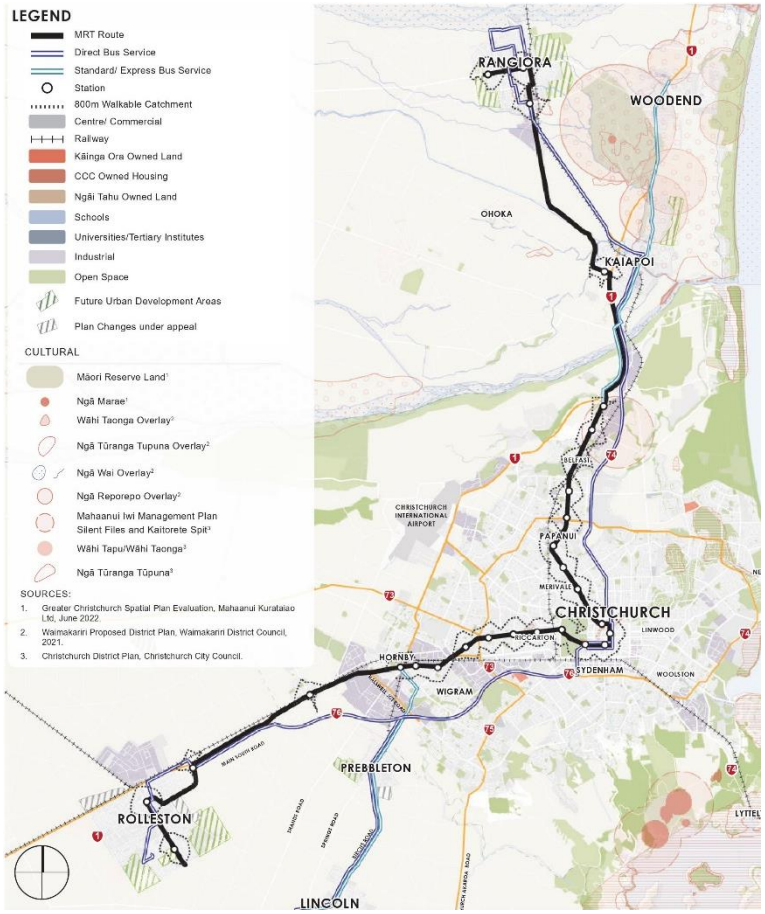


Figure 12-3: Option 1 B - Arterial Street Running MRT (Greater Christchurch)

Length: Approximately 59km

Mode: BRT or LRT

Stations: 29 stops

Street running MRT option extending from Rolleston via Christchurch Central City to Rangiora (i.e., combination of the preferred Stage 1 and Stage 2 routes).

The northern leg to Rangiora includes a connection via SH1 and Flaxton Road, and a station at Kaiapoi.

The southwestern leg connecting Rolleston utilises the SH1/Main South Road via Templeton, terminating at the southern end of Rolleston.

The preferred extension alignments to Waimakariri and Selwyn District were inconclusive in Stage 2. Hence, if this option is preferred then the route extensions would need further investigation prior to being finalised.

Key Assumptions:

- Headway of 5 minutes during morning and evening peak periods and 10 minutes at other times.
- The supporting bus network is that described in the PT Integration Paper, excluding the duplication of Route 1 & 5.
- There would be mode separation of LRT and Heavy Rail at interface points.
- The preferred mode technology could be procured with specifications that are suitable for operations in both urban and rural environments.
- The challenges with operating MRT through rural intersections could include a high-speed environment not suitable for traffic lights, and it is not common for MRT to operate through roundabouts in a rural context.
- LRT could negotiate 90-degree bends (particularly in Rolleston and Rangiora). This would need to be tested if this was a preferred way forward.
- Stop locations will not be placed (and hence, intensification will not occur) within the high-risk flood areas identified along Flaxton Road. In addition, MRT infrastructure could be designed to mitigate high risk flood areas.
- The SH1 & SH76 interchange would require new bridge structures.

12.2.3 Option 1 C - Arterial Street Running MRT (Christchurch only) + heavy rail to districts

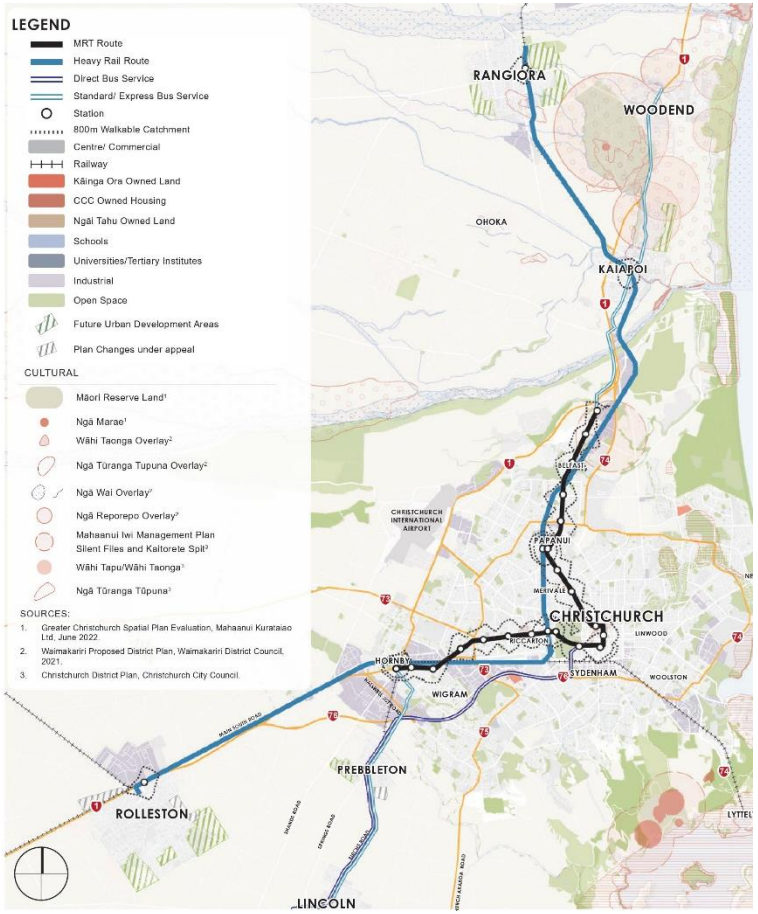


Figure 12-4: Option 1 C - Arterial Street Running MRT (Christchurch only) + heavy rail to district

Length: Approximately 22km + 58km heavy rail

Mode: BRT or LRT, plus heavy rail

Stations: 6 heavy rail stops and 21 MRT stops

Utilises the preferred Stage 1 arterial street running MRT for Christchurch City, extending between Hornby and Belfast.

Complementary heavy rail (approximately 58 km in length) is also proposed to provide a MRT connection to Kaiapoi and Rangiora.

Transit hubs would be required in Hornby, Deans Avenue and Papanui to connect the rail service and street running MRT.

Key Assumptions:

- Aims to capitalise on the existing rail infrastructure provisions. As a result, the complementary heavy rail line is assumed to remain single-tracked to the north but will require double tracking between Hornby and Rolleston and signalling upgrades north of Belfast.
- A 30-minute headway for the rail service was assumed for this option. This headway is limited by the single track on the Main North Line and limited passing loops at stations.
- A passenger service every 30 minutes would not trigger the need to grade separate level rail crossings.
- An existing railing siding along the corridor could be repurposed to house the six trains required and heavy maintenance activities could be undertaken by KiwiRail at existing facilities.
- The supporting bus network is that described in the PT Integration Paper.
- The heavy rail stops only include those at priority centres in the Greater Christchurch Spatial Plan, from Option 3.
- All MRT design assumptions are the same as Option 1a.

12.2.4 Option 2 - Motorway Street running (limited stops)

Note this option was refined since the interim report as detailed below:

- Runs down SH74 (Christchurch Northern Corridor) instead of Cranford and Main North Road (to differentiate from the arterial street running option and try to consistently align with the motorway).
- At Woodend the route extends to Ravenswood, based on more recent understanding of growth potential in this area.

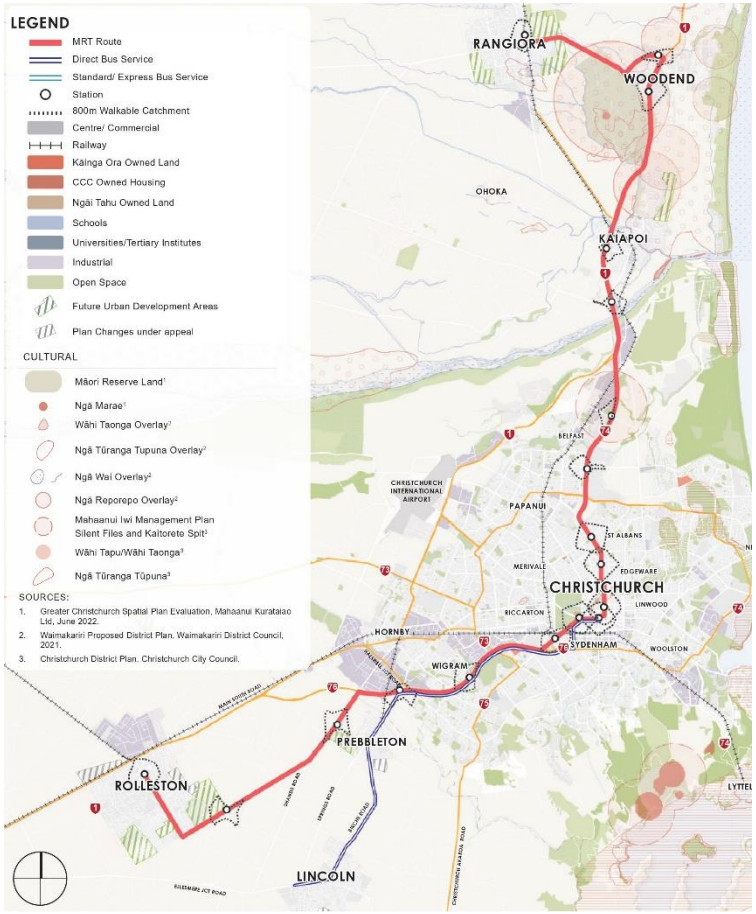


Figure 12-5: Option 2 - Motorway street running (limited stops)

Length: Approximately 60km

Mode: BRT

Stations: 18 stops

This reflects Scenario 2 from the interim report. It connects Rolleston with Rangiora via Christchurch Central City, generally utilising the motorway corridors with limited stops**.**

Key Assumptions:

- Headway of 5 minutes during morning and evening peak periods and 10 minutes at other times.
- Given the route traverses and adjoins Māori Reserve 873, any widening of the road corridor would fundamentally be opposed by Te Ngāi Tūāhuriri Rūnanga (refer to Mahaanui Kurataiao Report at Appendix B **– Mahaanui Kurataiao Ltd Report for Mass Rapid Transit Strategic Business Case** for further commentary).
- The supporting bus network is that described in the PT Futures Combined Business Case Medium Term Option.
- The infrastructure required is similar to the Auckland Northshore Busway (i.e., running parallel to the motorway rather than shoulder running). Within the urban centres the design philosophy is similar to Option 1a of this report.
- Consideration was made that this route interfaces with a Speed and Infrastructure Programme project in Waimakariri, which would not be incongruent with MRT.

12.2.5 Option 3 – Heavy Rail

Figure 12-6: Option 3 – Heavy Rail

Length: Approximately 60km

Mode: Heavy Rail

Stations: 13 stops

This is Scenario 1 from the interim report. It connects Rolleston with Rangiora via Christchurch Central City along the existing heavy rail route.

This option includes an additional rail connection to the Central City spur from the main line.

Key Assumptions:

- Track infrastructure upgrades would be required, forming a double-tracked alignment for the length of the route.
- A 10-minute headway (for all time periods) was assumed, to provide the serviceable frequency of a rapid transit service.
- A spur from the main line through to the City Centre would be required. The central city spur would be in a tunnel under Hagley Park and a tunnel or trench to the central city terminus station.
- A new bridge of the Waimakariri River is required.
- Signalling would need to be upgraded to allow for a train every 5 minutes to ensure freight trains can continue to operate with passenger services.
- A passenger service every 10 minutes would trigger the need for grade-separation at some level rail crossings.
- An existing railing siding along the corridor could be repurposed to house the six trains required and heavy maintenance activities could be undertaken by KiwiRail at existing facilities.
- It is assumed that track widening is achievable within KiwiRail's existing designation but may require some track slewing (moving the track from the centre of the designation to the edge).
- The stop pattern is the same as the Interim Report, except for the removal of a station at Chaneys due to the low boardings at this station in earlier reporting.

12.3 OPTIONS ASSESSMENT

12.3.1 Multi Criteria Analysis

MCA was undertaken across the five options, the results of which are outlined in Table 12-5 to Table 12-7. Below provides a further summary of the results against the investment objectives and technical and feasibility criteria. For further detail on the data behind the results, refer to Appendix N – Stage 3 Short List Route Assessment and Appendix P – KPI Assessment Report.

In regard to the Stage 3 route options, the Mahaanui Kurataiao (March 2023) report sets outs the position held by manawhenua including in relation to route alignments within Waimakariri District. Of critical concern is that the establishment of an MRT route via Kaiapoi and Woodend would require road widening of the existing road corridor where the route traverses or adjoins Māori Land i.e., the existing Woodend Rangiora Road. The taking of Māori land for the purposes of creating a wider road corridor is fundamentally opposed by manawhenua. The report notes that manawhenua have not given further consideration to a preferred option for MRT to Rolleston i.e., rail vs high frequency buses vs MRT and do not hold any position or opinions on the merits or otherwise of any particular option.

Note further detail regarding some key aspects feeding into the assessment are outlined in the following subsections:

- The urban design and land use integration opportunities/constraints that fed into this assessment are outlined in Section 12.3.2.
- Cost input, both capital and operating are detailed further in Section 12.3.3.
- Further specific detail regarding the value for money and constructability criteria that fed into this assessment is outlined in Section 12.3.4.

Investment Objective 1: Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051

Table 12-1: Stage 3 short list MCA scores - Investment Objective 1

KPI	Option				
	1a	1b	1c	2	3
KPI 1: Change in accessibility to and from the Central City ***KPI 2:*** Change in access to opportunities from prioritised locations ***KPI 3:*** Change in development potential	2	3	3	1	1

- Option 1b and 1c scored the highest. This reflects the high-quality public realm outcomes and area for potential comprehensive development sites proximal to the corridor. These options have the greatest opportunity to create more people-and-place focused streets within highly used corridors. These two options also capture high numbers of households and employment opportunities, as well as growth, relative to the other three options.
- Option 2 and 3 score the lowest. Both these options are considered to align with this investment objective, but they have notable drawbacks. For example, Option 2 is less aligned with urban areas and town centres given that it is a motorway focused alignment with limited opportunities for integration and connection with the wider communities. This option does not capture as many households or employments numbers and generates negligible additional household numbers able to access the central city. Option 3 (heavy rail) is similar, but integration opportunities also is constrained by the heavy rail stop locations.
- Option 1a was scored in the middle of these other four options. This is largely attributed to the lack of strategic policy alignment out to the districts (hence scoring lower than Options 1b and 1c). This is because it focuses around MRT implementation within Christchurch City, utilising existing bus enhancement networks to the districts.

One of the measures informing this assessment is the 800m household and employment values which as illustrated in the following figure shows the greatest opportunity is provided by Options 1b and 1c, followed by Option 1a and then Options 2 and 3.

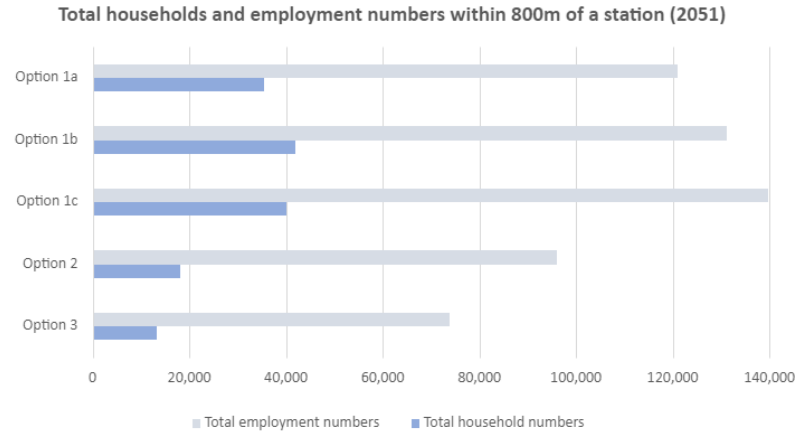


Figure 12-7: Household and Employment Measures

Investment Objective 2: Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051.

Table 12-2: Stage 3 short list MCA scores - Investment Objective 2

KPI	Option				
	1a	1b	1c	2	3
KPI 2: Change in access to opportunities from prioritised locations ***KPI 4:*** Shift in trips to public transport and active modes ***KPI 5:*** Change in journey times and reliability by public transport and private vehicles ***KPI 6:*** Ability to integrate efficiently and effectively with wider public transport	2	2	2	1	1

- Options 1a, 1b and 1c all scored the same. Across the assessment measures, there were negligible discernible impacts that offset one option from any other, so on balance the options were scored equally.
- Option 2 (along the motorway) and Option 3 (heavy rail) scored the lowest. This reflects the limitations on accessing opportunities from prioritised locations along these routes, in part due to the few numbers of stops and their more direct corridors. Also, for Option 3, within Christchurch City the journey times to/from prioritised locations are longer. For example, to/from the University of Canterbury, the required transit distance from the nearest station to the University is unfavourable.

One of the measures informing this assessment is household accessibility to Key Activity Centres (KACs). To measure this, the number of households that can access an additional KAC compared to the do-minimum within 30minutes using PT has been measured (e.g., in the base they can only access one KAC, but in the option they can now access two). The KACs are located across greater Christchurch and provide a range of employment, retail, and social opportunities. Hence this measure informs wider accessibility across Greater Christchurch. As illustrated in the following figure. Options 1a, 2a and 3a provide the greatest change to this measure compared to options 2 and 3.

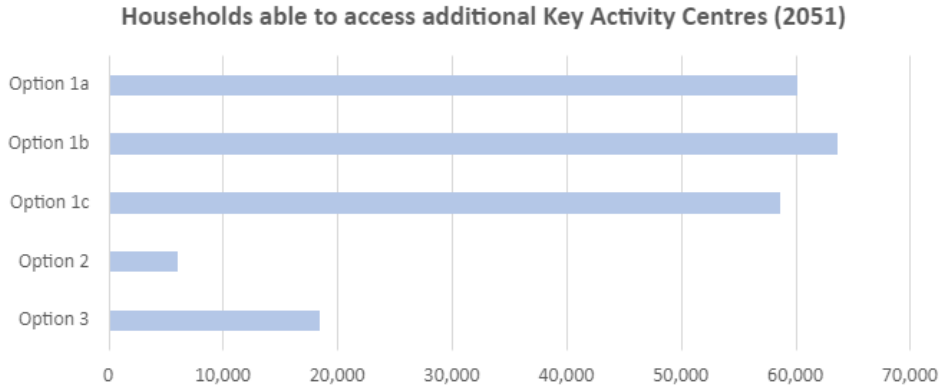


Figure 12-8: Accessibility to Key Activity Centres Measure

Daily ridership is a further measure that informs this assessment. As ilustrated below, Options 1b and 1c provide the best uptake of MRT, as a result of these options providing competative travel times, reaching the key growth areas and extending to the districts. Despite Options 2 and 3 also reaching the districts, they result in lower ridership as a result of the stations not aligning as well to the key growth areas. While Option 1a is less than 40% the length of Options 1b, it provides 60% the value of ridership.

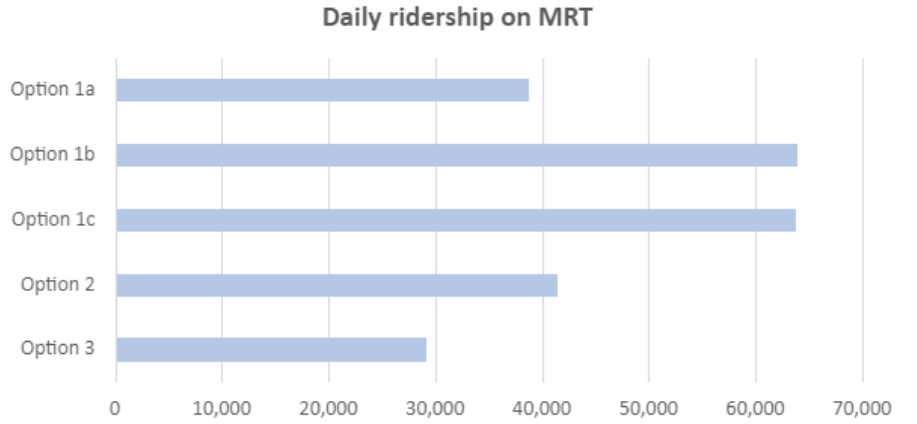


Figure 12-9: Daily Ridership on MRT from along the corridor to the city centre

Investment Objective 3: Reduce emissions from transport movements across Greater Christchurch by 2051.

Table 12-3: Stage 3 short list MCA scores - Investment Objective 3

KPI	Option				
	1a	1b	1c	2	3
KPI 7: Change in emissions from transport and improved environmental outcomes	1	3	3	2	2

- Option 1a scored the lowest. This reflects that the MRT portion of the route is only within Christchurch City, and that services to the districts are limited to enhancements of the existing bus network. Therefore, emission benefits are constrained due to a reduced extent of MRT network.
- Options 1b and 1c scored the same and were considered to have the highest emission reductions (greenhouse gas emissions, air quality and private VKT) than the remaining options, hence were scored the highest, in comparison to the other options.
- Option 2 and 3 both scored the same and were considered to be slightly more beneficial than Option 1. They have more emission reduction benefits across the three assessed measures, including greenhouse gases emissions, air quality, and private VKT changes.

One of the measures informing this assessment is greenhouse gas emissions. As illustrated in the following figure (noting the scale does not start at zero), while all options show a decrease in carbon emissions, Option 1a provides the less change from the 2051 base. As noted above this is a result of Option 1a being the shortest scheme in terms of length and it converts shorter trips to PT, compared to the other options that do reach the districts.

Note however, that embedded carbon has not been included in the assessment to date. Including embedded carbon would further support a short scheme in terms of infrastructure changes. Embedded carbon is a key component that needs to be considered in the DBC stage including the implications across modes.

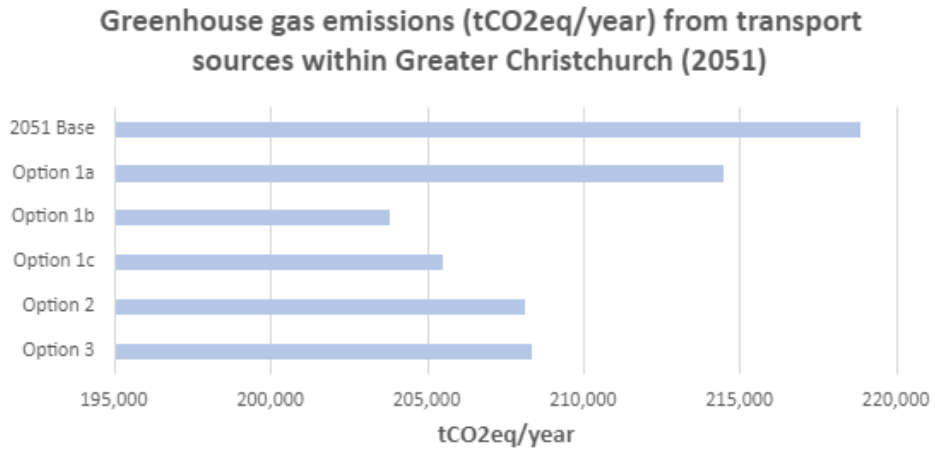


Figure 12-10: Greenhouse gas emissions (Total Carbon Equivalent)

Technical and feasibility criteria:

Table 12-4: Stage 3 short list MCA scores – technical and feasibility criteria

Description	Option				
	1a	1b	1c	2	3
Technical and feasibility criteria	-0.7	-1.7	-1.3	-1.4	-2.1

- Option 1a scored the highest against the technical and feasibility criteria. In particular, it performs strongly against cost and value for money, which reflects the fewer complexities of constraining MRT solely to the City Centre, as well as a lower investment being required.
- The remaining options scored notably worse. Of the remaining options, Option 1c scored the next highest. This has a positive BCR and also has fewer property requirements than the remaining three options, attributed to the fact that the district extensions utilise the existing heavy rail line and land acquisition requirements would be less. Option 2 did score similarly on balance across all the technical criteria, including having a similar BCR to Option 1c.
- Options 1b and 3 are the most unfavourable. This reflects the complexity of delivering these MRT options. All these options run MRT through the whole length of the corridor between Rolleston and Rangiora, which have big impacts on the operations of the wider transport network. Option 3 does score slightly worse because of the requirements of implementing a full

heavy rail route including additional operational and constructability challenges associated with the city spur extension.

Summary:

In summary, Option 2 (MRT street running limited stops along the motorway), and Option 3 (heavy rail) scored at the lower end of the range against achieving the investment objectives. Also, these options do not perform well against the technical and feasibility assessment criteria. This highlights the level of investment required and the challenges associated with implementing these two options.

Option 1b (Stage 1 MRT and Stage 2 preferred route) and Option 1c (Stage 1 MRT and heavy rail) scored the highest against achieving the three investment objectives, but still provide some challenges when considering the technical and feasibility criteria. These include:

- Option 1b has particular challenges around constructability and property requirements. This is due to the general expanse of this option and the complications of integrating MRT into an existing arterial network;
- Option 1c scores unfavourably in regard to cost and operational impacts, as a result of integrating a passenger rail service into an existing freight network.

Overall, the preferred option is Option 1a. It performs relatively well against the three investment objectives and significantly outweighs the remaining four options when factoring in the technical challenges with delivering MRT in Greater Christchurch. It has the highest BCR, attributed to the fact that this option focus on MRT within just Christchurch City and is therefore the lowest cost option.

Table 12-5: Investment Objectives of the Stage 3 Short List MCA Summary

PT Futures Mass Rapid Transit IBC MCA (Stage 3 Shortlist)				Do min	Shortlist Options				
					1a	1b	1c	2	3
Benefit	Investment Objective	KPI	Measure	Score	Score				
Greater public transport capacity along the transit corridor that can accommodate growth and support high density development around key nodes (33%)	1: Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051 (33%)	KPI 1: Change in accessibility to and from the Central City	Total households within 800 m of a station	0	2	3	3	1	1
			Total employment numbers within 800m of a station	0	2	3	3	2	1
			Households able to access the Christchurch Central City	0	1	1	1	0	2
			Change in PT Mode share to the central city	0	2	2	2	2	2
		KPI 2: Change in access to opportunities from prioritised locations	Change in households (2021- 2051)	0	3	3	3	1	1
			Change in the number of jobs (2021- 2051)	0	3	3	3	2	1
		KPI 3: Change in development potential	Enables high quality public realm outcomes (qualitative)	0	2	3	3	1	1
			Area for potential comprehensive development	0	2	3	3	1	1
			Contribution/alignment with strategic policy objectives	0	2	3	2	1	1
Investment Objective 1 (weighted scores)				0	2	3	3	1	1
Improved access to jobs, education and social opportunities (33%)	2: Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051 (33%)	KPI 2: Change in access to opportunities from prioritised locations	Number of households able to access additional KACs	0	2	2	2	1	1
			Number of households able to access 1000 additional employment opportunities	0	1	2	2	1	1
		KPI 4: Shift in trips to public transport and active modes	Proportion of trips made by PT along mass transit corridor(s)	0	2	2	1	1	1
			Change in single occupancy vehicle trips	0	2	2	2	1	1
		KPI 5: Change in journey times and reliability by PT and private vehicles	Journey time (perceived door to door) from prioritised Christchurch locations to Christchurch City	0	3	3	3	2	0
			Journey time (perceived door to door) from prioritised district locations to Christchurch City	0	1	3	1	3	2
		KPI 6: Ability to integrate efficiently and effectively with wider public transport	Daily ridership on the mass transit system	0	2	3	3	2	1
			Overall public transport mode share in Greater Christchurch	0	1	1	1	1	1
			Number of stops that integrate with PT routes	0	2	2	2	1	1
			Number of stops that integrate with major cycle ways	0	2	2	2	1	2
Investment Objective 2 (weighted scores)				0	2	2	2	1	1
Transition from single occupancy car use to lower-carbon transport options, reducing emissions (33%)	3: Reduce emissions from transport movements across Greater Christchurch by 2051 (33%)	KPI 7: Change in emissions from transport movements and improved environmental outcomes	Change in greenhouse gas emissions	0	1	3	3	2	2
			Change in air quality (PM10) and public health outcomes	0	1	3	3	2	2
			Change in private VKT per households	0	1	3	3	2	2
Investment Objective 3 (weighted scores)				0	1	3	3	2	2
Investment Objectives Sub-total (weighted)				0	1.7	2.7	2.7	1.3	1.3

Table 12-6: Technical/Feasibility Assessment of the Stage 3 MCA Summary

PT Futures Mass Rapid Transit IBC MCA (Stage 3 Shortlist)		Do minimum	Shortlist Options				
			1a	1b	1c	2	3
Technical/Feasibility Assessment		**Score**		**Score (weighted)**			
Costs	Costs of the option (Capex, Property and Opex)	0	-1	-3	-3	-2	-3
Constructability	Assessment of constructability / complexity of the option	0	-2	-3	-2	-3	-3
Operational Implications	Assessment of how well the option will integrate with the wider transport network	0	-2	-3	-3	-2	-3
Property Requirements	Scale and magnitude of the property impact along the corridor	0	-1	-2	-1	-2	-2
Value for Money	Consideration of the balance between costs and benefits, through cost–benefit analysis.	0	2	-1	1	1	-3
Consenting and Environmental Impacts	Assessment of the level of consenting complexity/difficulty and the likelihood of obtaining approvals for the proposal and qualitative assessment of key environmental risks	0	-3	-3	-3	-3	-3
Social and Community Impacts	Assessment of the impact on community access and cohesion including consideration of the number of sensitive receivers (schools / hospitals / day cares / etc.)	0	2	3	2	1	2
Technical/Feasibility Assessment Sub-Total (weighted scores)		**0**	**-0.7**	**-1.7**	**-1.3**	**-1.4**	**-2.1**

Table 12-7: Overall Scores of the Stage 3 Short List MCA Summary

PT Futures Mass Rapid Transit IBC MCA (Stage 3 Shortlist)	Do min	Shortlist Options				
		1a	1b	1c	2	3
Investment Objectives Sub-total (weighted scores)	0	1.7	2.7	2.7	1.3	1.3
Technical/Feasibility Assessment Sub-total (weighted scores)	0	-0.7	-1.7	-1.3	-1.4	-2.1
Overall score (weighted)	0	0.0	-0.4	-0.1	-0.6	-1.1

12.3.2 Urban Design and Land Use Integration assessment

The land use integration analysis of the Short List options is set out in the Urban Design and Land Use Integration Report at Appendix M – Urban Design and Land Use Integration Report with a summary of key findings set out below. As noted earlier, the same station location principles that were established for Stage 1 have been applied to the options. The motorway running stops are located in proximity to key destinations and in locations where there is opportunity for interchange facilities. However, achieving all of the Stage 1 principles is difficult given the motorway corridor is movement focused and has limited 'place' value. The Heavy Rail station locations identify opportunities for Transit-orientated development.

Street Running Option: The Arterial Street Running route will:

- Deliver a high amenity outcome in comparison to the other options given its 'Place' context and overall alignment with existing centres.
- Achieve a range of intensification benefits, as the corridor is aligned with travel demand and current policy direction of intensification around key centres, nodes, and townships within the districts.
- Have immediate benefits as the corridor will serve a large proportion of population, align with key employment locations and main centres from day one. Given current travel demand it will assist with reducing traffic congestion.
- Within the central city the Arterial Street Running option provides the greatest level of walkable catchment coverage with five stops, serving the greatest number of city centre jobs and residents. In addition, the majority of key destinations within the central city fall within the walkable catchment.

Motorway Running Option: The Motorway Running route will:

- Have limited 'Place' benefits given the extent of motorway running corridor. Currently the route results in severance between communities and therefore potentially provides a barrier to use.
- Have limited integration opportunities at stations given the motorway environment and lack of alignment with key centres and nodes. There is an opportunity at Addington to serve this city fringe neighbourhood, better integrate with Aidanfield/Wigram area and the Ngā Puna Wai Sports Hub and provide access to growth areas at the southern extent of the town.
- Include limited city shaping opportunities and is located in proximity to low density residential areas. It also has fewer stops within the central city (although this limited stop strategy could be adjusted).
- Traverses and adjoin Māori Reserve land with significant concerns identified by manawhenua (see MKT Report March 2023). Any taking of Māori land for the purposes of creating a wider road corridor is fundamentally opposed by manawhenua.

Heavy Rail Option: The Heavy Rail route will:

- Include fewer stops limiting population access and demand opportunities with only one stop via a rail spur in the central city limited accessibility to key central city destinations. It will also include limited city shaping opportunities.
- Provide the greatest opportunities at Papanui and Hornby given the proximity of the existing stations to the existing commercial centres. Master planning/neighbourhood planning would be required to achieve integration between the station and centre. There is also an opportunity to extend via a spur into the Rolleston town centre.
- Provide some opportunities for Transit-orientated, brownfield development given alignment with existing industrial land use adjoining the corridor, including at Middleton.
- Result in a Riccarton station located away from the existing town centre (i.e., Deans Avenue) with a risk that this pulls development/ intensification away from the existing centre.

Summary: The Street Running option will result in the greatest land use integration benefits given the following:

- It will align with travel demand, where intensification is currently occurring, is most aligned with current policy direction and broader connectivity with the wider PT network. It also aligns with the greatest number of key centres and destinations, linking people with where they want to go.
- It will deliver a high amenity outcome in comparison to the other options given its 'Place' context. It will also assist with reducing traffic congestion, as the corridor is aligned with current travel demand.

Although the Heavy Rail and Motorway running options could provide for greater Transit-orientated development opportunities (Brownfield development), the benefits of increased densities in these locations will take time to be realised.

12.3.3 Cost Assessment

A high-level cost estimate for delivery and operating phases has been prepared for each option, at comparable levels of detail. A flat rate was applied for Management Contingencies and Funding Risk Contingencies to ensure that options presenting more risk would not be penalised in several criteria. The costs relative to each option (including both LRT and BRT mode for Option 1a) are outlined in the following tables and supporting figures for the delivery and operating phase, respectively.

Table 12-8: Delivery Phase Expenditure (CAPEX) for each option

Elements of Capital Costs	$m, real terms, 2023 qtr1					
	Option 1a LRT	Option 1a BRT	Option 1b	Option 1c	Option 2	Option 3
Property Costs	119.025	119.025	314.025	119.025	314.025	314.025
Managed costs and Consultancy fees	257.79	186.14	542.35	304.49	265.35	467.45
Physical Works	1690.41	1220.56	3373.57	1996.59	1565.99	3065.23
Rolling Stock	182.80	87.00	365.60	404.80	174.00	666.00
Contingency	733.68	544.01	1437.33	906.14	695.81	1353.81
Funding Risk Contingency	829.26	608.49	1650.19	1030.47	811.78	1579.45
Total	3812.97	2765.23	7683.07	4761.51	3826.95	7445.96

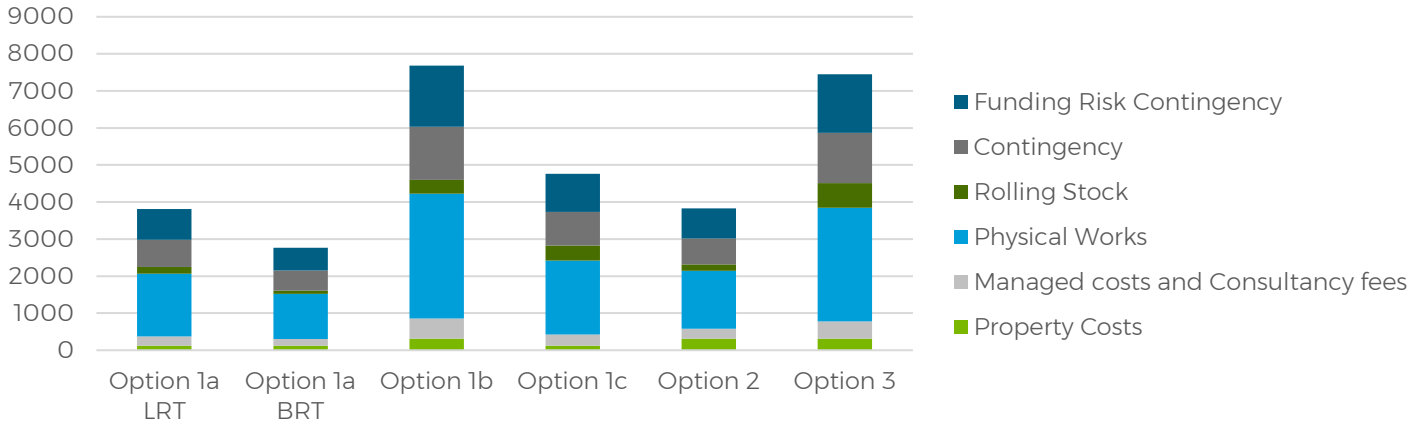


Figure 12-11: Delivery Phase Expenditure (CAPEX) for each option

Table 12-9: Operating Phase Expenditure (OPEX) for each option

Elements of Operating Costs	$m, real terms, 2023 qtr1					
	Option 1a LRT	Option 1a BRT	Option 1b	Option 1c	Option 2	Option 3
Operating Costs	9156.52	9208.35	11438.36	9908.44	11788.39	11067.76
Maintenance Costs	969.84	1093.51	2531.29	1750.57	2974.35	2342.17
Renewal Costs	1639.11	1185.18	3272.60	2249.36	1526.84	3494.43
Contingency	1846.55	1818.70	1839.82	1506.44	1744.56	1806.04
Funding Risk Contingency	676.42	634.66	1614.64	1114.55	1471.74	1563.95
Total (60 year)	14288.44	13940.41	20696.71	16529.35	19505.88	20274.35

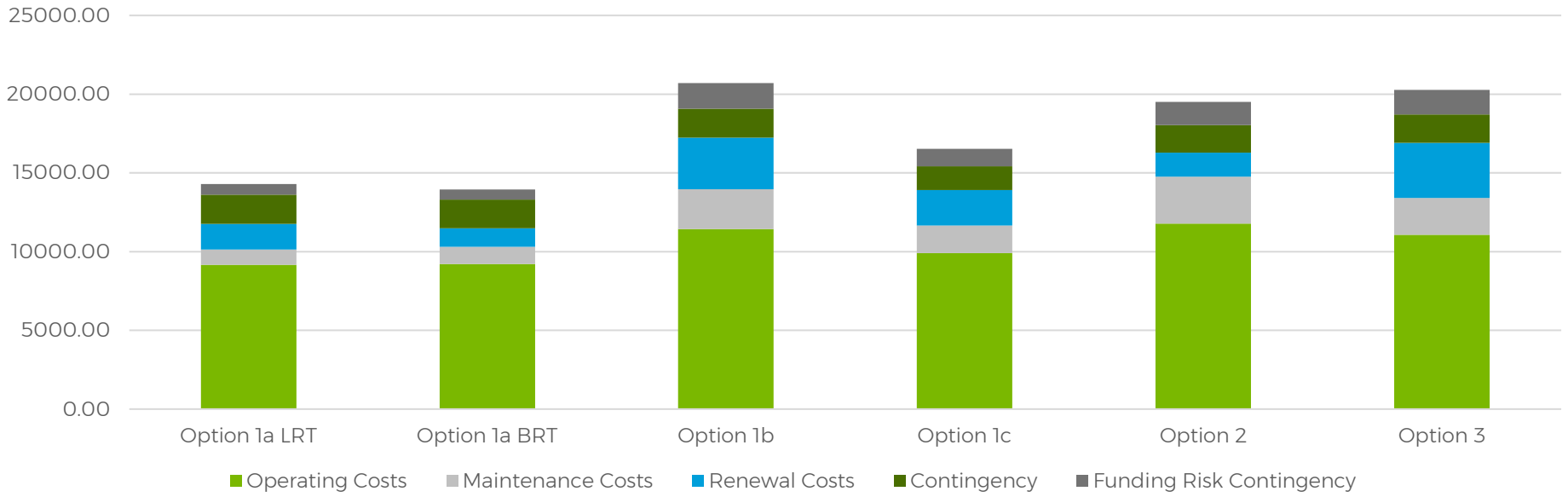


Figure 12-12: Operating Phase Expenditure (OPEX) for each option

12.3.4 Value for Money and Constructability

The value for money assessment and constructability/operational criteria were two key influencing components of the MCA assessment. The following table outlines further the assessment undertaken in regard to these two components. Further details can be found in Appendix Q – Economic Evaluation, Appendix S – Engineering Design Paper, and Appendix Y – Mass Rapid Transit Rail Options..

Table 12-10: Value for Money and Constructability Assessment

Option	Option 1a		Option 1b	Option 1c	Option 2	Option 3
Mode	LRT	BRT	LRT	LRT + Heavy Rail	BRT	Heavy Rail
BCR	1.15	1.44	0.8	1.07	1.16	0.54
Cost (PV) CAPEX+OPEX	$5,924B	$6,531B	$10,621B	$7,807B	$8,156B	$10,280B
Constructability	This option is limited to 22km of treatment, mostly within existing road corridors, albeit narrow. Its constructability is within the low range of large public transport infrastructure.		This option presents a longer route (three times that of Option 1a), including passing by significant numbers of sensitive receivers, river crossings, flood areas, and bridging.	This option has the added complexity of the interfaces between two modes. Its constructability is exposed to risks related to the current condition of the existing freight network, the number of sensitive receivers and increase in services along the rail corridor.	Option 2 includes technical challenges linked to the proximity of the motorway on a long route (60km+) including flooding plains (for example, the Cranford Basin). It scales up technical pavement requirements related to electric BRT vehicles.	This option requires significant complex design and possible construction of underground rail. The spur to the city centre in itself will impact major and critical facilities and spaces (including Hagley Park and the Hospital Precinct), which will all be disrupted and pose construction constraints. Double tracking and increased service frequencies will also be required.

12.4 OPTIONS ASSESSMENT SENSITIVITY TESTING

Following the MCA, a sensitivity test was undertaken on the five options, to determine how the scoring of the options is impacted by adjusting the weightings. Throughout the MCA process, the ILM assumed equal weightings across the investment objectives. An equal weighting was also applied to the technical and feasibility criteria. This gave an equal split of all the criteria assessed.

Four alternative weighted sensitivity scenarios were explored:

- **Sensitivity test 1:** Investment objectives focus.

  Applied a 60% weighting across the three investment objectives. This reflects the situation where the focus is on alignment with the investment objectives, with less focus placed on the technical and feasibility challenges around delivering the preferred option.

- **Sensitivity test 2** Network and operational implications focus:

  Applied a 60% weighting across the network and operational technical criteria: constructability, operational implications, and property requirements. This reflects the situation where the focus is placed on the wider network and considers the resulting impacts on the network and transport operations;

- **Sensitivity test 3** Broader outcomes and environmental focus:

  Applied a 60% weighting across consentability/environmental impacts, and social/community impacts. This reflects the situation where the focus is on broader benefits for the community and environmental considerations;

- **Sensitivity test 4** Economics focus:

  Applied a 60% weighting across costs and value for money. This reflects the situation where the focus is on the economic viability, and the benefit-cost analysis of the options.

A summary of the scores for each option following the sensitivity testing, is presented in the following table.

Table 12-11: Summary of the sensitivity weighted test scores

Sensitivity test	Applied weighting	Do-minimum	Option 1a	Option 1b	Option 1c	Option 2	Option 3
Base case	Equal weightings	0	0.0	-0.4	-0.1	-0.6	-1.1
Sensitivity test 1	Investment objectives: 60%	0	0.7	0.9	1.1	0.2	-0.1
Sensitivity test 2	Network and operational implications: 60%	0	-0.7	-1.4	-0.9	-1.3	-1.8
Sensitivity test 3	Broader outcomes and environmental impacts: 60%	0	-0.3	-0.2	-0.3	-0.8	-0.8
Sensitivity test 4	Economics: 60%	0	0.3	-1.2	-0.6	-0.6	-2.1

High

Low

Option 1a remains the preferred option for the majority of the sensitivity tests, with the exception of sensitivity test 1 (weighted towards the investment objectives), where it performs third best. This reflects that this option is primarily focused on MRT within the City Centre and does not fully capitalise on all benefits around extending MRT to the districts.

Option 3 remains the least preferred option regardless of the weighting applied to the criteria. This reflects the complexity and magnitude of the changes inherent within this heavy rail option. While there are several benefits, these come at a cost across a range of criteria and are not comparable with the offerings of the other options.

Option 2 is not preferred across any of the five sensitivity tests. This reflects that, similar to Option 3, while there are several benefits of implementing street running MRT throughout Greater Christchurch, there are technical challenges with implementing this option and at a moderate cost.

Option 1b and Option 1c perform well when the investment objectives are heavily weighted. This is because these options reach larger areas of intensification opportunity. However, when the operational and economic factors are considered for these options, the scores of these options drop. This reflects the challenges of integrating MRT and heavy rail with the wider transport (including rail) network, which also comes at a higher cost.

In summary, the sensitivity tests reinforce that Option 1a is the preferred way forward, given the robustness of this option across alternative weighting scenarios.

PREFERRED OPTION

13 PREFERRED OPTION ASSESSMENT

13.1 PREFERRED OPTION SUMMARY

Option 1A is the preferred MRT option, as summarised in Figure 13-1.

The route is approximately 22km in length, connecting Hornby to Belfast via the city centre. It includes 21 stop locations and could be developed as a BRT or LRT mode.

Direct bus services proposed under PT Futures Combined Business Case are utilised to connect to Waimakariri and Selwyn Districts. Opportunities to enhance these services alongside Park and Ride provisions are outlined further in Section 13.2.7.

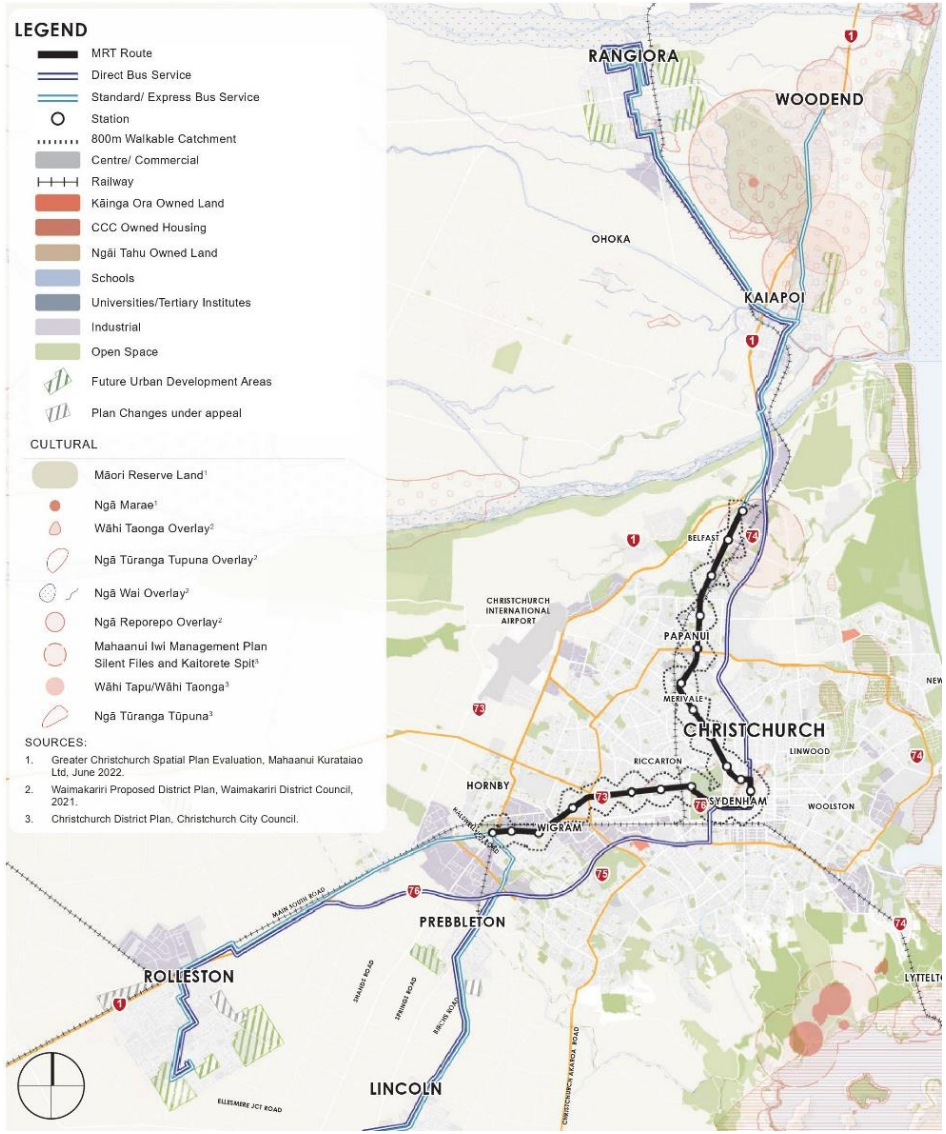


Figure 13-1: Preferred Option

13.2 PREFERRED OPTION DESCRIPTION

13.2.1 Route Description

The overall preferred route and context is presented in Figure 13-2.

North Corridor: The route follows Papanui Road and Main North Road, supporting the urban centres of Merivale, Papanui, Northwood, and Belfast along this corridor. There is an opportunity for a high place value corridor with the Christchurch Northern Corridor being the vehicle and freight priority corridor. The corridor:

- Aligns well with key activity centres and town centres.
- Includes a number of significant schools in the walk-up catchment.
- Includes opportunities for transit malls at key centres.
- Includes opportunity for intensification along the route.
- Aligns with pockets of Kainga Ora ownership with the potential to unlock development opportunities.
- Could utilise the existing overbridge structure to cross the railway line.

City Centre: The route follows Victoria, Kilmore, Manchester, and Tuam Streets along with Riccarton Avenue through Hagley Park. The corridor: • Provides good accessibility to all key city centre destinations, including the Canterbury Multi-use Arena, Ara Campus, East Frame residential area and future mixed-use developments to the east and south. The corridor:

- Uses Manchester Street, which leaves Colombo Street to become the spine of a pedestrianised core.
- Aligns with Manchester Street which is an exciting public transport.
- corridor with PT as an identified function for this corridor.
- Provides transfer legibility at both the Manchester and Hospital 'Super Stops' and the Bus Exchange.
- Will enable PT only opportunities to exist along Manchester and Tuam Streets.

Southwest Corridor: The route follows Riccarton Road and Main South Road to Hornby. The corridor:

- Aligns with Riccarton and Hornby emerging metropolitan centres as well as Church Corner Town Centre.
- Takes the shortest length in connecting Hornby and Riccarton.
- Provides an opportunity for a transit mall at Riccarton.
- Enables multi-modal transfer connection to the airport.
- Includes a high portion of residential catchment within corridor.
- Aligns with several Kainga Ora ownership parcels with the potential to unlock development potential.
- Is already has high bus patronage along corridor (strong existing market).

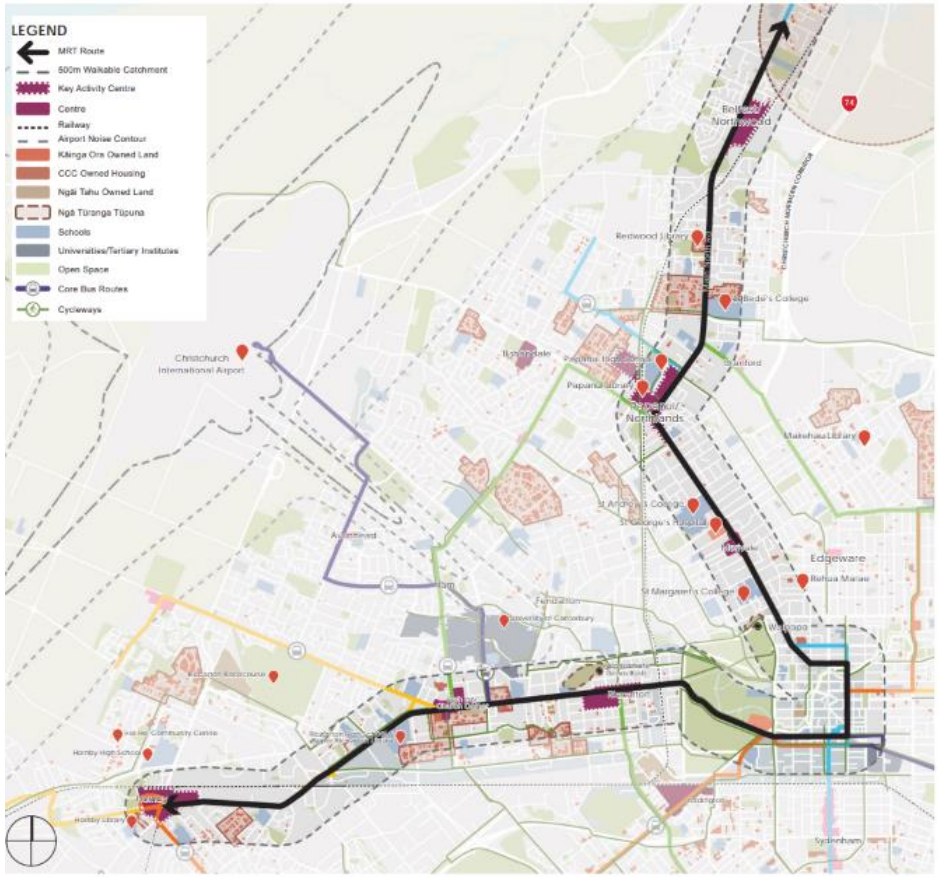


Figure 13-2: Preferred Option route Description

13.2.2 Station Location and Hierarchy

Station Hierarchy

Locating stations and stops at key town centres along the corridor will provide an opportunity to strengthen their role and function as primary destinations within the City and Sub-region.

The station hierarchies will align with the existing future role and function of key centres and areas of intensification identified by the Christchurch City Council through proposed Plan Change 14. They will also support the development of a legible urban form as the city continues to grow.

Introduction of MRT will enable a longer-term focus for the centres with a shift towards growth in the scale of the centres in line with the NPS UD objectives.

There will also be a greater focus on a mix of land use activities, with opportunities to develop currently retail orientated areas as a hub for a range of community, business, and retail activities. Along with growth and regeneration opportunities at key centres, there is the opportunity to integrate residential in the form of multi-storey townhouses and apartments of different scales.

Intensification both along the corridor and at key station/stop locations will be necessary to supporting mode shift and also help leverage the benefits of high frequency public transport. It will provide the opportunity to unlock development potential and promote exemplar developments and change in typologies to support mixed use developments. This could include transit-orientated development (TOD) projects.

Figure 13-3: Urban Built Form – Scale of Centres

Station Locations

The station and land use integration response aims to support a legible hierarchy of urban centres with different land use responses around MRT depending on the urban environment and context. These are described further as follows and presented in Figure 13-4.

CITY CENTRE STATIONS (Victoria Street, Town Hall, Manchester Street*, Bus Interchange, Hospital) - These stations have the highest demand as they interchange with the Bus Exchange/ PT network. These stations serve the highest density urban neighbourhoods and act as a gateway to the amenities within the city. The design of these stations should be reflective of the quality of existing public realm.

- Reduction in medium density typologies being built within the city centre (Four Avenues) superseded by high density typologies of 10+ storeys.
- Improved public realm amenity to support a well-functioning urban environment.

TOWN CENTRE STATIONS (Papanui, Riccarton, Hornby) - These stations serve the high-density neighbourhoods and intersect existing frequent bus routes and cycle corridors. Town centres are nodes for employment, education, and amenity, MRT stations in these locations unlock the potential for intensification.

- Reduction in medium density typologies being built superseded by quality high density typologies of at least 6 storeys with a wider medium density catchment.
- Opportunity for an increase of community urban amenity, mixed-use developments adding to Town Centre character.

CENTRE OR INTERCHANGE STATION (Northwood, Merivale*, Hagley Park, Church) - These stations serve a more compact high-density neighbourhood, intersect existing frequent or local bus routes and cycle corridors. Centres provide local amenity, nodes for employment, education, and amenity. MRT stations in these locations unlock the potential for intensification.

- Mixed-use typologies, with ground floors comprising of commercial, office and retail with residential above, supporting all day MRT ride ship within the immediate walkable catchment.
- Reduction in medium density terraced typologies being built superseded by quality low rise apartment typologies up to 6 storeys with a wider medium density catchment.
- Opportunity to achieve local urban amenity and for transport integration with active mode feeders for first/last mile links and other local connections.
- Opportunity for the Deans Ave stop to be shifted to align with interregional rail in the future.

NEIGHBOURHOOD STATIONS (Corner Dickeys Road, Belfast, Prestons Road, Northcote Road, Tomes Road, Clyde Road, Upper Riccarton, Springs Road, Neill Street) - These stations should be aligned with neighbourhood amenities and services such as local shops, medical centres, parks, and schools.

- Primarily residential development with opportunities for high-medium densities at areas of high demand, such as Clyde Road which serves the University.
- Transition to lower densities at the edge of the catchment.

Figure 13-4: Locations and Hierarchy of the 21 stops in the preferred option

Detailed Station Analysis

More detailed station analysis both in terms of location and first and last mile changes will be considered at the DBC stage. There are two station environments that will need particular resolution, being the Bus Interchange within the central city and Hornby. The key issues associated with these locations is set out in more detail below.

Bus Interchange Station:

The station stop location associated with Christchurch central city bus interchange, presents a number of integration challenges. The streets adjoining the Bus Exchange are constrained by the width of the corridor, impacts on the wider PT Network access to the Bus Exchange, impact on active modes and location of existing buildings which create pinch points.

- Optimising this stop location will require consideration of:
- How to achieve a space in the street which is dedicated to public transport, people on foot and public space.
- Restricting private vehicle access and/or highly controlled to enable pedestrian priority and public realm spaces.
- How to achieve a high quality, user focused interchange environment.

Stop location opportunities have been explored at a high level as outlined in Figure 13-5. However, further work beyond this IBC will be required to confirm the details of the route and stops at this location.

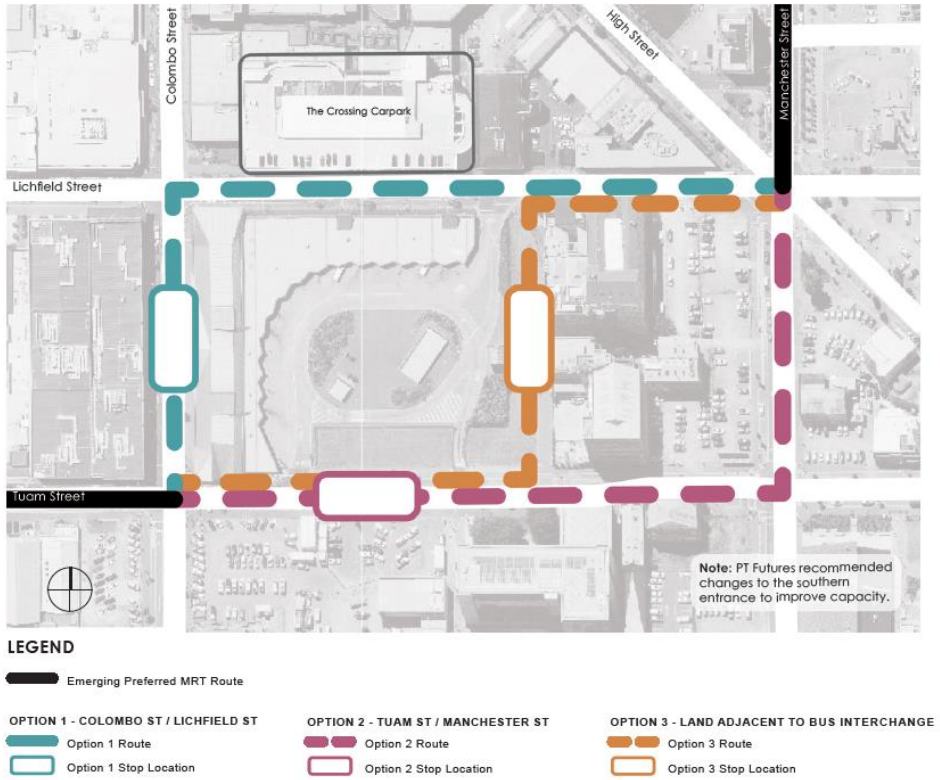


Figure 13-5: Station and route options at the Bus Interchange

Hornby Station

Hornby Town Centre and associated station stop also presents a range of challenges when considering how MRT would align with the centre. MRT has the potential to be a catalyst within the Town Centre, but further investigations will be necessary beyond this IBC to set the scene for MRT.

The key challenges include:

- The centre is dominated by movement (cars, trucks, and trains).
- Both SH1 and the railway lines result in severance of the Town Centre. Future MRT would require grade separation with the existing rail corridors.
- The Centre includes industrial areas that require freight access.
- These factors inhibit 'place' outcomes to support MRT and land use integration.

To maximise MRT opportunities within the Town Centre, changes to the movement hierarchy within the area will be required. These include potential changes to the ONF classification for the Main South Road. It is recommended that a master planning exercise is undertaken for Hornby to establish a future vision and address the broad range of changes facing the centre. The completion of this framework would be necessary prior to MRT extending to Hornby.

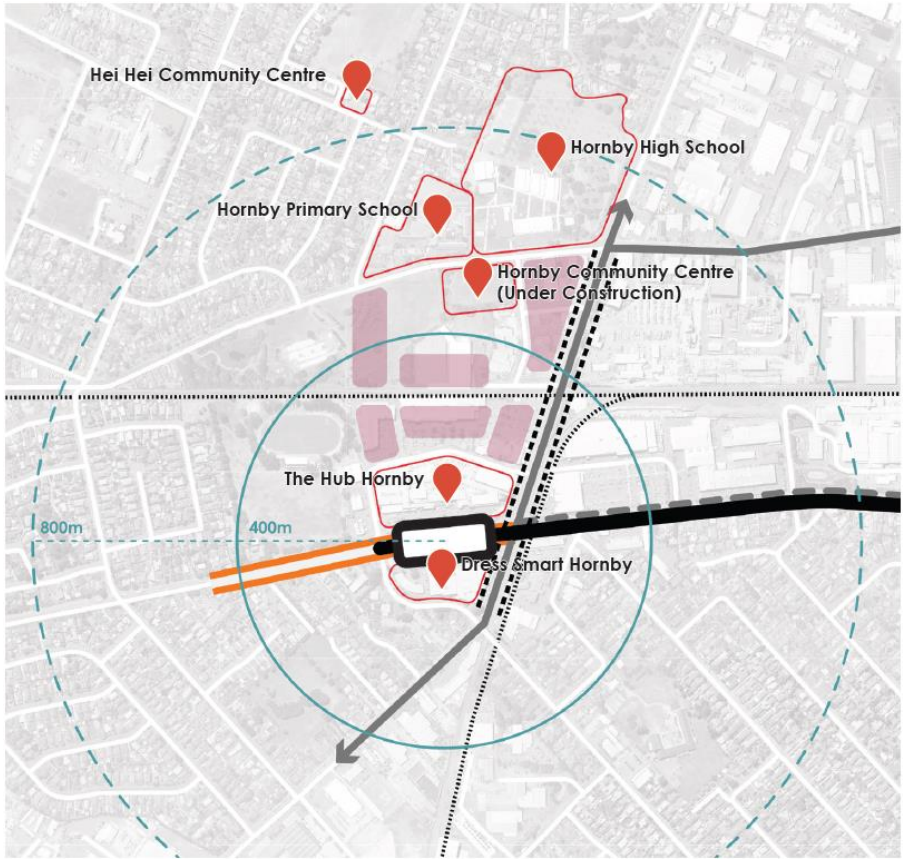


Figure 13-6: Main South Road Stop Alignment

13.2.3 Mode

Light Rail and Bi-articulated Bus are the preferred mode technology for the preferred street running option. The following table outlines the trade-offs that need to be considered in stages beyond this IBC to inform the final mode selection.

Table 13-1 Light Rail and Bi-articulated Bus trade-offs

Trade-off	Light Rail	Bi-articulated Bus
Capacity	A light rail would require a vehicle every 6-5 minutes to meet demand. The demand analysis shows that by 2051 the demand has reach 46% of the maximum capacity. However, light rail units can be coupled together to double the capacity of the vehicle. Light rail technology has to ability to support the corridor well into the future. However, it is uncertain if the headroom is required.	The 2051 forecasts estimate a bi-articulated bus would be required every 4 – 5 minutes to meet demand. The analysis shows that by 2051 the demand has reached 54% of the maximum capacity, assuming that anything more than 3 minutes would be unreliable.
Resilience And Development	Rail infrastructure is seen as permanent; hence this gives investors higher confidence in investing along the corridor due to high cost to relocate or revoke this infrastructure. This is seen in the literature review in this report, with Light Rail seeing an average 15% land value uplift in our case study review. However, the fixed route results in lower resilience as that track can be damaged in a natural disaster and needs to be repair before operations can resume.	Bi-articulated bus infrastructure, while a high investment, can be seen as flexible due to the rubber tyres allowing this technology to operate on other roads. This gives investors lower confidence as the technology can be redirected to other corridors with ease. The case study review highlights that BRT sees an average 8% land value uplift. Yet, the flexible of the technology allows for the service to be resilient to natural disasters and other events that may disrupt movement on the preferred corridor.
Value for Money	This IBC will undertake a value for money analysis to understand the benefits justifies the varying costs for these two modes. However, the DBC should focus on the two technologies ability to dictate the desired land use and in turn different benefit profiles. The two options will also have varying operational costs through time as demand grows and the technologies begin to vary. For this IBC the desired headway has been assumed at 5 minutes, which means the same number of vehicles is required at this time. However, Light Rail will have operation cost savings as demand grows. Further analysis is required to understand if the long-term lower operation cost or high benefits justifies the higher capital expenditure.	
Risks and Complexity	Depot: The distance of the depot to the route needs to be minimised to avoid additional infrastructure being laid. The depot is highly specialised (tracks) and estimated to require a land area of 27,700 m2. Depot requirements complicate phasing opportunities as securing adequate land closer to the city centre may prove complicated. Light Rail is also highly likely to require the grade separation from the current heavy rail corridor at the Riccarton Road level crossing.	Depot: The distance of the depot to the route will impact on the dead-running of a service and the operational cost but will not trigger the need to additional track infrastructure for the fleet to access the depot. The depot, requiring fewer specific structures and equipment, is estimated to require a land area of only 9,600 m2 as the flexibility of a BRT fleet to be parked on non-specific stabling facilities means that existing depots and parking can be used. There is an opportunity for technology to use the existing depot sites around Greater Christchurch.

13.2.4 Cross Sections

The preferred route corridor is further illustrated by way of cross sections and in context to the One Network Framework (ONF), for each section of the proposed MRT corridor.

The One Network Framework (ONF) is a useful tool that recognises the Movement and Place functions, as well as the surrounding context of the street. Christchurch City Council provided draft ONF information and the Centres Hierarchy approach which helped inform the corridor classification. The One Network Family categories have been applied to the preferred MRT corridor based on adjacent land use and the movement function of the corridor.

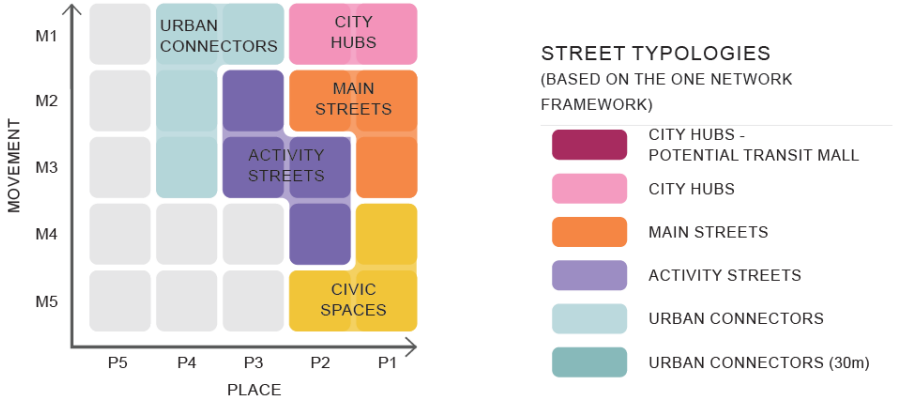


Figure 13-7: One Network Framework Street Typologies

In terms of cross sections, the preferred route corridor ranges in width. Dedicated space for MRT has been proposed along the length of the corridor to meet the project Investment Objectives. However, many of the existing streets are 20m in width, making it challenging to provide dedicated space for each user within the existing road reserve.

In some instances, the corridor will need to be widened, albeit wholesale road widening is not assumed. Given the city shaping nature of the project consideration is being given to targeted strategic land purchase along the 20m corridors in particular in supporting the intensification anticipated and in achieving a quality public realm outcome. Opportunities for localised and 'place based' amenity enhancements will be investigated further at the next stage of the business case.

In some instances, the introduction of 'Transit Malls' is being considered at key centres. Transit malls prioritise people, street-trading retail and hospitality, active modes, high quality public space and green infrastructure by removing private vehicle travel. This type of street environment is expected to catalyse well-designed mixed-use typologies and play an important civic space function for the community. The alternative is potentially compromising on the dedicated priority of people, the public realm or MRT. If a wider corridor is the preference consideration may be given to purchasing land (although the assumption of the Business Case is to investigate MRT within the existing corridor). In some instances, grade separation could be an option. 'Transit Malls' are discussed in more detail later in this Report.

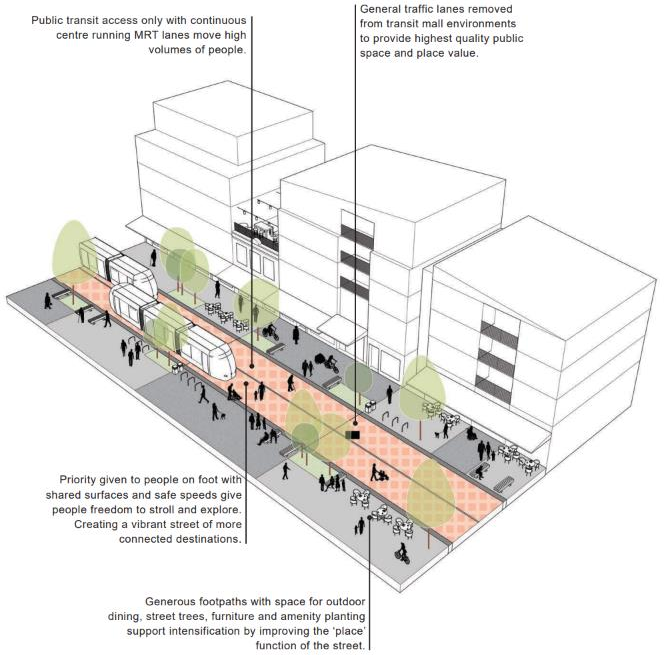


Figure 13-8: Transit Mall Concept

The cross sections indicate the proposed spatial allocation of road space within the existing corridor dimensions. Some street categories have the same spatial allocation given constrained widths. The street design will be explored, collaboratively with partners and key stakeholders in subsequent stages of this IBC to optimise space allocation between users and achieve higher place value. This will include consideration of strategic land purchase to support quality outcomes.

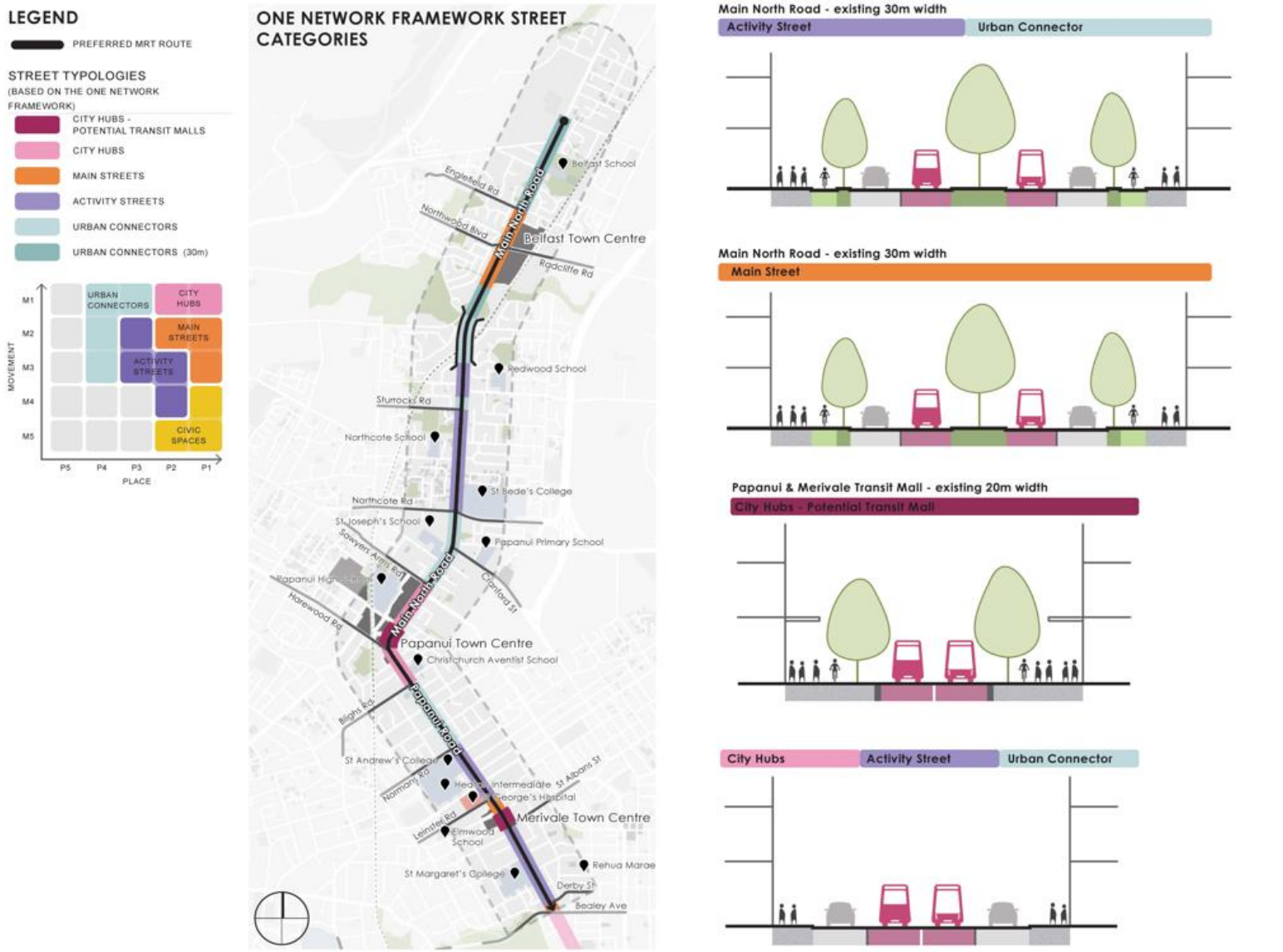


Figure 13-9: One Network Framework analysis for the northern corridor

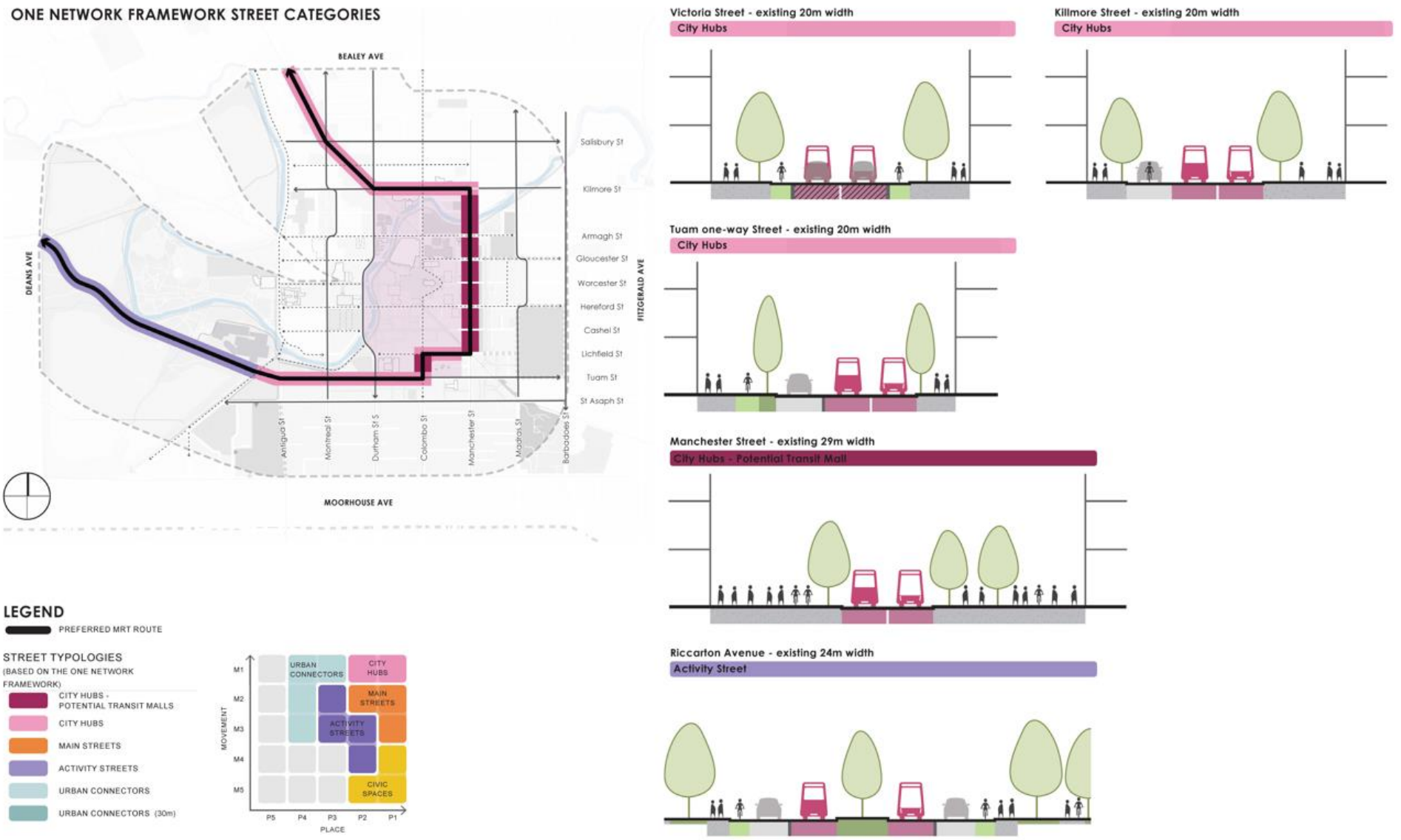


Figure 13-10: One Network Framework analysis for the central city corridor

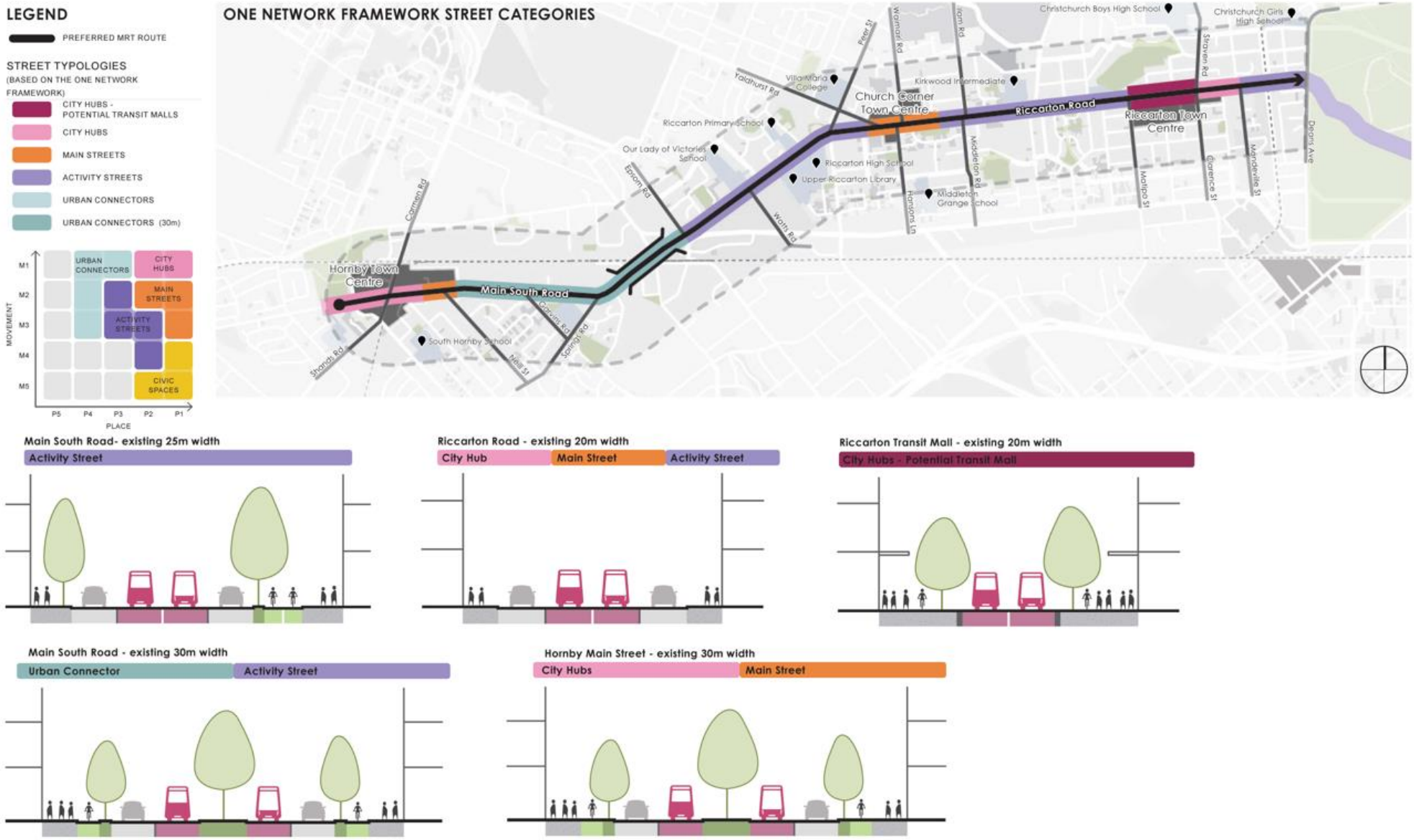


Figure 13-11: One Network Framework for the southwest corridor

13.2.5 Public Transport and Cycle Network Integration

PT Network Integration

The alignment of stations and stops will facilitate integration with the wider public transport network.

For the purposes of assessing the preferred option, various PT network integration assumptions were made. More information can be found in the Appendix L – Public Transport Network Integration, but at a high level the PT route adjustment philosophy includes:

- All routes except the Orbiter are to be removed from the MRT corridor.
- Key interchange locations with the rest of the public transport network are likely at the following:
  - Central Bus Exchange
  - Riccarton
  - Hornby
  - Papanui
  - Belfast (Waimakariri Services)

Note however, that while these assumptions were reasonable to inform the assessment further investigation and engagement with stakeholders, particularly ECan will be required to ensure optimisation of MRT with the PT network.

Cycle Network Integration

Supporting facilities at stations and stops including transfer opportunities and cycle storage will encourage seamless connections helping improve accessibility for the wider community.

The preferred option will also need to be integrated with the wider cycle network. The MRT route does not conflict with the Major Cycleway Network, (shown by the green hashed line) but there are some crossing points where infrastructure conflicts and priorities will need to be managed. Note there is also a wider network of cycle provision beyond the Major Cycleway Network.

As presented in the Section 13.2.4, there are cross section constraints along narrow sections of the corridor. A key consideration moving into stages beyond this IBC will be how people on bikes are catered for through the corridor, considering the wider mode priority and network functions.

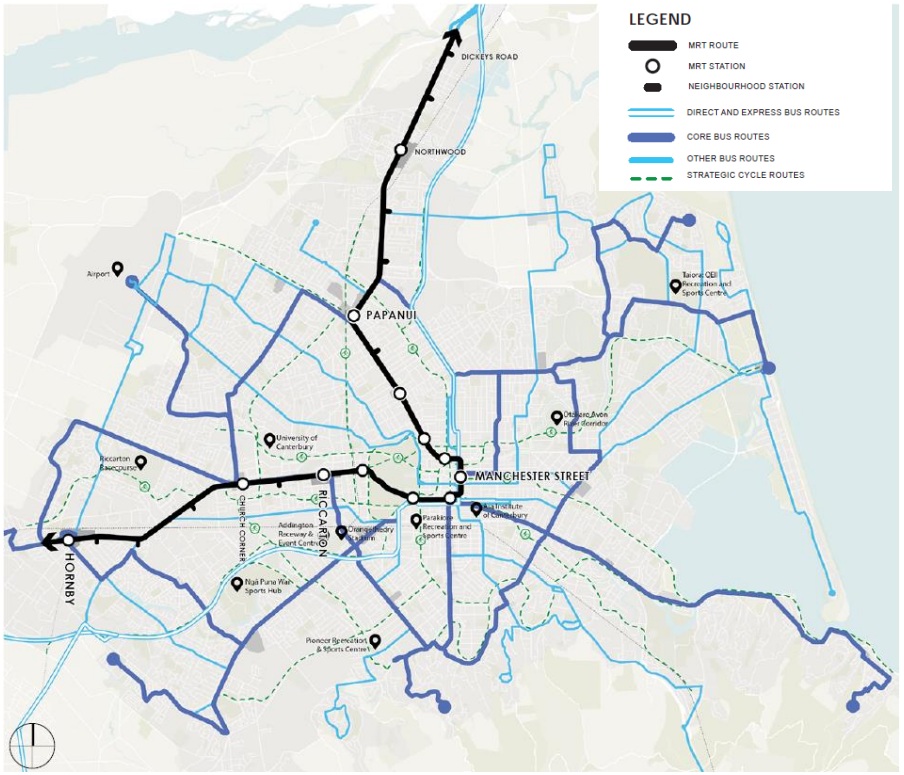


Figure 13-12: Integration with the PT and Cycle Network

13.2.6 Urban Outcomes

The land use scenario proposed for the preferred option seeks to establish a realistic growth scenario in alignment with GCSP and in response to MRT.

As such, Scenario 3 adopts a 'relative' growth approach at key station. It applies a staged approach to growth that seeks to 'move the dial' towards a desired urban form and densities to support MRT. It is important to reiterate this is just a scenario and also that the densities outlined are still well below the ideal levels that are recommended around stations/stop. Intensification around MRT is a priority. Greater densities in the right locations and well-integrated with the transport network helps to support MRT patronage and active mode travel along with wider health and sustainability benefits as part of a well-functioning urban environment.

Scenario 3 comprises:

- Priority growth areas and targeted intensification around key centres along the route. These centres also enable opportunities to link other key 'activity generators' and the wider PT network.
- The GCSP 'Compact' land use, which increases population and employment within Christchurch City (with corresponding reduction within Selwyn and Waimakariri Districts), with further modification made to allocate more of the Christchurch City growth to the MRT corridor. This shift in growth initially through targeted intensification reflects the opportunity to align MRT with corridors that comprise a range of key destinations, the greatest densities and the greatest travel demands.
- A focus on jobs and households into key centres including the central city in reinforcing their role and functions and the overall urban form of the city.
- A shift in focus away from the Neighbourhood Stations in the short term in order to support the Centres hierarchy.

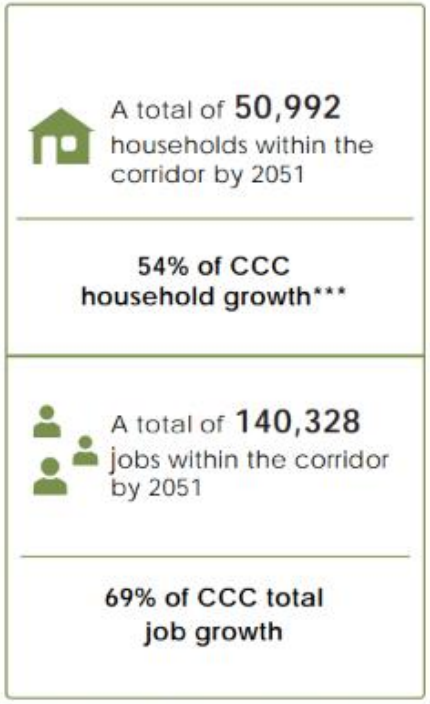


Figure 13-13: Land use Scenario 3

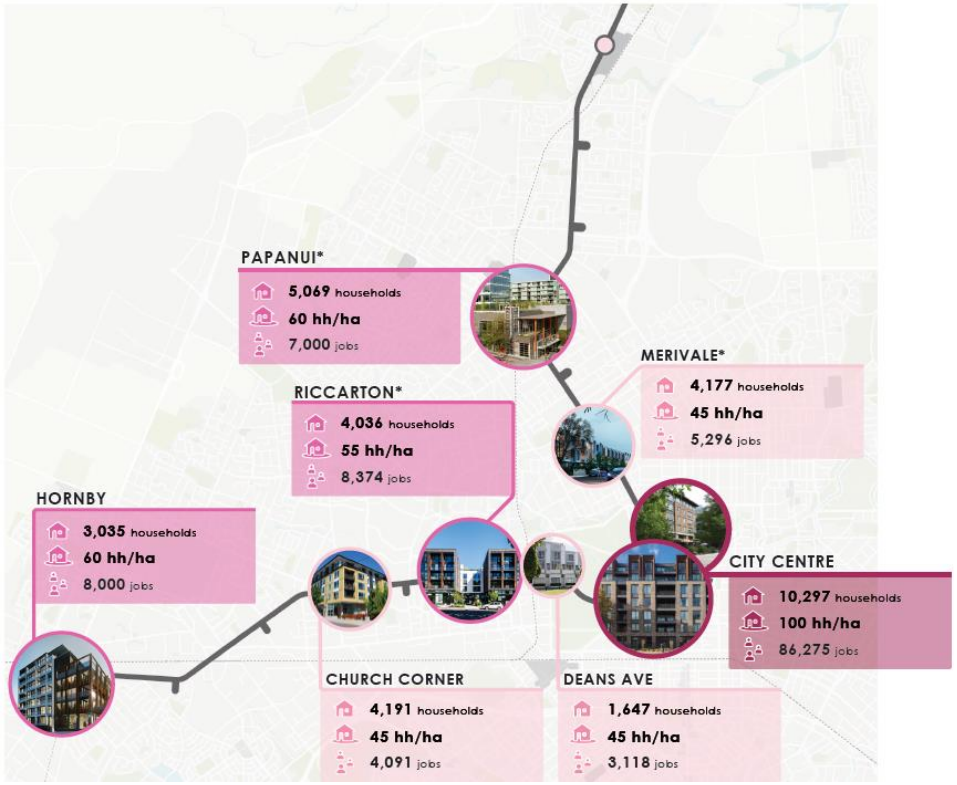


Figure 13-14: Spatial Summary of Land Use Scenario 3 outcomes

The outcomes of Land Use Scenario 3 spatially, and changes that could potentially be undertaken to the District Plan zoning to assist with achieving the above outcomes and mixed-use typologies, is further illustrated in Figure 13-15.

It outlines:

- Commercial Centres around stations identified potentially as mixed-use areas. A greater focus on mixed use typologies comprising vertical stacking of land uses will be key in achieving greater activation of the public realm and vitality of key centres. This could be achieved through changes to the existing Commercial Zones or introduction of a more targeted Mixed-Use zoning.
- Potential rezoning of some Industrial and Residential zoned land to Mixed Use.
- Tightening of the High-Density Residential zone in Papanui to support a more legible urban form.
- Removal of the High-Density Residential zone at Tomes Road.
- Simplification of the City Centre Mixed Use zones.
- Potential rezoning of the residential area between Victoria Street, Bealey Ave, and Manchester Street to a Mixed-Use zone to encourage more missed use typologies. Examples of land use integration opportunities within different centres along the route to support MRT are explored in more detail in the following section.

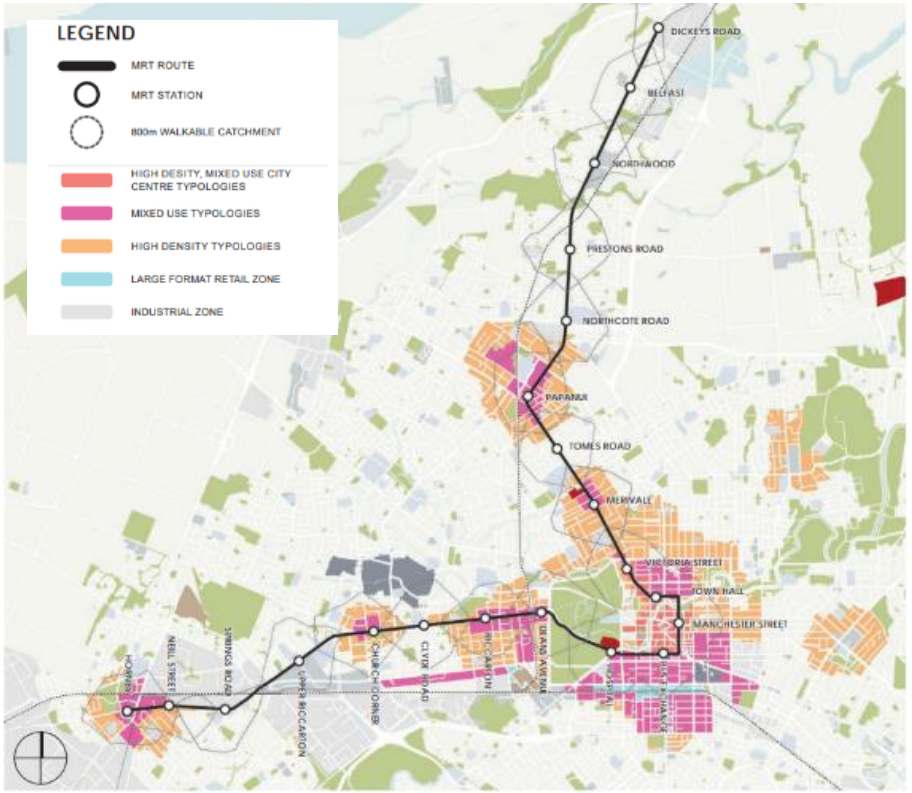


Figure 13-15: Land Use Scenario 3

13.2.7 Services to the Districts

The recommended option proposes strengthening connectivity with the districts, including enhancing local Park and Ride to ensure they are correctly scaled, configured, and spatially positioned to work effectively alongside MRT. This is in conjunction with additional direct bus services (proposed through PTFutures) and the standard connecting bus services, including express services, which will require optimisation to ensure efficient connectiveness from the districts, direct to the Central City and also the MRT system. The bus services available are further defined below::

- **Direct Bus Services:** These travel non-stop between the Districts and the city, with the route travelled depending on traffic conditions.
- **Standard and Express Bus Services:** These operate within the District and connect the Districts to the city via fixed routes and stop at each pickup/drop-off location. As part of this service Express Buses are provided typically in the peak morning and evening hour, whereby they only pickup and drop off at limited stops.

Direct Bus Service Offering:

The preferred route corridor proposes enhanced Direct Bus Services to connect Waimakariri and Selwyn Districts. The Direct Bus Services travel non-stop between the districts and the city, with the route travelled depending on traffic conditions. Frequency improvements to the Direct Bus Services are already proposed under the PT Futures Combined Business Case and hence provided for in the do-minimum base case for MRT. However, the intention is that these services are further enhanced to ensure these services provide a user experience equivalent to an MRT system.

PT Futures considered all day frequency improvements across the Direct Bus Services with 15-minute peak and 30-minute off-peak services, as outlined further in Table 13-2.

However, PT Futures had a study horizon through to 2038, hence, there is a risk that the proposed services are not sufficient to meet demand through to 2051, Of particular note is Rolleston, which is forecast to have the greatest PT demand to the central city from across the districts.

In the next stages of work, beyond this IBC, a service plan should be reviewed to consider if higher frequencies and or higher capacity vehicles would be required beyond the ten-year horizon considered under PT Futures.

Table 13-2 Frequency of the Direct Bus Services

Service	Current	PT Futures
Rangiora – City	AM peak hr 30min freq PM peak hr 30min freq	AM and PM peak 15min freq IP 30min freq
Kaiapoi - City	AM peak hr 30min freq PM peak hr 30min freq	
Rolleston - City	AM peak hr 30min freq PM peak hr 30min freq	AM and PM peak 15min freq IP 30min freq
Lincoln - City	AM peak hr 30min freq PM peak hr 60min freq	AM and PM peak 15min freq IP 30min freq

Standard and Express Bus Service Offering:

Standard bus services connect between the districts and the city, which take fixed routes and pickup/drop-off at each stop location. During peak periods these standard bus services also offer an Express Service which follow the fixed routes but reduce the number of pickup and drop off points. The intension under MRT is that these routes (standard bus services including express services) connect into the MRT terminus with smooth transfer onto the MRT system. In line with the proposed phasing approach of MRT, these transfer points will initially be to Church Corner and Papanui and then ultimately Hornby and Belfast.

Beyond this IBC, consideration of bus service interconnectivity within the districts, including any proposals under PTFutures, should also be reviewed, and optimised in the context of the MRT offering, to ensure suitable internal district connectivity (Intra-district) and connectivity to MRT.

Infrastructure: The direct bus services are flexible in their routing; hence the drivers can deviate their route in response to any traffic conditions. However, they are understood to generally follow the route below: Waimakariri Direct Services via SH1 – SH74 - Cranford Street Selwyn Direct Services via SH75/Brougham Street – Selwyn St. The Waimakariri route has as a number of priority provisions (including T2 lanes on SH74) as part the Christchurch Northern Corridor (CNC) improvements and Downstream Effect management Plan (DEMP). The Selwyn route has not been prioritised for public transport, but NZUP SH75 Brougham Street Pre-Imp is currently in progress and hence any future bus priority measures should be coordinated with that programme of works. In the next stages of work, beyond this IBC, a further review of bus priority provisions and constraints specific to the direct bus services should be

undertaken. This should confirm where, if any, future bus priority measures are needed to ensure ongoing reliability for direct bus services into the future.

Park and Ride Facilities: Park and Ride facilities are currently provided and those proposed in PT Futures are outlined below and shown in Table 13-3:

Table 13-3: Park and ride locations proposed in WDC and SDC

Location	Current	PT Futures
Rangiora	Rangiora Southern (South Belt); Rangiora Central Park and Ride (White St); and Rangiora (River Road)	New shelters and Real Time Information Displays
Kaiapoi	Kaiapoi South (Wrights Road and Main North Road); and Kaiapoi Central (behind New World)	New shelters and Real Time Information Displays
Rolleston	Foster Park Rolleston Council	Relocate Rolleston Council P&R to a permanent site; and Formalise Foster P&R
Lincoln		Lincoln Events Centre, including new shelter and Real Time Information

The proposed PTFutures park and ride sites offer a good basis from which to connect the district services.

In addition to district park and rides, the preferred MRT also assumes a park and ride at the Belfast terminus station and one to be investigated near Hornby. (Noting Hornby is more constrained and hence identification of a suitable park and ride location would need further investigation). Given the extent of park and rides proposed, ratification of these should be considered beyond this IBC to ensure they are still optimal in context of MRT and the GCSP.

To align the park and ride services closer with an MRT type offering, further enhanced investment is proposed across all the Park and Ride sites. Moving beyond this IBC, consideration should also be given to referencing these as 'Multimodal Interchanges' to reflect the wider function these sites offer, in connecting transfer facilities to PT and MRT from a variety of modes including cars, bikes and scooters.

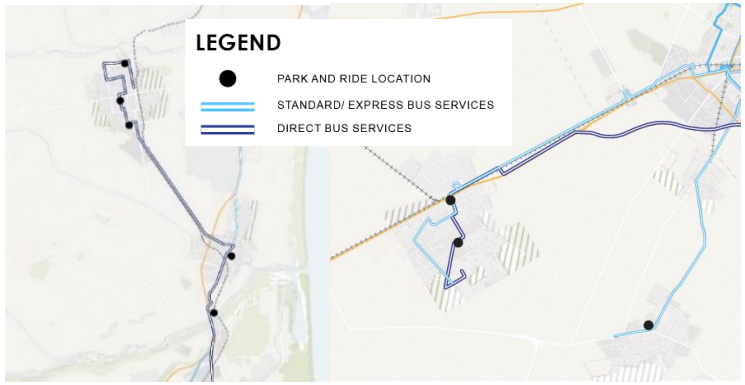


Figure 13-16: Park 'n' ride locations proposed in WDC and SDC

Park and Rides will play a critical role in linking the Districts' with MRT; therefore, experience and quality will be a part of future improvements. A greater level of facilities would be expected at a park and rides associated with MRT, including, real time information, public bathrooms, safe and legible stations, active mode parking and active mode network integration. Examples of high-quality park and ride sites are illustrated in Figure 13-17.

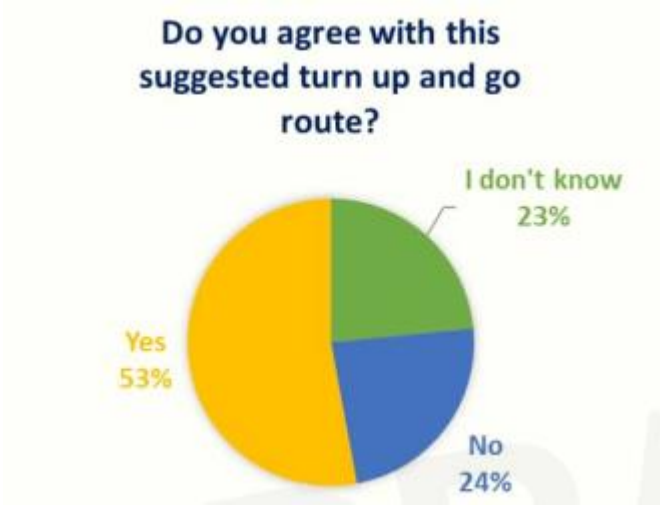
Figure 13-17: Brisbane Park and Ride environment and Albany busway park and ride with green amenity, a covered, legible walkway and lighting.

13.3 EARLY COMMUNITY ENGAGEMENT RESULTS

In February and March, the Urban Growth Partnership for Greater Christchurch went to the community to seek their feedback on the future growth and the proposed MRT service investigations. A key objective of the engagement was to raise awareness of the 'turn up and go' MRT route and potential investment along with seeking community input on the work undertaken to date. Key feedback received relevant to MRT is outlined below.

Support for the suggested MRT route:

- Overall, 53% of people agree with the proposed MRT route.
- Those who lived in the suburbs along the route were mostly supportive at 75%.
- Those who lived in the districts were least supportive.
- For those not supportive of the route, the most common reasons were that it didn't go to Rolleston or Rangiora and to a lesser extent, eastern Christchurch, or Sumner and also there was a preference for a heavy rail corridor.



Space allocation in street:

- Along the route 37% would like to see cycleways, with 25% outdoor dining and street furniture, with 30% car lanes and 8% parking with limited pedestrian space.
- Younger respondents and those who lived in the suburbs on the 'turn up and go' route had a notable preference for 'cycleways' and 'outdoor dining' over other road users.

The Huihui Mai Community Engagement Report 2023 is included on the Greater Christchurch Partnership Website at: https://greaterchristchurch.org.nz/urbangrowthprogramme/huihui-mai

13.4 ASSUMPTIONS AND DEPENDENCIES

13.4.1 Key Assumptions

There are several assumptions that underpin the preferred route assessment and should be taken into consideration for future investigations beyond this IBC.

- **Intensification:** Intensification around stations is fundamental to MRT's success. Intensification opportunity has been measured against strategic and policy direction and urban design best practice.

  This land use scenario assumed in the analysis (Land Use Scenario 3) aligns with the current direction from the GCSP at the time of writing, but may need adjusting in stages beyond the IBC, depending on the final outcome of the GCSP. Further analysis as to the future densities around centres and stations is referred to in Appendix M – Urban Design and Land Use Integration Report.

- **Property**: It has been assumed that large-scale corridor widening will not be necessary. If this assumption does not hold then there are potential implications on the design philosophy, in particular the typical cross sections..

In addition, there may be strategic land acquisitions required to deliver the project outcomes near stations and major intersections; Given the city shaping nature of this project consideration should be given to targeted strategic land purchases to support the intensification anticipated (including change in housing typologies), the change in the character of the corridor, and in achieving quality streetscape/public realm and specific 'place' outcomes.

- **Public transport (PT) integration**: It was assumed that any existing bus services will be modified to support / integrate with MRT but not compete with it. The PT network integration assumptions are further outlined in Section 13.2.5 and Appendix L – Public Transport Network Integration. If this assumption doesn't hold then there are potential implications on the design philosophy, in particular the station layout/footprint.
- **Service Frequency**: Headway of 5 minutes during morning and evening peak periods and 10 minutes at other times. The direct bus services have a headway of 15-20 minutes as recommended in PT Futures
- **Heavy Rail Network Integration**: Under an LRT mode scenario. Mode separation of LRT and heavy rail is required at any interface points;
- **Park and Ride**: Park and ride locations in the districts has been assumed as outlined in PT Futures. In addition, for the preferred option assessment, park and ride was also provided for at Belfast. A further park and ride could also be established at Hornby, but space to provide for this and how it connects/influences the proposed Hornby stop location would need further investigation.
- **Mode**: Assumed mode is bus rapid transit (BRT) or light rail transit (LRT) as outlined further in Section 13.2.3 and Appendix I – Mode Assessment Paper. The space requirements for both modes are assumed to be compatible and hence the same design envelope (7 m width) for has been assumed for both.
- **Modelling**: Modelling assumptions informing the analysis are outlined in Appendix T – Stage 1 - Transport Modelling Technical Note. However, of particular note is that the same model was used to assess both LRT and BRT, given they are assumed to use the same dedicated corridor, travel at the same speed, and carry the same volume of patronage.

13.4.2 Dependencies and Constraints

below lists key dependencies and constraints for the Project, that could significantly change the Project's scope or delivery timeframes. These need to be carefully managed and monitored in subsequent stages.

Table 13-4: Key Project Dependencies and Constraints

Key Dependency/Constraint	Impact and Plan to Manage
PT Futures Programme: Identifies a range of infrastructure and service enhancements to Greater Christchurch's public transport system that is being delivered by local government and the regional council, with the support of the Crown. Infrastructure: Prioritise bus movements on the inner core route, in particular at congested locations to maintain reliable services. This includes bus stop enhancements. Of particular importance is the recommendation along Papanui and Riccarton Road. Service: Enhancements to the five core and four secondary core routes will lead to a new public transport network for Greater Christchurch will more direct routes and frequencies.	The MRT project is dependent upon the PT Futures programme to deliver the wider public transport network and demand for a MRT service. Modelling for MRT assumes the PT Futures Programme is implemented, if not MRT will not achieve expected outcomes. There is an opportunity to align delivery of the PT Future Programme with the MRT Project to reduce cost and reputation risks and enable the benefits of MRT. Key actions: Infrastructure: Ensure the PT Future infrastructure provisions are suitable to the MRT Project's design philosophy to reduce the risk of infrastructure being replaced early in its design life. Service: Network planning and procurement is conscious of a future MRT spine and the need for complimentary network to enable benefits. Early works package to align the two Project's and reduce the risk of rework
Land Use Context: This project is dependent on the outcomes of the Greater Christchurch Spatial Plan (GCSP) and Urban Intensification (including Christchurch City Council's proposed PC14).to set the land use enablement / context for the region and enable urban intensification which is critical to the success of the project.	Impacts on our land use model and estimated growth in the corridor station locations Once the GCSP and Christchurch City's PC14 are notified / adopted an exercise is required to understand the implication on the Projects Land Use and modelling assumptions. This will also provide clarity regarding the land use context or certainty on public support for intensification. It will be necessary to investigate a range of regulatory and non-regulatory tools and incentives beyond zoning to drive a change in intensification and land use patterns to support MRT and a more sustainable urban form for Greater Christchurch. The following are most relevant to shaping the urban outcomes anticipated along the corridor: Implementation of Priority Development Areas. Collaboration and Partnerships, with local and central government and including Kainga Ora, which could enable strategic land purchase, site amalgamation and delivery of exemplar developments, including TOD's. Increased investment in the public realm and supporting infrastructure. Master planning to unlock the potential of different stations/stops, including reducing severance, improving walking, and cycling connections. This will also enable a 'place-based' response which is responsive to local urban conditions and opportunities.

Key Dependency/Constraint	Impact and Plan to Manage
	Regulatory tools such growth management, minimum densities, and more enabling mixed-use policies. Potential tools and levers to support MRT and secure the desired urban outcomes will be investigated further through future spatial planning and Business Case processes.
Transport Context: The Government Policy Statement (GPS) sets out how funding should be allocated between road safety policing, state highway improvements, local and regional roads PT. This is used to outline the Government's priorities for the NLTP.	The MRT modelling and assessment has been completed on the current GPS and local policies and documents to implement these objectives. If a fundamental change is made to national strategic objectives the MRT project may need reassessment to ensure strategic alignment.
Operations: Legislation on Public Transport operating models (SPTF to PTOM) set operational boundaries	Policy changes that can influence how this project is operated and delivered may happen during its pre-delivery and delivery phases. These changes will impact the feasibility of the project through operational constraints. In turn these constraints may change the relative advantages of various technology choices by exacerbating some of their inherent risks.
Neighbourhood & Master Planning: Various neighbourhood plans and network considerations need to be considered including Hornby Master Planning, MRT Transit Malls (Papanui, Merivale, City, Riccarton), wider network planning as a result of movement restrictions.	Hornby Master Plan and freight network considerations will be key pieces of work influencing the design philosophy at these locations and construction phasing. Similarly other local Neighbourhood plans will also impact the design philosophy and the development of these is critical in understanding the wider impacts and mitigation opportunities.
Project Interfaces: Given the scale, location, and duration of the MRT project it is expected there will be a number of interfacing projects (known and unknown) which could drive changes to the MRT project or will need to change to align with MRT.	Projects with known interfaces include: Te Kaha Street Upgrade and Salisbury & Kilmore network improvements Major Cycleway - Wheels to Wings and Northern Line Sockburn Roundabout Improvements Various central city improvement projects. Asset & service renewals (i.e., wastewater, stormwater, pavement) It is proposed that an investigation is conducted early in the DBC to understand projects that share an interface with MRT and the potential impacts, plans to mitigation these impacts can then be implemented in future design stages and strategic planning.

13.5 PHASING AND STAGING

13.5.1 Overall programme

A high-level staging methodology has been developed for the preferred MRT option to provide the following strategic benefits:

- Allows existing problems to be addressed and benefits to be realised in the shorter-term with less costly interventions (compared to a full-investment non-staged approach which is less attractive where funding is constrained).
- Allows for more informed decision making at each stage, assessing the effectiveness of interventions allowing the programme to evolve as necessary to meet future needs, this includes delaying a mode decision until more information is available.
- Enables the urban growth intensification to support GCSP targets and timeframe.
- Enables integration with the existing network and PT Futures programme providing a consistent user experience across the wider PT network influencing behaviour change towards a permanent balanced mode share.
- Has an early focus on mitigating key risks (threats and opportunities) to the programme's implementation.

The rest of this section presents the proposed phases for MRT and a potential pathway forward including indicative timeframes for key next steps and implementation of the programme. It is anticipated that as the programme evolves timeframes and activities will need to be refined. Funding gateways and monitoring of triggers have not yet been set for each element of the programme. These are anticipated to be monitored and are ultimately expected to supersede this indicative pathway.

13.5.2 Phases for Delivery of MRT

It is recommended the MRT programme is developed in two phases, as outlined in Figure 13-19.

Phase 1 - Involves development of MRT from Church Corner to the Papanui, via the City Centre. It focuses on the inner core of the city (defined as the area within the Orbiter Route), to support intensification around highly accessible centres and minimise urban sprawl. This will promote a sustainable urban form that supports MRT including:

- Reinforcing key centres to support origin / destination travel and investment in key amenities and services at these locations;

Intensifying along key corridors supported by MRT and other frequent services;

Intensifying in other highly accessible locations; and

Minimising urban sprawl to support a sustainable urban form.

Phase 2 would extend the route to terminus stations in Belfast and Hornby. This will support the future role and function of Hornby as a key centre and growth and connectivity in the north of the city.

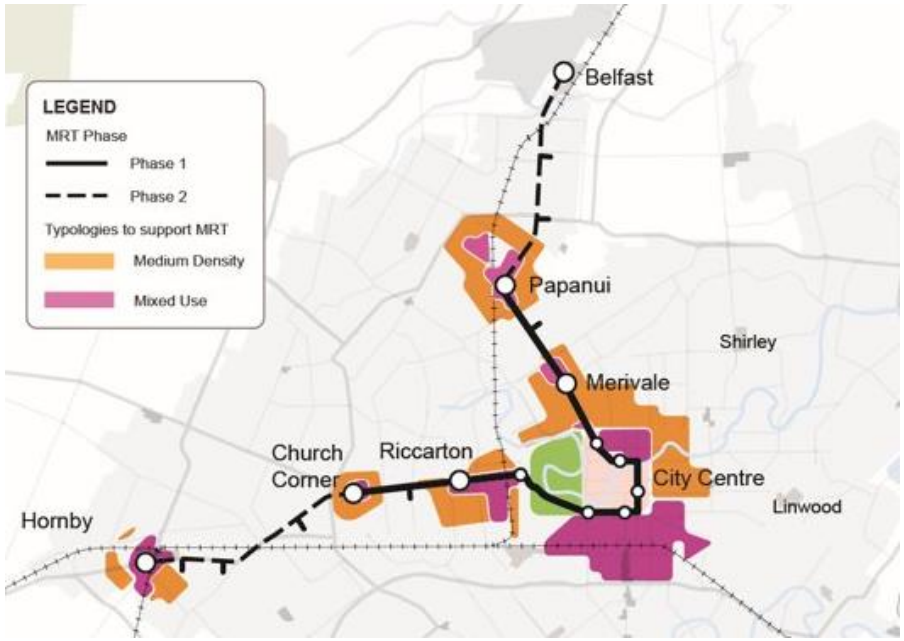


Figure 13-18: MRT supportive land use integration at Phases 1 and 2

Note, consideration was also given to phasing the delivery by separating the corridor into two parts terminating in the city e.g., the southwest corridor Hornby to city and then the north corridor Belfast to City (or vice-versa). However, this would trigger other depot and turn around requirements within the central city, which would further complicate delivery. A consistent continuous system through the city centre was therefore considered a more favourable approach.

The proposed phasing will need to be refined further as part of work beyond this IBC, in particular the following needs to be considered:

- The finalised mode decision may further influence the phasing, as LRT has more complex depot requirements that may complicate phasing opportunities.
- The preferred MRT solution and associated phasing, does not preclude the potential for additional MRT extensions in the future, in response to strategic and policy direction. For example, extensions to the Airport, east corridor, south corridor, or extension to the regions via the heavy rail corridor, in response to the potential progression of inter-regional passenger rail..

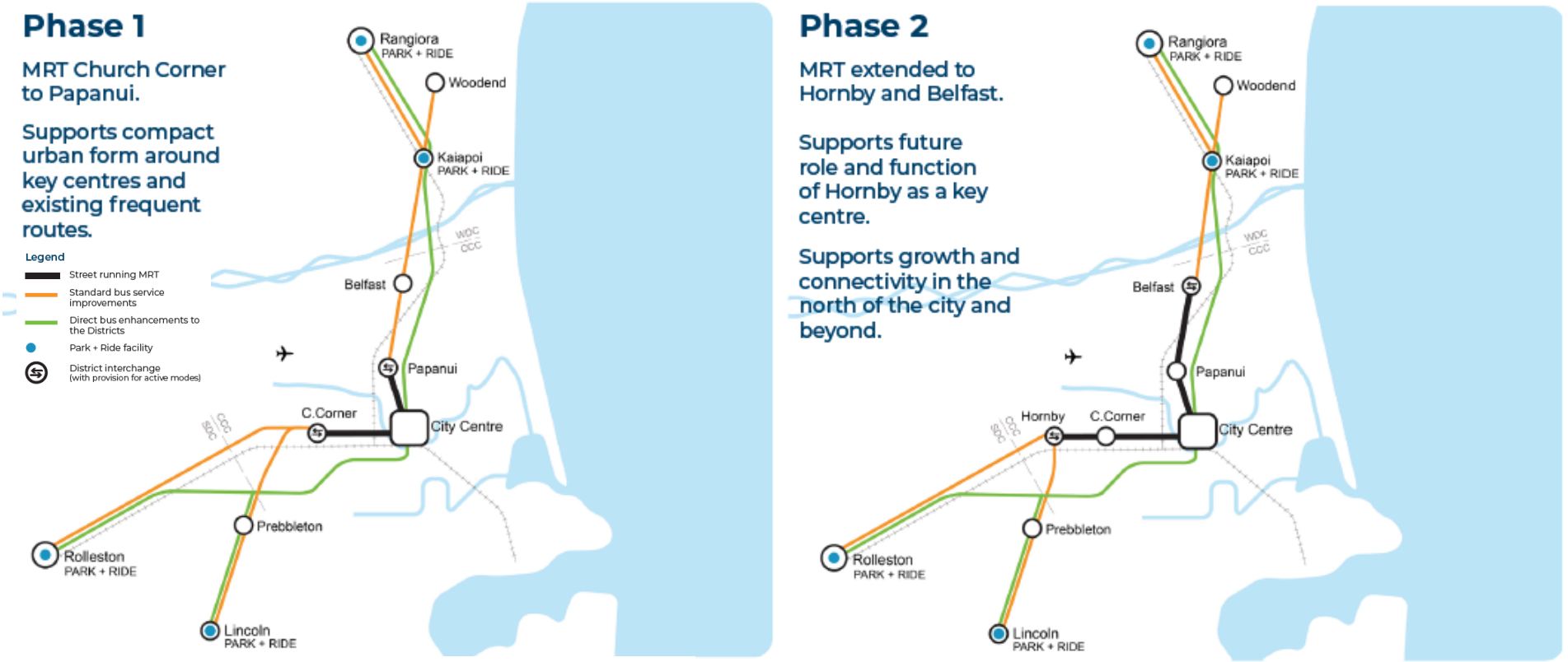


Figure 13-19: Phase 1 and Phase 2 diagrams

13.5.3 Potential Staging Pathway for MRT

A potential staging pathway for the MRT programme has been developed, underpinned by the National Land Transport Fund (NLTP) intervention hierarchy which involves the prioritisation of integrated planning and non-infrastructure elements to meet demand before new infrastructure is considered.

This hierarchy as shown in Figure 13-20, has been considered in the staging of the MRT programme. This alignment helps to maximise value for money by ensuring the lowest cost intervention is implemented first. The figure also identifies specific elements of the MRT programme and how they align to the intervention hierarchy.

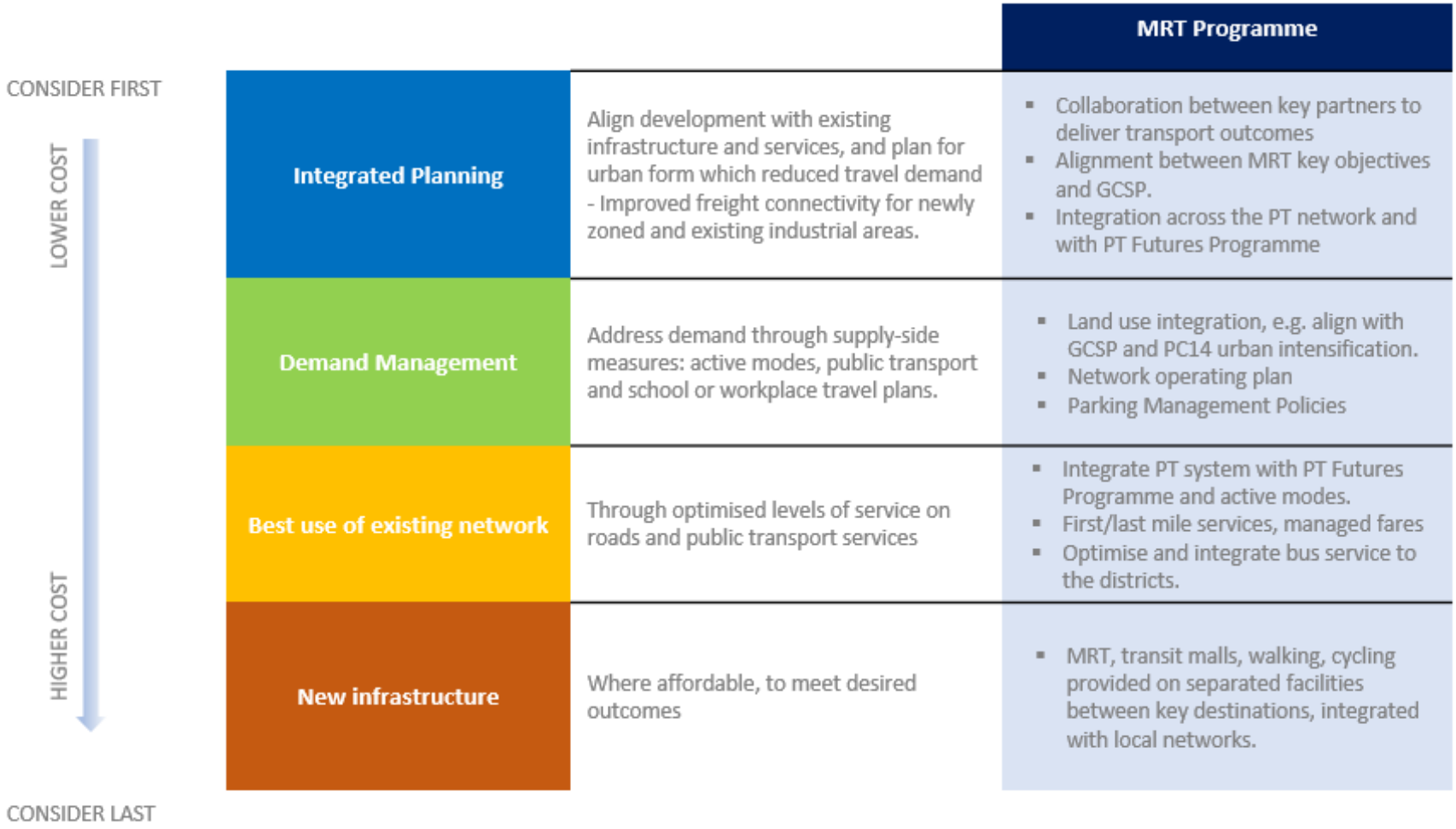


Figure 13-20: MRT Alignment with NLTP Intervention Hierarchy

13.5.4 Staging Horizons

The pathway for MRT assumes the programme will be implemented in two phases (as described in Section 13.5.2). This implementation has been broken down into three broad horizons but is agile and can be adapted to meet future demands and align with the GCSP and PC14 to enable intensification outcomes. This includes connections to the districts and using the existing rail system if this is necessary in the future. If inter-rail is built it could work alongside MRT and be delivered in parallel.

The following section describes the three staging horizons of the MRT:

- **Horizon 1** –DBC (Early Stages), Optimisation/Alignment with PT Futures Programme
- **Horizon 2** – DBC (Finalisation), Pre-Implementation Design, Consents and Planning, Vehicle Procurement
- **Horizon 3** - Design and Implementation of chosen MRT System

However, to inform these initial horizons consideration has been given to the potential construction delivery of the proposed constraint phases

Each Horizon is characterised by:

- The strategic and practical purpose of the horizon.
- The specific elements to be delivered in the horizon (e.g., infrastructure, service), and
- Key decisions, funding gateways (investment management approach) that outline both practical delivery dependencies and operational requirements.

Figure 13-21 illustrates the potential staging pathway for MRT. It also includes the PT Futures Programme work to prompt discussion on opportunities for alignment and optimisation between the two programmes. It is recommended the PT Futures programme is reviewed prior to undertaking any alignment work. An operational start date of 2033 has been used to build the cost and BRC models. This is considered the earliest reasonable time for delivery providing a conservative approach for the financial case. The actual delivery dates need to be refined within the DBC but still need to be delivered prior to 2051 to meet the GCSP and PC14 intensification outcomes.

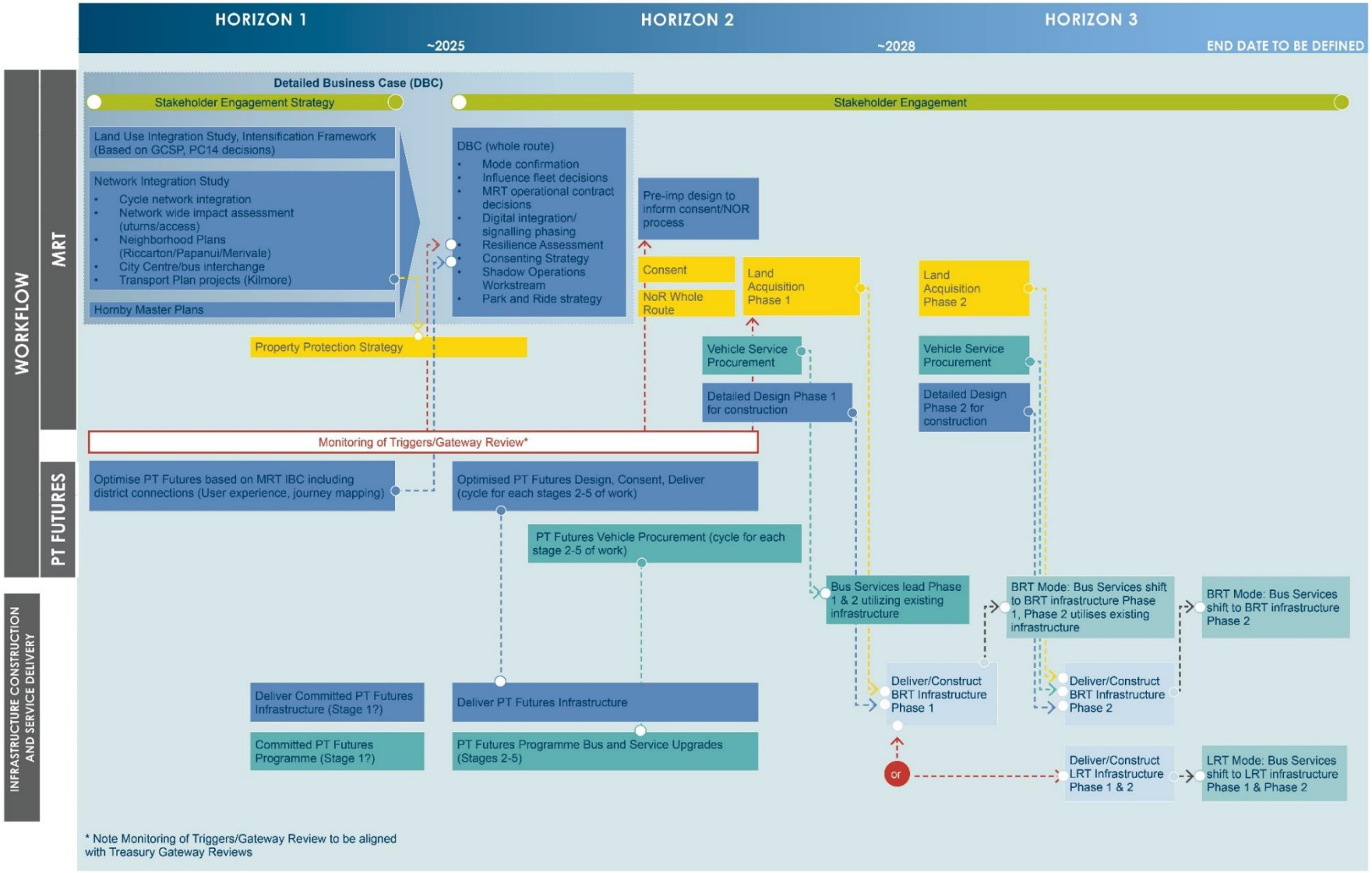


Figure 13-21: Potential Staging Pathway for MRT and PT Futures Programme

Horizon 1: DBC (Early Stage), PT Futures Programme Alignment

Horizon 1 includes the early stages of the DBC, the commencement of the Property Protection Strategy and an investigation to align and optimise MRT with the PT Futures Programme as summarised in Table 13-5.

Table 13-5: Horizon 1 Summary

Component	Details
Time Horizon	Endorsement of this IBC until 2025 (tentative)
Description	DBC (Early Stage)
Purpose	This stage will enable key investigations to mitigate risks and opportunities identified during this IBC and will then progress to a DBC to understand if MRT is a viable option for Greater Christchurch and the best ways to proceed. It will also involve a separate piece of work to align and optimise the PT Futures Programme with the proposed MRT programme.
Key Activities	MRT Project Management and Delivery Setup Establish project team and define project roles and responsibilities and key deliverables. Develop programme to deliver Horizon 1 tasks, confirm funding and working together project partners. Engagement Strategy and Implementation Development of a stakeholder engagement strategy specific to the MRT and active implementation in subsequent phases. This strategy should incorporate and respond to feedback received from the public engagement being undertaken at the writing of this IBC. PT Futures Integration This is a package of work to optimise and align the PT Futures Programme with MRT which is recommended to reduce reputational risks and maximise benefits and value for money across both programmes. Network Integration Study A network integration study to inform subsequent feasibility and design phases. This study would include integration of MRT with the cycle network, network wide impact assessments (e.g., removing U-turns and access at key locations), integrating with neighbourhood plans (Riccarton, Papanui, Merivale) and freight services the city centre/bus exchange and transport plan projects (Kilmore Street). Land Use Integration Study Based on the outcomes of the GCSP and PC14 decisions development of a Land Use Integration Study as an early piece of work to investigate a range of regulatory and non-regulatory tools and incentives beyond zoning to drive a change in intensification and land use patterns to support MRT. This will include collaboration and partnership strategies with Government Agencies around strategic Priority Development Areas, land purchase and exemplar development, local master planning to unlock development potential and regulatory tools such as growth management, minimum densities, and mixed-use policies. Hornby Master Planning

Component	Details
	In order to support an MRT station within the town centre and encourage catalyst development changes are necessary to the movement hierarchy in the area. This includes potential changes to the ONF classification for the Main South Road. A master planning exercise is necessary to establish a future vision and address a broad range of changes and will be necessary before extending MRT to Hornby. Property Protection Strategy Development of a property protection strategy as an early piece of work to reduce consenting, corridor protection and property acquisition risks. Property implications have only been considered at a very high level within the IBC. Having an early deeper understanding of this risk and potential opportunities including strategic land purchase for amenity improvements, means the design philosophy can be better understood moving into the full DBC stage. MRT Service and Technology Integration Study Determines and refines the service and technology boundaries to understand fleet technology considerations to ensure an integrated approach to operations and whole of life costs.
Key Decisions	Outcomes of these key investigations and studies will inform subsequent stages of the DBC
Complexity/Risk/ Constraints/ Opportunities	Completing the investigations listed above as soon as possible will provide opportunities to integrate with the wider network and other proposed programmes of work providing greater certainty and decision confidence on the proposed pathway.

Horizon 2 – DBC (Finalisation), Pre-Implementation Design, Consents and Planning, Vehicle Procurement

If the DBC is finalised in Horizon 2 and endorsed Pre-Implementation Design, preparation of Consents and Planning, land acquisition and vehicle procurement will commence later in this horizon. A summary of Horizon 2 is included in Table 13-6.

Table 13-6: Horizon 2 Summary

Component	Details
Time Horizon	~2025 to ~2028 (Indicative only)
Description	DBC (Finalisation), Pre-Implementation Design, Consents and Planning, Land Acquisition (Phase 1), Vehicle Procurement
Purpose	This stage will enable a complete understanding of acceptable risks, uncertainties and the benefits associated with the investment, so that a final decision can be made on whether to implement MRT (Business Case Endorsement). If the DBC is endorsed this horizon will involve pre-implementation design and planning, consents, land acquisition and any procurement required to enable a service led approach to be implemented in Horizon 3.

Component	Details
Key Activities	DBC (Whole Route) Development of the DBC will cover specific details relevant to MRT, including but not limited to mode confirmation; fleet decisions; digital integration/signal phasing; park and ride strategy, shadow operations workstream, operational contract arrangements and a resilience assessment. **If the DBC is endorsed, Horizon 2 may include:** Pre-Implementation Design, Consenting, Notice of Requirement (NoR) Route, Land Acquisition Phase 1 Vehicle Procurement Detailed Design Phase 1 for Construction
Key Decisions	Endorsement of the DBC, Mode Selection (BRT or LRT), Property Acquisition Strategy and Implementation, Route Protection

Horizon 3 -Design and Implementation of Chosen MRT System

Horizon 3 includes the service led design and implementation of the chosen MRT System. This stage is currently shown on Figure *14-1* with two options separated by the red 'OR'. Once a mode (LRT or BRT) is chosen this process will simplify to one process. A summary of this Horizon is included in Table 13-7.

Table 13-7: Horizon 3 Summary

Component	Details
Time Horizon	~2028+ ~2033 (Indicative Only) – needs to be refined in the DBC
Description	Design and Implementation of Chosen MRT
Purpose	Detailed design and construction of the chosen MRT service and enabling infrastructure. This stage will involve moving from Service Led Bus Services to the chosen MRT system, details of these stages will need to be refined once the mode is chosen.
Key Activities	Will depend on mode chosen and service led/construction methodology adopted. Activities for this Horizon will be further developed within the DBC.
Key Decisions	Demand led triggers to proceed with next phases, to be confirmed and refined at DBC stage.

13.6 Effectiveness of the Preferred Option

13.6.1 Alignment with the Programme Business Case

The Greater Christchurch PT Futures Combined Business Case recommended an investment programme for inclusion in the partner organisations' Long-Term Plans that:

- Delivers high-frequency PT options to existing Key Activity Centres (KACs) and planned growth areas;
- Provides reliable bus services with journey times that are competitive with private vehicles;
- Enhances the safety and attractiveness of the environment at bus stops for customers;
- Improves bus routing and frequency that takes people where they want to go, when they want to get there; and
- Provides a catalyst for land use development adjacent to frequent public transport routes

The Preferred Option is aligned with these overarching core objectives of the PBC and if implemented will help to achieve these outcomes as discussed throughout this IBC.

13.6.2 Key outcomes and alignment with MRT investment objectives

MRT systems provide opportunities for mode shift and behaviour change. Proactive infrastructure that policy enablers can then further enhance to optimise benefits. There needs to be investment in this enabling, proactive infrastructure first; to then generate mode shift, urban form development, and behaviour change. By providing the right built environment up front, MRT can deliver a step change in travel habits and mode shift.

MRT will deliver infrastructure to facilitate the movement throughout Greater Christchurch safely and efficiently through providing low carbon and resilient public transport options. Furthermore, MRT is expected to unlock urban development, which can significantly improve sustainable accessibility and drive an even greater decease in carbon emissions.

With PT Futures (2051 Do minimum) PT Patronage will increase from 51,000 per day in 2021 to 106,000 per day in 2051. MRT will further increase PT patronage to 126,000 per day in 2051 (a 20,000 per day or 19% increase from the 2051 Do Minimum). Annually MRT equates to an increase in PT trips of 5.7 million per year (2051 Option compared to 2051 Do minimum), resulting in the total PT system carrying 36 million passengers per year.

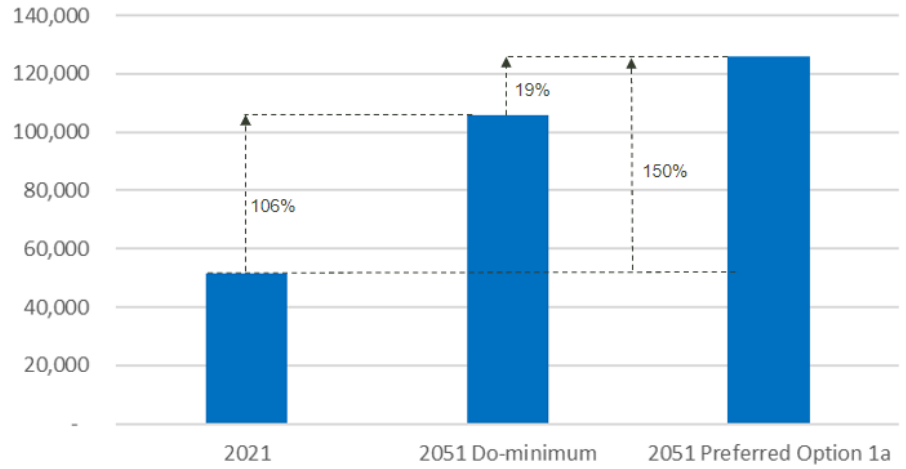


Figure 13-22: MRT Daily Patronage Forecasts

This forecasted ridership on the MRT system is 39,000 people per day. During the peak hour MRT is anticipated to attract over 5000 boardings. Considering people joining and leaving the MRT system along the route, the maximum anticipated capacity at any one time and direction is 2000 passengers per hour, as illustrated in the following figures.

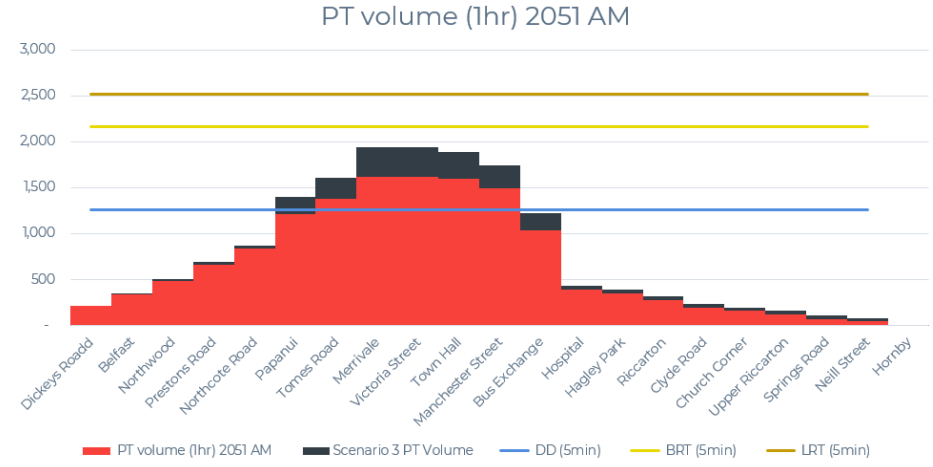


Figure 13-23: MRT AM Passenger Volumes on Northern Corridor

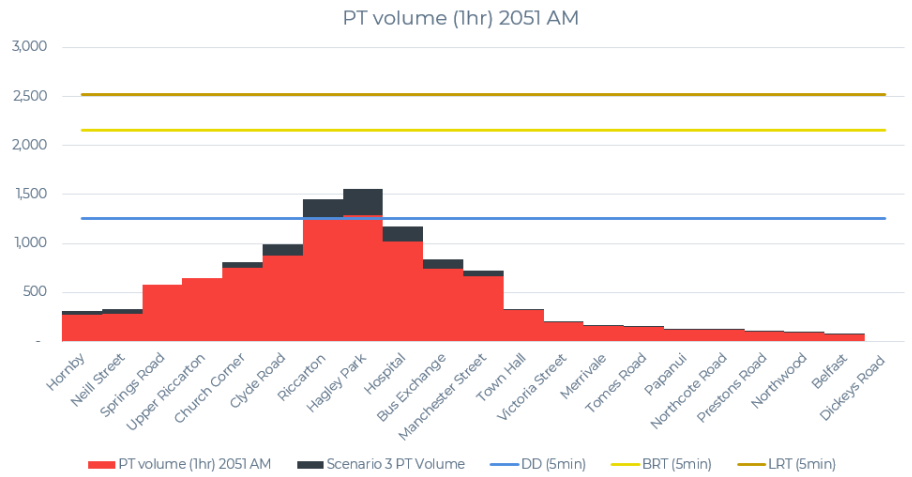


Figure 13-24: MRT AM Passenger Volumes on Southwestern Corridor

MRT is expected to result in an increased mode share beyond the do-minimum (PT Futures) as follows;

- 17% increase (35% to 52%) for trips on MRT corridor to the central city.
- 6% increase (34% to 40%) for trips from Greater Christchurch to central city.
- 1.5% increase (6% to 7.5%) for trips across whole of Greater Christchurch.

The Preferred Option contributes to all the investment objectives, as outlined below, and quantified further with respect to the KPIs in Table 13-8.

Investment Objective 1: *Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051*

The preferred MRT solution focuses on high potential job and household growth locations. It compliments and enhances the vision of the Greater Christchurch Spatial Plan, unlocking urban development and increasing housing densification along the proposed route. MRT is expected to stimulate intensification with an additional forecasted growth of 15,000 additional households and 54,000 additional jobs (between 2021 and 2051) within the station (800m) catchments.

Investment Objective 2: *Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051*

MRT will provide a dedicated right of way system with priority throughout the corridor, avoiding the effects of congestion and conflicts with other vehicles. Hence the service will run reliably at consistently higher average speeds compared to a public transport bus service. Reliability is a key differentiator of MRT, which allows rapid transit services to compete with the private car as it provides users with the confidence and trust that they can get where they need to at the required time.

End-to-end (perceived) public transport journey times are expected to decrease as a result of improved in-vehicle journey times and frequency (decreased wait times). This improves access to a range of Key Activity Centre and employment areas. An additional 39,000 households are able to access an additional KAC within 30minutes using PT and accessibility to strategic land use areas, such as Hornby Mall, increases by up to 50%.

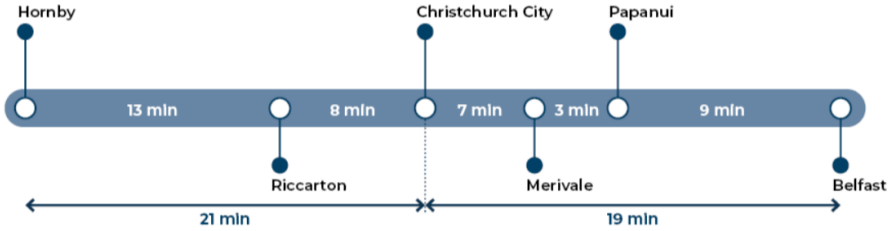


Figure 13-25: In-vehicle journey times between MRT stations

Investment Objective 3: *Reduce emissions from transport movements across Greater Christchurch by 2051*

Transport modelling forecasts the programme coupled with unlocking higher land use can reduce emissions by a further 2% relative beyond the do minimum option (PT Futures) by 2051. Although, there are several other factors

and levers that could lead to greater reductions in enabled emissions. These include changes in technologies, human behaviours, and policies. By investing in mass rapid transit systems, network wide active transport infrastructure, and improvements to public transport service, MRT is enabling behaviour change and mode shift to lower emission forms of transport.

Reducing transport emissions requires a combination of factors including modal shift towards public and active transport while also reducing the distance people have to travel. MRT will not only provide a reduction in private vehicle kilometres and increased PT mode share, by providing safe and efficient alternative options to driving, but will also facilitate higher density land use. Intensification in targeted locations can result in people living closer to employment opportunities and other amenities. Hence, a greater proportion of people can live, work, and play in smaller geographical areas, which also have safe and convenient active and public transport options to access employment opportunities. Ultimately significantly decreasing the distance these people have to travel on a daily basis (commuting to work, getting groceries, going to the park, travelling to schools, sports, social activities, etc.).

13.6.3 Assessment of KPI Measures

The KPI measures associated with each Investment Objective are further outlined in Table 13-8.

Table 13-8: Investment objectives – key achievements

Investment Objective	KPI	Measure	Result
IO1: Increased proportion of the population within key prioritised locations and along identified transport corridors within Greater Christchurch with improved access to Christchurch's Central City by 2051	KPI1: Change in accessibility to and from the Central City	Total households and employment within 800m of a station.	36,000 households and 121,000 jobs
		Households able to access the Christchurch Central City from within 30 minutes using the PT system.	114,000 households (14% increase)
		Change in PT Mode share to the central city	6% difference increase from 34% to 40.0%
	KPI2: Change in access to opportunities from prioritised locations	Change in households and jobs (2021-2051) located within 800m of stations along the corridor	16,000 households and 54,000 jobs
	KPI3: Change in development potential	Area for potential comprehensive development, sites above 3000m2 within the walk-up catchment (Include KO, Council, and private sites)	365 sites for comprehensive development (sites above 3000m2). Total of 350Ha.
IO2: Improved journey time and reliability of PT services relative to private vehicles within Greater Christchurch by 2051	KPI2: Change in access to opportunities from prioritised locations	Number of Households able to access additional KAC and strategic land uses within 30 minutes by PT.	Additional KACs – 60,000 households Airport – 20,000 households (2% decrease) Hornby Mall – 42,000 households (51% increase) Hospital – 100,000 households (17% increase) Northlands Mall – 73,000 households (4% increase)

Investment Objective	KPI	Measure	Result
			Riccarton Mall – 86,000 households (29% increase) University of Canterbury – 38,000 households (12% decrease)
		Number of Households able to access 1000 additional employment opportunities within 30 minutes by PT	4,000 households are able to access an additional 1000 employment opportunities
	KPI4: Shift in trips to PT and active modes	Proportion of trips made by PT along mass transit corridor(s) to the central city	17% increase from 35% to 52%
		Change in single occupancy vehicle trips (based on car person trips as a proxy to inform single occupancy vehicle) along the mass transit corridor(s)	17% decrease from 4,900 to 4,000 trips
	KPI5: Change in journey times and reliability by PT and private vehicles	Journey time difference (perceived door to door) from prioritised Christchurch locations to Christchurch City between PT and private vehicle:	PT and Car (perceived) travel time difference improves by -100% (17 mins)-Hornby Hub to City Centre -30% (6 mins)-Northlands to City Centre -200% (20 mins)-University of Canterbury to City -30% (7 mins)-Westgate Riccarton to City
	KPI6: Ability to integrate efficiently and effectively with wider PT	Daily ridership on the mass transit system	39,000
		Overall public transport mode share in Greater Christchurch	1% increase from 6% to 7%
IO3: Reduce emissions from transport movements across Greater Christchurch by 2051	KPI7: Change in emissions from transport movements and improved environmental outcomes	Change in greenhouse gas emissions (tonnes of CO2 equivalent) from transport sources within Greater Christchurch	2% (4,000 tCO2eq/year) decrease from 219,000 to 215,000 tCO2eq/year
		Change in air quality (PM10) and public health outcomes from transport sources within Greater Christchurch	3% (2.5 tPM10/year) decrease from 97.2 to 94.9 tPM10/year
		Change in private VKT per household within Greater Christchurch	1% (1 VKT/household/day) decrease from 54 to 53 VKT/household/day

13.7 ECONOMIC ANALYSIS

The Economic Evaluation, attached as Appendix Q – Economic Evaluation and summarised below follows procedures specified in the Waka Kotahi 'Monetised Benefits and Costs Manual' (MBCM) updated April 2023. For the purposes of the evaluation, Time Zero (assumed to be the first cost not already sunk, associated with pre-implementation) is assumed to be 1 July 2025. The base date for costs and benefits is assumed to be 1 July 2022, in line with the latest available (1 April 2012) MBCM A12.2 (cost) and A12.3 (benefit) update factors.

13.7.1 Existing and estimated PT, motor vehicle and cycle volumes

The adopted methodology involved utilising existing up-to date regional transport models (CTM and CAST) and supplementing these with a PT project model which is used to improve the estimation of changes to PT demand in response to the proposed interventions and provide detailed outputs relating to KPIs and economic assessment.

In particular, the following key strengths of the CTM transport model have been maintained:

- Estimation of travel demand by person (and PT), based on land use inputs for future years previously agreed by the various partners.
- A reasonably detailed PT assignment that includes walk access, waiting at bus stops, interchanging between routes.
- Mode split sub-model which is responsive to relative changes in generalised cost between modes (PT, private vehicle, and cycle).
- Useful outputs that include skimmed travel times (walk, wait, in-vehicle), bus journey times, passenger on/off and in vehicle at each modelled stop.
- Critical PT parameters have already been established (calibrated locally) and implemented.

The PT project model supplements the CTM transport model as follows:

- The default CTM mode-split model is mostly influenced by vehicle availability (at the household level) and, to a lesser extent, the relative generalised cost of travel between modes. While this approach adequately replicates observed behaviour in 2006, it has been found that the resulting model is rather insensitive to interventions where a reasonable uptake in PT might be expected. Elasticities have been introduced to ensure more appropriate responses.
- This is especially the case for interventions which are likely to result in significant change away from existing (2006) travel behaviour (i.e., 'step changes'), which will be required to achieve the proposed mode share targets.
- More direct control over inputs and outputs is possible.
- The CTM does not include crowding curves for buses, therefore bus capacity is unconstrained. Consideration was given to adding bus crowding curves to the model but was rejected due to a lack of Christchurch-specific data.

The project model 2021 base year scenario was found to adequately match observed data (bus journey times, general traffic travel times, passengers on and off). Therefore, no additional calibration changes were required.

For option testing, the base year CTM PT demands (for each modelled year) has initially be applied to the option PT network (which includes option specific interventions) in order to extract updated travel time data (walk, wait, in vehicle etc.). This has then been used to establish the quantum of travel time savings achieved relative to the base for each Origin-Destination (OD) zone pair. The default CTM mode split-model, which has limitations described earlier, was supplemented by elasticities which have been applied to travel time and other savings associated with proposed intervention options in order to indicate the likely corresponding change in patronage. The resulting adjusted PT demands (option) matrix were finally re-assigned to the option network and key model outputs updated.

13.7.2 Benefit and cost assessment

Due to the scale of the project, Full Procedures have been applied. Key benefits and costs included in the analysis include:

Benefits:

- PT travel time benefits, reflecting increased service frequency, wait time, in vehicle time and interchange time.
- PT reliability improvement benefits.
- Road traffic reduction benefits (incorporating both positive and negative effects for other road users).
- Walking health benefits (walking to/from bus stops).
- Wider economic benefits (WEBs) have been calculated and the BCRs presented with and without these.

Costs:

- Any additional capital expenditure (Capex) over what is expected to be spent on the Do-Minimum.

- Any additional operational expenditure (Opex) over what is expected to be spent on the Do-Minimum.

13.7.3 Recommended programme: benefit cost ratio

The resulting present value (PV) of net benefits (with update factors applied) and costs are summarised below. The resulting National BCR_N is 1.4 (BRT variant) and 1.15 (LRT variant), with sensitivity in the range 0.8 to 2.8. The Government BCR_G is 1.5 (BRT) and 1.2(LRT). This BCR is between 1.0 and 3.0, therefore project is considered to have a 'low' rating for the Economic Efficiency component of the Waka Kotahi Investment and Revenue Strategy assessment profile.

Table 13-9: Short term benefit cost ratio for BRT

BCR Summary – Preferred Option (BRT Variant)	
Existing User Service Benefits (39%):	$1,351m
New User Service Benefits (10%)	$341m
Reliability Improvements (39%):	$1,331m
Road Traffic Reduction Benefits (6%):	$192m
Additional Vehicle TTC and VOC (-1%):	$-24m
Walk Benefits (7%)	$243m
Total Benefits	**$3,433m**
Present Value of Costs	
Total costs	**$2,380m**
Benefit Cost Ratio (n) (without WEBs)	1.4
Benefit Cost Ratio (g) (without WEBs)	1.5
Sensitivity Range (including WEBs)	1.0 to 2.8

Table 13-10: Short term benefit cost ratio for LRT

BCR Summary – Preferred Option (LRT Variant)	
Existing User Service Benefits (39%):	$1,351m
New User Service Benefits (10%)	$341m
Reliability Improvements (39%):	$1,331m
Road Traffic Reduction Benefits (6%):	$192m
Additional Vehicle TTC and VOC (-1%):	$-24m
Walk Benefits (7%)	$243m
Total Benefits	**$3,433m**
Present Value of Costs	
Total costs	**$2,988m**
Benefit Cost Ratio (n) (without WEBs)	1.1
Benefit Cost Ratio (g) (without WEBs)	1.2
Sensitivity Range (including WEBs)	0.8 to 2.3

13.7.4 BCR refinements

This analysis assumed LRT and BRT to provide similar user and service benefits. As discussed in the mode selection part of the optioneering process, there is evidence worldwide that LRT can attract more users and stimulate more growth than a BRT options. The expected uplift difference between LRT and BRT can be approximately 25% higher, linked to this, the Land Value Uplift could be superior for LRT than BRT.

Our assumptions reflect a conservative approach to the evaluation of LRT Benefits for Option 1a, strengthening the decision to carry forward both modes to the DBC stage of the project. It will then be possible, while refining the features of the mode system considered, to best quantify the advantages LRT may have to BRT in these terms.

13.8 INVESTMENT PROFILE

13.8.1 Prioritisation of the Proposed Investment

The priority for the potential investment has been assessed in accordance with the Waka Kotahi method for the 2021-24 National Land Transport Programme[4]. This Investment Prioritisation Method requires the assessment of three factors – GPS alignment, Scheduling and Efficiency. The assessment against each factor is outlined below.

GPS Alignment

GPS alignment indicates the alignment of the proposed project with a GPS strategic priority and identifies the potential contribution to achieving it. A rating of Very High/High/Medium/Low alignment is applied. It is noted that where a project contributes to more than one GPS strategic priority, the rating is assigned based on the highest expected contribution to a single strategic priority.

Development of the Business Case is under the overarching strategic direction of Our Space, with strong links to the GPS 2021. The investment in MRT is expected to contribute to three of the four GPS 2021 strategic priorities (Better travel options, climate change and safety) for investment in New Zealand's land transport system[5]. High level commentary on how the recommended option contributes to each of these strategic priorities is outlined in the following Table 13-11.

Table 13-11: Recommended option's alignment with GPS 2021

Strategic priority	Benefit	Alignment of recommended option with strategic priority
Safety: Developing a transport system where no-one is killed or seriously injured	Impact on social cost and incidences of crashes	The recommended programme of MRT will contribute towards a mode shift from private vehicles to public transport, which is an inherently safer mode of transport. Also, any reduction in congestion from MRT resulting in a more efficient network is also likely to achieve safer outcomes. Further, the provision of a prioritised MRT corridor will reduce conflicts with general traffic and further improve road user safety. Upgrades to station facilities and reduced wait times along the MRT corridor will also contribute to perceived safety element improvements.
Better travel options: Providing people with better transport options to access social and economic opportunities	Impact on access to opportunities	The MRT system provides an alternative travel mode to private vehicles use. The recommended MRT option capitalises and further enhances the benefits to the districts from the PT Futures Business Case and provides better travel options within Christchurch City. The priority afforded to MRT enables a reliable and consistent travel time by avoiding conflicts with other vehicles. End-to-end (perceived) public transport journey times are also generally expected to decrease as a result of improved in-vehicle journey times and frequency (decreased wait times). This will result in improved access to a range of destinations and KACs around Christchurch, and social and economic opportunities. This includes improved accessibility to goods and services and jobs, with town and urban centres within Christchurch being well connected.
Improved freight connections: Improving freight connections for economic	Impact on network productivity and utilisation	Improving freight connections is not a key strategic priority for this project. However, any initiative to reduce private vehicle kilometres travelled will help to provide additional capacity and reduced congestion in the network for other activities such as freight. It is noted that the preferred MRT option will require integration with the freight network, specifically at Hornby to enable MRT to align with the Hornby centre, providing a potential opportunity for optimising this centre as a whole, including better integration with the freight network..
Climate change: Developing a low carbon transport system	Impact on GHG	The recommended option will contribute towards a mode shift from private vehicles to public transport (MRT). Mode shift is expected to occur across Greater Christchurch, with greatest benefits being realised along the mass transit corridor. There are expected reductions in greenhouse gas emissions, air pollution (including from PM10), and vehicle kilometres travelled, associated with this mode shift behaviour. These will all contribute towards climate change objectives including a low carbon transport system.

[4] Investment prioritisation Method for the 2021-24 National Land Transport Programme, Waka Kotahi December 2020

[5] Government Policy Statement on Land Transport 2021/22–2030/21, Waka Kotahi, September 2020

The highest GPS metric relates to 'Better travel options and climate change' components of the strategic priorities. This focuses on the mode choice (e.g., shift from private passenger vehicle to other modes) and greenhouse gas (GHG) emissions reduction and air quality improvements. In addition to the information provided in Table 13-11 above, this GPS metric has been further expanded on below, under the GPS 2021 guidelines.

Mode shift for the recommended option has been assessed against several measures, across Greater Christchurch and along the option's mass transit corridors. The KPIs most closely aligning with the Investment Prioritisation Method rating criteria are the PT mode share to the Central City in 2051, both along the mass transit corridor and across Greater Christchurch. When considering improvements along the mass transit corridor, there is approximately a 21% change (reduction) in the private vehicle (car) mode share in 2051 for the preferred option relative to the do-minimum. This reflects a 2-hour AM peak and considers all modes as per the measure definition in the GPS Alignment table for 'Better travel options and climate change'. The rating of the corresponding metric would be **Very High** as a 21% change in private vehicle mode share exceeds the 6% rating listed for very high.

For trips originating from locations across Greater Christchurch, the preferred option's PT mode share (PT trips) to the Central City increases by 16% from the do-minimum to the preferred Option 1A, where total person trips for this metric considers PT, car, and bike modes.

The increase in PT trips (and reduction in private vehicle trips) arising from MRT and specifically the preferred option is therefore noticeable across Greater Christchurch. Further, the preferred MRT option performs particularly strongly when focusing on benefits along the mass transit corridor.

A Very High rating indicates that both the extent of alignment and scale of the expected contribution are well aligned with the GPS strategic priority.

Scheduling

Scheduling in the Method relates to either of two factors: criticality and interdependency. Criticality is the significance of the project's role as part of the network, and the degree of impact to users, particularly due to availability (or not) of alternatives. Interdependency refers to the degree to which the project is necessary to unlock the benefits of another related or integrated investment. The other investment may be part of the same transport programme or package, or a major housing or industrial development or international event.

In this case the dominant factor is interdependency as this project is intrinsically linked to wider strategic initiatives. In particular, the improvements included in this IBC will drastically influence the realisation of benefits associated with the Greater Christchurch Spatial Plan and the wider programme. In addition, the direction of MRT will also significantly influence the direction of other planned projects including those in the Christchurch Transport Plan and Greater Christchurch Transport Investment Plan.

Similar to the rating of GPS alignment, a rating of High/Medium/Low is applied. Considering the high interdependency with other projects, this project meets the **High** criterion of interdependency as it is "part of a programme, package or another investment, and its delivery in the 2021 NLTP period is required to enable further implementation of that programme, package, or investment" and non-delivery means that "one or more benefits will not be achieved or will be delayed for more than 3 years".

Efficiency

Efficiency indicates the expected return on investment and considers the whole of life costs and benefits. BCR is generally used for looking at monetised impacts of the investment. For this business case, the BCR ranges from 1.1 to 1.5 with a sensitivity range of 0.8 to 2.8, therefore giving a **low** rating. WEBs and sensitivity analysis indicate that the project BCR, when refined at DBC Stage to include refined technical assumptions and costs, could increase to a Medium priority range.

Overall Priority

The preferred option has been assessed against the 2021-24 NLTP Investment Prioritisation Method. The assessment indicates that the preferred option has:

Very high GPS alignment; **High** scheduling; and **Low** efficiency.

Applying the Investment Prioritisation 3-factor matrix to the above ratings, the priority order for the project would be **Priority 2.**

13.8.2 Appraisal Summary Table

Appraisal Summary tables prepared for all shortlisted options in accordance with Waka Kotahi requirements6, are included in Appendix U – Waka Kotahi Appraisal Summary Tables.

[6] https://www.nzta.govt.nz/resources/appraisal-summary-table/

COMMERCIAL CASE

WSP | Aurecon | Boffa Miskell |QTP

14 COMMERCIAL CASE

14.1 PURPOSE

The purpose of this Commercial Case is to provide decision-makers with appropriate assurance of the viability and deliverability of the commercial components of the Project.

This commercial case includes:

- The industries capability
- Funding certainty
- Delivery options and issues
- Project scope and potential procurement pathways

The analysis presented in this Commercial Case is based on the identified corridor, stop locations and a mode agnostic solution (LRT or BRT).

14.2 INDUSTRY CAPABILITY

At this IBC stage the preferred option is mode agnostic between bus rapid transit and light rail. The industries capability to deliver the next stage, the DBC, including early investigations will vary depending on the mode selected.

The majority of consultants in Aotearoa are multi-national and therefore have the capacity to resource a project of this size and nature. However, given the forecast programme of major project work of this nature across the national transport sector, industry capacity may be a risk for both consulting service and for internal capacity and capability of project partners and key stakeholders.

Beyond the large resource pool, it is important to have the right capability sourced locally and internationally committed to this Project. To provide the best resources, a blend of local and global specialists will be needed. Industry knowledge and lessons learnt should also be drawn from other similar projects across New Zealand, includes Let's Get Wellington Moving and Auckland Light Rail. Advanced planning and careful programming of work will help to alleviate resourcing issues.

14.3 FUNDING CERTAINTY

The recommended programme for the Preferred Option allows for the MRT to be developed in two stages within a 10-year horizon. The staging can be completed to keep pace with anticipated growth in demand as well as the ability and time needed to implement the recommended infrastructure changes. Funding is yet to be sourced and confirmed, refer to the Financial Case for details around funding requirements. It is important to note that funding uncertainty will bear on the risk profile of the project, it may impact its ability to secure timely delivery and value for money.

14.4 DELIVERY OPTIONS AND ISSUES

14.4.1 Responsibility

The "traditional" split of responsibilities for implementation of PT services and infrastructure is outlined below:

- ECan responsible for planning and operating urban PT services in Greater Christchurch (Metro).
- CCC, WDC and SDC responsible for delivering the PT infrastructure on their networks within their respective districts.
- Waka Kotahi responsible for delivery of PT infrastructure along State Highway portions of the network.

The suitability of this typical delivery model needs to be considered in context of MRT and its associated risks, the benefits, intellectual property, and experience of the regional and local council's needs consideration alongside Waka Kotahi's experience in delivering complex major projects, to ensure a delivery model that is fit for purpose and minimises risk to successful delivery. The DBC should consider various models in detail to inform subsequent stages of procurement, project governance and roles and responsibilities as discussed in the Management Case.

14.4.2 Consenting

The Indicative Consenting Strategy for the Project identifies opportunities available to secure statutory approvals under the relevant resource management provisions to deliver the Project. The indicative strategy is based on the current Project scope and may need to be revised as the scope develops in the next phase.

The recommended option aims to utilise the existing networks across the city, implementing a street-running route connecting Hornby and Belfast via the Central City. The recommended option also includes an enhanced bus service to Waimakariri and Selwyn Districts.

The majority of the route is within existing road reserves and transport corridors. Where measures relate to network improvements (such as frequency improvements / non-infrastructure) or improvements such as the establishment of minor infrastructure upgrades (i.e., new bus stops within the existing transport zone/road reserve), it is anticipated that any associated environmental effects will be minimal, as it is occurring within existing urban transport corridors. This is largely anticipated to be the case for the Waimakariri and Selwyn Districts. Any corridor upgrades to improve bus priority should consider integration with the streetscape and urban environment.

Despite this, statutory approvals will be required to deliver the Project. These will largely depend on the final selected mode and the associated nature and scale of the works. The measures with potential to result in a need to obtain resource consent are those that require land outside the transport zone (i.e., any new bus stops, stations, interchanges and/or depots), construction methodology and the location and treatment of environmental attributes within the road reserve (such as waterbodies and street trees).

Any earthworks associated with the construction of new infrastructure to support the proposed upgrades should be managed appropriately with site specific erosion and sediment control and dust control measures. Earthworks within 5m for example, or the felling of, any street tree within the road corridor that is greater than 6m in height will require consent as a restricted discretionary under the Christchurch District Plan.

In addition, it is noted that all three district councils (Waimakariri, Selwyn and Christchurch City) are currently undertaking district plan reviews, to give effect to Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 (EHS Act 2021). The EHS Act seeks to enable the development of three houses of three storeys in height within residential sites without the need for resource consent. Selwyn and Waimakariri District Councils have notified their plan changes, with Christchurch City to be notified on 17 March 2023. The nature of the works required to support the Project (i.e., access arrangements, anticipated daily vehicle movements, earthworks, impervious service area, landscaping etc.) may have the potential to impact on consents granted and conditions.

To add further complexity to the consenting pathways for the Project, the Government is currently undertaking a Resource Management Reform, repealing the Resource Management Act 1991 (RMA). The proposed Natural and Built Environment Act (NBA) will be the primary piece of legislation in the reform package supported by the Strategic Planning Act (SPA) and Climate Adaptation Act. A bill of the NBA was introduced to the house late 2022 and is expected to be passed by end of 2023. While it is likely that there will be a transition period, there is increased uncertainty of the implications of the reform package and the NBA which introduce un-challenged concepts and terms. This increases the complexity in assessing the consenting requirements and what processes will be required and available for the Project.

14.4.3 Property Planning

The current design approach for the MRT assumes large-scale corridor widening will not be necessary. But strategic land acquisitions will be necessary to deliver the project outcomes near stations, major intersections, and depot sites. These requirements will also be further influenced by the final mode decision.

Given the city shaping opportunities this project presents, consideration should be given to targeted strategic land purchases in future stages to support the intensification anticipated (including change in housing typologies), the change in the character of the corridor, and in achieving quality streetscape/public realm and specific 'place' outcomes.

The land requirement plans, and property acquisition strategy is to be developed during the DBC, when there is more certainty regarding mode technology and the design philosophy has been agreed in more detail.

In the DBC collaboration and partnerships should be further investigated, including with local government, central government and Kainga Ora, to enable strategic land purchase, site amalgamation and delivery of exemplar developments, including TOD's.

Further details of work that has been completed around required property acquisition can be viewed in the Mass Rapid Transit Route Stage 1- Christchurch City Property report prepared by WSP. Key risks pertaining the property aspects include:

- Implications on design philosophy.
- Project timeframes and resolving objection to compulsory acquisition; and
- Property escalation cost while identifying land requirements.

14.4.4 Required Services

During this IBC service impacts/conflicts have been considered at a high level only. Further investigation will be required in the DBC, taking into consideration the confirmation of the design envelope, particularly at intersections, agreed mode and advances in technology. Early discussions with service providers are also recommended at DBC stage to further quantify and mitigate the potential risks.

Underground services have not been assessed but it is known that within the preferred corridor Orion has 66kV cables. It is uncertain at this stage if any protection or relocation of these cables may be required during construction, but it is a risk to the Project.

It should also be noted that the preferred corridor and depot site will require services from either Orion or Transpower. This will depend on the load requirements and grid connection point and requirements will be linked to the mode chosen.

14.5 DETAILED BUSINESS CASE PHASE

14.5.1 Scope of the Detailed Business Case

The next formal stage of works under a business case process is the DBC which builds on this IBC to ensure the Project is viable and will meet agreed objectives. A potential forward pathway and programme has been developed and is shown in Figure 14-1.

This pathway supports a delayed decision on mode until further investigations are completed within the DBC stage. Once a mode decision is made the design and construction process will be refined. This refinement is indicated by the red "OR" box on Figure 14-1 . This approach: Provides an opportunity to optimise the PT Futures Programme to ensure works are congruent with the proposed MRT.

- Integrates mitigations and controls for key risks identified, as discussed further in the Management Case, with full risk register also provided in Appendix W – Project Risk Register.
- Provides flexibility to manage funding constraints by providing staging, early work/investigations that can be commenced if required. These are highlighted to the left of the DBC scope.
- Enables flexibility to add additional scope over time if necessary (e.g., links to the airport).
- Allows the project to be delivered in two phases adopting a service led delivery approach. Refer to Section 13.5.4 for a discussion on potential staging of this project and the reasons for adopting a service led delivery approach which allows services to be implemented prior to investing in infrastructure.

14.5.2 Key components and priorities for the DBC scope are:

Engagement Strategy and Implementation

A stakeholder engagement strategy specific to the MRT objectives should be developed at the front end of the DBC and then actively implemented in subsequent phases. This strategy should incorporate and respond to feedback received from the public engagement being undertaken at the writing of this IBC.

Network Integration Study

MRT has significant interfaces with the surrounding network, to reduce the risk of these interfaces it is recommended a network integration study is completed at the start of the DBC to inform subsequent feasibility and design phases. This study would include integration of MRT with the existing roading network, active mode facilities including the cycle network, network wide impact assessments (e.g., removing U-turns and access at key locations), integrating with neighbourhood plans (Riccarton, Papanui, Merivale), the city centre/bus exchange and transport plan projects (Kilmore Street) and the freight network.

Land Use Integration Study

Based on the outcomes of the GCSP and PC14 decisions development of a Land Use Integration Study as an early piece of work to investigate a range of regulatory and non-regulatory tools and incentives beyond zoning to drive a change in intensification and land use patterns to support MRT. This will include collaboration and partnership strategies with Government Agencies around strategic Priority Development Areas, land purchase and exemplar development, local master planning to unlock development potential and

regulatory tools such as growth management, minimum densities, and mixed-use policies.

Property Protection Strategy

Development of a property protection strategy has been identified as an early piece of work to reduce consenting, corridor protection and property acquisition risks. Property implications have only been considered at a very high level within the IBC. Having an early deeper understanding of this risk and potential opportunities, means the design philosophy can be better understood moving into the full DBC stage. Timing and scope for this work will be developed during the early works.

DBC Specialised Workstreams

The DBC will also need to cover specific details relevant to MRT, including but not limited to mode confirmation; fleet decisions; digital integration/signal phasing; shadow operations workstream, operational contract arrangements and a resilience assessment.

In addition, once the mode is selected within the DBC it is recommended a shadow operations team is engaged to support the design process by identifying and providing operating requirements at early stages of design, reducing conflicts and rework in later design and implementation stages. This mitigation has been successfully used on other mega projects.

The specific scope of work and a delivery programme will be developed as part of the procurement process at the commencement of this IBC.

Optimising and Integrating with PT Futures, Hornby Master Planning

Parallel workstreams not included in the DBC but also shown on Figure 14-1 are the PT Futures workflow and a Hornby Master Planning package. It is assumed these will be procured separately from the DBC, but they are completed as early as possible to reduce reputational risks and maximise benefits and value for money across both programmes. More details around these work packages are provided in the Management Case Next Steps.

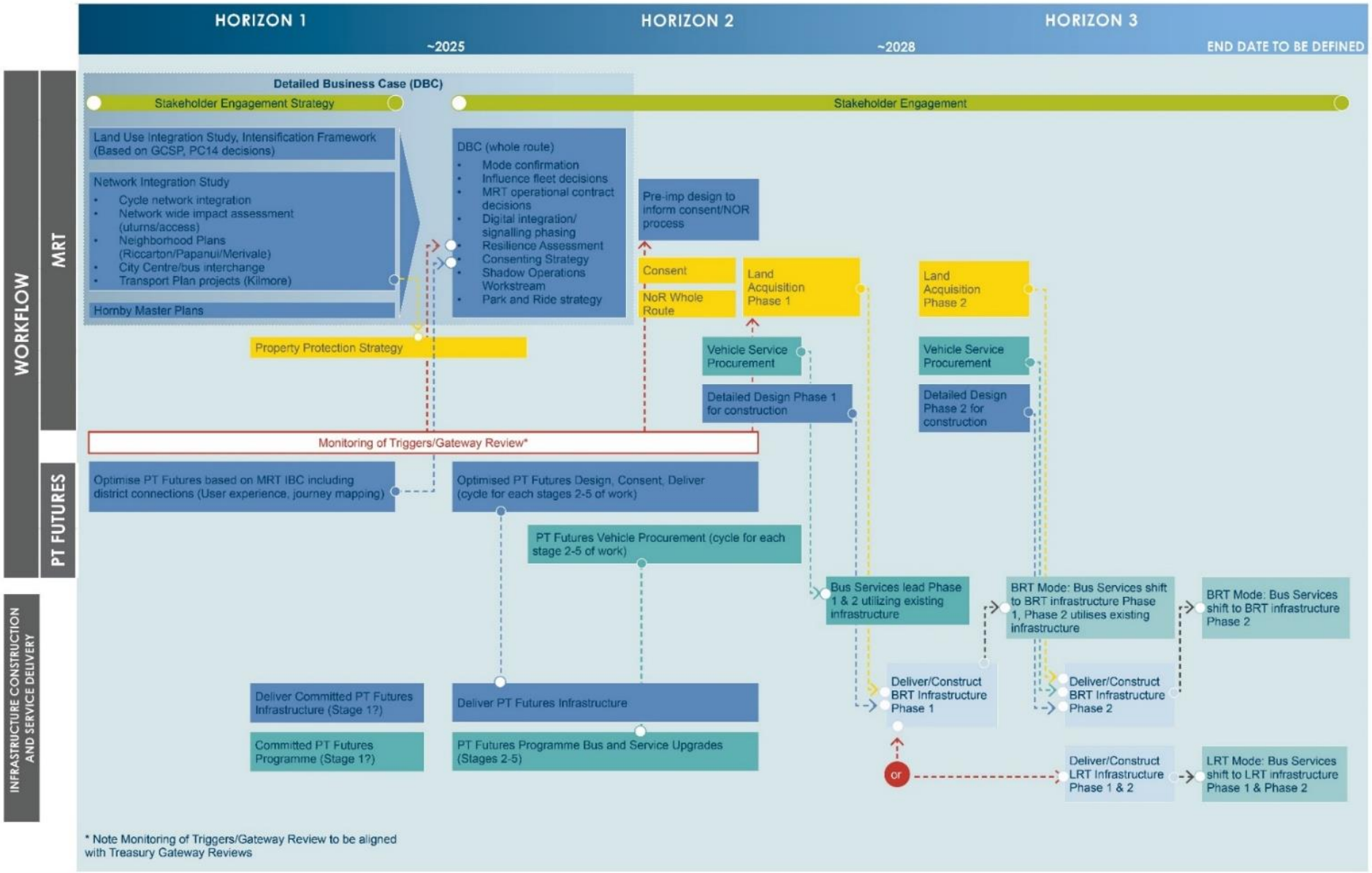


Figure 14-1: Potential Staging Pathway for MRT

Timeframes for the Detailed Business Case

The delivery of MRT has been considered over a 10-year horizon to identify how the timing for its implementation is linked to a range of other projects and initiatives, including outcomes of the Greater Christchurch Spatial Plan work and the PT Futures accelerated investments. Acknowledging the extent of unknowns at this IBC stage, there are identified opportunities that may need the early delivery of MRT. For instance, if MRT is to be strategically leading change of urban form to support the reduction of future emissions, rather than being responsive to change, then MRT's accelerated implementation will be necessary. To fully understand these opportunities and decide on a potential investment in MRT to deliver them, the next stage of the MRT Investment lifecycle must follow this IBC without delay but will need to align with available funding.

Indicative programme durations anticipate scoping, procurement, and award of professional services to occur within a 12–18-month period. This is then followed by a 24–36-month design, consultation, and planning period. From the completion of the DBC, the planning approvals, land acquisition and construction, assuming a two-phase approach, are anticipated to occur prior to 2033 but this will need review within the DBC phase to align with GCSP and PC14 targets.

Funding and governance approvals present a potential delay risk to the pre-implementation procurement and the delivery timeframes. Delays will have potential knock-on effects throughout the programme.

Progressing the DBC as early as possible will enable more efficient systematic planning, ensure integration opportunities with accelerated PT Futures infrastructure delivery are maximised and support better risk quantification and hence improved mitigation.

In addition, planning/property aspects such as property protection, notice of requirement land acquisition can be better planned and executed. The longer a city shaping project like MRT is delayed, the more barriers there are to change and integration with the wider network, delay will also result in a loss of momentum and critical working knowledge already acquired.

14.5.3 Procurement and risk allocation options for the Detailed Business Case

The expectation is that all procurement associated with the project will be conducted according to the Government Procurement Rules (4th edition), regardless of the procuring organisation.

The next stage of procurement needs to leverage industry knowledge, while enabling integration across the various interfaces and partners/stakeholders. This integration is essential for ensuring effective decision making, establishing forward momentum, appropriately allocating risk, and optimising the benefits realisation of MRT.

Section 16.4 outlines early investigations and packages of work that have been identified to best prepare the Project to go into the DBC phase. This section includes high level scope for each package and suggested organisations to lead the delivery of work. In the absence of established funding framework and confirmed governance models, the procurement strategies for the delivery/leading organisations will apply.

The following table outlines various procurement models. Specific strengths and weaknesses for each model and its performance during a DBC (including early investigations) have been provided for consideration. Please note there are other factors and models that are not included in this table that may be considered when selecting the procurement model for MRT. It should also be noted that as the project evolves through the project stages the procurement model may need to evolve to manage specific risks and constraints associated with the stage.

Table 14-1: Procurement Options for DBC

	Strength	Weakness	Suitability to MRT DBC
Traditional Client/ Consortium IBC/DBC model	Strong ownership of performance from the Professional Technical Advisor (PTA) A significant benefit is established relationships that come with a consortium-led PTA. This model can be supplemented by best-for-project services procured separately by client or directed into PTA. e.g. Early investigations could be appointed directly to manage key risk areas and better inform the scope required for the DBC. Commercial mechanism can reflect scope uncertainty through development of task plans against scope as the project develops. This allows team to scale up and down accordingly.	Client may have preference for particular specialists. This can be overcome working with the PTA to incorporate nominated specialists. It has the potential for some partners to disengage from the project.	The most efficient model in terms of procurement and where the general scope of the services and outcomes sought are understood, even if there is uncertainty as to how the project will develop. A mechanism for the contract and commercial approach can be executed through the development of "task plans" for elements of the scope as the project developed through the phases. This enables the client to ensure that the team scales up and down according to the project demands, optimising utilisation of the team and managing cost effectively. Enables the work to get underway with lower value investigations while there is funding uncertainty.
Alliance	Allows for full integration of owner partners (Waka Kotahi, CCC, SDC, WDC, ECan) and Principal Technical Advisor proponents (PTA) at a commercial level which encourages joint ownership of outcomes and can be measured against Key Result Areas (KRAs). Unanimous decision-making across all Alliance Participants is a fundamental principle of an alliance. Full integration of partners.	Significant effort and cost up front to establish agreed contractual and commercial terms and alignment on KRAs to drive the right behaviours and best for project outcomes. Ongoing cost of governance does not allow for effective downscaling of the team depending on the project stage. Alliances perform best where financial returns are directly related to performance against a tight scope. Value is lost where scope flexibility is required.	Other models are better suited to DBC phases of projects and can achieve the same level of collaboration and project outcomes, offering better value for money. The Alliance model manages/integrates internal partnerships well but can sometimes lose focus on managing/integrating with external partners and key stakeholders.
Special Purpose Vehicle (SPV)	Dedicated organisation set up to run the delivery from concept to operations which brings singular focus of delivering the	Require substantial legal and commercial frameworks to be set up rendering them expensive to time consuming to establish.	The establishment of a SPV would be more beneficial in subsequent stages of the project/programme (pre-implementation onward) once the scope and programme

	Strength	Weakness	Suitability to MRT DBC
	project/programme. As long as the project is well defined, this will lead to efficiencies in delivery. Inclusive governance with multiple clients as project partners.	This expense would be disproportionate for a DBC phase. Client partners/sponsors can lose a level of influence and control depending upon their role in the SPV.	are better defined and the implementation programme timing confirmed. This would be considered as part of the Management Case for the DBC.
Role by Role best for Project	Able to secure the people and organisations that the client wants on a specialty basis. Able to test value for money through the procurement of roles. Not all services required at same time so can be procured as and when needed.	Needs strong client leadership, depth of capability and direction to drive everyone on a best for project basis. Requires depth of procurement capability to procure services in a timely manner to achieve programme objectives. Introduces integration complexities, but these can be overcome on the basis that everyone is working on a best for project basis. Project management, cost management of individual supplier contracts can be more complicated and require greater client management. More expensive than single consortium. Loss of single point delivery accountability.	This model is not recommended for the DBC as a whole. It could be considered for early investigation stages of the DBC but would require significant effort to ensure integration across the various pieces of work.

FINANCIAL CASE

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15 FINANCIAL CASE

The financial modelling of the 5 short list options is reported in 8.1.7 above, as part of the affordability and fundability analysis of each option in the short list assessment. The analysis presented in this Financial Case is based on the cost estimate for the identified corridor, station locations and a mode agnostic solution (LRT or BRT), of Option 1a.

A full financial and funding analysis is to be completed at DBC stage. This Indicative Business Case Financial Case provides the high-level summary and analysis required for decision makers to assess the financial dimensions of the project that may result from a future DBC, and the financial commitment related to the next phases.

15.1 APPROACH AND ASSUMPTIONS

The whole-of-life financial analysis of the preferred solution has been conducted in line with Waka Kotahi Guidelines for IBC.

Costs for Pre-delivery, Delivery and operating phases are all provided in real terms, Qtr1 2023 New Zealand dollars. Nominal terms costs, including the forecast effect of inflation, are not provided at this IBC level.

Costs for option 1a are detailed in Appendix R – Cost Estimate and include both capital and operational expenditures for the pre-delivery, delivery, and operating phases of the contract.

For the purposes of providing a conservative financial case the earliest reasonable delivery timeframe for the start of services is 2033 has been used to build the cost models and BCR calculations.

15.1.1Quality Assurance

The base estimate builds up and estimate contingency (uncertainty and risk) process is presented in Appendix R – Cost Estimate and follows Waka Kotahi's Risk Management Process Z44 and Cost Estimate Manual SM014.

An external independent high-level review of the cost estimates for options 1a LRT and 1a BRT was commissioned by Waka Kotahi and carried out April 2023. As a result, a review of the cost estimates, risk and funding risk contingency was completed. The financial information provided in this Financial Case use the reviewed costs.

Note that early estimations of Delivery Phase Costs and Operating Phase Costs presented in Section 12.3.4 above have not been modified so as to protect the integrity of the option selection process.

At a high level the reconciliation process increased the P(95) CAPEX cost of Option 1a LRT from $3.8bn to 4.0bn by way of:

- Aligning Contingencies and Funding Risk Contingency to all element of cost.
- Applying Contingencies of 30% to all elements of cost.
- Increasing Funding Risk Contingencies to 45% to all elements of cost.

15.1.2 Risks, Contingencies and Optimism bias

In developing the financial case, appropriate care was taken to avoid optimism bias by using a rigorous cost-estimation methodology (SM014) and recent industry data from similar projects and operations in New Zealand and worldwide to benchmark costs estimates. This included the operating phase costs of similar vehicles on comparable services. This effective baselining of whole of life costs on recent and relevant data matches the inherent uncertainty remaining at IBC stage.

When estimating our base estimates, all assumptions and simplifications required were taken to er on the conservative side and mitigate the risk of under-estimating the costs of the project.

The accuracy of the cost and benefits estimations relied upon necessarily reflect the uncertainty of the solutions that may result from a future DBC. Acknowledging transparently this uncertainty, and building on the findings of the external review, this financial analysis provides risk adjusted costs built by applying,

- For all delivery phase capital expenditures, a 30% of Base Estimate contingency and a further 45% of Base Estimate Contingency to estimate an equivalent P(95) cost estimate.
- For all operating phase operational and capital expenditures, a 10% of Base Estimate contingency and a further 15% of Base Estimate Contingency to estimate an equivalent P(95) cost estimate.

This conservative approach provides a total 75% contingency on conservative delivery phase capital expenditure that reasonably reflects the risk profile of the project and is adequate for a project of this magnitude at this stage of its planning.

15.1.3 Project delivery phasing

Considering the start of this project is still contingent to many decisions, this financial case adopts a simplified phasing approach to the project. A simplified delivery programme including limited representation of procurement and delivery allocation of costs across delivery years was adopted.

The analysis of the pre-delivery and delivery costs extends across a duration of 10 years, from Year -5 to Year 4. Year 0 being the year when physical works start.

The analysis of the operation phase of the contract extends over 66 years, from Year -5 to Year 60 to allow for the net operation cost analysis to consider Do-Min operating phase costs incurred during the Pre-delivery and Delivery phases. Year 6 is the first year of operation of the Mass Transit service.

15.1.4 Delivery phase costs

Option 1a requires a maximal capital investment of $3.0bn to $4.0bn, in real term 2023 qtr1 New Zealand dollars, including all contingencies and funding risk contingencies. A likely delivery cost, excluding funding risk contingencies, while very uncertain at this early stage of the project can be estimated between $2.2bn and $3.0bn. These do not include wider networks upgrade costs that may be required to mitigate the effect of MRT.

Capital costs reported consider the delivery of all aspects of the infrastructure, stations, facilities, and fees required during the delivery phase of the project. Table 15-1 below provides a breakdown of the capital costs associated with:

- Option 1a – LRT
- Option 1a - BRT

Table 15-1: Breakdown of Capital Costs

Elements of Capital Costs	**$m, real terms, 2023 qtr1**	
	BRT Solution	**LRT Solution**
Property Costs Allowance	119.03	119.03
Project Development	54.94	54.94
Pre-Implementation Phase	104.41	143.14
Implementation Phase	60.04	81.34
Physical Works	1261.80	1731.38
Rolling Stock	87.00	182.80
Total excluding contingencies	**1687.21**	**2312.63**
Contingency	*506.16*	*693.79*
Total including contingency (i.e., excl funding risk) P(50)	**2193.37**	**3006.42**
Funding Risk Contingency	*759.24*	*1040.68*
Total with all contingencies equ. P(95)	**$ 2,952.61m**	**$ 4,047.10m**

15.1.5 Operating phase costs

Operating phase costs reported include the operational expenditures required for the management, operation (including energy) and maintenance of the fleet of mass transit vehicles, their depots, and facilities, as well as the operation costs of the PT Futures high frequency buses linking the preferred MRT corridor's end to districts.

The table below provides estimates of yearly operational and maintenance costs associated with Option 1a – LRT and option 1a – BRT. These are expressed in yearly averages over the first decade of operation and exclude bus connections to districts.

Table 15-2: Operating Phase, Operational Costs

Elements of Operating Costs	$m, real terms, 2023 qtr1	
	BRT Solution	LRT Solution
Operation costs	34.86	33.94
Maintenance Costs	19.53	17.32
Contingency	5.44	5.13
Funding Risk Contingency	8.16	7.69
Total excluding contingencies	54.39	51.26
Total with all contingencies equ. P(95)	**$ 67.99m p.a.**	**$ 64.07m p.a.**

15.2 WHOLE OF LIFE COSTS

Operating phase capital expenditure required for the renewal of deteriorated assets were estimated at high level for the preferred option. These are based on conservative serviceable life assumptions of 40y for all fixed assets, 30y for LRT rolling stock and 20y for BRT rolling stock.

Operating phase capital expenditure required for the renewal of deteriorated assets related to the Do-Minimum were not assessed.

Net operating costs including capital expenditure are therefore over-estimated. This very conservative assumption is adequate at IBC level but will require further analysis at future stages, as PT Future fleets and operating models are refined by other stakeholders in the coming years.

The table below provides a breakdown of the operational and capital costs associated with the operation to Year 60 of:

- Option 1a – LRT
- Option 1a – BRT

Table 15-3: Breakdown of Operating Phase, Whole of Life Costs

Elements of Whole of Life Costs (60 years of operation)	$m, real terms, 2023 qtr1	
	BRT Solution	LRT Solution
Operation costs	9208.35	9156.52
Maintenance Costs	1093.51	969.84
Renewal costs	1185.18	1639.11
Contingency	1818.70	1846.55
Funding Risk Contingency	634.66	676.42
Total excluding contingencies	11487.05	11765.47
Total with all contingencies equ. P(95)	**$ 13,940.41m**	**$ 14,288.44m**

The anticipated cash flows for the project over its intended life span are as set out in the subsequent charts for each of the implementation options.

Table 15-4: Option 1a, LRT fleet

	$m, real terms											
Cost elements	**Y-5**	**Y-4**	**Y-3**	**Y-2**	**Y-1**	**Y0**	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Total**
Property Costs	0.00	0.00	0.00	59.51	59.51	0.00	0.00	0.00	0.00	0.00	0.00	**119.03**
Project Development	27.47	27.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**54.94**
Pre-Implementation Phase	0.00	0.00	47.71	47.71	47.71	0.00	0.00	0.00	0.00	0.00	0.00	**143.14**
Implementation Phase	0.00	0.00	0.00	0.00	0.00	16.27	16.27	16.27	16.27	16.27	0.00	**81.35**
Physical Works	0.00	0.00	0.00	0.00	0.00	346.28	346.28	346.28	346.28	346.28	0.00	**1731.38**
Rolling Stock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	182.80	0.00	**182.80**
Contingency	8.24	8.24	14.31	32.17	32.17	108.76	108.76	108.76	108.76	163.60	0.00	**693.79**
Funding Risk Contingency	12.36	12.36	21.47	48.25	48.25	163.15	163.15	163.15	163.15	245.41	0.00	**1040.68**
Total excluding contingencies	27.47	27.47	47.71	107.23	107.23	362.55	362.55	362.55	362.55	545.35	0.00	**2312.63**
Total with all contingencies (P95)	48.07	48.07	83.50	187.65	187.65	634.45	634.45	634.45	634.45	954.35	0.00	**4047.10**

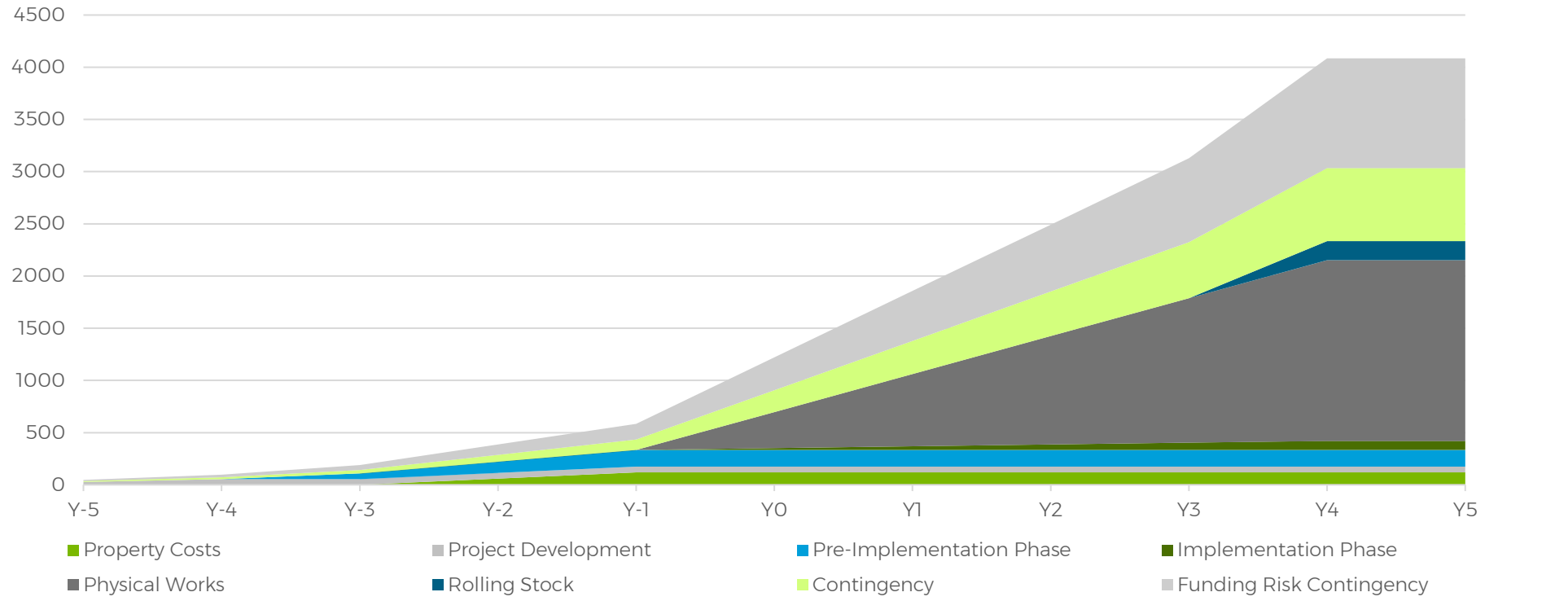

Figure 15-1: Cumulative cashflow for deliver phase of LRT fleet

Table 15-5: Option 1a, BRT fleet

	$m, real terms											
Cost elements	Y-5	Y-4	Y-3	Y-2	Y-1	Y0	Y1	Y2	Y3	Y4	Y5	Total
Property Costs	0.00	0.00	0.00	59.51	59.51	0.00	0.00	0.00	0.00	0.00	0.00	**119.03**
Project Development	27.47	27.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**54.94**
Pre-Implementation Phase	0.00	0.00	34.80	34.80	34.80	0.00	0.00	0.00	0.00	0.00	0.00	**104.41**
Implementation Phase	0.00	0.00	0.00	0.00	0.00	12.01	12.01	12.01	12.01	12.01	0.00	**60.04**
Physical Works	0.00	0.00	0.00	0.00	0.00	252.36	252.36	252.36	252.36	252.36	0.00	**1261.80**
Rolling Stock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	87.00	0.00	**87.00**
Contingency	8.24	8.24	10.44	28.30	28.30	79.31	79.31	79.31	79.31	105.41	0.00	**506.16**
Funding Risk Contingency	12.36	12.36	15.66	42.44	42.44	118.97	118.97	118.97	118.97	158.12	0.00	**759.24**
Total excluding contingencies	**27.47**	**27.47**	**34.80**	**94.32**	**94.32**	**264.37**	**264.37**	**264.37**	**264.37**	**351.37**	**0.00**	**1687.21**
Total with all contingencies (P95)	**48.07**	**48.07**	**60.91**	**165.05**	**165.05**	**462.64**	**462.64**	**462.64**	**462.64**	**614.89**	**0.00**	**2952.62**

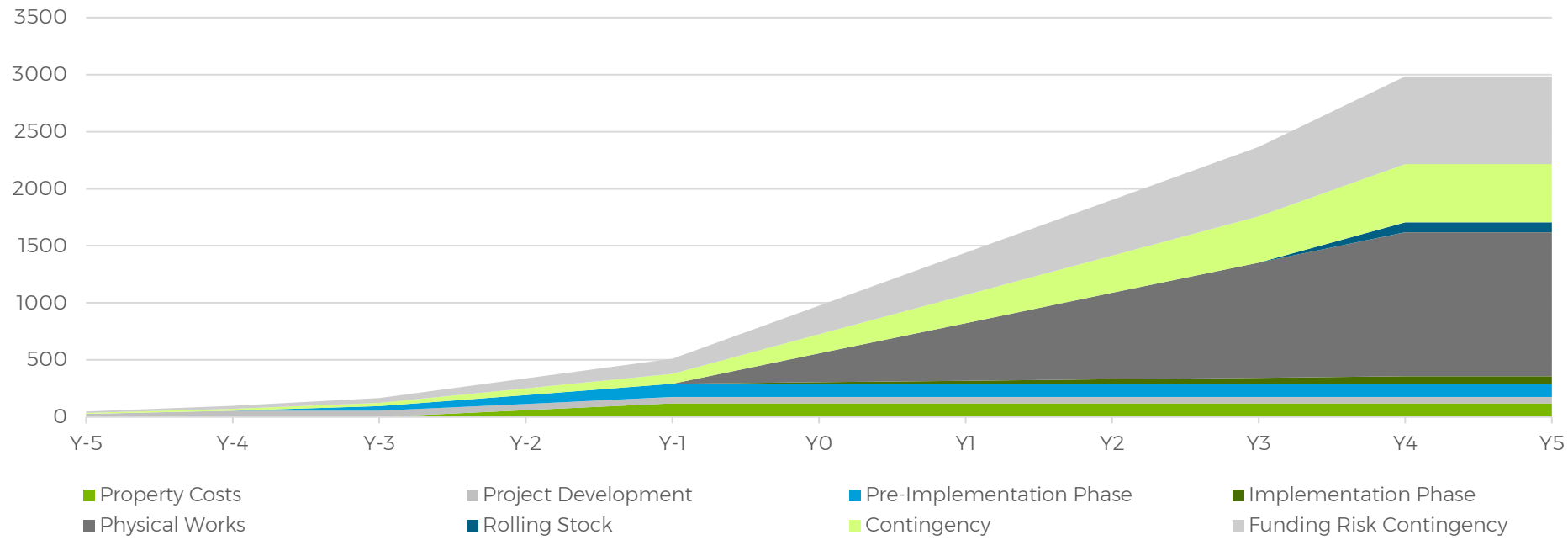

Figure 15-2: Cumulative cashflow for deliver phase of BRT fleet

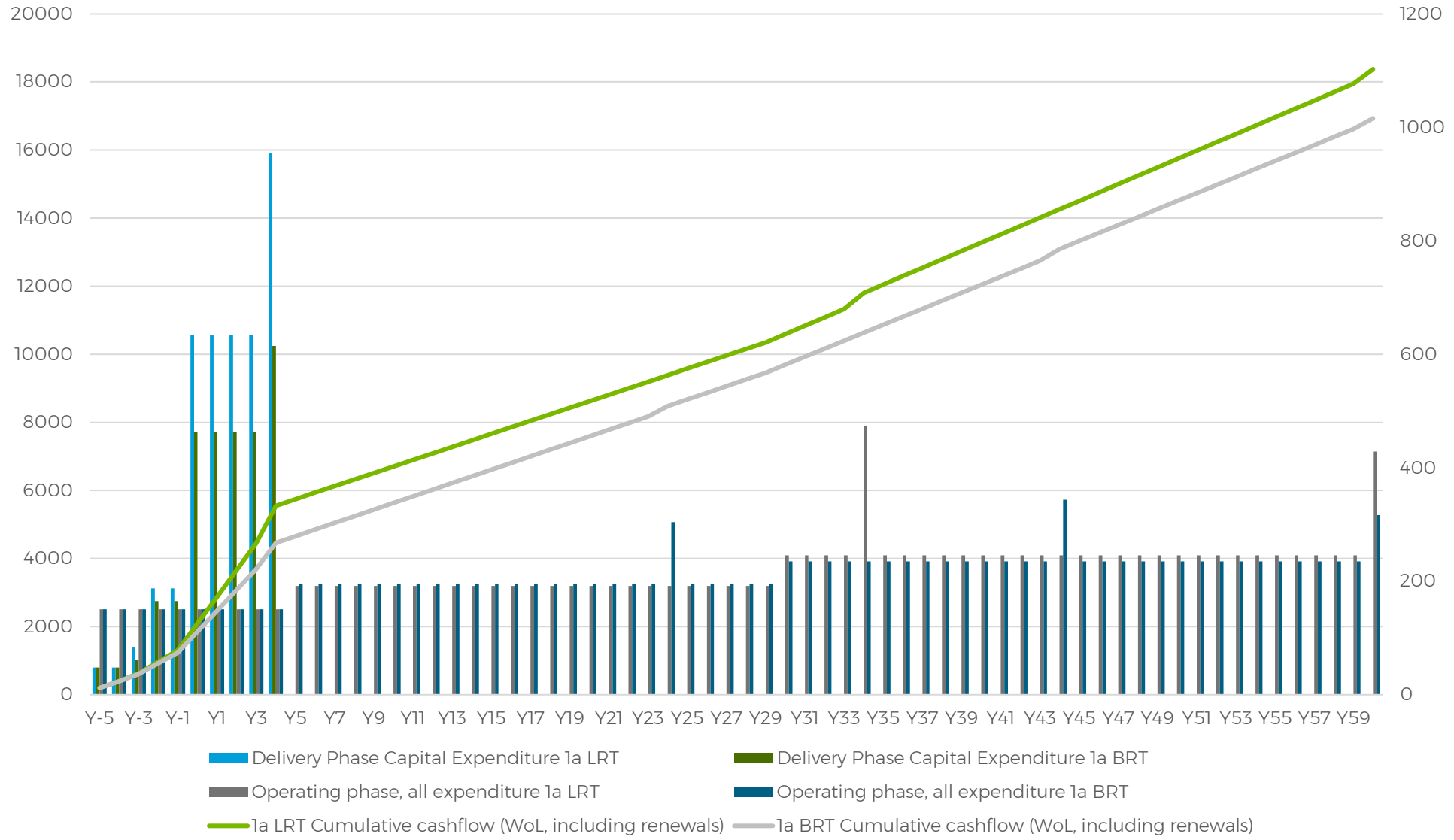

Figure 15-3: Cumulative cashflow for gross whole of life project for LRT and BRT

15.3 FUNDING APPRAISAL

The current assumptions are that part of the project would be funded through the National Land Transport Fund and part through funding from the Central Government.

However, there is potential that additional funding may be secured through private sector investment – to be determined when examining procurement options and selecting a preferred method at DBC level.

Consequently, a funding model is recommended to be developed as part of the DBC. This will inform a financial analysis and a funding analysis.

15.3.1 Indicative funding stream analysis

An indicative analysis of the costs related to Option 1 a allows the identification of financial commitments according to traditional splits for projects of this nature:

Delivery Agency Costs, including project development costs, and pre-implementation costs, and implementation phase costs. This stream of funding will have to be born by the organisation or organisations delivering the project.

Fixed Asset Owner Costs includes all Physical Works costs and ongoing asset renewal costs. This stream will fund the final assets and therefore typically sits with the asset owner. In this case, with option 1a running through the local road network, it is assumed to sit with the City Council.

Fleet and Operating Costs includes fleet purchase cost and operation costs as well as fleet whole of life costs. This stream relates to the farebox income and sits traditionally with the organisation mandated to provide public transport in the region. We note these includes Do-minimum operating costs related to PT Futures services' energy costs.

Using this high-level analysis, Figure 15-4 below provides indicative estimates of cashflows per streams for Option 1a LRT for the period spanning the next Long-Term Plan. It shows an indicative peak investment needed in FY32 of $939m.

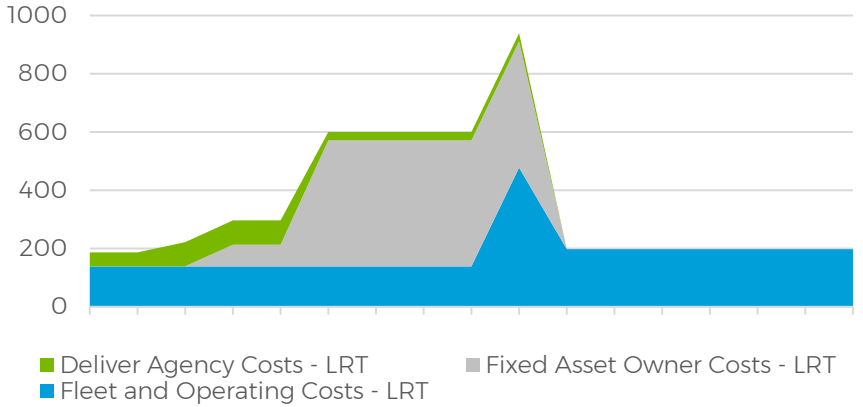

Figure 15-4: Option 1a LRT Funding Streams Cashflows - upcoming LTP period

Figure 15-5 below provides indicative estimates of cashflows per streams for Option 1a BRT for the period spanning the next Long-Term Plan. It shows an indicative peak investment needed in FY32 of $772m.

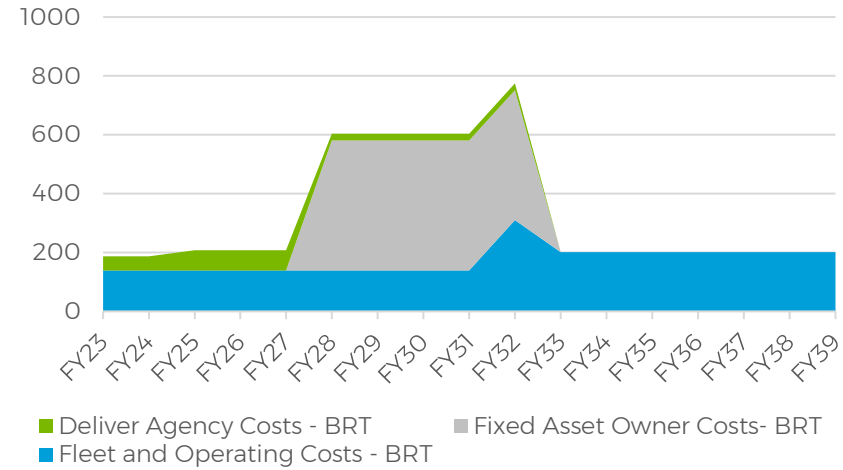

Figure 15-5: Option 1a BRT Funding Streams Cashflows - upcoming LTP period

Acknowledging the high level of uncertainty remaining at this IBC stage, it is possible to complete an early assessment of the cashflows by origin funds.

We note the below information is based on initial assumptions that are not validated. Extensive financial analysis and consultation at, and after DBC stage will be required to identify the most appropriate splits of funding streams for MRT.

Taking the initial assumption that Delivery Agency Costs, Fixed Asset Owner Costs and 50% of Fleet and Operating Costs will be borne by Central Government, through direct grant or via existing NLTF processes and existing FAR, the peak investment linked to Central Government funds in FY32 is $700m for Option 1a LRT and $618m for Option 1 BRT. This means that a peak investment linked to Local Government funds in FY32 is $239m for Option 1a LRT and $155m for Option 1 BRT. Noting funding is subject to cost share agreements to be determined at the DBC phase.

The indicative estimates of cashflows per origin of funds for Option 1a for the period spanning the next Long-Term Plan are provided in Figure 15-6 for LRT and in Figure 15-7 below for BRT.

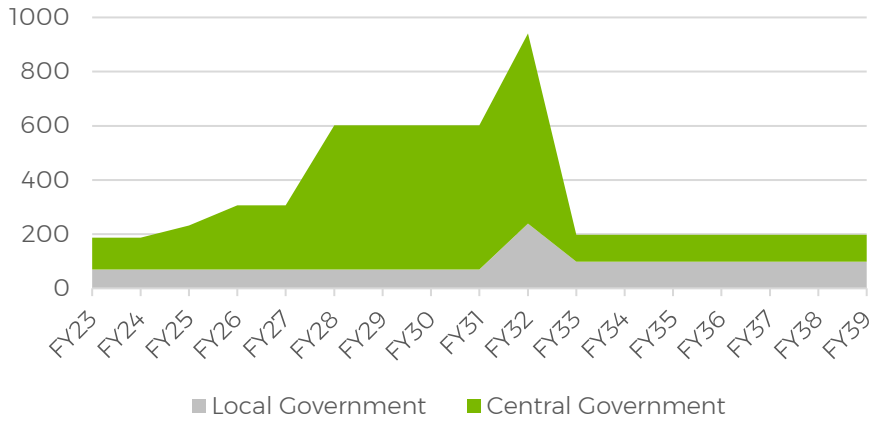

Figure 15-6: Option 1a LRT - Funding Cashflows by Origins

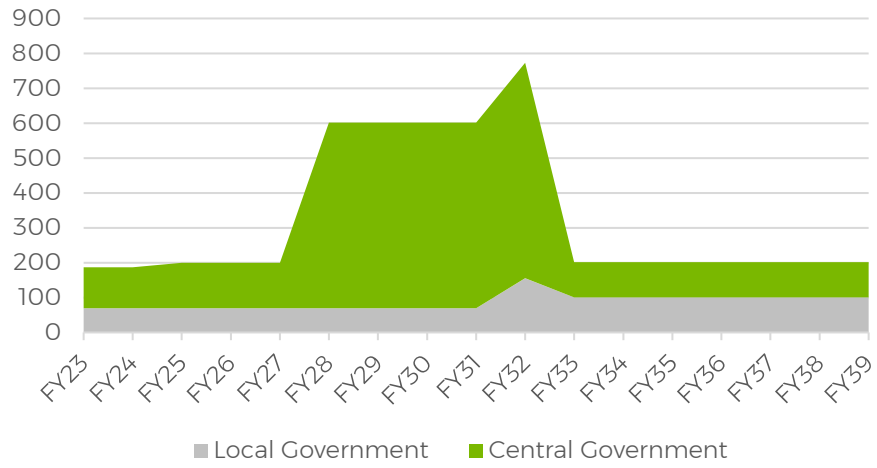

Figure 15-7: Option 1a BRT - Funding Cashflows by Origin

Financial consideration of next steps

The next steps of the project, detailed in the Management Case, will require the funding of Project Development Phase costs of $54.9m excluding contingencies. These include an estimated $12.7m of Waka Kotahi Managed costs and $42.3m of Consultancy Fees, all excluding contingencies, that will focus primarily on the DBC activities.

MANAGEMENT CASE

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16 MANAGEMENT CASE

16.1 INTRODUCTION

This Management Case presents the arrangements that will be put in place for the successful delivery of the preferred option, both to ensure successful delivery and to manage programme risks. It covers:

- Management strategy approach and frameworks
- Governance arrangements, delivery roles and supporting agreements
- Staging, project development and Investment Management
- Early activities and workstreams
- Benefits realisation plan
- Next steps to address key risks and opportunities.

The Management Case responds to the proposed staging of the project in the medium to long term and sequencing of activities in the near-term.

The specific structures and methods outlined in the Management case respond to the risks and opportunities for the MRT project to ensure that the project progresses with certainty.

16.2 MANAGEMENT STRATEGY AND FRAMEWORKS

16.2.1 Timeframes and key considerations of the Management Case

The recommended management strategy and frameworks for the next phases of the MRT project are based on the following considerations.

- The works are expected to be delivered as part of a long term (10 yr) programme, developed in stages to manage uncertainties, constraints, and interdependencies over the lifecycle of the programme.
- Given the long timeframes, governance and management strategies will need flexibility to evolve as required by the project to address risks at each phase. The programme will initially utilise as many existing governance structures and frameworks as possible for the next phases, but these will need review in future stages for their suitability.
- This is a complex project due to being located in an established urban area, its scale and the number of parties involved. Specific examples of complex interfaces include:
  - The Governance structure and roles of the programme partners including Waka Kotahi, manawhenua, ECan, CCC, WDC and SDC.
  - A mix of rapid transit and local network improvements and impacts
  - Interrelated networks and infrastructure
  - Interaction with operations and PT Futures procurement
  - Multiple infrastructure asset owners
  - Multi-year (decade) programme
  - Uncertain and possibly multiple funding sources.

At the time of preparing this IBC the PT Futures programme has just received funding to commence the next stages of delivery. There is an opportunity to align and optimise both the PT Futures Programme and delivery of the MRT to ensure they are congruent.

16.2.2 Programme and business case assurance arrangements

Discussions around appropriate governance arrangements to deliver the next stages of the MRT Programme have commenced and will continue to agree an appropriate delivery structure for the Project. A governance structure/diagram has not been provided at this stage but will be available once delivery roles and responsibilities are clearly defined.

It is recommended the governance structure chosen reflects the attributes and needs outlined below.

Optimise existing governance structures and knowledge. In 2007 the Greater Christchurch Partnership (GCP) Committee was formed to enable a co-ordinated approach to urban planning and joint investment in transport across the Greater Christchurch region. This partnership included local government, manawhenua and Waka Kotahi. This Committee endorsed the co-ordinated PT Futures investment programme and recommended, to the respective Councils, to make provision for the recommended investment programme in their respective draft Long-term plans. This programme included the development of the MRT Business Case (this case) to determine the viability of MRT for the Greater Christchurch Region.

In 2022 the Whakawhanake Kāinga Komiti (WKK), an urban growth partnership was formed to support the GCP Committee's partnership with local government, central government (the Crown) and manawhenua. This committee will address existing challenges and position Greater Christchurch effectively for long-term growth while creating a well-functioning urban

environment that supports the decarbonisation of transport and improves resilience, housing affordability and accessibility. The MRT Project is a key project for the Whakawhanake Kāinga Committee.

Utilise existing Major Project Frameworks and Processes provided by Waka Kotahi- Waka Kotahi's End to End Project Management approach has been established to provide a consistent approach to governance, while allowing for project specificities, such as level of complexity and risk, to influence the degree to which the level of internal resource is scaled. In addition, it aims to maintain continuity of people in project roles throughout the life of the project, including the Sponsor. In the proposed Governance structure, it is anticipated that Waka Kotahi will provide additional support to the Project Steering Group.

Incorporate feedback from other similar Major Projects. Using existing structures and organisational knowledge will enable connections to similar projects nationally. Consideration should be given to specific connections and knowledge sharing avenues in the details of the structure as it is developed.

Reduce integration risk – this project has multiple complex-interfaces which need to be carefully managed to achieve a successful outcome. Using this structure will enable the Delivery Entity to liaise directly with WKK sharing timely information to inform decisions.

It is anticipated that the Governance and management structures will evolve and adapt for key stages of the project, to ensure successful outcomes as project delivery requirements change. Any changes may require adjustments to the integrated programme. These will be agreed and discussed with the Chief Executive Advisory Group (CE) for presentation to the Whakawhanake Kāinga Komiti (WKK). The WWK will make recommendations to the respective partner council's for consideration in future annual and long-term plans.

16.2.3 Programme management arrangements

It is proposed the next stages of the MRT Project will be managed using the project management methodology contained in Waka Kotahi's Project Management Manual's. These manuals outline:

- Governance and decision-making criteria
- Project planning
- Project execution
- Project completion and evaluation
- Reporting, Change Control and Risk Management Practises.

For infrastructure projects, a Project Sponsor and Project Director will oversee the project, in accordance with Waka Kotahi's delivery methodology. A project team will be established with relevant staff from across the organisation responsible for project delivery. The Programme Manager will be responsible for regular reporting updates to the Project Steering Group.

16.2.4 Programme Roles and Responsibilities

Table 16-1 below describes each partners role and responsibility for the Project. In addition to the roles listed in the table they all have a governance role as a Participant in the Whakawhanake Kāinga Komiti to support delivery of MRT outcomes. This governance role will include actively participating in the programmes oversight and communicating and engaging programme information with the organisations they represent.

Table 16-1: Programme Roles and Responsibilities

Partner/Organisation Overarching Role	Responsibilities and Considerations in the DBC Phase
Waka Kotahi: Waka Kotahi is a key investor in the transport system through co-investment in transport projects. Their role within this programme will be to lead the Delivery Entity, providing programme management to deliver the programme.	▪ Managing the relationship with Crown / Cabinet ▪ Providing project delivery and management, implementing Waka Kotahi frameworks and processes ▪ Consenting Strategy and Implementation ▪ Property Acquisitions (in partnership with KO and Local Authorities) ▪ Provides potential funding of subsequent phases with contribution from the other partners.

Partner/Organisation Overarching Role	Responsibilities and Considerations in the DBC Phase
Manawhenua: Mahaanui Kurataiao have set out the interests in, and position of, manawhenua on the project.	▪ There is an opportunity through the DBC to confirm manawhenua partnership roles and responsibilities and how and their interests can be reflected in the governance structure and the development and delivery of MRT in the future.
Ministry of Transport: MoT is the government's principal transportation policy advisor. Working with other government agencies, local authorities, interest groups and transport operators to realise opportunities, mitigate the risks and ensure the transport system improves wellbeing and liveability.	▪ Provide guidance and strategic policy advice during the development and refinement of the business case and integration with the wider transport systems. MOT is currently investigating opportunities that may exist to co-ordinate/deliver MRT/Rail Systems at a national level across New Zealand. Future stages of this project will consider any result of the MOT investigation available at the time.
Christchurch City Council: CCC is responsible for public transport infrastructure and for managing the local road network in Christchurch as well as land-use planning, district plan development and enforcement.	▪ Responsible for long-term strategic and spatial planning including rapid transit corridors. ▪ Ensure link of MRT planning to long-term plans and spatial strategies by working with partners. ▪ Support consenting processes and frameworks. ▪ Provide input and guidance on network planning and integration with wider network, as required. ▪ Ensure PT Futures Infrastructure is congruent with MRT design philosophy. ▪ Integration with LTP projects and assets. ▪ Delivery of supporting infrastructure/projects to enable MRT benefits. ▪ Digital/operational systems SCATS. ▪ Enforcement of MRT lanes including operations and technology and disruption during construction. (Details of roles and responsibilities to be confirmed). ▪ Provides potential funding of subsequent phases with contribution from the other partners. ▪ Deliver Master Planning for Hornby. ▪ Role to manage the impact of MRT on the surrounding network.
Environment Canterbury: ECan is the lead agency responsible for the delivery of public transport within Greater Christchurch.	▪ Provide input and guidance on public transport planning and integration with broader PT services. ▪ Provide guidance on interdependencies with inter-regional rail and other transport providers. ▪ Ensure PT Futures service design in congruent with MRT. ▪ Responsible for fare strategy, timetables, MRT operational systems, collection, etc. (including ticketing system). ▪ Provision of supporting feeder buses, temporary bus routes during and post any construction or disruption in the community.

Partner/Organisation Overarching Role	Responsibilities and Considerations in the DBC Phase
	▪ Potential MRT ownership responsibilities (Noting depending on the mode decision and the replacement of the Public Transport Operating Model (PTOM) with the Sustainable Public Transport Framework (SPTF) - ownership could be with an operator or ECan): ▪ Procurement of vehicles. ▪ Procurement of depot sites and facilities. ▪ Procurement of some or all station/stops/interchange sites and infrastructure. ▪ Service design and planning, including integration with the wider network. ▪ Customer interfaces, including branding, information, and ticketing.
Waimakariri District Council: WDC is the asset owner and responsible for managing the local transport system, including public transport facilities and infrastructure in the Waimakariri District.	▪ Responsible for long-term strategic and spatial planning for WDC. ▪ Provide input and guidance to infrastructure and alignment with the PT Futures programme and MRTWDC roles and responsibility with be further developed through the DBC as the infrastructure and service offerings to Waimakariri are refined. ▪ Provides potential funding of subsequent phases with contribution from the other partners.
Selwyn District Council: SDC is the asset owner and responsible for managing the local transport system, including public transport facilities and infrastructure in Selwyn District.	▪ Responsible for long-term strategic and spatial planning for the SDC. ▪ Provide input and guidance to infrastructure and alignment with the PT Futures programme and MRT. ▪ SDC roles and responsibility with be further developed through the DBC as the infrastructure and service offerings to Selwyn are refined. ▪ Provides potential funding of subsequent phases with contribution from the other partners.
Kāinga Ora: works closely with other government agencies tasked with delivering public housing and support services for New Zealanders.	▪ Ensuring that planning and design stages allow for optimised urban development. ▪ Provide development planning and consenting expertise. ▪ Jointly develop land acquisition strategy. ▪ Potential to utilise the UDA to acquire land adjacent to stations and transport corridor to drive desired densification. ▪ Potential to facilitate strategic land acquisition for the project in coordination with Waka Kotahi.

KiwiRail: own and maintain the national rail network infrastructure.	▪ Provide input and guidance on network planning and integration with wider heavy rail network, as required. Specific areas that will require KiwiRail's input are:
	  ▪ Riccarton Road Level Crossing
	  ▪ Hornby Master Planning (due to Main South Line & Hornby)

16.2.5 Agreements required to give effect to governance.

As an early action, the governance should identify any agreements already in place that are relevant or new agreements that may be required to give effect to the governance structure and project delivery outcomes.

These could include addressing issues such as:

- Agreement on outcomes and decision-making principles
- Responsibilities and collaboration
- Connections and cross-project integration
- Communications and engagement
- Dispute resolution and escalation
- Funding and financial processes and arrangements
- Managing and allocation of risks
- Physical Ownership/responsibility of new assets.

16.3 STAKEHOLDER COMMUNICATION AND ENGAGEMENT PLANNING

The stakeholder communication and community engagement undertaken to date has been detailed in Section 9.5 of the IBC. In summary, during the development of the IBC, engagement has been held across partners and key stakeholders by way of briefings and workshops. In October 2022, the Project commenced wider stakeholder communication and community engagement under the Greater Christchurch Urban Growth Work-Programme, including an online public survey regarding the Greater Christchurch Spatial Plan and potential for Mass Rapid Transit. This was initially undertaken through Focus Groups (Phase 1) which then led to public engagement in February 2023 (Phase 2).

Figure 16-1: Communication and Engagement Phases.

To date, this Project and the GCSP have aligned communication and engagement timelines that has allowed for a single engagement plan. However, at Phase 3, the two programmes of work will have different communication and engagement objectives. It is recommended at the earliest stage possible in the DBC that a detailed stakeholder communication and engagement strategy is developed and then implemented. Stakeholder communication and engagement in the DBC phase of the Project will focus on opportunities to 'consult' and involve' communities and stakeholders.

16.4 PROJECT NEXT STEPS

Section 10.1.5 within the Commercial Case outlines the scope for the DBC, the next logical step for this Project. Early strategic pieces of work that will de-risk the delivery of the DBC have been identified. These are shown in Table 16-2. The scope and justification for expediting these early pieces of work to manage key risks and support critical decision making are presented in the following table. It also includes Figure 13-21 Potential Staging Pathway which provides a possible way forward for the early works and the multi-year delivery programme of the MRT Project.

Note the final mode decision is not a required input to the steps outlined below. These early pieces of work can be progressed prior to mode selection, with various activities informing further the mode decision to be made in the DBC.

Table 16-2: Early Strategic Pieces of Work

Key Activity	Scope	Risks mitigated	Questions answered	Timeframe / Lead
MRT Project Management and Delivery Setup Including **Stakeholder Engagement and Communication Strategy**	This activity will provide further clarity around the project team and definition of project roles, responsibilities, and key deliverables. It will also allow for early clarification around an agreed Governance Structure, including working closely with manawhenua. In addition, it will also allow for further development of the programme to deliver Horizon 1 tasks and confirmation of funding. This piece of work will also build on the stakeholder engagement and communication strategy, which to date has been led by the GCSP.	Links to mitigating Governance risk and Social Issues/Stakeholder Engagement risk (Ref Risk ID 2052-02, 2052-06) IP loss /Sub-par decision making based on flawed understanding of the IBC's conclusion/Silo decisions by partners.	What is the DBC Programme? What are the key roles/ risks/ responsibilities/ to be transferred to WKK partners as the project integrates with PT Futures and wider planning initiatives? What are the possible funding streams for the project? What are the broader engagement and communications strategies required to transfer the project to a DBC phase? What are the Te Ao Māori inputs and collaborations needed to prepare for the DBC? How are the key MRT risks and mitigations evolving?	Ongoing until DBC is procured, and Project IP is transferred to suppliers. The current arrangement is that Waka Kotahi leads this stream.
PT Futures Integration: Optimisation of PTFutures based on the outcomes of the MRT IBC.	There has already been an announcement by the Ministry to accelerate PT Futures. CCC, SDC, WDC and ECan have already initiated investment into some of the next steps. However, there are number of proposals that conflict with the now proposed MRT route that will need refinement prior to investment including: ▪ Bus Route changes ▪ Bus priority infrastructure ▪ Bus stop locations/shelters ▪ Park and ride	Links to mitigating. PT Futures Integration risk. (Ref Risk ID 2052-16) Risk that misaligned services and infrastructure improvements originally proposed by PTFutures are not aligned with MRT and if progressed will lead to redundant investment.	What projects identified under PTFutures can continue to be progressed as part of their accelerated programme, need to go on hold or need to be adjusted as a result of the MRT proposal? For those components that need adjustment what optimisation is proposed? Which projects continue under PT Futures delivery programme, and which are implemented as part of MRT?	Start immediately to input into ECan/ CCC/ SDC/ WDC acceleration of PT Futures. Maintain along MRT delivery and transfer to operating client. Following on the current arrangement, Waka Kotahi would lead this stream.

Key Activity	Scope	Risks mitigated	Questions answered	Timeframe / Lead
Land Use Integration Study: As described in the IBC Management Case. In addition to LUI items above	This scope will enable consideration of the need for wider master planning beyond Hornby and PDAs for the central city, Papanui, and Riccarton such as Church Corner and Sockburn (in collaboration with other partners). This will create greater certainty around land use and urban development outcomes along the corridor.	Links to mitigating Greater Christchurch Intensification risk (Ref Risk ID 2052-08) Risk that misaligned LU decisions erode MRT's value proposition. Imperative that growth and density is achieved at the right level and quality at key centres along the corridor.	What tools and levers are available and will be implemented to provide certainty and guide growth and density at key centres and along the corridor? Are wider neighbourhood master plans required to promote catalyst development in support of MRT and the different role and function of centres?	To start mid-year following completion of GCSP and hearings process for PC14. Following on the current arrangement, Waka Kotahi would lead this stream. Future arrangements to be confirmed by governance, may see Waka Kotahi contribute to CCC led activities.
Network Integration Study: An integration of MRT with the network as a whole, inc. programmed projects, active mode integration, urban amenity, operation and broader impacts on the wider transport network and neighbourhoods.	While initial work has been undertaken to understand the potential impact on the capacity of the roading network, impacts and potential mitigations need further consideration. This process may highlight the extent of impact resulting in additional projects beyond the MRT corridor. This work will enable WK to work in collaboration with CCC to confirm the One Network Framework aspirations for the corridor, including confirmation of the 'place and movement' vision and the 'low traffic zones' within impacted neighbourhoods, providing certainty around future street allocation.	Links to mitigating Project Interface/Complexity risk, Network Operations risk, and Accessibility risk. (Ref Risk IDs 2052-07, 2052-21, 2052-23) It will reduce the risk of investing in planned projects which then need rescoping or become redundant as a result of MRT. Will allow deeper understanding of extent and quantification of network and neighbourhood implications to enable scoping of master plans and neighbourhood plans. Establishing an urban design framework as part of the Integration Study to identify neighbourhood opportunities and impacts as a result of land use change and intensification ensuring legible, high amenity	<u>Programmed Improvements:</u> Which projects have planned improvements (LTP, Activity Management Plans, RLTP, NLTP) in that align with the MRT corridor? Planned changes to be deferred or changed to accommodate MRT. <u>One Network Framework:</u> How does the proposed MRT corridor align with the One Network Framework, PDA's, and Master Plans? When and how are these decisions made? What input is required from the MRT project team? <u>Extent of Impact:</u> What extent of network changes (beyond the MRT corridor) might be required to enable implementation of MRT while supporting of network function such as residential access, service and delivery access and low traffic volumes local neighbourhood areas? <u>Active Modes</u>: What are the constraints and opportunities associated with integrating cycle and micro mobility with the MRT station? How does this inform the current planning underway to connect further the major cycle routes with the local cycleway network?	To start immediately to inform programmed projects and allow deeper understanding of extent and quantification of network implications to better inform scoping of the DBC stage. Following on the current arrangement, Waka Kotahi would lead this stream. Future arrangements to be identified as other PT Futures programmes are delivered, may see Waka Kotahi contribute to CCC led activities.

Key Activity	Scope	Risks mitigated	Questions answered	Timeframe / Lead
		outcomes that maximises accessibility to MRT.		
LUI - Priority Development Areas (PDA) within Central City, Papanui, Riccarton, and Rolleston	This scope will enable WK to be a key partner/collaborator in development of the PDA workstream, influencing actions/outcomes for the key centres along the MRT corridor. This will ensure consideration of the right urban development and density outcomes supportive of MRT. This will provide greater certainty that catalyst development and intensification will occur at key locations, increasing confidence in urban uplift. It will also ensure the right mechanisms are in place to support and incentivise growth to key locations.	Links to mitigating Greater Christchurch Intensification risk and Project Interface/Complexity risk (Risk Ref IDs 2052-08 2052-07) Risk that misaligned LU decisions erode MRT's value proposition. Imperative that growth and density is achieved at the right level and quality at key centres along the corridor. Risk that misaligned actions and outcomes including infrastructure and property investment are not aligned with MRT outcomes and if progressed will lead to redundant investment and underdevelopment.	Which properties are opportunities for comprehensive redevelopment that will comprise catalyst development and how do they relate to future station locations and improve accessibility to MRT? What land uses are proposed and how will these support mixed use outcomes and contribute to the urban amenity of the corridor? Will the development sites enable creation of exemplary urban development (scale and typologies) for developers to follow suit?	Start immediately to work with key partners to scope and contribute to PDA's aligning with the key centres along the corridor. Following on the current arrangement, Waka Kotahi would lead this stream. Future arrangements to be confirmed by governance, may see Waka Kotahi contribute to CCC led activities.
LUI - Hornby Master Plan	This scope will enable WK to lead the integration of key transport decision making and influence the urban outcomes considered necessary to support MRT. It will involve representation on Master Planning project team and lead agency for Programme Business Case for Freight and SH1 network realignment project. There is necessary to resolve a series of issues and constraints and	Links to Hornby Network Interface risk and Project Interface/Complexity risk. (Risk Ref IDs 2052-18, 2052-07) LU and urban design solutions for the centre are inconsistent with urban amenity, accessibility, and value proposition outcomes sort for MRT. Property availability & affordability erodes with time and excludes provision of	Where is the future centre of Hornby in order to know what the options for station location are? Where can the station be located so it does not conflict with SH and Rail corridors or effect their LOS? Where is a potential depot site that does not undermine town centre regeneration and urban development opportunities within the walk-up catchment? What are the future land uses that will align with the corridor influencing corridor and wider street design?	Begin input into a collaborative process late 23/early 24 given it will take some time to resolve the key issues. There is benefit in progressing key aspects of this work programme immediately. Following on the current arrangement, Waka Kotahi would lead this stream. Future arrangements to be confirmed by governance, may see Waka Kotahi

Key Activity	Scope	Risks mitigated	Questions answered	Timeframe / Lead
	enable the DBC to be more focused.	depot sites for BRT/LRT options. Land value uplift benefits erode with time.		contribute to CCC led activities.
Property Protection Study: starting with establishing a Strategy in coordination with WKK Partners.	This scope includes development of Property Protection and Acquisition Strategy, Land value and uplift studies. It will involve review and alignment with preliminary work already completed around the preferred option with new information, as available. This study will also support the Priority Development Area Strategy.	Links to Corridor Protection and Property acquisition risk (Risk Ref ID 2052-19) Risk that property availability & affordability erodes with time. Risk that land uplift benefits erode with time.	Which properties will need to be acquired to enable the preferred option and are they available? What levers will be put in place to acquire the right properties and enable appropriate development outcomes? What properties best align with achieving wider urban amenity outcomes at centres and along the corridor? What is the appropriate acquisition strategy and how is this influenced by the designation process and changing legislation?	Can start in FY24 but needs LUI and NI studies to start first. PDA's may also influence the strategy. Following on the current arrangement, Waka Kotahi would lead this stream. Future arrangements to be confirmed by governance, may see Waka Kotahi contribute to CCC led activities.
MRT Service and Technology Integration Study: Determines and refines the service and technology boundaries	Despite different vehicle types being required between PTFutures and MRT, fleet technology considerations should be considered to ensure an integrated approach to operations and whole of life cost (OPEX/CAPEX), energy provisions and supply chain studies. This will also help inform PTFutures and form valuable input to the mode decision to be made at DBC stage.	Links to Technology Changes risk (Ref Risk ID 2052-12) Risk that misaligned Services and fleet decisions by others erode MRT's value proposition. Completing this study early with introduce opportunities for future stages.	If ECan purchase a vehicle fleet to service the acceleration of PT Futures acceleration, what is the best technology considering likely expansion to MRT in the future and long terms decisions around energy?	Start immediately to input into ECan's acceleration of PT Futures. Maintain along MRT delivery and transfer to operating client. Following on the current arrangement, Waka Kotahi would lead this stream. Future arrangements to be identified as other PT Futures programmes are delivered, may see Waka Kotahi contribute to ECan or CCC led activities.

16.5 CHANGE MANAGEMENT PLANNING

The recommended programme is informed through several key assumptions that could change over the duration of the programme. The governing body should regularly monitor any changes in key assumptions, which may result in a trigger for change, as outlined in Table 16-3.

Table 16-3: Recommended programme triggers for change

Aspect	Key Assumption	Trigger for Change
Population growth	As New Zealand's second largest and one of the fastest growing regions, Greater Christchurch's 2021 population of 499,000 is projected to grow to over 655,000 by 2051. This equates to a population growth rate of around 31% and translates to approximately 64,000 new households in Greater Christchurch by 2051.	Consider altering the recommended programme if population growth rate differs from the assumed forecast.
Employment growth	Employment is forecasted to grow by approximately 47% between 2021 and 2051, from 244,450 to 359,068. In total, an additional 114,618 employment opportunities are projected by 2051, with most of these (71%) within Christchurch City.	Consider altering the recommended programme if employment growth rate differs from the assumed forecast.
Land use integration and development	Land use policy nationally and locally is under review and has the potential to impact on the location of growth and intensification and the ability to achieve land use integration benefits arising from investment in MRT. This includes the Natural and Built Environment Act, Plan Change 14 and the Greater Christchurch Spatial Plan.	Consider changes to land use policy to that currently set out in the IBC, i.e., if the NBEA changes the built form outcomes aligning with rapid transit stations, PC14 is not adopted and the Greater Christchurch Spatial Plan outlines growth and intensification away from the preferred corridor. Monitoring of resource consents for development along the preferred corridor to track land development outcomes.
Integrating with other initiatives	Road network infrastructure improvements included within TLAs Long Term Plans (and the Waka Kotahi National Land Transport Programme), PT Futures and other identified projects likely to achieve funding, as agreed for the CTM/CAST v21 model update.).	Consider changes to the recommended programme should any future initiatives not identified in the Do-Minimum be prioritised. For example, policy direction that relates to central city parking, public transport fares or emission reduction policies.
Patronage numbers	The recommended option is expected to increase annual PT trips by 5.7 million trips per year by 2051 (growing at a 4.8% annual average rate from 2021 to 2051).	Consider altering the recommended programme if patronage growth rate differs from the assumed forecast.

16.6 BENEFITS MANAGEMENT PLANNING

The ILM workshop developed a number of KPIs for the programme. The intention is that KPIs will be used, during and following the implementation of the programme, to assess whether the programme is achieving the desired benefits.

A Benefits Realisation Plan (BRP) has been prepared for the MRT project (see Appendix V – Benefits Realisation Plan). The BRP maps the identified problems and investment objectives for the sub-projects to performance measures that can be used to test how the objectives are being met. This ILM mapping is shown in Appendix A – Investment Logic Map.

The BRP includes the proposed methodology for performance measure capture, baseline data and expected results.

The performance measures provide a framework for post-implementation monitoring. The BRP is a living document that will be reviewed and updated over time as required to remain current with the delivery of the programme.

The benefit realisation of earlier phases is one of many factors to consider in terms of investment in the future phases. There are overlaps between investment driver measures proposed to support the gateway reviews and associated monitoring and reporting, and those that are included in the BRP. This is a potential synergy.

To ensure effective management of the benefits realisation monitoring process, benefits management should be included in the governance and delivery management plans of the project. The BRP includes responsibility for monitoring and measurement of indicators and these responsibilities shall be included in the specific roles and responsibilities in the governance model as it is developed.

The KPIs developed at the workshop have been further refined as performance measures to make them more specific to the investment. These performance measures are set out in Appendix A – Investment Logic Map.

Table 16-4 below provides details on the performance measures, including proposed methodology for capture, baseline data and expected results.

It is expected these measures will be further refined in the next stage during the DBC development.

Table 16-4: Performance measures for the PT Futures Mass Rapid Transit Project (MRT) IBC

Measure	Linked KPI (ID#)	Method	Time of Measurement	Baseline	Expected Result
Change in the number of households able to access the Christchurch City within 30 minutes end-to-end travel time using the PT system	1	Baseline existing in-vehicle journey time for MRT (using ECan's Power BI GPS data) and current household census data to confirm the number of households located within a 30 min end to end travel time system. Measure: Average MRT journey time over a week to determine the 30-minute travel catchment. Changes in households: Census data of the changes in population within the 30-minute travel catchment area	5 yearly (Census year)	Current Census data / current network	Accessibility to the city centre improves across the locations with both the short- and medium-term improvements.
Change in number of people/households within 800m of a MRT station.	1, 2	Use the Census data to determine the number of residents within households located within 800m of the route.	5 yearly (Census year)	Current Census data	Increase in the number of people living within 800m of a station.

Measure	Linked KPI (ID#)	Method	Time of Measurement	Baseline	Expected Result
Change in the proportion of trips made by PT to the Central City.	1, 7	Refer to the mode shift split for Greater Christchurch from the census data and taken from monitoring data for Waka Kotahi's Mode Shift Plan for Christchurch.	5 yearly (Census year)	Current Census data	Increased proportion of trips in Greater Christchurch made by PT..
Change in number of additional jobs within 800 m of an MRT station.	2	Baseline employment location numbers from census data. Number of jobs located within the 800m of an MRT station taken from census data.	5 yearly (Census year)	Current Census data / current network data (Power BI)	Accessibility to employment opportunities increase across Greater Christchurch.
Change in number of households able to access additional KAC and strategic land uses (hospital / university / airport) within 30 minutes by PT.	2	Baseline existing in-vehicle journey time for PT (using ECan's Power BI GPS data) and household census data to confirm the number of households located within a 30 min end to end travel time system. Measure: Average PT journey time over a week to determine the 30-minute travel catchment. Changes in households: Census data of the changes in population within the 30minute travel catchment area	5 yearly (Census year)	Current Census data / current network data (Power BI)	Increases in number of households able to access additional KAC and strategic land uses.
Change in number of employment opportunities within 30 minutes by PT in Greater Christchurch	2	Baseline employment location numbers from census data. Measure: Average PT journey time over a week to determine the 30-minute travel catchment Number of jobs located within the 30-minute catchment taken from census data.	5 yearly (Census year)	Current Census data / current network data (Power BI)	Accessibility to employment opportunities increase across Greater Christchurch.
Change in proportion of trips made by PT along mass transit corridor(s) to the central city.	4	Using boarding information from MRT Operator and population data as per the Census determine the number of PT trips made per capita.	5 yearly (Census year)	Current Census data and existing MRT boarding information for relevant year.	Increase in annual PT trips following implementation of the short-term option and a further increase following the medium-term recommendation.

Measure	Linked KPI (ID#)	Method	Time of Measurement	Baseline	Expected Result
Change in the in-vehicle journey time along a specific route for PT compared to general traffic (prioritised Christchurch locations to Christchurch City)	5	Baseline existing in-vehicle journey time for PT (using ECan's Power BI GPS data) along specific MRT route and compare to general traffic data (using Tom Tom or bluetooth CTOC data).	Should be measured following implementation of the short-term solutions (Years 1-6) and the medium-term solutions (Years 7-10).	Current Census data / current network operation data from Power BI	Car journey times remain relatively consistent with the implementation of MRT.
Change overall PT mode share in Greater Christchurch.	6	Refer to the mode shift split for Greater Christchurch from the census data and taken from monitoring data for Waka Kotahi's Mode Shift Plan for Christchurch.	5 yearly (Census year)	Current Census data	Increased proportion of trips in Greater Christchurch made by PT.
Change in the greenhouse gas emissions (CO2) from all transport sources within Greater Christchurch.	7	Baseline environmental measurements of greenhouse gas emissions from selected key locations along core routes. Once baseline quantitative data is gathered, implement monitoring plan to regularly measure changes in key indicators over the life of the project.	Bi-annual measurements following implementation of the short-term improvements	Should be measured prior to construction start.	Very little reduction in emissions compared to the base data (despite the reduction in total vehicle kilometres travelled per capita).
Change in the air pollution from PM10 and NO2 within Greater Christchurch.	7	Baseline environmental measurements of air pollution (PM10 and NO2) gas emissions from selected key locations along core routes. Once baseline quantitative data is gathered, implement monitoring plan to regularly measure changes in key indicators over the life of the project.	Bi-annual measurements following implementation of the short-term improvements	Should be measured prior to construction start.	Minimal change anticipated.

16.7 CRITICAL RISKS TO THE PROJECT

Two risk workshops were held to identify risks to implementing the Preferred Option. Further work was completed to quantify identified risks and choose appropriate mitigations and controls, the full risk register for the Preferred Option is included in Appendix W.- Project Risk Register. Risks with a 'critical' rating are presented in Table 16-5 below, in addition a 'high' risk around governance structures is also included as it relates to the governance structure included in this management case. These risks could lead to the programme not being fully delivered or result in a delay to the implementation timeframe of the programme if left unmitigated or controlled.

The controls column describes activities and steps that have been identified to mitigate and manage the associated risk. None of these risks pose a threat that prevent the programme from proceeding to the next phase. However, ensuring these (and any other identified) risks remain sufficiently mitigated will be a key component of the CEAG's oversight role. The Management and Commercial Cases respond to these risks through governance, the scoping and sequencing of next stages and implementing the Benefit Realisation Plan (BRP)

Table 16-5: Risk management planning

Risk Identifier	Risk Description	Risk Cause(s)	Controls	Current Risk Level (without control)
2052-07	**Project Interface/Complexity** Complex known, and unknown interfaces exist for this project. There is a threat interfaces and/or dependencies force changes to this project or the project forces changes to surrounding services and infrastructure.	Known interfaces at the IBC Stage include: '-Integration with wider city shaping policies and planning (PC14, Traffic Plans) - Integrating with existing central bus exchange and around transit malls, ECan Bus Routes. - Integration with existing utilities and services. - Broader levers being proposed to support mode shift e.g. parking policies. - Staging/phasing of the project may not integrate with the existing bus network or may trigger additional scope/projects. - Neighbourhood Planning/Cycling Strategies business cases/strategies - Hornby Master Planning - station locations and MRT integration. - GTP Government Transport Partners.	- Suggested early investigations as part of the DBC to better understand and mitigate existing and potential future project interfaces. - Next stages of DBC to complete Utilities assessments/site investigations workstream. - Use of existing governance model with high levels of engagement from all partners.	**Critical**
2052-08	**Greater Christchurch Intensification** To meet key objectives the project is reliant upon urban intensification to occur within the MRT corridor. There is a threat that intensification doesn't occur in the manner (scale, location, form) needed to	This is caused by: -. MDRS and NPS-UD policy, which are to be included in PC14 (CCC) enabling greater housing supply than demand for the next three decades. -. Possible qualifying matters on the MRT corridor. -. Intensification across the whole city, intensification does not occur within the MRT corridor. -. Revisions to airport noise Contours (CIAL 50dB noise contours) could reduce intensification within the MRT route and/or station catchment areas.	Land use Integration and Intensification framework study is recommended as an early piece of work in the DBC.	**Critical**

Risk Identifier	Risk Description	Risk Cause(s)	Controls	Current Risk Level (without control)
	support MRT and project objectives.	-. Existing services (e.g., wastewater, water supply) do not have sufficient capacity to support the urban development. Lower risk, checked by Greater Christchurch Spatial Plan.		
2052-06	**Social License/Stakeholder Engagement** There is a threat the general public/ local communities/ key stakeholders may not support the proposed solutions or objectives for the project.	- There has been limited public engagement on the MRT concept to date. - Engagement is being completed late in the IBC phase after the preferred way forward has been selected. - Stakeholder may be missed as haven't been identified. - There could be significant disruption and changes to adjacent landowners' access. - Cost/timeframe priority misalignment.	- Develop and revise master list of stakeholders and stakeholder engagement strategy for feedback received from engagement during the IBC stage. - Engagement with stakeholders and the community to be undertaken as part of the next planning stages to give people an opportunity to help shape the project.	**Critical**
2052-10	**Resourcing - Capability & Capacity** There is a threat appropriate capability and capacity many not be available to deliver the project.	- Length/complexity of project - Wider industry capacity, given other key transport projects planned across the country - Supply chain disruption - Includes operators, specialised staff - are they available in NZ, technology	- Investigate opportunities to share IP and resources with other key transport projects across the country during the DBC phase. - Capture lessons learnt from PT Futures Programme delivery/other projects. - Ability to be first project off the ranks.	**Critical**
2052-18	**Hornby/Freight Network Interface** There is a threat MRT may force significant changes to the existing freight state highway and/or rail network at Hornby.	This is caused by: - Proximity to existing State Highway and priority freight network (e.g., Main South Road) - Area is already very established with major routes already in place.	- Use sensitivity testing to check scenarios. - Costings to include work to integrate freight network. Scoping to assess and review appropriate treatments. - Early piece of work suggested to do a deep dive on this.	**Critical**
2052-19	**Corridor Protection/Property Acquisition** The preferred corridor is not currently protected but has been publicly announced. There is a threat the corridor (and or property to enable the preferred option) cannot be acquired.	- Property acquisition and corridor protection has not yet been confirmed. - Depot sites/park and ride facilities have not been identified or planned - Additional Property may be required to ensure intersections are safe and meet appropriate standards. - Hornby Master Planning may identify changes to Property requirements	- Engage with KiwiRail around Hornby freight lines. - Property acquisition plan to be created.	**Critical**

Risk Identifier	Risk Description	Risk Cause(s)	Controls	Current Risk Level (without control)
2052-21	**Network Operations** There is a threat the preferred option may significantly impact network operation and requirements forcing fundamental changes to scope and route alignment in future stages.	- The impact of right hand and U turns restrictions along the corridor. - Integration with one-way system (vehicles may have to turn across MRT/Bus Lane to access properties). - The proposed corridors for the frequent stop street running scenario are largely only 20m in width, requiring substantial road-space reallocation. - Removal of on-street parking, loading zones for delivery of goods. - Integration of cycleways. - Centre located stop infrastructure. - Crime Prevention Through Engineering Design (CPTED) Assessment. - Safety in design assessments.	Network integration study at the start of the DBC to identify integration challenges and opportunities.	**Critical**
2052-23	**Accessibility** There is a risk the MRT system may reduce accessibility for specific community members to key activity centres and locations.	- Parking along the corridor route will be removed. - Kerbs and channel heights may have to increase to align with rail infrastructure. - One-way streets (vehicle have to turn across MRT lane to access properties - Transit malls (will be restricted to public transport and active modes only) at key locations along the MRT corridor will improve priority and frontage activation, but the subsequent impact of traffic diversion, reduced vehicular access and removal of on-street parking may result in access issues for businesses and surrounding communities. - Areas of city not serviced by MRT route e.g., East.	- Network integration study at the start of the DBC to review accessibility/access for the proposed designs.	**Critical**
2052-02	**Governance** There is a threat the future Delivery Entity is not fit for purpose and doesn't have the appropriate powers/mandates.	- The delivery entity and its mandates/powers are currently unknown for the next phases of this project delivery. - ALR and LGWM lead to a national policy on how to govern major transport projects and MRT is forced to adopt the mandated governance structure.	- Proposed Governance structure to mitigate.	**High**