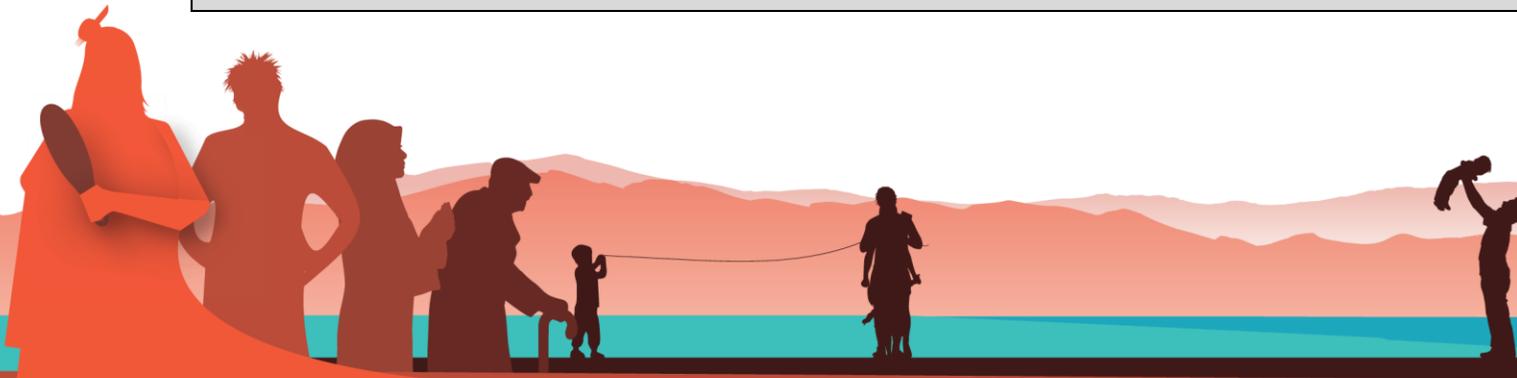


URBAN FORM SCENARIOS EVALUATION REPORT

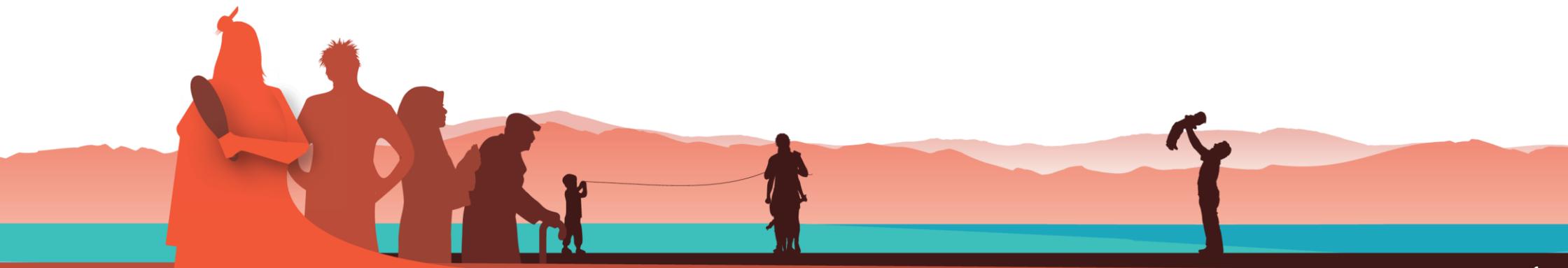
DECEMBER 2022

The high level conclusions of this evaluation were captured in [August 2022 briefing to the Whakawhanake Kāinga Komiti](#). This evaluation assessed scenarios, not options, and informed the development of urban form directions also contained in the August briefing to the Whakawhanake Kāinga Komiti. Further work has also since been done to translate these urban form directions into a potential desired pattern of growth and further articulation of the future function of centres.



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Introduction

Purpose of this report

The Greater Christchurch Spatial Plan work programme has five phases. Phase 1 (Evidence Base) and 2 (Strategic Context) is summarised in the Foundation Report.

This report summarises the work undertaken for Phase 3 – Urban Form Scenario Evaluation. The purpose of this Phase is to understand how different land-use scenarios and transport packages contribute to the realisation of our outcomes and priorities as set out in the Greater Christchurch Spatial Plan Strategic Framework (Strategic Framework), to inform the development of urban form direction and development of the Plan. The methodology used in Phase 3 includes the following steps:

1. The development of urban form scenarios that include both land-use and transport packages.
2. The development of an evaluation framework which enables assessment of the urban form scenarios against the outcomes and priorities set out in the Strategic Framework.
3. Assessment of the urban form scenarios against the desired outcomes for our urban form is being led through a process of technical evaluation. The evaluation of each urban form scenario considers a set of criteria which have been derived from the Opportunity Statements.

This report provides the conclusions of the steps taken up to and including the 'evaluation of urban form scenarios' in Phase 3 of the work programme.

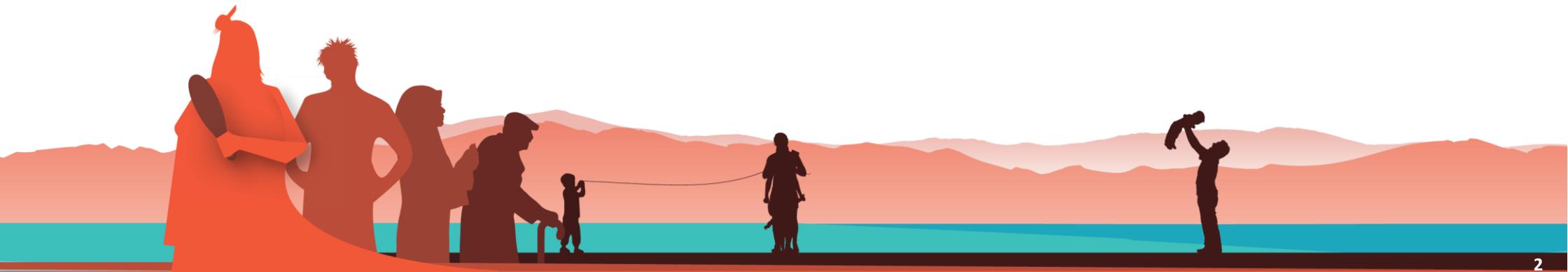
Consideration of the urban form scenarios by mana whenua has been undertaken outside of the technical process having regard to the obligations of Te Tiriti o Waitangi, rangatiratanga and the ManaWhenua Wellbeing Index developed by the University of Canterbury Ngai Tahu Research Centre. Where appropriate, outcomes from that evaluation are noted in the technical evaluation described in this report.

Broad phases of work to develop the spatial plan



Scope of the Urban Form Scenario evaluation

To inform the Plan Development, three land-use scenarios and three transport packages were evaluated to understand the implications and intersections of land-use and transport planning and consider land-use, investment and policy interventions to achieve reduction in emissions and Vehicle Kilometres Travelled (VKT). A quantitative, qualitative, and mana whenua evaluation was undertaken.



Strategic framework for the Spatial Plan

The Strategic Framework (overleaf) provides direction to the Greater Christchurch Spatial Plan. It describes the priority issues we need to start to address now in Greater Christchurch, and the collective aspirations we have for the future of our people and place. These priorities and outcomes have been previously agreed through the establishment of the Greater Christchurch Urban Growth Partnership and emerging direction of Greater Christchurch 2050.

These outcomes and priorities, alongside the assessment of urban challenges and opportunities set out in the Greater Christchurch Spatial Plan Foundation Report, translate into six Opportunity Statements that identify how we can close the gap between our current state and our desired future state through the Spatial Plan.

Evaluation framework

The evaluation framework described in this report was designed to assess the performance of different urban form scenarios against a range of evaluation criteria. The approach included the establishment of a set of evaluation criteria structured under the Opportunity Statements, and a cascading assessment structure as follows:

1. Assessment of whether the urban form scenarios perform differently against the criterion
2. If so, ranking the performance of the urban form scenarios from best to worst
3. Assessment of the performance of each urban form scenario relative to now



Greater Christchurch Spatial Plan Strategic Framework

Te Tiriti o Waitangi

GC2050 Kaupapa

Tiaki tāngata tiaki whenua - care for the people, care for the land

GC2050 Outcomes

What we want Greater Christchurch to be like in the future

- 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
- Empowered people

UGP Priorities

What we need to focus on now to achieve our desired outcomes for Greater Christchurch

Create a well-functioning and sustainable urban environment. In achieving this, priority will be given to:

- decarbonising the transport system
- increasing resilience to natural hazards and the effects of climate change
- accelerating the provision of quality, affordable housing
- improving access to employment, education and services

Opportunities / Objectives

What we will do through the spatial plan to address our priorities and contribute to our desired outcomes for Greater Christchurch

Opportunity #1

Enable diverse and affordable housing in locations that support thriving neighbourhoods that provide for people's day-to-day needs



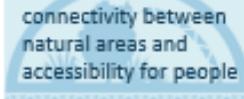
Opportunity #2

Prioritise sustainable transport choices to move people and goods in a way that significantly reduces greenhouse gas emissions and enables access to social, cultural and economic opportunities



Opportunity #3

Protect, restore and enhance the natural environment, with particular focus on te ao Māori, the enhancement of biodiversity, the connectivity between natural areas and accessibility for people



Opportunity #4

Protect, restore and enhance historic heritage and sites and areas of significance to Māori, and provide for people's physical and spiritual connection to these places



Opportunity #5

Reduce and manage risks so that people and communities are resilient to the impact of natural hazards and climate change



Opportunity #6

Provide space for businesses and the economy to prosper in a low carbon future



Urban Form Scenarios

Introduction

To understand the implications and intersections of land-use and transport planning, an approach was developed to test combinations of three land-use scenarios and three transport packages. The 3 x 3 approach is illustrated opposite.

The three land-use scenarios were developed through:

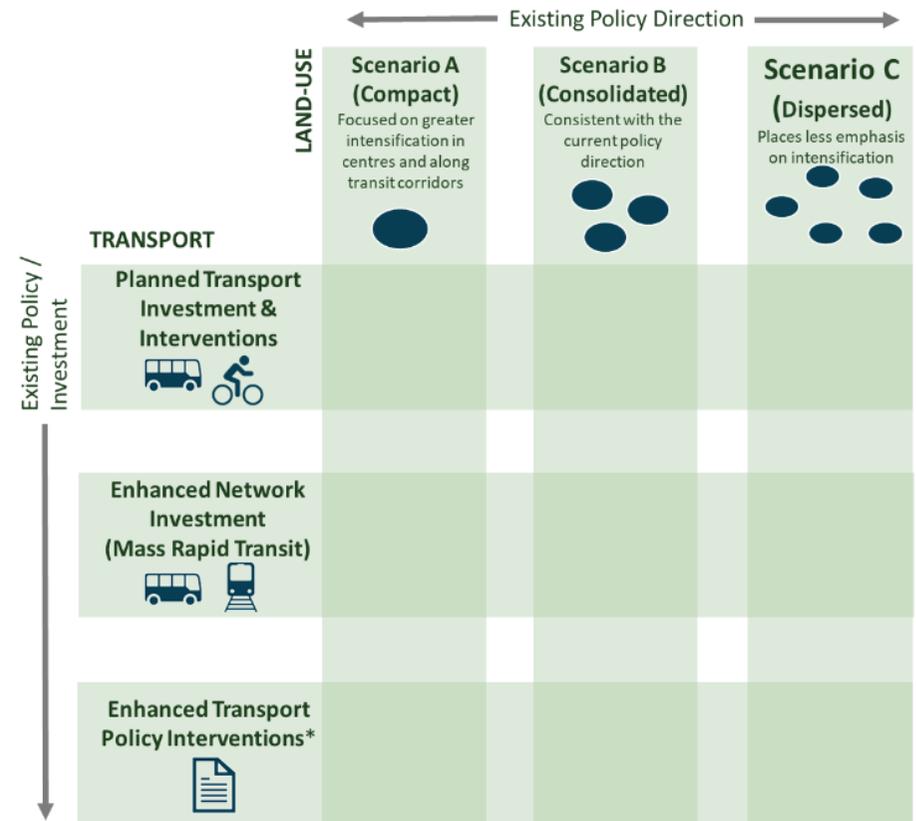
1. Identification and analysis of individual spatial elements, which created a 'long-list' of potential locations for growth and intensification.
2. Development and modelling of three land-use scenarios (household and employment), with associated assumptions about the distribution of growth, household typologies, intensification vs greenfield ratios, and the role of centres.

The three transport packages involved:

1. Incorporating information on planned interventions and investment, and a future Mass Rapid Transit (MRT) scenario.
2. Modelling of transport through the Christchurch Transport Model.
3. The development of a simplified transport model to assess a representative transport policy intervention package.

Details of land-use scenarios and transport packages is provided in the sections below.

Urban Form Scenarios



Land-use scenarios

The following section describes the land-use scenarios.

Scenario A (Compact)

Focused on greater intensification in and around centres and along transit corridors

Scenario A assumes more intensive growth with a higher proportion of household and employment growth concentrated in Christchurch City, and intensified around key centres and corridors, including within the townships.

Growth would also be focussed into the existing urban areas of townships, with limited greenfield and low density development.

Centres:

- Christchurch Central City is the primary centre
- Other significant centres – Riccarton, Hornby and Papanui
- Growing urban centres – Merivale, Upper Riccarton/Bush Inn, North Halswell
- Rolleston and Rangiora are major towns within the Districts

Scenario B (Consolidated)

Consistent with the current policy direction

Scenario B provides for intensification across existing urban areas, with apportionment of household and employment growth assumed to be as per the Housing & Business Capacity Assessments 2021/22 prepared under the National Policy Statement on Urban Development (NPS-UD).

Some greenfield development is assumed, but at a higher density than current, consistent with the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act.

Centres:

- Christchurch Central City is the primary centre
- Riccarton, Hornby, Papanui, Rolleston and Rangiora are significant sub-regional centres

Scenario C (Dispersed)

Places less emphasis on intensification

Scenario C assumes that a higher proportion of growth will be in the Districts, with that growth focused around existing townships at densities that align to market demand or higher. Within Christchurch City there would be an increased greenfield allocation and less intensification across the city

Centres:

- Christchurch Central City is the primary centre
- Riccarton, Hornby, Papanui, Rolleston and Rangiora are significant sub-regional centres



The following table provides further information on the differences in growth assumptions between the three land-use scenarios:

	Scenario A (Compact)			Scenario B (Consolidated)			Scenario C (Dispersed)		
	CCC	SDC	WDC	CCC	SDC	WDC	CCC	SDC	WDC
Population growth allocation	70%	20%	10%	52%	32%	16%	40%	35%	25%
Employment growth allocation	84.2%	8.1%	7.7%	83.2%	8.8%	7.9%	82.7%	9.0%	8.3%
Central City / Sub-Regional Centres	Central city remains as the primary centre and is developed near to full growth potential Significant Urban Centres - Riccarton, Hornby and Papanui Growing Urban Centres - Merivale, Upper Riccarton / Bush Inn, North Halswell Rolleston, Rangiora are major towns within Districts			Central city remains as the primary centre Sub-regional centres – Riccarton, Hornby, Papanui, Rolleston, Rangiora			Central city remains as the primary centre but growth is more evenly distributed to sub-regional centres – Riccarton, Hornby, Papanui, Rolleston, Rangiora		
Other Important Centres	Linwood, Shirley, Belfast Rolleston (focal point), Lincoln, Leeston, Darfield Rangiora (primary), Ravenswood, Kaiapoi (main), Oxford			Linwood, Shirley, Belfast Merivale, Upper Riccarton / Bush Inn, North Halswell Lincoln, Leeston, Darfield Ravenswood, Kaiapoi, Oxford			Linwood, Shirley, Belfast Merivale, Upper Riccarton / Bush Inn, North Halswell Lincoln, Leeston, Darfield Ravenswood, Kaiapoi, Oxford		



	Scenario A (Compact)	Scenario B (Consolidated)	Scenario C (Dispersed)
Rationale	<p>The role and function of the centres changes to be commensurate with the level of residential growth in the surrounding residential catchment and employment agglomeration.</p> <p>Central city: primary employment centre (focus for health, leisure, knowledge intensive services).</p> <p>Riccarton: retail hub and concentration of knowledge intensive services spilling over from central city and leveraging co-location with the University of Canterbury.</p> <p>Hornby: main western retail and logistics hub leveraging from close proximity to airport and freight corridors. High regeneration potential.</p> <p>Papanui: main northern service and retail hub with significant regeneration potential.</p> <p>Upper Riccarton: growth potential within transport corridor and close proximity to the University of Canterbury.</p> <p>Merivale: strong health cluster and high demand area within transport corridor.</p> <p>North Halswell: new emerging centre.</p>	<p>Christchurch - business growth in existing business locations proportionate to current and future potential enabled role.</p> <p>Rolleston growth is due to population growth and its continued emergence as a sub-regional economic hub</p> <p>Rangiora growth is population rather than economic led (noting Rangiora has good self-sufficiency which will grow with this scenario) – growing scale and intensification of employment alongside population. If MRT is feasible, it would connect direct into Rangiora and further justify this status.</p> <p>While Kaiapoi is second largest town in District, it has limited growth opportunities (due to constraints).</p>	<p>Christchurch centres are not developed to full potential providing longer term capacity.</p> <p>A greater proportion of growth to the Selwyn District will mean more demand in Rolleston.</p> <p>Greater proportion of growth to the Waimakariri District also means more demand in Rangiora as the main centre, with greenfield in this option located adjacent to grow the townships of Rangiora and Ravenswood especially. Rangiora already has good employment base / self-sufficiency. If MRT is feasible, it would connect direct into Rangiora.</p>



Transport Packages

The three transport packages are assumed to be consistent across each of the three land-use packages. The impact of the transport packages is primarily assessed through Opportunity 2 – which considers accessibility, vehicle kilometres travelled (VKT) and other transport-related criteria.

The three transport packages are cumulative; i.e. Package 2 includes all of the elements of Package 1; and Package 3 also includes all of the elements of Packages 1 and 2.

Transport Package 1: Baseline

The baseline transport package assumes the completion of currently planned transport projects, including Public Transport Futures Foundations and Rest of Network, cycle infrastructure, intersection and safety improvements etc. but without any major new policy or infrastructure initiatives.

It is assumed that all of the projects will be in place by 2051, the Spatial Plan modelling horizon.

Transport Package 2: MRT

In addition to the network additions assumed for the baseline Package 1, Package 2 assumes the implementation of a mass rapid transit (MRT) system on the northern corridor from the central city to Belfast and the south-western corridor from the central city through Riccarton to Hornby. It is also assumed that the MRT investment will be supported by a high-frequency connection to the Airport and University of Canterbury.

The proposed route and mode for MRT in Greater Christchurch are the subject of a parallel investigation as part of the MRT business case. However, for this scenario evaluation, it is assumed that MRT will operate as light rail transit on the route illustrated below.



Transport Package 3: Policy Interventions

Package 3 assumes that a range of policy interventions will be put in place in addition to the investments outlined in Packages 1 and 2. These interventions will be primarily aimed at managing transport demand to reduce vehicle kilometres travelled (VKT) and emissions.

The package includes a suite of measures that will result in changes to the following model inputs:

- Work-at-home: 50% increase (from 10% to 15%)
- Road network speeds: 20% general reduction
- Public Transport fares: 80% reduction
- Public Transport frequency: 50% increase
- Public Transport access time: 10% improvement
- Road pricing – distance-based charge of \$0.25 per km
- Cycle level of service: 20% improvement
- Walking level of service: 10% improvement
- Trip rate adjustment: 5% reduction in non-home-based trips



Technical Evaluation

Assessment of Urban Form Scenarios

The technical evaluation of the land-use scenarios and transport packages were undertaken through a workshop of over 40 partner agency and central government staff from a range of disciplines. The Community and Public Team of Canterbury District Health Board (now Te Whatu Ora) provided significant guidance on the methodology and approach to the evaluation, and designed and facilitated the workshop.

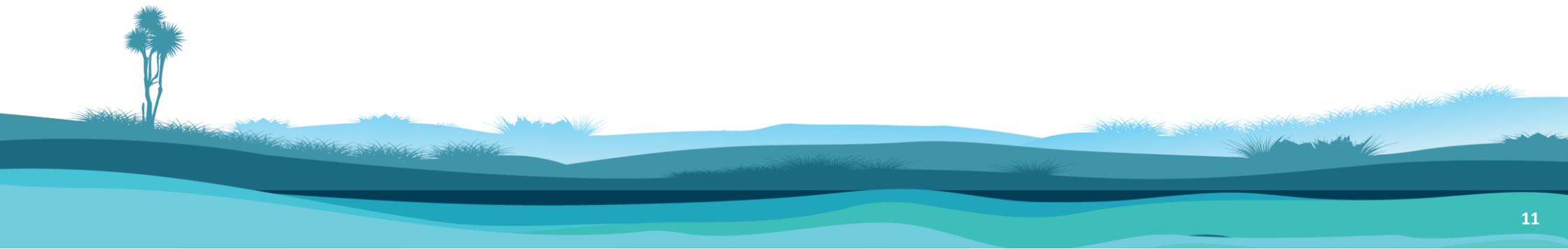
The scenarios were assessed against the evaluation criteria associated with Opportunity Statements 1, 2, 3, 5 and 6 by two different breakout groups, to allow for a range of perspectives to be incorporated into the evaluation. The assessment against Opportunity Statement 4 was excluded from the technical evaluation workshop, as Opportunity 4 is primarily focused on sites and areas of significance to Māori.

The technical evaluation was qualitative, leveraging the expertise of the people participating in the workshop, but drew on quantitative information where it was available:

- A quantitative evaluation undertaken by WSP – assessing the urban form scenarios against transport and economic criteria
- GIS mapping of constraints and areas to protect

The output of the technical evaluation for each of the criteria was summarised using a 5-point assessment score as follows:

	Significantly Better	Provides a considerable improvement so that over the 30-year period positive change is noticeable
	Better	Provides some improvement and will be noticeably different over the 30-year period
	Neutral	No discernible positive or negative difference
	Worse	Somewhat worse over the 30-year period
	Significantly Worse	Is considerably worse so that over the 30-year period negative change is noticeable



Conclusions

The evaluation concluded that **Scenario A (Compact)** performs best across almost all of the assessment criteria. In particular, the **Scenario A (Compact)**:

- Provides the best opportunity to achieve higher density typologies consistent with household and demographic trends towards demand for smaller housing.
- Performs best for accessibility, and has lower VKT and greenhouse gas emissions than other urban form scenarios.
- Has the least impact on productive soils and is most likely to deliver positive outcomes for air quality and water use.
- Provides better opportunities to mitigate risk associated with hazards and provide economies of scale to fund delivery.
- Enables the best opportunities for economic agglomeration and redevelopment.

However, the **Scenario A (Compact)** land-use package on its own, is not sufficient to fully deliver the Spatial Plan opportunities. The evaluation found that additional transport packages (MRT, and additional transport policy interventions) improved the performance of all scenarios. However, VKT and greenhouse gas emissions failed to meet anticipated Emission Reduction Plan (ERP) targets under all scenarios.

The evaluation also concluded that avoiding natural hazards, particularly related to climate change, suggests that significant growth should be focused away from areas vulnerable to coastal inundation. This can be achieved in all the land-use scenarios evaluated.

Further work is required to determine how the Spatial Plan should address housing affordability and market dynamics.

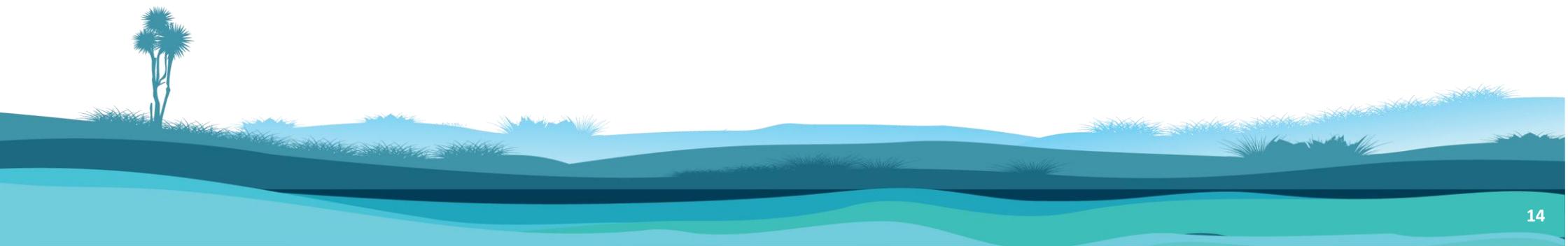




Opportunity 1: Enable diverse and affordable housing in locations that support thriving neighbourhoods that provide for people’s day-to-day needs

Overall Assessment				
<p>Scenario A (Compact), as a concept, was assessed to have better overall outcomes for housing, including providing for greater range of dwellings to meet future household’s needs, especially as the population ages. The Scenario A (Compact) land-use scenario assumes higher densities which provides more opportunities for lower priced dwellings and better social connection. However, there will still be demand for standalone dwellings at lower densities.</p> <p>Each land-use scenario could perform well if the right ‘levers’ are pulled, and each land-use scenario would require ‘levers’ to be pulled to perform. Levers could include affordability interventions, investment in open space and infrastructure, tools to encourage higher densities (e.g. financial contributions incentivising or dis-incentivising) and investment into communities where increased density has wider benefits. These will come at a cost and must be developed in a unified way across Greater Christchurch, otherwise development will go where it’s ‘easier’.</p> <p>It was noted that growth allocation in Scenario A (Compact), as assumed, would not meet the requirements of ‘expected demand’ outlined in the NPS-UD for each territorial authority as it reallocated growth within the Greater Christchurch area.</p>				
Criteria	Scenario A (Compact)	Scenario B (Consolidated)	Scenario C (Dispersed)	Explanation
Housing Development Capacity	<i>Can be achieved under all urban form scenarios</i>			<p>Each land-use scenario provides sufficient feasible development capacity to meet the total expected demand for housing across the three territorial authority districts. However, Scenario A (Compact) does not cater for the expected demand in the Selwyn and Waimakariri Districts. That is because the demand calculated as likely to occur in the Districts in the Housing Capacity Assessment is assumed to ‘shift’ in to the City and so that expected demand is not met in in the projected location.</p> <p>To be compliant with the NPS-UD, as a Future Development Strategy, the preferred urban form will need to allocate, at a minimum, capacity to meet expectant demand in the Districts.</p>
Diversity of Housing Types				Each land-use scenario can provide for the range of housing typologies to cater for future household composition, however Scenario A (Compact) will likely support higher densities and a greater range of typologies.

				<p>Household composition in 30 years will consist of more single and couple households largely driven from an ageing population. This will require a greater range of housing types, especially more 1 and 2 bedroom homes. These homes will vary in typology depending of their location with typologies ranging from apartments and terraces to duplexes and standalone.</p> <p>Increases in density can create and provide for change in this range of typology and Scenario A (Compact) is likely to generate this greater density and therefore a greater range in housing typologies.</p> <p>However, to get shifts in development types, in the right location, and done well, will require central and local government interventions, policy changes, and investment. Conversations with the development sector on how and when this could happen are also important.</p>
Housing Affordability				<p>As with housing typologies, higher densities can support lower priced dwellings. It is difficult to divorce affordability from typology, hence Scenario A (Compact) performs slightly better.</p> <p>This only considers the price element of housing as it relates to the influence of a spatial plan but affordability is a comparison of income and price points. More work is required in this space to create a measure and define affordability in a Greater Christchurch context.</p> <p>Although Scenario C (Dispersed) may provide cheaper land there are other cost consideration, such as travel costs, and Scenario A (Compact) may also reduce the overall ‘true’ cost of housing by reducing emissions etc. Note that this criteria is about housing affordability – access and transport considerations are covered under Opportunity 2.</p> <p>One key way that affordability can be delivered more immediately and on large scale is through private and public partnerships. This is a further area to consider in the Spatial Plan. Another area is coordinated policy to comprehensive developments.</p>
Water Infrastructure	<i>Different considerations and requirements under each scenario</i>			<p>Whether or not any given land-use scenario has efficiencies in infrastructure depends on the investment required for the number of people in any given catchment.</p> <p>The cost of investment would likely be higher in Scenario A (Compact) but the cost per person is lower because a higher number of people in each catchment (more rates, more cost effective). Scenario C (Dispersed) would be the opposite in that the cost is higher per person, as there are less people. However, retro-fitting an already developed area can be expensive compared to starting with new infrastructure, which can be easier and cheaper to put in (e.g. ‘Greenfield’). This is often paid for by developer, although there are on-going maintenance costs that are not captured.</p>



<p>Meets diverse needs of the community and is equitable</p>	<p><i>Can be achieved under all scenarios, but considerations and requirements differ</i></p>	<p>Each land-use scenario can enable thriving, liveable communities that meet the needs of all people throughout their life. Particular focus is needed for an ageing population and this is discussed in the typology and affordability criteria.</p> <p>Further discussion around access to public space and connection is discussed in the following criteria and will also help meet the needs of the community.</p>
<p>Access to green space</p>	<p><i>Can be achieved under all scenarios, but considerations and requirements differ</i></p>	<p>Each land-use scenario has the potential to encourage access to high quality open (green/blue) spaces for play, recreation, community interaction and enjoyment.</p> <p>The definition of ‘green space’ is important in assessing the land-use scenario. Green space could be active/sports areas, passive walking areas, local gardens or plazas with planting. What is important to access for one person and demographic may be different for another, which is particularly important in an ageing population.</p> <p>Each land-use scenario could achieve this but Scenario A (Compact) and Scenario B (Consolidated) may require greater investment by requiring more space within existing neighbourhoods. However, these land-use scenario could also provide greater potential access, with larger populations around able to access these spaces. Conversely, Scenario C (Dispersed) could be seen as providing easier access to green spaces through larger yard / garden space. Further, larger green space / regional parks can be integrated in and planned around in Scenario C (Dispersed), although there may be more of need to use motor vehicles to access this space.</p>
<p>Sense of place, connection and safety</p>	<p><i>Can be achieved under all scenarios, but considerations and requirements differ</i></p>	<p>Each land-use scenario can encourage gathering and connectedness, which builds a greater sense of community and helps improve safety. However, it is very difficult to compare land-use scenario as it depends on the level of investment and on design.</p> <p>Safety is very subjective and changes with the age of population. Children (Parents) feel safer on quieter streets whereas busier streets are better for crime prevention. Different land-use scenario are better suited to support different stages of life.</p> <p>It is difficult to separate sense of place from other criteria with access to public space and services also encouraging safety and connection.</p>

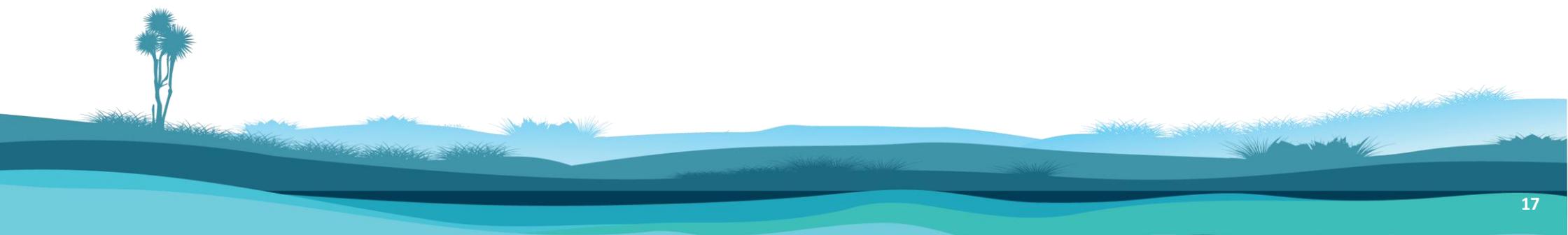


Opportunity 2: Prioritise sustainable transport choices to move people and goods in a way that significantly reduces greenhouse gas emissions and enables access to social, cultural and economic opportunities



Overall Assessment				
<p>For each of the criteria under this Opportunity, the ranking of the 3 land-use scenarios was the same: Scenario A (Compact) performed best, then Scenario B (Consolidated), then Scenario C (Dispersed). For several of the criteria, however, the degree of difference between the 3 land-use scenarios is not as great as may have been expected. In part, this reflects the fact that much of the current urban form is already in place, and a degree of commonality between the 3 land-use scenarios relating to the location of household and (especially) employment growth, so differences are often at the margin.</p> <p>While several criteria showed improvement over 2021 (accessibility, mode share, support for Public Transport, and equitable access), VKT increased under all scenarios. This is contrary to the need for a VKT reduction under the Emissions Reduction Plan (ERP). Similarly, while greenhouse gas emissions are lower than the 2021 base for all scenarios, this is mainly driven from model assumptions on vehicle fleet profile, not from reduced travel (as above, VKT is increasing). The resulting emission reductions are still well short of ERP targets.</p> <p>The assessment also tested the impact of additional transport interventions over and above the base (MRT, and a package of additional transport policy interventions). These interventions generally improved the performance of all land-use scenarios against each of the criteria. This improvement was generally additive: Transport package 2 (MRT) performed better against all criteria than Transport package 1 (currently planned initiatives); and Transport package 3 generally performed better again. There were two exceptions to this: for access to jobs by car and freight travel times, package 3 performed worse than package 2, mainly due to slower travel speeds assumed in the policy package.</p> <p>Generally, the best performing combination is Scenario A (Compact) land-use scenario with Transport package 3 (MRT and additional policy interventions). However, this combination still falls short of what is needed for some key criteria, notably VKT and emissions.</p> <p>This implies that achieving targets for VKT and emissions will require a more radical approach to the policy interventions, and/or a stronger emphasis on behavioural change.</p> <p>The assessment has also shown that changes to urban form, in isolation, will only get us part way along the path to our targets.</p>				
Criteria	Scenario A (Compact)	Scenario B (Consolidated)	Scenario C (Dispersed)	Explanation
Access to social and economic				Under a Scenario A (Compact) more jobs are accessible to households, both by car, and especially by public transport.

opportunities – jobs				<p>For access to jobs by private vehicle, Scenario B (Consolidated) performs best, regardless of the transport interventions. Scenario C (Dispersed) performs the worst. For access by Public Transport, Scenario A (Compact) performs best.</p> <p>The transport policy interventions reduce access by car, due to slower speeds and allocation of road space to MRT. However, Public Transport access is significantly improved as the interventions under Transport Packages 2 and 3 are added.</p>
Access to social and economic opportunities - local activities				<p>This criterion assesses how well the land-use scenarios support household access to local opportunities, by measuring access to the nearest schools, KACs, medical centres and supermarkets.</p> <p>Access to these activities improves with the increased density of Scenario A (Compact). Scenario C (Dispersed) performs worst.</p>
Travel mode share				<p>Public Transport, cycle and walking mode shares increase under all land-use scenarios, but more strongly under Scenario A (Compact). The addition of transport interventions, especially the policy interventions, has a significant positive impact on Public Transport mode share.</p> <p>Note, however, that this improvement is off a small base, and the share of trips by private car is still dominant. The combination of urban form and transport interventions reduces the number of transport trips by private vehicle by a maximum of 1%.</p>
Vehicle kilometres travelled				<p>Compared to the 2021 base, VKT increases under all land-use scenarios and transport intervention combinations. The Scenario A (Compact) has the lowest increase, but it is still 31% more than 2021 under the base transport layer. The MRT and transport policy interventions can improve this picture, but the combination of these interventions with Scenario A (Compact) still sees a VKT increase of 24%.</p> <p>Scenario A (Compact), with only baseline transport improvements has the same level of VKT increase as Scenario C (Dispersed) with both MRT and transport policy interventions (31%).</p>
Transport emissions				<p>The relative performance of the land-use scenarios in relation to greenhouse gas emissions follows a similar pattern to VKT.</p> <p>The vehicle emissions prediction model (VEPM) calculates greenhouse gas emissions using transport model outputs for vehicle trips and VKT for light vehicles and heavy vehicles, and assumptions of light and heavy vehicle fleet profiles (which are common across each land-use scenario).</p>



				<p>The model forecasts a reduction in greenhouse gas emissions from the 2021 base for all the land-use scenarios, ranging from 40-45%, but this is mainly driven from assumptions on changes to the vehicle fleet profile (i.e. conversion to zero / low emission vehicles), not from reduced travel (as above, VKT is increasing).</p> <p>The difference in emissions for each of the land-use scenarios is more pronounced for light vehicles than heavy vehicles.</p> <p>Despite the improvement from 2021, emission reductions are still well short of ERP targets (hence the neutral rating)</p>
Public transport				<p>This criterion considers how well each land-use scenario will support an efficient Public Transport system, measured by the proportion of households within walking access to a high frequency Public Transport route. This measure will increase under all land-use scenario, due to the combination of increased density and service level improvements from Public Transport Futures.</p> <p>The improvement is most pronounced under Scenario A (Compact), where 59% of households will be within 400m of a frequent route (Scenario B (Consolidated) 55%, Scenario C (Dispersed) 52%. The Scenario A (Compact) also has a much higher proportion of new households located close to Public Transport.</p>
Equitable access				<p>This criterion considers how well the land-use scenarios contribute to improved access to opportunities for deprived communities. This was assessed by comparing access to local facilities (schools, key activity centres, medical, supermarkets) and high frequency Public Transport for households in areas with current NZ Deprivation scores 8-10.</p> <p>Scenario A (Compact) would locate a significant amount of its growth within areas which currently have high deprivation. In contrast, Scenario C (Dispersed) would locate less of its growth in these areas.</p> <p>As a result, Scenario A (Compact) has a significantly higher number of households that have good access to public transport, schools, key activity centres, medical centres and supermarkets, and most of these households are located in areas of currently high deprivation.</p> <p>In contrast, Scenario C (Dispersed) results in only a small increase in the number of households with good access to these services, and those tend to be located in areas of currently low deprivation.</p>
Freight efficiency				<p>This criterion considered freight travel times on 3 strategic freight routes as an indicator of freight efficiency under each land-use scenario.</p> <p>Travel times in 2051 increase relative to the 2021 base under all land-use scenarios.</p>



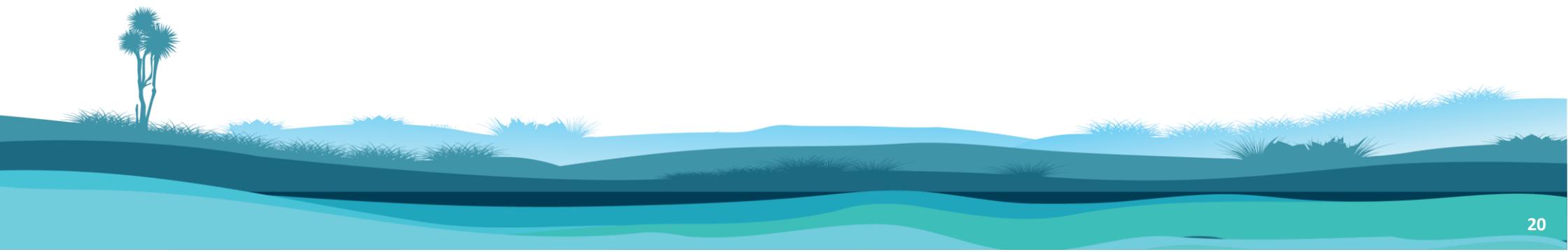
				<p>Freight travel times on the selected routes are generally faster under Scenario A (Compact) and slowest under Scenario C (Dispersed).</p> <p>The impact of the transport interventions on freight travel times was mixed. The MRT intervention improves freight travel times slightly, but the policy interventions result in a slower travel time for freight, especially during inter-peak periods. This is in part due to the interventions included within the model that assumes lower speed limits along parts of the each route.</p>
<p>Transport infrastructure</p>				<p>This criterion involved a qualitative assessment of how well each land-use scenario minimises the need for additional transport investment.</p> <p>Scenario A (Compact) is considered to perform best on this criteria, as it will generally make better use of existing infrastructure, and the mode share changes will help to reduce demands for additional road capacity.</p> <p>The quantitative assessment for other transport criteria suggests that Scenario C (Dispersed) would require a larger investment in infrastructure and policy interventions to achieve the same outcomes as Scenario A (Compact) without those investments and interventions: hence, Scenario C (Dispersed) is likely to be more expensive.</p>



Opportunity 3: Protect, restore and enhance the natural environment, with particular focus on te ao Māori, the enhancement of biodiversity, the connectivity between natural areas and accessibility for people



Overall Assessment				
<p>Overall, Scenario A (Compact) performed the best of the land-use scenario, having the least impact on productive land and being most likely to deliver positive outcomes for air quality and water use. Scenario C (Dispersed) generally performed the worst, particularly in relation to likely impacts on land with high productive potential, with more rural / greenfield land required to support future development. It also performed poorly, when compared with the other land-use scenarios, in relation to water use and air quality.</p> <p>Across many of the criteria, but particularly those related to water quality and biodiversity, the performance of all land-use scenarios was highly dependent on the planning and design of developments, associated infrastructure, and the mitigation and/or enhancement measures in place to support environmental outcomes.</p>				
Criteria	Scenario A (Compact)	Scenario B (Consolidated)	Scenario C (Dispersed)	Explanation
Significant landscapes	<i>Significant landscapes are protected under all urban form scenarios</i>			Across all land-use scenarios, urban development is assumed to be located outside of any identified significant natural landscapes. With a smaller urban footprint, Scenario A (Compact) is likely to result in the least encroachment into greenfield areas and have the least impact on other landscape values, for example rural landscapes.
Productive land				Scenario A (Compact) has the least impact on land with high rural productive potential and locates more development further away from rural activities, reducing the likelihood of reverse sensitivity issues. However, so productive land is still lost. Scenario C (Dispersed) has the greatest potential impact and increased risk of reverse sensitivity impacts, with more rural / greenfield land required to support future development.
Water quality	<i>Can be achieved under all scenarios, but considerations and requirements differ</i>			Water treatment infrastructure could potentially be integrated more easily into greenfield developments when compared to the challenges of retrofitting infrastructure in more intensively developed areas. However, the extent of impervious surfaces is likely to be greatest under Scenario C (Dispersed) due to the urban area taking up more land, and Scenario A (Compact) and Scenario B (Consolidated) may provide efficiencies in terms of servicing smaller catchment areas. Increased mode shift towards active and public transport has the potential to reduce heavy metal contaminants. The performance of



				all land-use scenarios is highly dependent on the design of developments, associated infrastructure, and mitigation and/or enhancement measures in place to support water quality outcomes.
Water use				Scenario A (Compact) has the potential to result in the lowest water use, given the smaller section sizes and greater opportunities to promote water re-use.
Biodiversity	<i>Can be achieved under all scenarios, but considerations and requirements differ</i>			Scenario A (Compact) has the smallest urban footprint and consumes the least amount of greenfield land and may therefore provide the greatest protection to biodiversity and ecosystems. However, intensification has the potential to reduce tree canopy cover. The performance of all land-use scenarios is highly dependent on the design of developments, associated infrastructure, and mitigation and/or enhancement measures in place to support biodiversity outcomes.
Air quality				Scenario A (Compact) is considered likely to have the least negative impact on air quality, due to the potential for higher density developments resulting in reduced home heating and transport emissions when compared to a lower density, Scenario C (Dispersed) . However, more intensive housing could lead to more concentrated pollutants in specific areas.



Opportunity 4: Protect historic heritage and sites and areas of significance to Māori



The assessment against Opportunity Statement 4 was excluded from the technical evaluation workshop, as Opportunity 4 is primarily focused on sites and areas of significance to Māori.

The evaluation of the urban form scenarios undertaken by mana whenua concluded that the **Scenario A (Compact)** was preferred as:

- It reduces expansion of urban areas over wāhi tapu and wāhi taonga; and
- Reduces the irreversible loss of productive soils and provides opportunity to restore and enhance the natural environment, including waterways between urban areas; and
- Is more likely to better achieve the policy directives for integrated planning of the use of land and water.





Opportunity 5: Reduce and manage risks so that people and communities are resilient to the impact of natural hazards and climate change

Overall Assessment				
<p>The land-use scenarios perform differently, but all can achieve the objective of avoiding, or reducing, placing people and property in areas affected by natural hazards. Strategies to avoid, mitigate, or remediate will be required for each land-use scenario, but will have different cost implications. Growth in western areas of Greater Christchurch is generally best, and can be achieved in all land-use scenarios.</p> <p>A key consideration is the implications for infrastructure, with Scenario A (Compact) considered better able to mitigate risk and provide economies of scale to fund delivery. However, Scenario B (Consolidated) and Scenario C (Dispersed) could provide more flexibility for managed retreat, including lifestyle choice and ability to retain community coherence.</p>				
Criteria	Scenario A (Compact)	Scenario B (Consolidated)	Scenario C (Dispersed)	Explanation
Natural hazards – Climate related				<p>Growth towards the west is preferred, but climate related risks are accelerating e.g. a 1:200 year event may happen sooner/more frequently.</p> <p>Scenario A (Compact) provides better economies of scale (including rates revenue) to address hazards and provide resilient infrastructure. Investments can improve existing mitigation measures and benefit existing communities, not just new growth areas. Land acquisition may be more complex and costly, and could impact on house prices as well as infrastructure.</p> <p>Scenario C (Dispersed) may help to dilute exposure to hazards. Greenfield sites could be cheaper and more readily able to integrate infrastructure e.g. stormwater detention, but benefits would be limited to new sites rather than the wider community. Extended infrastructure (and utility) networks potentially increase vulnerability from major events and could contribute to greater risk of socio-economic disruption.</p>
Natural hazards – Geotechnical				<p>Growth towards the west with the flat lands generally performing better.</p> <p>Scenario A (Compact) at the right location is an important consideration. Intensification offers the opportunity to replace old building stock with new buildings that are up to code. Building design may address risk, but there is potential for increased construction costs – however, Scenario A (Compact) will allow more focused/targeted infrastructure investment.</p>



				<p>Scenario C (Dispersed) is better able to spread risk, but more extended infrastructure and utility networks increase the risk of disruption and cost (both capital and operating expenditure) especially from a major event such as the Alpine fault. Greenfield sites are more likely to be able to provide a rapid response following a major event, as happened following the earthquakes.</p>
<p>Climate Change – adaptation</p>	<p><i>Can be achieved under all scenarios, but considerations and requirements differ</i></p>			<p>Scenario A (Compact) provides better economies of scale (including rates revenue) to address hazards and provide resilient infrastructure, and can contribute to greening the city, depending on design, to address heat related issues from global warming. Investments can improve existing mitigation measures and benefit existing communities, not just new growth areas. Land acquisition may be more complex and costly.</p> <p>Scenario C (Dispersed) with more greenfield sites could be cheaper (land value) and more readily able to integrate infrastructure e.g. stormwater detention.</p>
<p>Climate Change – managed retreat</p>				<p>The quantity of any managed retreat is yet to be determined, but it is considered that all land-use scenarios could provide for the required capacity to accommodate population retreating from hazard. Scenario C (Dispersed) could be quicker to establish and provides more lifestyle choice and ability to retain community coherence.</p>



Opportunity 6: Provide space for business and the economy to prosper in a low carbon future



Overall Assessment				
<p>Scenario A (Compact) provides the best economic performance relative to the other land-use scenarios, with Scenario C (Dispersed) performing the worst overall. This is because Scenario A (Compact) provides better access to employment, agglomeration benefits (economic and consumption), better supports redevelopment opportunities and best supports a low carbon future. More dispersed employment provides slightly more equitable access to employment for people in deprived areas, and supports the self-sufficiency of townships.</p> <p>The provision of public transport, in the form of MRT in the western and northern corridors has a more significant impact on access to employment - including equitable access, economic agglomeration and consumption density - than the land use scenario.</p>				
Criteria	Scenario A (Compact)	Scenario B (Consolidated)	Scenario C (Dispersed)	Explanation
Business Development Capacity	<i>Can be achieved under all urban form scenarios</i>			<p>All land-use scenarios would provide for projected business demand.</p> <p>Further work is required to consider the growth, requirements and suitable locations for employment at an industry level, in the context of future trends.</p> <p>How current business demand projections are met will impact on economic outcomes overall.</p>
Effective Job Density	<i>Slightly better</i>			<p>All land-use scenarios provide better access to the employment opportunities compared to now with Scenario A (Compact) performing 5.4% better than Scenario B (Consolidated), and Scenario C (Dispersed) performing 5% worse than Scenario B (Consolidated). The provision of improved public transport through MRT along the western and northern corridors has a more significant positive impact (around 11% points) on access to employment than the land use scenario.</p>
Effective Agglomeration-Adjusted Job Density				<p>Scenario A (Compact) provides more opportunity for economic agglomeration for relevant industries than Scenario B (Consolidated) and Scenario C (Dispersed). Scenario A (Compact) performs 14.2% better than Scenario B (Consolidated) and Scenario C (Dispersed) performs 12.2% worse than Scenario B (Consolidated). The provision of MRT has a more significant positive impact (around 22% points) on economic agglomeration than the land use scenario.</p>

Effective Consumption Density				Scenario A (Compact) provides more opportunity for density of consumption offering than Scenario B (Consolidated) and Scenario C (Dispersed) . Scenario A (Compact) performs 9.1% better than Scenario B (Consolidated) and Scenario C (Dispersed) performs 7.7% worse than Scenario B (Consolidated) . The provision of MRT has a more significant positive impact (16% points) on economic agglomeration than settlement patterns.
Equitable Access to Employment			<i>Slightly better</i>	All land-use scenarios provide better access to employment for people in the most deprived areas (in the order of 61,500 – 67,500 having improved access to employment by private car and 30,750 – 40,800 by public transport). Scenario C (Dispersed) provides slightly better performance compared with Scenario B (Consolidated) (4.5% and 0.2% better for access by private car and public transport respectively, while Scenario A (Compact) performs slightly worse compared to Scenario B (Consolidated) (-1.7% and -3.3.% worse for access by private car and public transport respectively). MRT improves access to employment by people in high deprivation areas by between 22.5% – 25.7% points across all settlement patterns. The transport policy intervention packages improves access by an additional 5% points.
Central City Vibrancy	<i>Slightly better</i>			The central city is important both as an employment centre and as leisure destination for both residents and visitors. All land-use scenarios confirm the primacy of the central city as an employment centre. However, growth in central city employment under Scenario C (Dispersed) does not achieve the Christchurch City Council 2028 employment growth target.
Redevelopment opportunities				There is significant opportunity in and around the inner city and key activity centres for redevelopment of industrial land towards residential and commercial uses. Scenario A (Compact) best supports these opportunities. There is potential and capacity for industrial activities to move west to accommodate this redevelopment.
Low carbon future				Scenario A (Compact) best provided for a low carbon future by both reducing travel by workers, and providing better freight efficiency. There is also the potential for more effective use of infrastructure and economies of scale to provide energy efficient buildings and business premises.
Self-sufficiency				The self-sufficiency of townships and neighbourhood centres provides local access to services and employment – this is best provided for under Scenario C (Dispersed) . However this needs to be balanced with the benefits of access to a wider range of employment opportunities in the city.

