Taranaki Public Transport SSBC

Prepared for Taranaki Regional Council
Prepared by Beca Limited

8 October 2024

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
0.1	Kuan-Wen Sang	70% draft of Strategic Case for client comment	20/01/24
0.2	Kuan-Wen Sang	Draft for client comment	14/08/24
0.3	Kuan-Wen Sang	Draft for IQA	20/09/24
0.4	Kuan-Wen Sang	Peer Review Comment	02/10/24
0.5	Kuan-Wen Sang	Updates to finalize Peer Review	04/10/24
0.6	Kuan-Wen Sang	Minor updates made	07/10/24
1.0	Kuan-Wen Sang	Issue for IQA	08/10/24

Document Acceptance

Action	Name	Signed	Date
Prepared by	Kuan-Wen Sang		08/10/24
Reviewed by	Andrew Collings		08/10/24
Approved by	Robert Broadnax		08/10/24
on behalf of	Beca Limited		

Executive Summary

Introduction

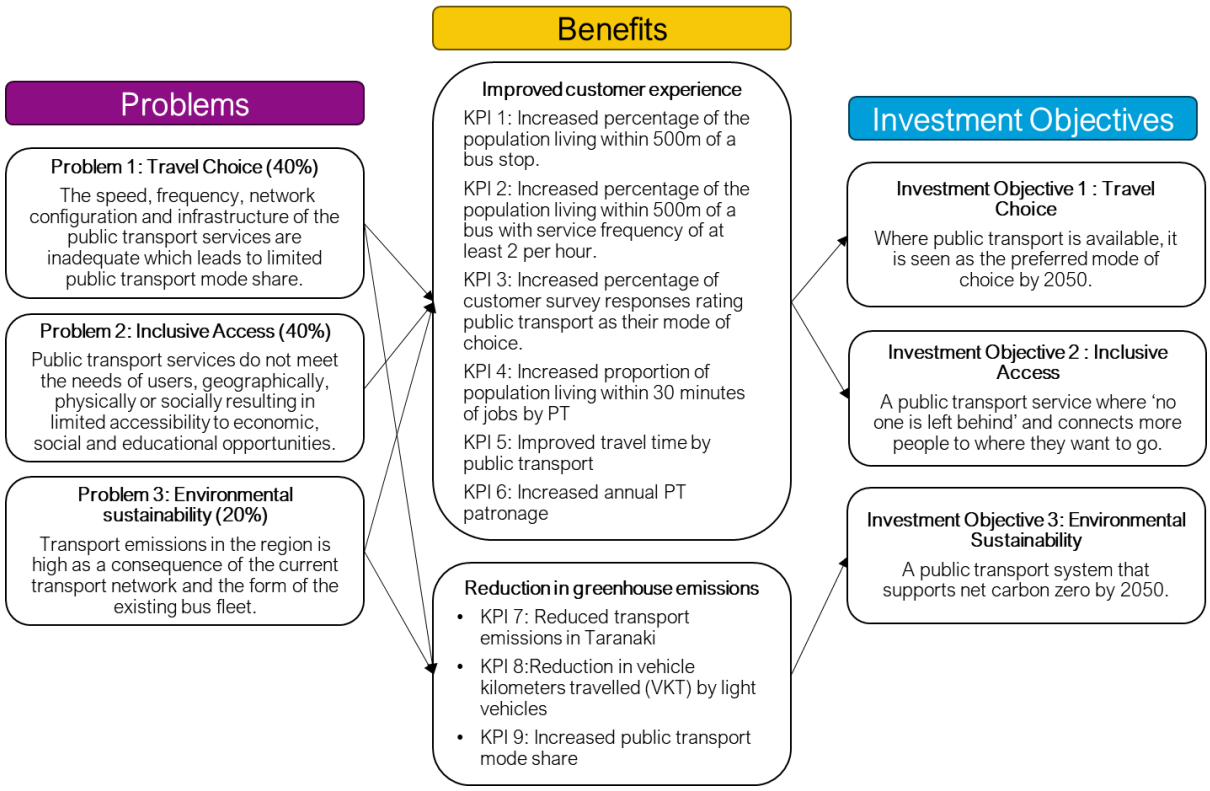
This Single Stage Business Base (SSBC) has been prepared for Taranaki Regional Council (TRC) to present the case for investing in improved public transport services and minor infrastructure in the Taranaki region.

Specifically, the Business Case is recommending a 'Gold' option as the long-term vision, but that the 'Bronze' option is the immediate funding request with a total 40-year cost of $66M and an estimated BCR of 1.0. Noting that the 'Bronze' option is of similar annual operating cost as the existing services and minimal additional funding is requested. This business case seeks:

- Approval of the preferred network option with minimal additional funding requested.
- Acknowledgement and endorsement of a staged frequency approach with 'Gold' being the desired frequency option for which further funding will be sought when available. Noting that prior to approval of additional funding an addendum to this SSBC will be undertaken including an updated BCR.
- Agreement to establish a Joint Committee between Taranaki Regional Council and New Plymouth District Council to facilitate and support the development of public transport moving forward.

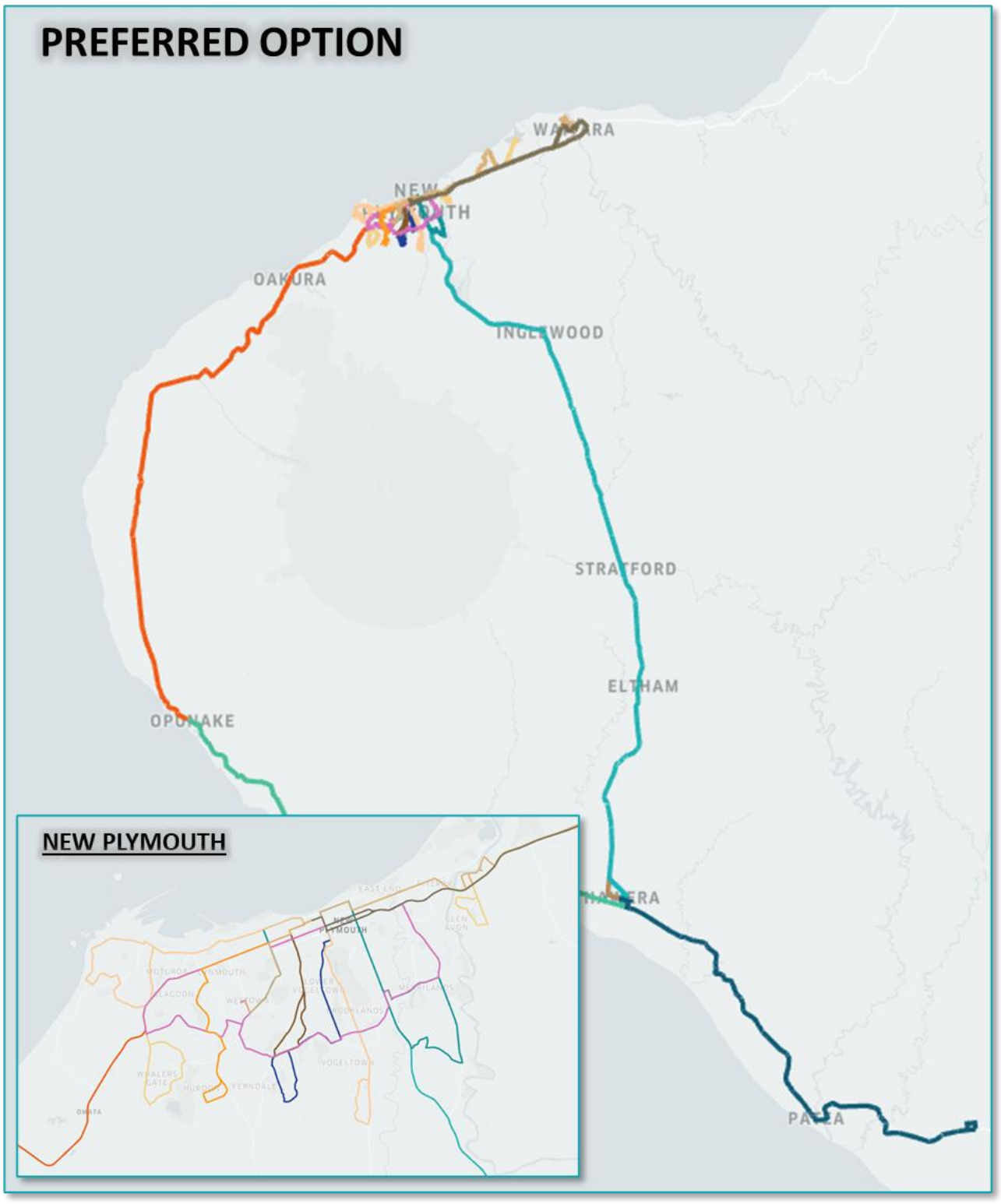
The Identified Problems, Benefits, and Investment Objectives

The existing public transport network has largely been unchanged for the past 15 years. During this time the community has grown, and land uses have changed. Addressing the identified problems will ultimately lead to improved customer experience, increased access to economic opportunities, and a reduction in greenhouse gas emissions. The proposed investment aims to focus on three areas – travel choice, inclusive access and environmental sustainability. The Problem Statement, Benefits and Investment Objectives are shown below.



The Preferred Network Option

In developing the preferred option, the SSBC recognises the constrained funding environment and the importance of community feedback in providing a service that is people centric. Following community engagement on the short-listed options, an amended option was proposed. This amended option was subsequently assessed to be the preferred option. The preferred option includes provision for minor infrastructure improvements necessary to achieve the investment objectives such as bus stops/ shelters.



Staging of the Preferred Network Option

With network changes in place, three frequency options have been considered for the preferred option (referred to as Bronze), Silver and Gold. Gold is the desirable preferred with 15-minute headways during the peak periods for the Urban routes and increased services on the weekends. Bronze and Silver options are considered for staging, based on current funding constraints. The difference in the frequency of services for each option is presented below.

	BRONZE		SILVER		GOLD		
	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Sunday & Public Holidays
Urban Services							
Airport to Whalers Gate	70		80	4	165		12
Carrington / Govett	70		80		125		12
Frankleigh Park	70		80		125	12	12
Mangorei Taranaki Hospital	70		80		125	12	12
Port Taranaki - Vogeltown	70		80		165	12	12
Proposed Orbiter Route	70	2	80	4	125	12	12
Route 3-Hurdon	70		80		165	12	12
Route 5 - Waitara	30		40		65	12	12
Waitara Express Route	25		35		60		
Regional Services							
Waverly to Hawera	1		1		2		
Opunake to Hawera	1		1		10	2	2
Opunake to NP	10		10		20	2	2
Hawera - Taranaki Hospital	20	4	20	4	20	4	4
Hawera to NP	5		5		40	8	8

Same as current schedule

30 min during peaks

15 min during peaks

Increased weekend & regional services

Outcomes Achieved

The preferred network option provides the following customer outcomes over the Do-Minimum:

- An estimated reduction in average travel time via public transport of 2 minutes (5%) between Glen Avon and the CBD, which increases to 6 minutes with the 'Gold' frequency. An estimated 5 minute reduction (14%) between Marfell and the CBD, which increases to 10 minutes with the 'Gold' frequency.
- The New Plymouth Airport is now accessible via public transport increasing travel choice for locals and travellers alike.
- An estimated 14% increase in the overall daily bus patronage by 2035 with the 'Bronze' frequency. This will be further increased to a daily increase of 44% with the implementation of the 'Gold' frequency option.
- By 2053, approximately 54,500 people will be within a bus route. This is a 3,100 or 6% increase from the Do-Minimum.
- Reduction of 4,812 tonnes of CO_2 over 40 years with the 'Bronze' frequency, and a reduction of 13,335 tonnes with the 'Gold' frequency option due to private vehicle trips diverted to public transport.

BCR and Costs

The overall estimated annual operating cost and BCR for the different frequency options are shown in the table below. This analysis takes a conservative approach in estimating the BCR which assumes there is no 'Do Min' cost. The BCRs in this table underestimate the benefits of the Bronze option significantly when compared to cost. This option has very minor new costs for public transport operations and infrastructure, and also provides significant benefits in comparison. In this

scenario reassessing the BCR for the 'Bronze' option using the traditional approach would result in a high BCR- 33.7 – that would not appear credible when compared to other NZTA endorsed public transport business cases.

Whichever way the BCR is calculated, the Bronze options is the only financially viable option currently as minimal additional funding is being sought. It is also noted that the BCR for the Silver and Gold option will be reassessed in the future using the latest guidelines at the time.

Option	Annual Operating Cost ($million, undiscounted)	BCR
Bronze	$3.5	1.0
Silver	$4.1	1.4
Gold	$7.2	1.7

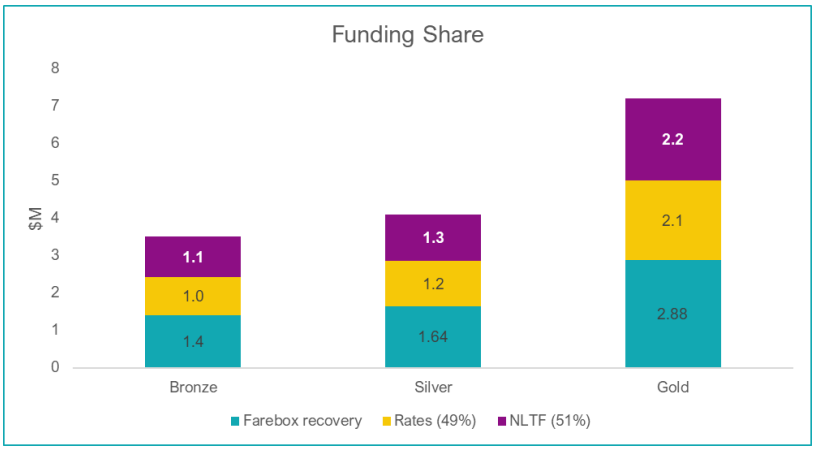
The incremental BCR analysis is shown in the table below with a target incremental BCR of one.

Option	Next-higher Cost Option	Incremental BCR	Above/Below Target incremental BCR
Bronze	**Silver**	3.8	Above
Silver	**Gold**	2.4	Above

The above analysis shows that the Gold option provides the strongest return on investment with a BCR of 1.7. The incremental BCR analysis indicates that each step change provides additional benefits that outweigh the additional cost. The above also highlights that the Silver frequency option is an important step change towards the preferred aspirational Gold frequency.

Funding Share

The estimated funding split for the operational costs for the different frequency options are shown below based on an assumed 40% farebox recovery. It also assumes standard FAR (51% from the NLTF).



It is noted that the only new funding request for infrastructure is for bus stops and shelters at this point in time (minor infrastructure) and that there can be additional updates to the network over time. It is also noted that alternative funding sources may be available and these can be considered by the Joint Committee.

The Investment Prioritisation profile is detailed below. As noted a conservative approach has been applied for developing the BCR and if full benefits and limited costs were considered a high BCR that may not be credible would be calculated – noting the BCR utilizing this approach was 33.7. We considered as an alternative, capping the BCR at 3 or 5, however on the basis of being conservative have left this at one (1) – given that minimal additional funding is being sought under the Bronze option.

Investment Prioritisation Method

The NZTA Investment Prioritisation Method for the 2024-27 National Land Transport Programme (NLTP) has been used to understand the potential investment prioritisation of the SSBC. Overall, the investment proposal has been assessed as priority order 5 and is considered to have medium alignment with the GPS, a high level of scheduling priority and a low efficiency rating. These ratings will be reviewed and assessed by Waka Kotahi as part of their internal assessment processes.

Factor	Rating
GPS Alignment	**Medium** The investment proposal has been assessed as medium as it responds to economic growth and productivity through 'operation of public transport services enabling access to employment and other economic opportunities. The preferred option is estimated to increase public transport patronage by 14% and is expected to at least maintain farebox recovery. The improvement in bus services will provide the opportunity to travel to the airport via public transport where previously this was only accessible by car. The improvements will also see a reduction in travel time via public transport to the New Plymouth CBD by up to 10 minutes from Marfell under the 'Gold' frequency and 6 minutes from Glen Avon.
Scheduling	**High** The investment proposal has a high scheduling priority alignment via the Criticality factor. The current bus service contract, with an extension, are set to expire in April 2026 and there is a need to tender a new contract to enable service continuity. The successful operator will need to invest in supporting buses to enable the improvements. Any delay would have significant impact on the RPTP goals and community needs.
Efficiency	**Low** (BCR 1.0 – 1.7**)** This could be **High** if a BCR of 33.7 or Medium if 3 or 5 was adopted.
Priority order	**5** If a higher Efficiency rating was adopted, the priority order could be as high as 3. However, minimal funding is being sought currently and the priority order will have minimal impact.

Commercial

Taranaki Regional Council has several contracts in place for public transport services.

In late 2024 procurement contracts will be reviewed. These lead to a new 2026 bus procurement contract. This contract will consider the proposed network, Ministry of Transport Requirements, the current Transport GPS, and will be flexible to allow changes in the network. There will be a one-year lead in time.

As of writing this business case (8 October 2024) the following is noted from a procurement perspective:

- Procurement will consider proposed network and vehicle kilometres, purchases of buses and percentage of EVs.

- Increased service provision and provision items with variable rates e.g. three years or nine years to allow for changes.
- Provisional items and changes included.

It is anticipated that there will be feedback from operators during procurement planning that may result in refinements but not fundamental changes.

In short, there is a current mechanism for procurement that will go to market in September 2024 giving operators a year to consider changes, with implementation commencing in April 2026. The new procurement is proposed to be for nine years, and there is room for flexibility.

Management

The management case puts in place appropriate arrangements for the successful delivery of the business case – and future management and delivery. Specifically, the case helps to refine the preferred option by clarifying a partnering approach to governing and managing delivery, flexibility to stage implementation together with the financial and commercial cases, and provides details on the following:

Arrangement	Details
Programme Management and Governance	Proposed Joint Committee between Taranaki Regional Council and New Plymouth District Council.
Project management	Details on the specific project management systems, how these may operate, if they are compliant with NZTA requirements and relevant roles
Change management	Processes in place to manage changes as they occur including mitigation measures
Benefits management	Details on benefit realisation
Risks and uncertainty management	List of potential risks and uncertainties and how they will be managed along with mitigation measures
Post-implementation evaluation	Details on evaluation after the new bus network is implemented

Dependencies and Uncertainties

The following dependencies and uncertainties are noted:

- The New Plymouth Integrated Transport Framework Programme Business Case is currently in draft format.
- Funding envelopes are unknown, which is why a staged approach is proposed.
- Future bus procurement contracts are unknown (although the team is working with the Procurement team to minimize risk).
- Future fares and policy changes are unknown.

Recommendations Sought for Approval

This SSBC sets out the rationale for investing in an improved public transport network in Taranaki. Based on the information provided throughout this document, the following approvals are sought:

- Approval of the preferred network option with minimal additional funding requested.
- Acknowledgement and endorsement of a staged frequency approach with ‘Gold’ being the desired frequency option where further funding will be sought when available. Noting that prior to approval of additional funding an addendum to this SSBC will be undertaken including an updated BCR.
- Agreement to the establishment of a Joint Committee between Taranaki Regional Council and New Plymouth District Council to facilitate and support the development of public transport moving forward.

1 Introduction

This Single Stage Business Base (SSBC) has been prepared for Taranaki Regional Council (TRC) to present the case for investing in improved public transport services and infrastructure in the Taranaki region.

TRC's aspirations from this business case are simple:

- to create a public transport network that connects people to where they want to go; and
- to create a network where public transport is the preferred mode of choice on key corridors.

Sadly, the current bus network and services do not achieve these aspirations or provide 'real' modal choice for residents because:

- the current bus services have largely been unchanged for the past 15 years even though the community has grown, and land uses have changed; and
- services are complex, meandering and with land use changes do not meet the needs of the community.

Together, these have contributed to high private vehicle use and transport emissions in the region. In addition, those without access to a car have been left behind as the public transport network does not meet their needs.

Without investment, accessibility to jobs, education and sport, the health and wellbeing of residents, as well as customer experiences, will continue to be compromised. In short, **things need to change.**

To achieve change, this SSBC does two things:

- builds upon the public transport review carried out in 2023 which sought public consultation as part of 'Better Travel Choices Part B: Regional Public Transport Plan 2024-2054', and
- at the same time, comes to the Taranaki regional public transport network with a blank slate to enable the most innovative and revolutionary options to be considered.

Specifically, the Business Case is recommending a 'Gold' option as the long-term vision, but that the 'Bronze' option is the immediate funding request with a total 40-year cost of $66M and a BCR of 1.0. Noting that the 'Bronze' option is of similar annual operating cost as the existing services and minimal additional funding is requested. This business case seeks:

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1.1 Background

At 723,610 hectares, the Taranaki region makes up approximately 3% of New Zealand's total land area and is home to 2.5% of the country's population. An additional 68,910 hectares of Stratford District, which is within the Manawatū-Whanganui (Horizons) Region, is covered by Taranaki for the purposes of transport planning – bringing the total land area for the Plan to 792,520 hectares.

Taranaki is home to around 129,000 people, most of whom (nearly 70%) live in the coastal city of New Plymouth. The region is split into three districts: New Plymouth to the north with a population of about 90,000; Stratford in central Taranaki servicing about 9,000 people; and South Taranaki, including the main centre of Hāwera, with a population of approximately 29,000.

The main urban centres in Taranaki are New Plymouth, Hāwera, Waitara, Inglewood, Stratford, Ōpunake, Oākura, Eltham, Manaia, Pātea and Waverley.

Figure 1-1 : Taranaki Region

Taranaki has 2.5% of New Zealand's population, ranking it tenth in population size out of the 16 regions. Its dispersed population centres have implications for public transport ridership.

1.1.1 Population growth and land use

Population growth pressures remain steady, with the New Plymouth district specifically classified as a high-growth area. The region sees a net growth of around 1,500 residents per year.

The majority of the area in the region is rural. New Plymouth is the main urban centre and there are many satellite towns and settlements spread throughout the region which are generally serviced by the State Highway with limited alternative routes; these include SH3, SH3A, SH45 and SH43.

The economic wellbeing of the Taranaki region relies on natural resources, with farming (especially dairy), forestry, and the oil and gas industry being key contributors to the regional economy. The oil and gas sector, centred around the Taranaki Basin, is significant, while tourism is on the rise. However, as an export-driven economy, Taranaki is vulnerable to global economic changes and commodity price fluctuations. It is noted that the ban on gas and oil exploitation has been reversed by the current government meaning that the oil and gas sector will continue to be a major contributor to the economy.

The estimated population growth is as detailed in **Figure 1-2** below.

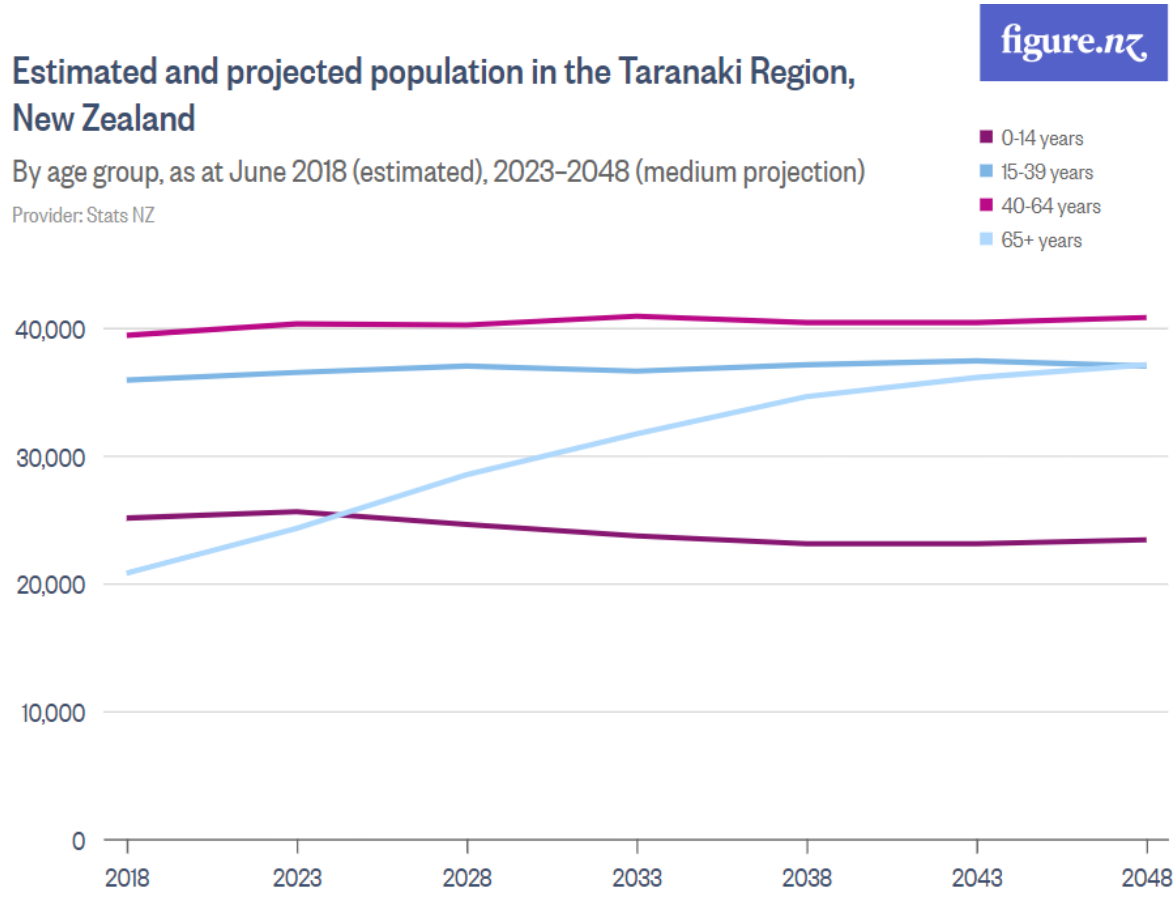


Figure 1-2 : Population Projection (Source: Stats NZ)

In summary, projections indicate that by 2043, the population could reach around 144,000, driven by factors such as economic prosperity, attractive living conditions, and strategic investments in infrastructure.

1.2 Current Public Transport Service

Public transport in the region includes inter-regional bus services and subsidised regional and urban services provided by TRC. There are currently five forms of public transport services provided in the region as described in **Table 1-1**.

Table 1-1 : Summary of Current Public Transport Services

Type of Public Transport or Location	Details
New Plymouth	• **Citylink** – These operate from Monday to Friday with 14 services per day with varying frequency until around 6pm. Two different routes operate on Saturdays with two services each. Currently, no services are provided on Sunday or public holidays. • **School services** – There are 27 individual services with each service performing one weekday AM and PM trip. These are well utilised, and, in some instances, additional buses are required.

Type of Public Transport or Location	Details
Regional Connector	There are services from Ōpunake, Hāwera and Stratford to New Plymouth. These operate four times per day in each direction. There are also two school services which travel from Hawera to various schools in New Plymouth.
Southlink	There are three routes in South Taranaki providing basic access option for those in the area: • **Ōpunake – Kaponga – Manaia – Ohawe (on-demand) – Hāwera –** Thursday weekly service. • **Waverley – Pātea – Hāwera –** operates on Tuesday and Thursday only. • **Ōpunake – Oākura – New Plymouth –** Friday weekly service only.
Total Mobility	For people with a disability who are not able to use conventional public transport.
Additional Public Transport Services	There are also the following public transport services: • Extensive rural school services funded directly by Ministry of Education (MoE). • Community transport services run by local charities such as the Ironside Society. • Long-distance coach services to Auckland and Wellington operated by InterCity.

The current public transport network for New Plymouth is provided in **Figure 1-3**.

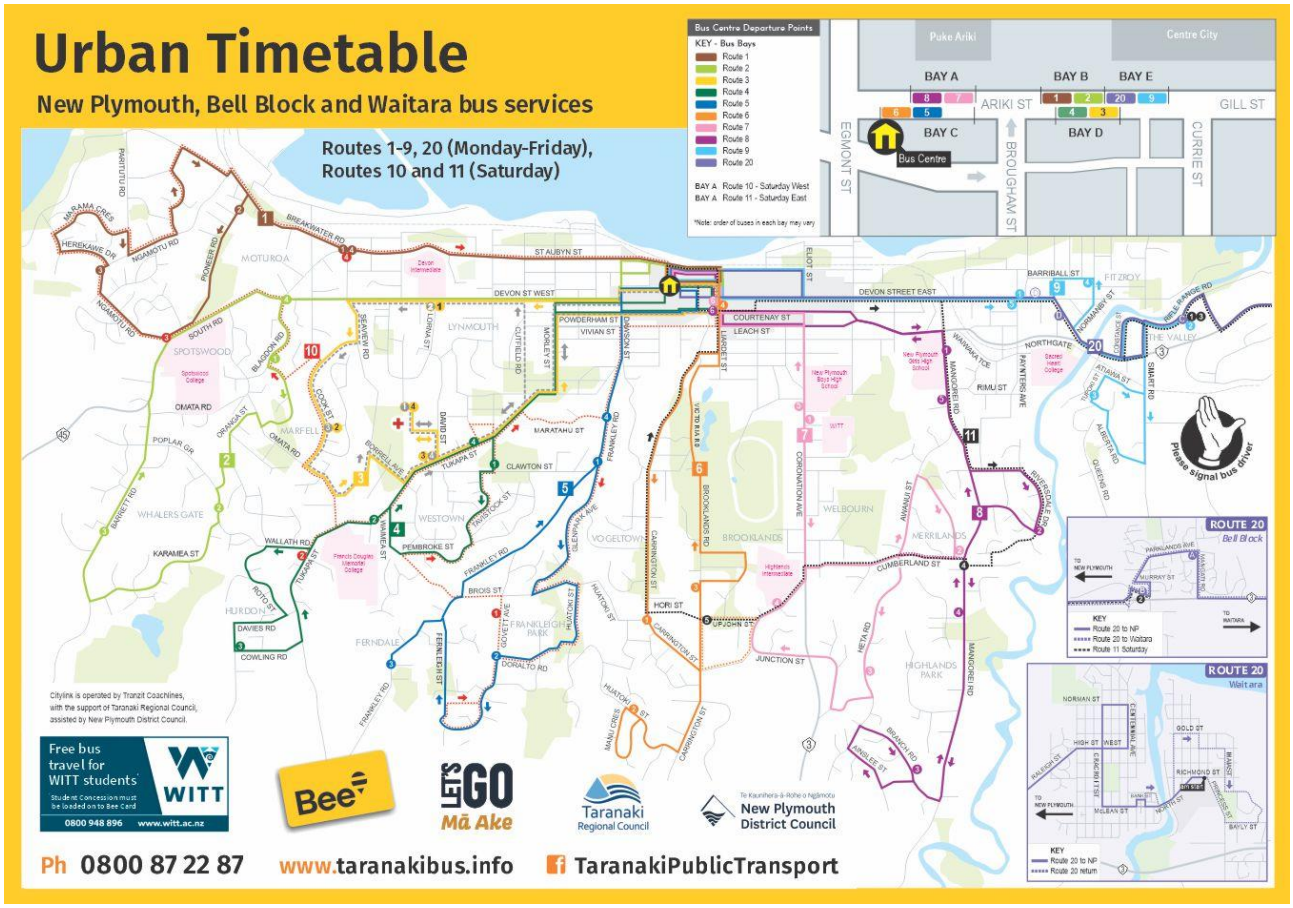


Figure 1-3 : New Plymouth Public Transport Network (Source: TRC)

1.3 Previous Work Undertaken

1.3.1 Bus Network Review

A bus network review was undertaken in September 2023 by Taith Consulting for TRC, 'Taranaki Public Transport Network Review'. The review sought to make positive changes and recommendations to encourage mode shift towards public transport. The review focused on the short-term changes that could be achieved within the existing budget and as such did not explore all opportunities available.

The review identified the Citylink service was complex in terms of timetable and route: frequency varied throughout the day, and vehicle utilisation and patronage numbers were sub-optimal. The proposal set out to simplify the routes and timetable. The proposed routing changes are shown in **Figure 1-4**. Two frequency options were recommended:

- Standard hourly frequency for all routes except number 5 or.
- Half hourly frequency.

It recommended no network changes at present for the school routes given occupancy rates are high – however consideration is needed to be given to reducing any duplication between the urban network and school routes.

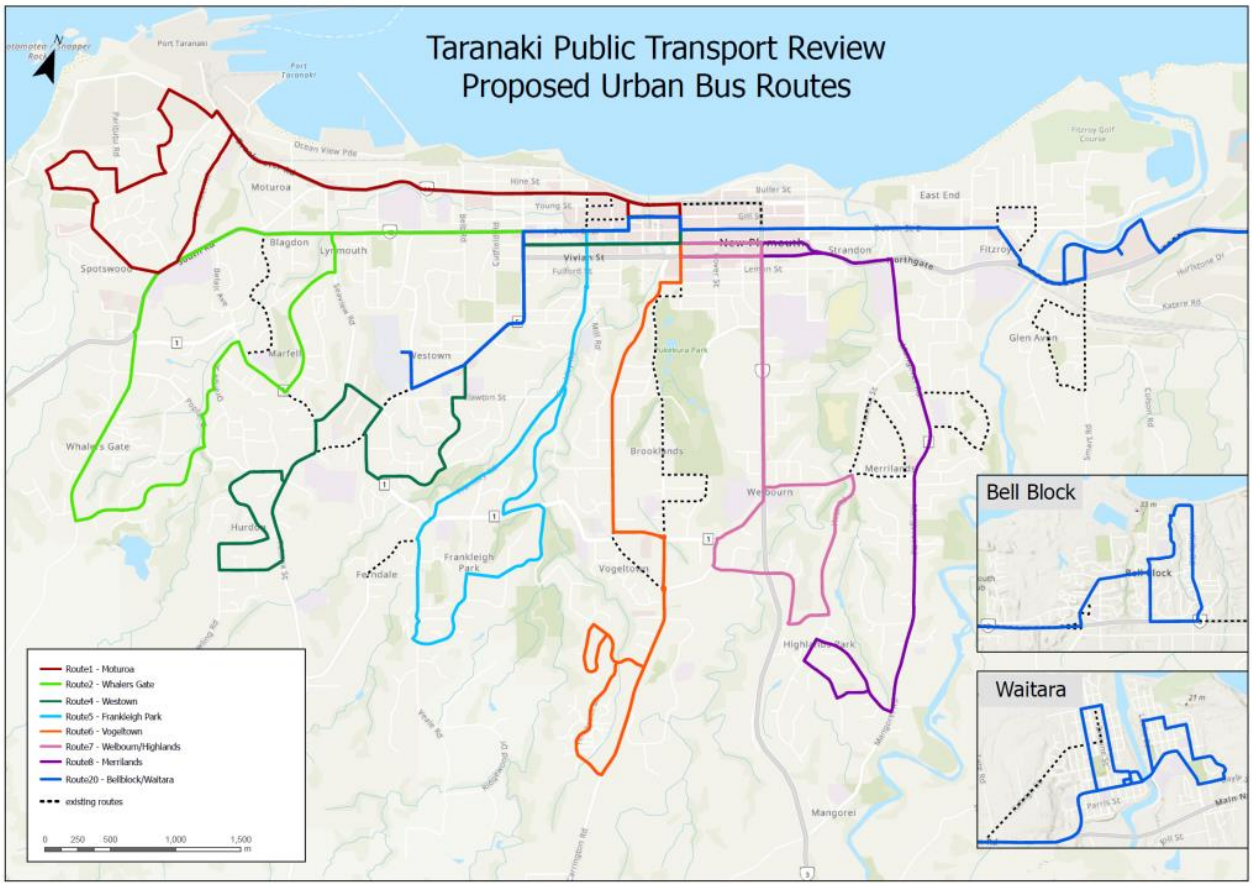


Figure 1-4: Propose Service Routing Changes (*Source: 'Taranaki Public Transport Network Review', Taith Consulting)*

Note: The above relates to an earlier review and is not what is being adopted as part of this business case.

Review of the connector service between Hāwera, Ōpunake and New Plymouth suggested the Ōpunake to Hāwera section of the route be withdrawn as it carries very few passengers and adds considerable time. However, the review also notes social reasons should be considered before discontinuing this. In addition, bus stops are recommended to be relocated to the main streets within these smaller settlements to make them more prominent.

For the Southlink services, short term improvements recommendations include extending the route and a review of the fare. In the medium to longer term, the review suggests these are assessed against the provision of a community transport alternative to provide better value for money and more flexibility for customers.

The outcome of the review has been incorporated into 'Better Travel Choices Part B: Regional Public Transport Plan 2024 -2054' for public feedback. It is noted that the consultation also included alternative routes. This review and feedback are key inputs for this SSBC.

1.3.2 Point of Entry 2023

The Point of Entry (POE) was undertaken by TRC and approved by NZTA in November 2023. The POE identified that the most appropriate next step would be an SSBC to confirm future investment for public transport services and supporting infrastructure. The investment is needed to address the following:

- Mode shift away from private motor vehicles through improved provision of PT services and infrastructure; and
- Reducing transport emissions through a focus on providing alternative travel options to decrease vehicle kilometres travelled.

On approval, funding was confirmed and the SSBC commenced.

1.3.3 Integrated Transport Framework Programme Business Case (PBC) - Draft

The point of entry noted the connection between this work and the New Plymouth Integrated Transport Framework Programme Business Case. The former business case is in preparation and is expected to demonstrate the case for change and establish an integrated transport system for New Plymouth District Council. At the time of writing, the preferred program is being reviewed and PBC is still in its draft form which is expected to be approved in 2024.

1.4 Document structure

The present business case has been developed and prepared in line with both the requirements of the Waka Kotahi Business Case guidance and the Better Business Case Five Case Structure. The document structure is outlined in **Table 1-2**.

Table 1-2 : Document Structure

Section	Chapter/Case	Content
2	Background	Provides information about the project and its strategic context.
3	Strategic Case - The Case for Change	Defines the problems and opportunities, benefits of investment and summary of issues and constraints.
4	Economic Case including Option Development	Outlines the process undertaken from the identification of options to determine the preferred way forward. This includes the economic assessment of the preferred option.
5	Financial Case	Provides information surrounding delivery and maintenance costs and funding options with associated risks.
6	Commercial Case	Provides evidence of the commercial viability of the proposal and the consenting and procurement strategy that will be used to engage the market.
7	Management Case	Provides information surrounding the viability of delivering the proposal.

1.5 Partners and Key Stakeholders

The following partners and key stakeholders have been involved in developing this SSBC.

Table 1-3 : Partners and Key Stakeholders

Partners and Stakeholders	Role
Investment Partners	
New Zealand Transport Agency	Potential investment partner as always invest in the PT continuous programme.
New Plymouth District Council	Partner for public transport via a new Joint Committee
Key stakeholders	
Iwi	Advice and agreement on options and process
Bus Advocate Groups	Advice
Disability Groups	Advice

Taranaki Regional Council has run two rounds of community consultation on the potential options for this business case via the Regional Public Transport Plan, and also for short list options for this project.

STRATEGIC CASE

Taranaki Public Transport SSBC

2 Strategic Alignment

Figure 2-1 shows the strategic policy context alignment for the SSBC with **Table 2-1** providing more details.

Figure 2-1 : Strategic Policy Context

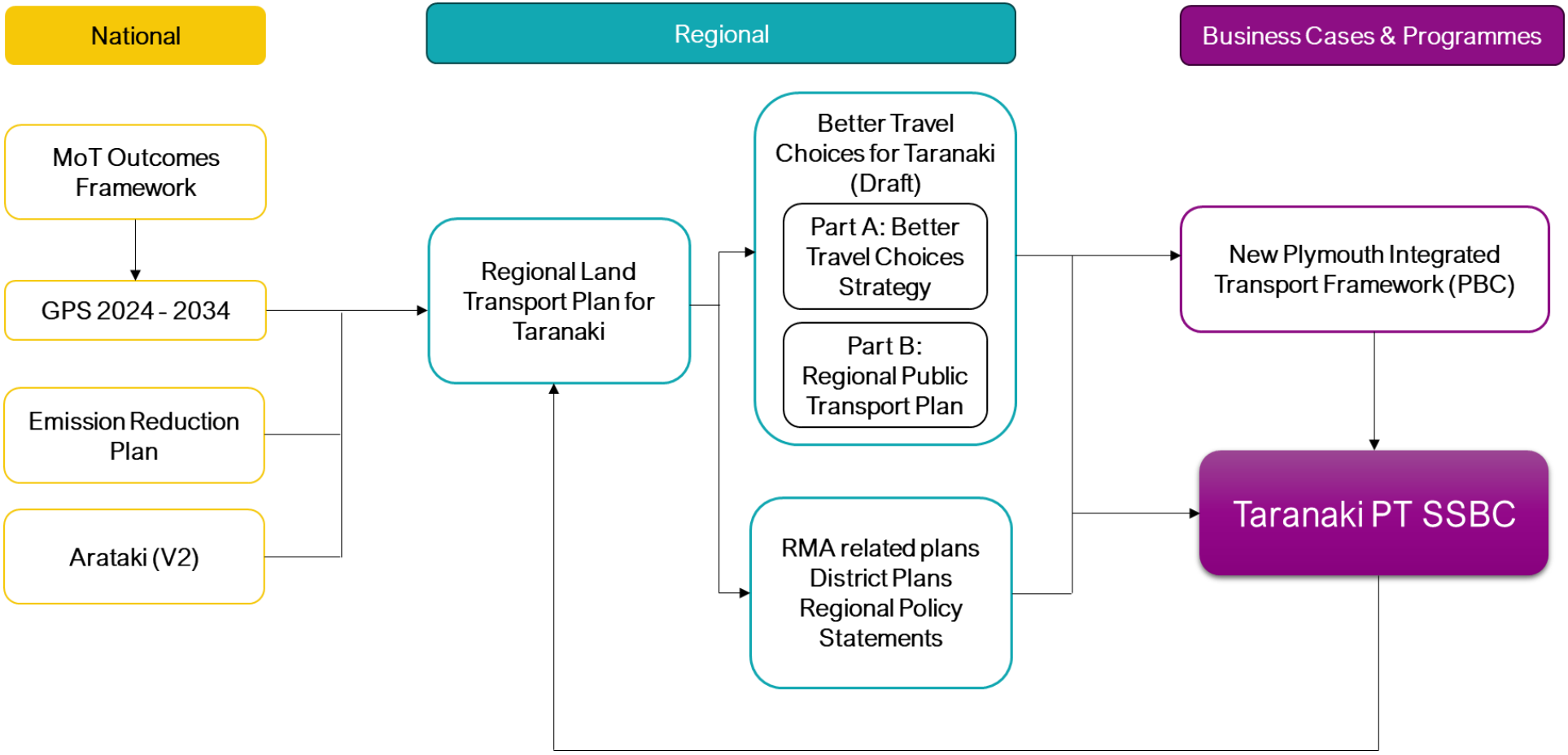


Table 2-1 : SSBC Alignment and Relevance to key policies and strategies

Policy and Strategy	SSBC Alignment and Relevance
National Direction	
Government Policy Statement on Land Transport 2024 – 2034 (GPS 2024) The final GPS 2024 was released in June 2024. The four strategic priorities are: • Economic Growth and Productivity • Increased Maintenance and Resilience • Safety • Value for money	The outcomes sought within this SSBC are well aligned with supporting economic growth and productivity which is the overarching strategic priority. The GPS states existing public transport services will continue to be funded where they are cost effective, achieve value for money and where outcomes are less congestion and increased patronage. Specifically, this SSBC demonstrates that changes to the existing public transport services will decrease congestion, improve access to jobs, and lead to a reduction in emissions with the increase in patronage. It also highlights that additional improvements will increase these benefits further. It is noted that walking and bus travel are considered the two safest modes of travel based on assessments undertaken internationally and within New Zealand.
Emissions Reduction Plan (ERP) An outline of New Zealand's pathway to reduce transport emissions by 41% by 2035 and decarbonise transport by 2050.	The Ministry of Transport (MOT) has indicated public transport will be a key intervention to reduce vehicle kilometres travelled (VKT). The investment therefore has a strong alignment with the ERP by improving public transport services to encourage mode shift away from private vehicles.
Arataki (version 2) Arataki sets out the plans for the land transport system for 2021 to 2031 by Waka Kotahi. For the Taranaki region, the document identifies walking and cycling as being effective in reducing VKT in the region, while shifting more freight to rail and coastal shipping to help cut emissions. Safety, resilience, and supporting the transition to a low-carbon economy are highlighted as the other crucial transport challenges for Taranaki in the next 30 years.	The objectives of the SSBC will positively contribute towards reducing VKT and emissions in the region. This is by making PT a viable alternative to private vehicle usage via a more complete and connected network with faster services and increased frequencies.
Regional Context	
Regional Land Transport Plan (RLTP)	The investment in improving public transport services directly responds to the benefit sought in reducing reliance on private vehicles through increased use of public

Policy and Strategy	SSBC Alignment and Relevance
The 2021 RLTP[1] for Taranaki has a vision of *"a vibrant, resilient and connected region, with a safe transport system enhancing liveable places"*. The 2024 RLTP was finalised in July 2024.	transport by creating a public transport network that is effective and takes residents where they need to go in a time efficient manner.
Draft Better Travel Choices for Taranaki • **Part A Better Travel Choices Strategy** • **Part B Regional Public Transport Plan (RPTP)** The strategy sets out the Taranaki vision in supporting mode shift to more sustainable modes and providing more travel choices for the community. TRC undertook community consultation in March 2023 seeking feedback in four focus areas: • Road safety and speed management • Long-term vision for transport in Taranaki • Public transport (including buses and rail) • Cycling, walking and active travel From September to October 2023, public consultation was undertaken on the RPTP. The RPTP aims to achieve the following: • Support an active (walking, cycling and other active travel) and public transport system that provides safe, healthy, and environmentally sustainable options for a range of journeys. • Deliver a bus network that is reliable, and which gives additional choice for more people, for a wider range of journeys and • Provide a public transport system that is well-integrated with other modes of transport.	The outcome sought from this SSBC aligns with the vision of Better Travel Choices in providing for greater travel choice through a bus network that meets the needs of the people who are actual and potential customers and who have provided extensive feedback on the options as they have evolved. The community feedback received has been incorporated throughout this SSBC including in the evidence base for the problem statements and was considered during optioneering.
Draft New Plymouth District Future Development Strategy 2024-2054 and draft Integrated Transport Framework	This SSBC considers both current and future land use to assist in developing a network that serves the community now and is compatible with future land uses as well.

[1] https://www.trc.govt.nz/council/plans-and-reports/strategy-policy-and-plans/transport-planning-documents/

3 Problem Statements

A workshop was held on 30th November 2023 to confirm the problems, benefits, and investment objectives with key stakeholders.

Three problem statements were identified and subsequently agreed:

1. **Problem 1: Travel Choice (40%)**

   The speed, frequency, network configuration and infrastructure of the public transport services are inadequate which leads to limited public transport mode share.

2. **Problem 2: Inclusive Access (40%)**

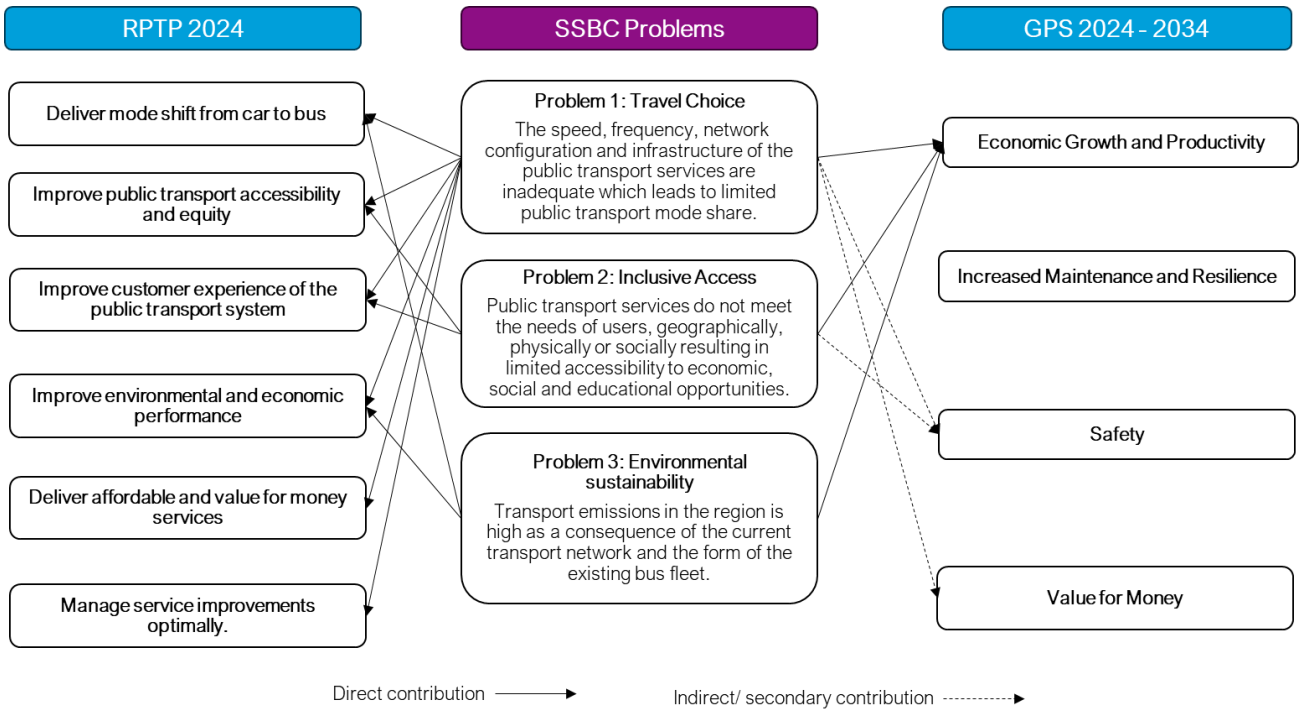
   Public transport services do not meet the needs of users, geographically, physically, or socially resulting in limited accessibility to economic, social, and educational opportunities.

3. **Environmental Sustainability (20%)**

   Transport emissions in the region is high as a consequence of the current transport network and the form of the existing bus fleet.

Figure 3-1 shows how these problem statements align with the RLTP and GPS 2024. It shows that there is significant overlap between key objectives and that the problem statements link to multiple key priorities.

Figure 3-1 : Problem Statements Relationship with the RPTP 2024 and GPS 2024



The following sections documents the evidence for each of the problem statements.

3.1 Problem Statement 1: Travel Choice (40%)

"The speed, frequency, network configuration and infrastructure of the public transport services are inadequate which leads to limited public transport mode share."

The current bus network in Taranaki and its frequency are shown in **Figure 3-2** and **Figure 3-3**.

Figure 3-2 : Existing Bus Routes in Taranaki

Route	Number of services/ day	Frequency	Comment
Route 1 - Moturoa	14 services	30 mins to 1 hour 35 mins	
Route 2- Whalers Gate	14 services	40 mins to 1 hour 20 mins	
Route 3 - Lynmouth/Marfell	14 services	30 mins to 1 hour 10 mins	Slight change in routing after 10am (does not go via Outfield Rd)
Route 4 - Westown/Hurdon	14 services	30 mins to 1 hour 20 mins	
Route 5 - Frankleigh Park/ Ferndale	14 services	30 mins to 1 hour 25 mins	
Route 6 - Vogeltown/ Brooklands	14 services	40 mins to 1 hour 10 mins	Route extension during school terms
Route 7 - Welbourn/ Highlands Park	14 services	30 mins to 1 hour 25 mins	
Route 8 - Merrilands/ Highlands Park	14 services	40 mins to 1 hour 20 mins	
Route 9 - Fitzroy/ The Valley/ Glen Avon	14 services	40 mins to 1 hour 25 mins	
Route 10 - Saturday WEST	2 services	Depart at 9.30am and 12.30pm	Saturday ONLY
Route 11 - Saturday EAST	2 services	Depart at 10.18am and 1.18pm	Saturday ONLY
Route 20 - Bell Block/ Waitara	6 services in each direction	1 hour 25 mins to 2 hours 10 mins	

All routes run from Monday to Friday except for Route 10 and 11 which runs only runs on Saturdays
First service for routes 1 - 9 is around 7.00am with the last service at 6.20pm.
First service for route 20 is at 9.10am and last service at 5.30pm.

Figure 3-3 : Citylink bus timetable and routes in New Plymouth

This current network is complex with some routes changing depending on the time of day i.e. Route 3 runs differently before and after 10am, Route 6 is extended during the school term and some routes use different roads in opposite directions (i.e. Route 2,5 and 6), creating long one-way loops resulting in slow journey times. This reduces the efficiency of public transport and consequently it is currently much faster (and more reliable) to travel via a private vehicle. **Figure 3-4** shows examples of travel times to New Plymouth CBD via private vehicle and public transport

which indicates commuting via public transport will take over twice as long or over 20 minutes longer.

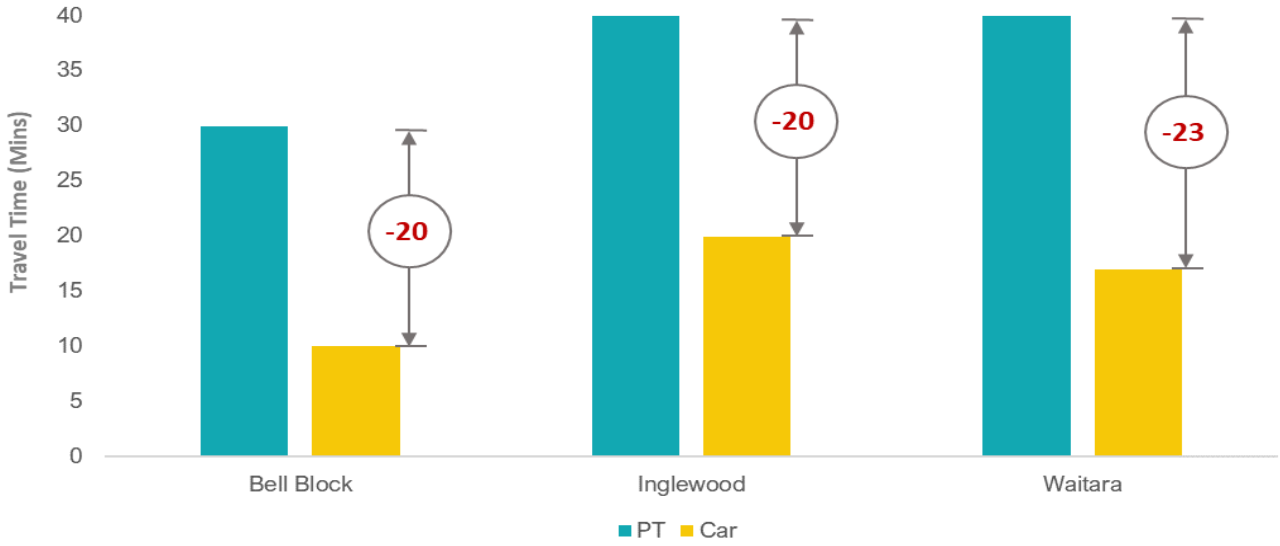


Figure 3-4 : Travel Times to New Plymouth Central by public transport and private vehicle[2]

In addition, the frequency of services is variable throughout the day, between 30 minutes to an hour and 25 minutes for Routes 1 to 9. For Route 20, there may be up to two hours between services. This means passengers who miss a bus will have extended wait times, making public transport a less desirable mode of choice.

Services are also limited especially during the weekend with only two services available, namely Route 10 and 11. The urban services (Citylink buses) run from around 7am with the last service departing around 6:20pm during the weekdays and is a drop-off service only. This restricts social opportunities outside of these hours especially for those without access to a vehicle; they will either have to miss out on evening events or rely on other forms of travel such as Ubers and taxis that tend to be more expensive and out of reach for some customer groups.

Outside of New Plymouth, services are limited with nothing available on the weekends. Depending on where you live, there may only be services once or twice a week for instance, Kaponga.

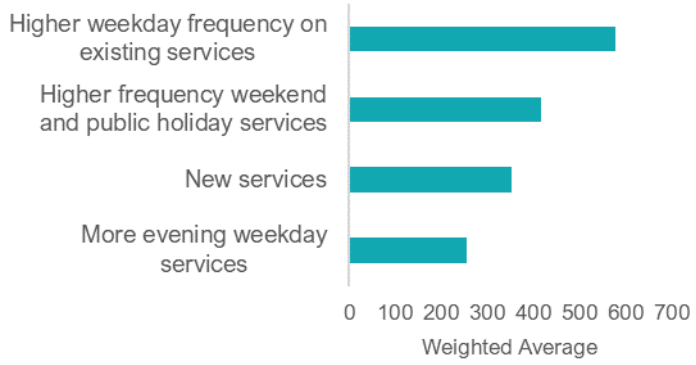
The above suggests the current network configuration and frequency is inadequate which is reflected in the customer feedback received through the 'Better Travel Choices' consultation. When asked to prioritise public transport improvements, respondents expressed a need for increased frequency for both weekday and weekend services (see **Figure 3-5**). A common request was to have at least two services per hour, no more than 30 minutes apart with higher frequency during work and school start times.[3]

It is also noted that the network is primarily based on a coverage-based model. This allows for greater accessibility for residents but isn't as direct. A throughput network where high-quality corridors for key parts of the city is normally considered best practice now. As such, the bus network by its design does not encourage higher travel choice.

[2] *'Integrated Transport Framework Programme Business Case', Beca, December 2023.*

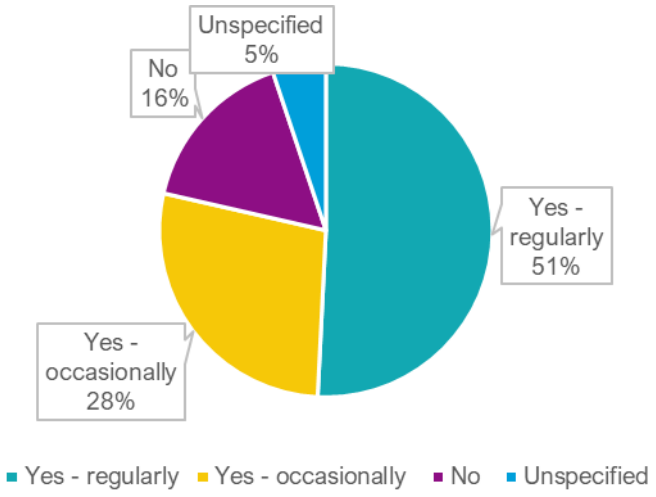
[3] *Source: 'Better Travel Choices Consultation Report, 2023'.*

Figure 3-5 : Bus Service Prioritisation (Source: Better Travel Choices Consultation Report, 2023)



> *"Instead of every hour, every half-hour would be better. An hour is a long time to wait!"*
>
> *"All services for regular commuting to allow workers into the city to walk to their workplaces with staggered start times…"*

Figure 3-6: Frequency of buses and increased patronage *(Source: Better Travel Choices Consultation Report, 2023)*



If buses were more frequent, 79% of respondents said they would use public transport more. This further emphasises the importance of frequency for public transport uptake.

As part of the consultation process, respondents were also asked about establishing community transport for areas where fixed bus services are not feasible. A key emerging theme included concerns for areas that are poorly served by public transport such as Ōkato and Oākura, highlighting the inadequacy of the current network configuration.

High-quality infrastructure is also an important element for an attractive public transport system. This includes bus stops, interchanges, and bus priorities. Bus stops can be described as the 'shop front' for public transport as it provides occasional and new users confidence in using the system. Currently, the bus stops in the region have very little public presence with some limited to a single standard legal sign limiting their visibility. No real-time information is available at bus stops and no stops including shelters are available at the outer settlements such as Stratford and Hawera. Improvements in infrastructure such as real-time information displays, and safer shelters were identified as the most desired improvement by respondents of the Future of Transport community engagement carried out in March/April 2023.[4]

These inadequacies contribute to limited public transport uptake and mode share. **Figure 3-7** and **Figure 3-8** shows the average and total number of passengers for each service in March 2023, respectively. This indicates:

- For the Citylink Services, passenger numbers are highly variable, with the average load being just over 10 passengers per journey. With a bus being able to accommodate up to 50 passengers, occupancy is well below 50% highlighting low public transport usage.

[4] https://www.trc.govt.nz/assets/Transport/The-Road-Ahead-Public-Consultation-Summary-March-to-April-2023.pdf

- The busiest route is Route 20 from Bell Block and Waitara.
- The Southlink services carry a small number of passengers and performs similarly in terms of average passenger numbers per load, however it is noted that these are services designed to achieve social outcomes not service commuter requirements.

Figure 3-7 : Average number of passengers per journey in March 2023 (*Source: Better Travel Choices Part B RPTP September 2023)*

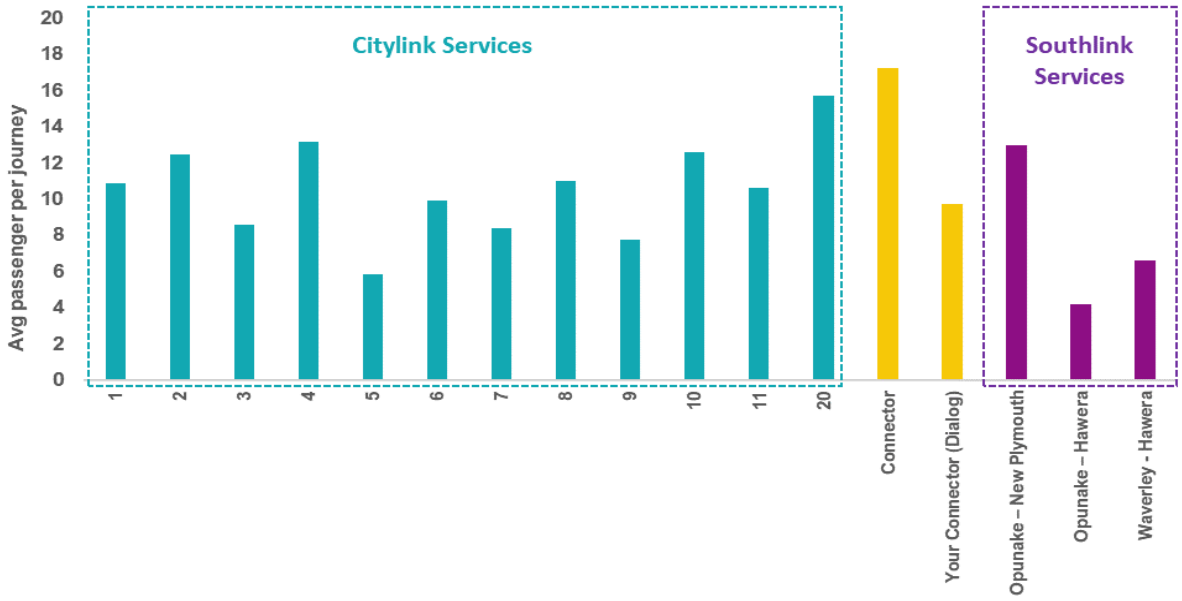


Figure 3-8 : Total Passengers per service in March 2023 (Source: Better Travel Choices Part B RPTP September 2023)

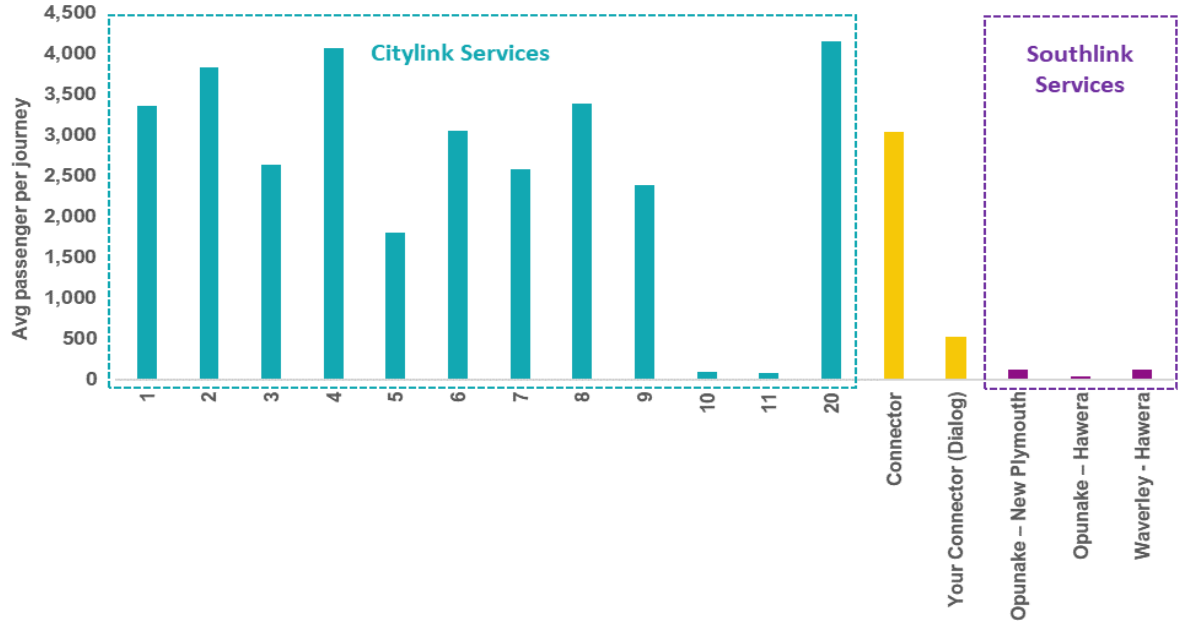


Figure 3-9 : 2018 Census Journey to Work data (Source: Waka Commute)

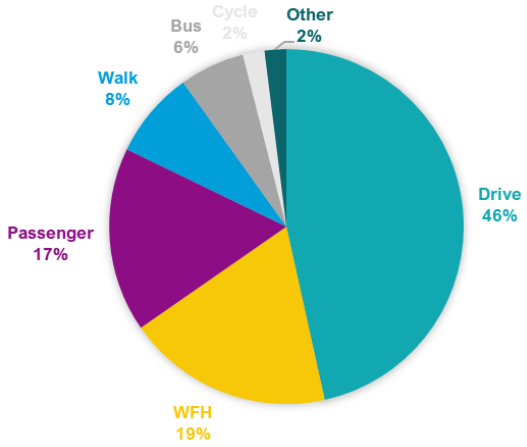


Figure 3-9 shows the 2018 journey to work Census data for Taranaki. It shows private vehicle use is the dominant mode of transport (63%) with public transport at 6%. This further confirms the lack of public transport uptake.

What if we do nothing?

If no investment is made, public transport patronage will remain low, and there will be a continued lack of travel choice and an over reliance on private vehicle use for the community. This lack of long-term sustainable transport choice will be counter intuitive to the objectives set out within the draft RPTP 2023 in delivering mode shift from car to buses and in contributing to reduction in carbon emissions from transport. Key disbenefits include:

- Continued inaccessibility to jobs and economic opportunities
- Limited travel choice
- Continued high and increased carbon emissions

3.2 Problem Statement 2: Inclusive Access (40%)

"Public transport services do not meet the needs of users, geographically, physically or socially resulting in limited accessibility to economic, social and educational opportunities."

This problem focuses on the current public transport services being unable to meet the needs of the users in the community which consequently leads to lack of access to economic, social, and educational opportunities. The main cause of the problem is missing transport connections especially for those that are transport disadvantaged (often referred to as underserviced communities).

Figure 3-10 and **Figure 3-11** shows the social deprivation index for New Plymouth and for the Taranaki region, respectively. It indicates there is socioeconomic inequality between the communities within the region and along the current bus routes. Areas such as Bell Block and the outer fringes of New Plymouth City experience higher levels of deprivation (indicated by the low social deprivation score and lighter colours in the figures). Generally, those that reside in deprived areas have limited access to a vehicle, thus have limited access to health care, employment, education, and other social opportunities.

Figure 3-10: 2018 Census Deprivation Data for New Plymouth City

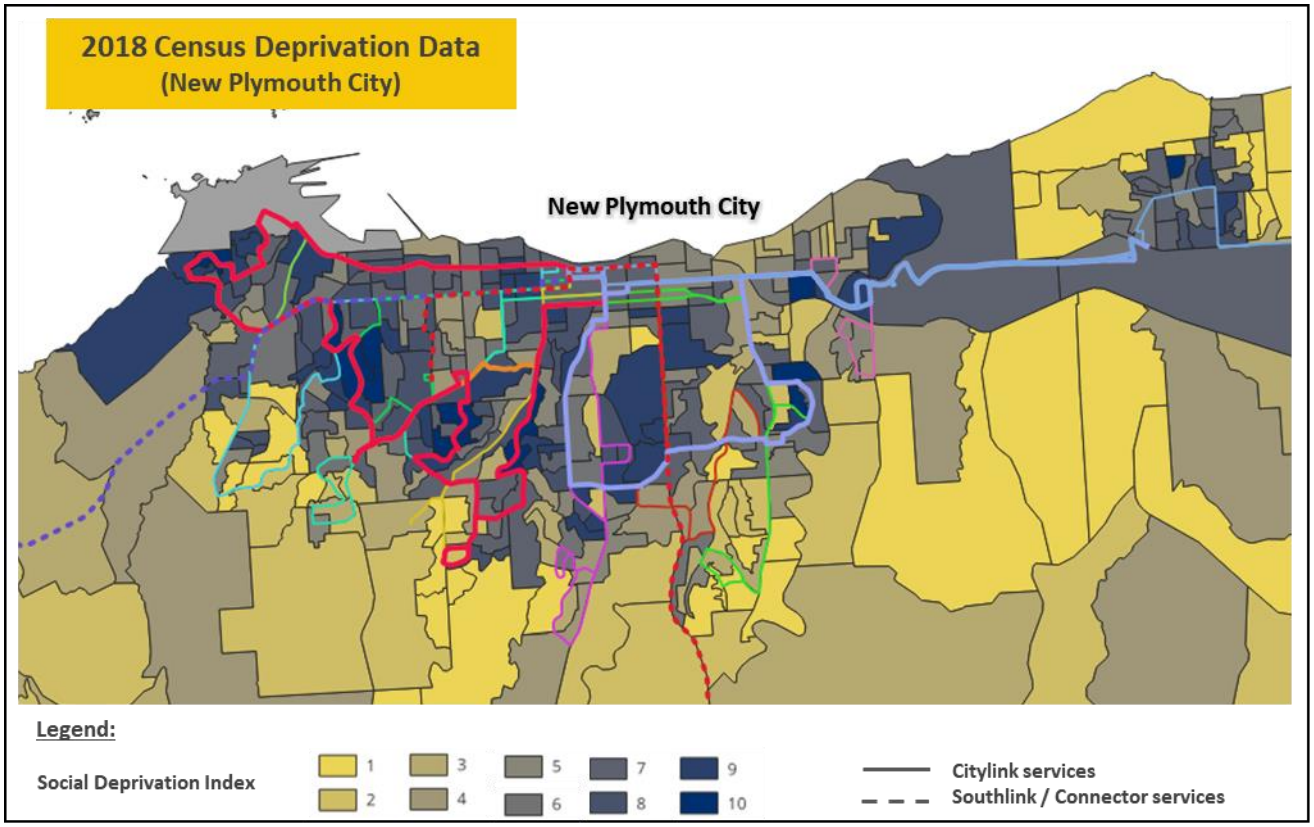
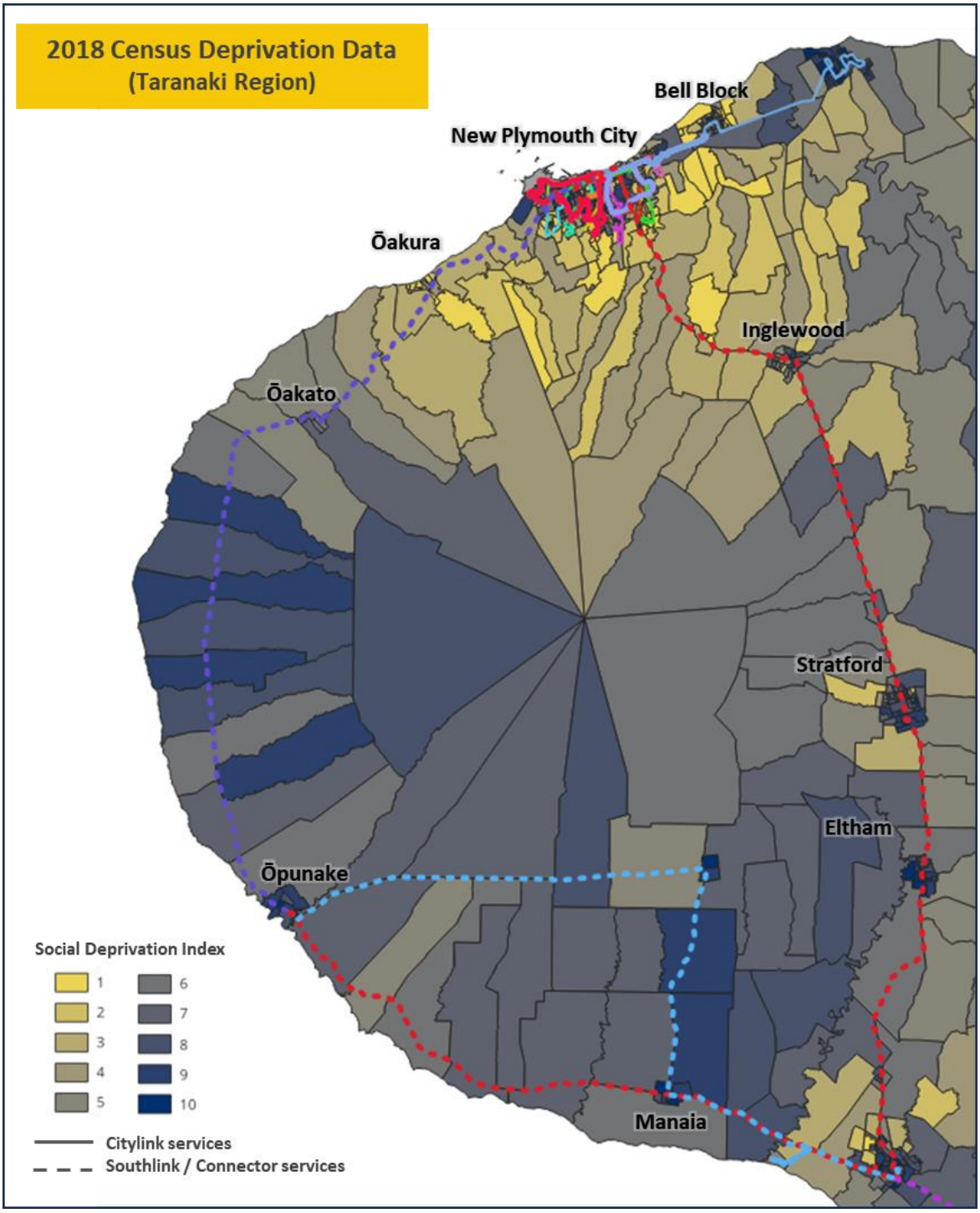


Figure 3-11: 2018 Census Data for Taranaki Region



In addition, transport costs were the third highest weekly household expense in New Zealand in recent years ($216 per week in 2019)[5] combined with the rising cost of fuel will indicate that operating a private vehicle, will continue to remain a top expenditure into the future. This will have the greatest impact on those within the low socio-economic group where disposable income is already stretched and will be further burdened. Other travel options such as that of public

[5] https://www.stats.govt.nz/information-releases/household-expenditure-statistics-year-ended-june-2019

transport, therefore, becomes vital as an affordable alternative to enhance accessibility and consequently wellbeing for those in the community.

As noted in Problem Statement 1 (**Section 3.1**), the current timetable is limited and restricts access:

- The current services do not provide options for many of the most highly deprived communities which is reflected in (**Figure 3-10** and **Figure 3-11**).
- There are only two services that operate during the weekend, and both are within New Plymouth. For those in the outer communities such as Inglewood, Stratford, and Eltham, there is no public transport option.
- Frequency and number of services outside of New Plymouth range from weekly to four services a day during the weekdays.
- The last Citylink services are at 6:20pm and is a drop-off service only. This means those without access to other means of travel are constrained by this and are prohibited from doing any evening activities.

Increased frequency was a top priority noted by respondents through the 'Better Travel Choices" consultation (see **Section 3.1).** Feedback received had requested weekend and public holiday services and increased services in South Taranaki. Sample comments received are provided below further evidencing that the current services do not meet the needs of the community, in particular in getting to where they wish to go and when they need to.

"All areas in New Plymouth should have evening bus services every day of the week, including weekends. Lack of these services is preventing people from accessing work, health, education, business and recreational options. The lack of a comprehensive bus service in New Plymouth and greater Taranaki causes extreme hardship and massive social costs. It obstructs people from raising their living standards and social conditions."

"We support the extension of public transport frequency, cross route links and later in the day public transport. This will support more children and young people with opportunities to participate in physical activity after school and supports them being less reliant on their parents for transport."

– Sport Taranaki

"Regular and high frequency buses on weekdays, evenings and weekends. Too few buses going at the moment and makes it difficult to rely on the bus. 6pm is way too early for the last bus, no busses on the weekends is super limiting for non-drivers."

"I think all services deserve weekend coverage. I mostly use the #9/#20, but would love to see more weekend services designed to cater to recreational opportunities (e.g. Pukekura Park, the pools, mountain, beaches, walkways etc.) "

What if we do nothing?

Failure to improve the public transport system to meet the needs of the community will continue to compromise social, education and economic opportunities for the community and further increase inequality and equity for those that are disadvantaged.

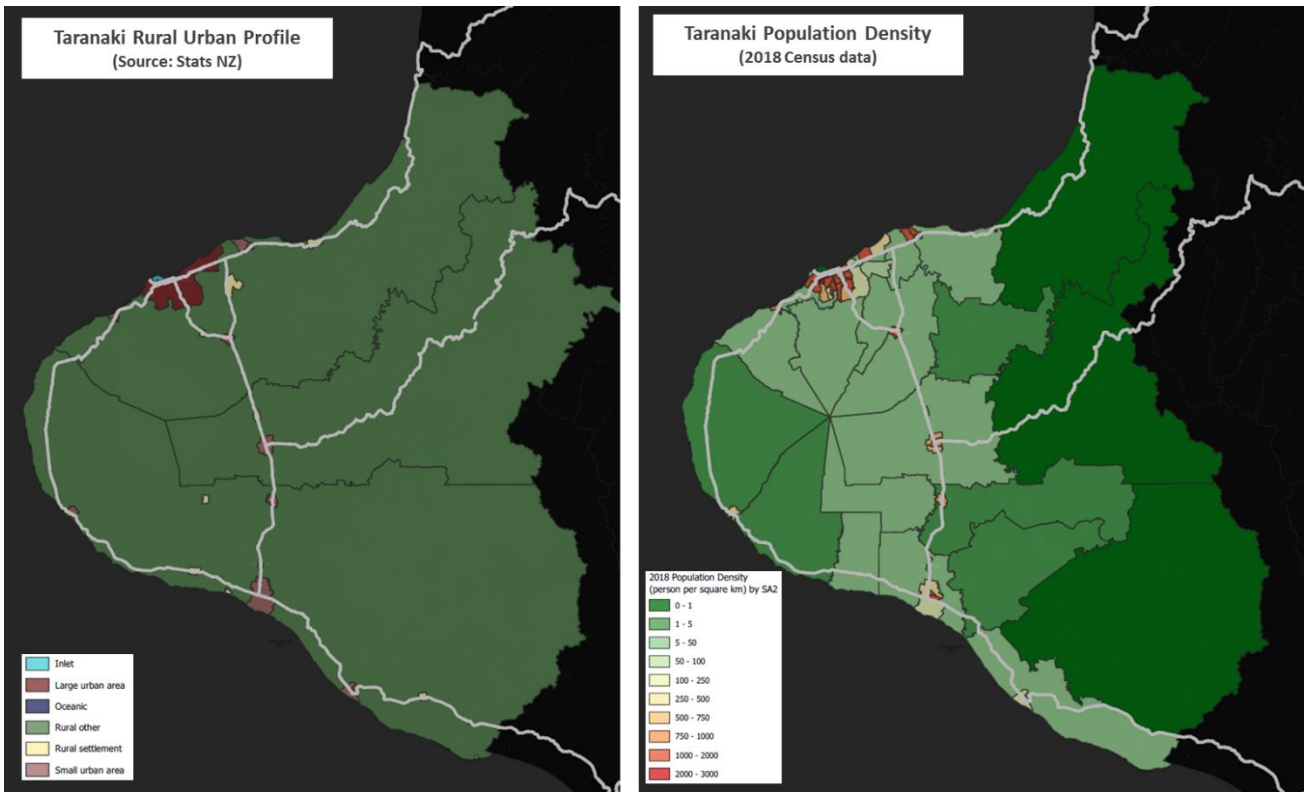
3.3 Problem Statement 3: Environmental Sustainability (20%)

"Transport emissions in the region is high as a consequence of the current transport network and the form of the existing bus fleet."

The current transport network favours private vehicle for several reasons. Firstly, public transport struggles to compete with private vehicle travel times and reliability resulting in over reliance on the latter, as detailed in Problem Statement 1 and 2 (refer to **Section 3.1** and **Section 3.2**, respectively).

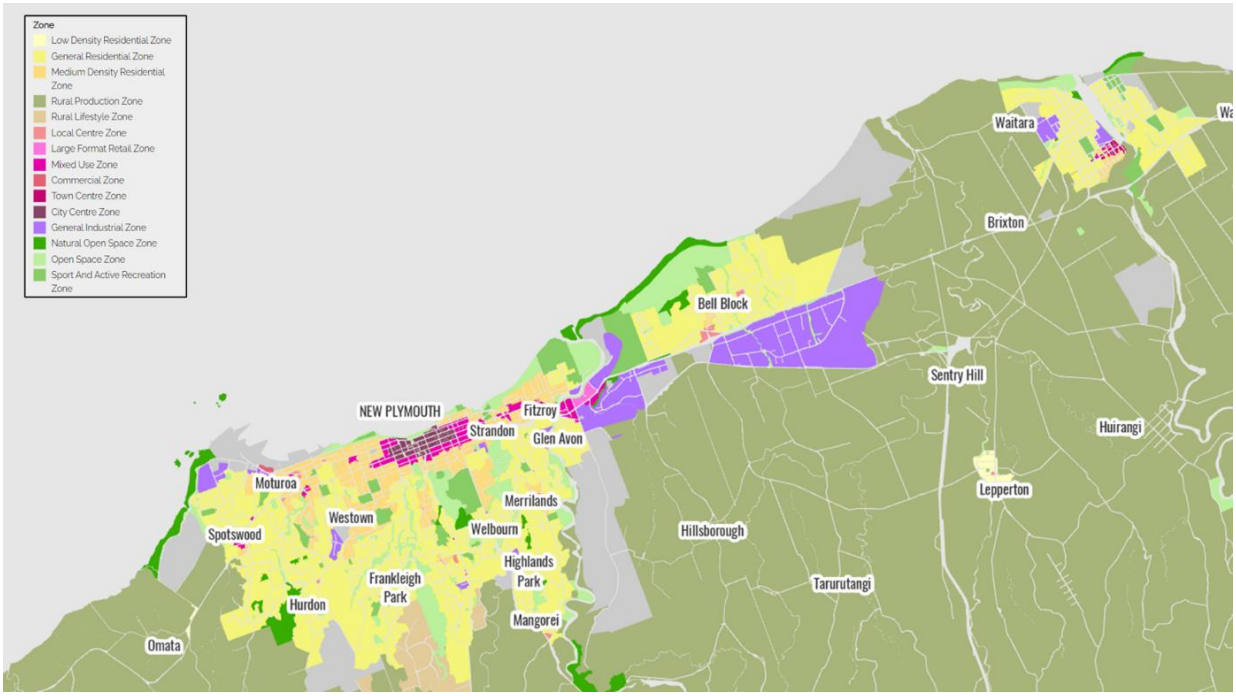
Secondly, historical settlement patterns and low-density residential developments have hindered access to employment, education and social opportunity by public transport, walking and cycling. A large proportion of the Taranaki region is of rural nature (see **Figure 3-12**) which has low population density while the dispersed nature of the satellite urban areas outside of New Plymouth means active mode travel is unlikely to occur given the distance to key destinations outside of the immediate settlement. Fixed frequent bus services are also typically not economically feasible with the low population density.

Figure 3-12: Taranaki's Rural Urban Profile and Population Density



While New Plymouth is the main urban centre and the most densely populated area in the region, the current district plan has large areas that are zoned 'low density residential zone' (see **Figure 3-13**). These low-density residential areas increase distances between destinations making walking and cycling less practical and public transport less efficient.

Figure 3-13 : Sample of the New Plymouth District Operative Plan



All of this drives private vehicle dependency which is reflected in the vehicle ownership per capita (**Table 3-1)** and the mode share (**Figure 3-9**). As shown, Taranaki is on the higher end of car ownership when compared with other regions in the country.

Table 3-1 : Vehicle ownership per capita by region[6]

No.	Region (group)	Car Ownership Per Capita
1	Nelson-Tasman-Marlborough	0.99
2	Southland	0.95
3	Canterbury	0.92
4	West Coast	0.89
5	Bay of Plenty	0.88
6	**Taranaki**	**0.81**
7	Manawatu/Wanganui	0.81
8	Waikato	0.79
9	Hawke's Bay	0.79
10	Otago	0.78
11	Northland	0.74

[6] https://www.transport.govt.nz/statistics-and-insights/road-transport/sheet/vehicle-ownership

No.	Region (group)	Car Ownership Per Capita
12	Auckland	0.74
13	Gisborne	0.70
14	Wellington	0.68

Thirdly, the existing active mode network is fragmented and unsafe which discourages its uptake. **Figure 3-14** shows the existing and proposed active travel routes in New Plymouth which indicates there are still gaps in the network. Even where there are cycling facilities, often times these are not protected; an example is shown in **Figure 3-15**.

Figure 3-14 : New Plymouth Existing and Proposed Active Travel Routes *(source: Better Travel Choices Strategy)*

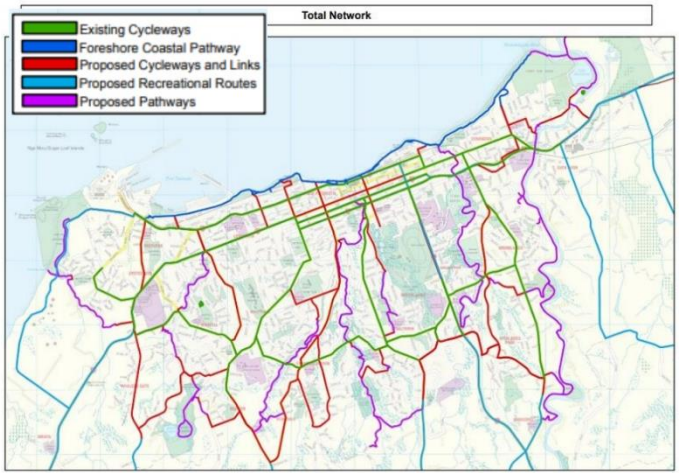
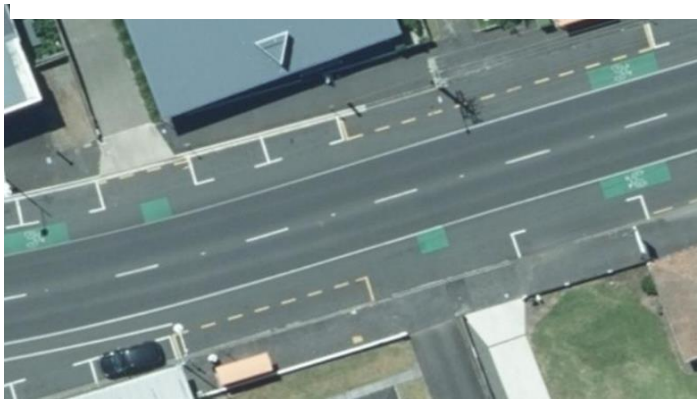


Figure 3-15 : Cycle way in St Aubyn St in New Plymouth



For rural areas and smaller settlements there are often limited alternative routes to the high speed and heavily trafficked State Highway. This has driven a perception of poor safety for vulnerable road users which is reflected through community engagement where the top enabler to switch to active travel is improved infrastructure and safety[7]. Active travel is a vital part of every journey such as the 'first and last mile' for public transport. Without a good active travel network, public transport uptake and overall mode share is impacted.

Another contributing factor of transport emission in the region is the existing diesel bus fleet, although noting that its contribution is relatively small. Nevertheless, from July 2025 no new diesel vehicles may be introduced into urban bus contracts and from July 2035 all buses in TRC, and New Zealand wide, must be zero emission.

As a consequence of the existing transport network and bus fleet, transport emission has been between 250 and 300 kilotonnes of carbon dioxide equivalent in the last ten years (**Figure 3-16**) with household transport emission accounting for approximately 70% of the total transport emission in 2021. This highlights private vehicle use as the biggest emitter of transport emission. Inherently, active travel and public transport are more space efficient than the private vehicle. In the Auckland city centre, 35 general traffic lanes carry the same number of people as seven bus lanes,

[7] 'Better Travel Choices Consultation Report", November 2023

that is 700 buses carrying the same number of people in 25,000 vehicles[8]. This shows the reduction in vehicles on the roads that may be achieved with the right mode shift and therefore a reduction in transport emissions. It is noted that this reduction is due to mode shift and not the electrification of the bus fleet which is outside of the scope of this business case.

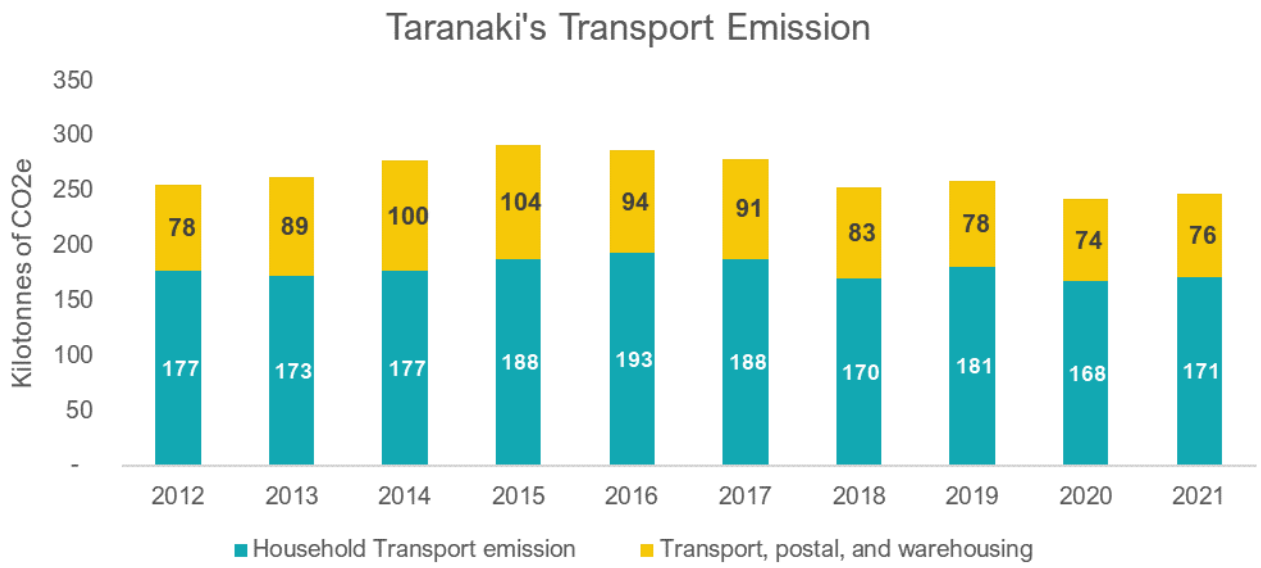


Figure 3-16 : Taranaki's Transport Emissions (*Source: Stats NZ)*

What if we do nothing?

If nothing is done, transport emissions, especially from private vehicles, will remain high in the region. This will have detrimental effects on the health and wellbeing of the people in the community and is counter-intuitive to the climate change objectives for New Zealand. It would also result in economic impacts which is counter-intuitive to the current GPS.

[8] https://at.govt.nz/media/1986154/aucklands-city-centre-bus-plan.pdf

4 Investment Logic Map

Following on from the development of the problem statements, the benefits and key investment objectives were developed and agreed upon with the relevant stakeholders. The Investment Logic Map (ILM) is shown in **Figure 4-1**.

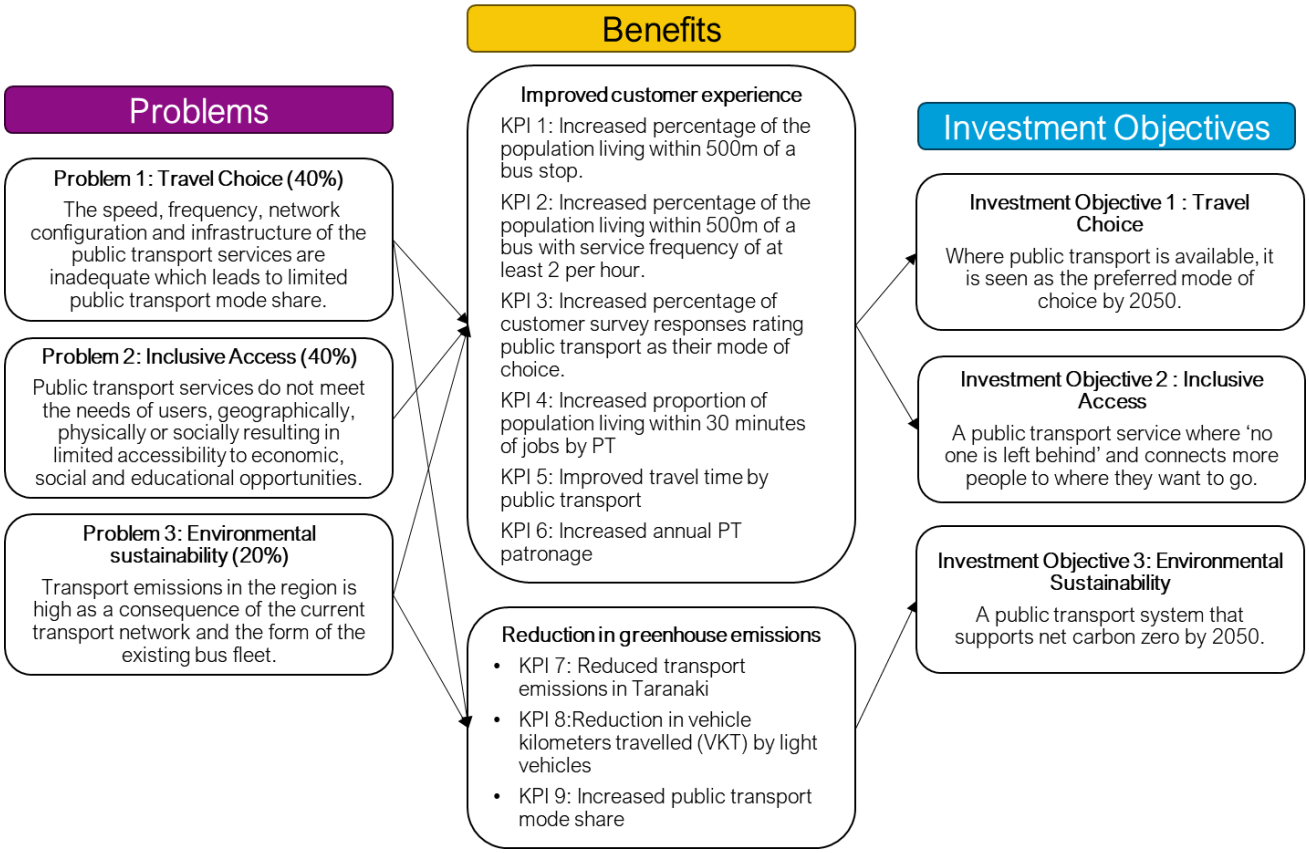


Figure 4-1 : Problem, Benefits, and Investment Objectives

As shown, the problems can be mapped to three investment objectives to address the problems identified. The key benefits from addressing these problems are:

- Promoting and encouraging the uptake of public transport,
- Improved social and economic accessibility for the community, and
- Reduced vehicle kilometres travelled by light vehicles and therefore a reduction in transport emissions improving health and wellbeing for the community.

5 Benefits, investment objectives and measures

Key performance indicators (KPIs) were developed for each investment objective. These are outlined in **Table 5-1** along with baseline and target measures, where green represents priority.

Table 5-1: Benefits, objectives, and measures

Benefit	Key Performance Indicator	Non-monetized benefit measure	Target	Investment Objective
Benefit One: Improved Customer Experience				
KPI 1	Increased percentage of the population living within 500m of a bus stop.	Current percentage of population based on 2024 data (Remix)	Increase of 20% by 2030	IO1
KPI 2	Increased percentage of the population living within 500m of a bus with service frequency of at least 2 per hour	Current percentage of population based on 2024 data (Remix)	Increase of 10% by 2030	IO1
KPI 3	Increased percentage of customer survey responses rating public transport as their mode of choice	2024 survey to be used as a base	Increase of 20% by first year	IO2
KPI 4	Increased proportion of population living within 30 minutes of a job by public transport	Current percentage of population based on 2024 data (Remix)	Increase of 25% by 2030	IO2
KPI 5	Improved travel time by public transport	Current corridors as of 2024 travel time	10% improvement within 1 year	IO2
KPI 6	Increased annual public transport patronage	Current 2024 ridership will be utilized	25% improvement by 2030	IO2
Benefit Two: Reduction in Greenhouse Gas Emissions				
KPI 7	Reduced transport emissions in Taranaki	Emissions based on current as of 2024	Net zero by 2050	IO3
KPI 8	Reduction in VKT by private vehicles	VKT based on current as of 2024	Reduction of 20% by 2030	IO3
KPI 9	Increased public transport mode share	Mode share current as of 2024	Increase of 20% by 2030	IO3

5.1 Dependencies and Uncertainties

The following dependencies and uncertainties are noted:

- The New Plymouth District Council Programme Business Case is currently in draft format.
- The Regional Public Transport Plan is in draft format.
- National Land Transport Plan has set public transport funding envelopes for Taranaki.
- Future bus procurement contracts are unknown (although the team is working with the Procurement team to minimise risk).
- Future fares and policy changes are unknown.

These are further expanded below.

Dependencies:

1. **Funding**: Securing adequate funding from government sources, private investors, and partnerships is crucial.
2. **Infrastructure**: Existing road networks and facilities must support new bus routes and services.
3. **Technology**: Implementing modern technologies for scheduling, ticketing, and fleet management.
4. **Regulatory Approvals**: Compliance with local, regional, and national transportation regulations.
5. **Community Support**: Engagement and support from local communities and stakeholders.

Uncertainties:

1. **Population Growth**: Future population trends that may affect the demand for public transport.
2. **Economic Conditions**: Economic fluctuations impacting funding and ridership.
3. **Technological Advances**: Rapid changes in transportation technology, such as autonomous vehicles or electric buses.
4. **Behavioural Shifts**: Changes in commuting patterns or preferences for alternative modes of transport.
5. **Environmental Policies**: Evolving environmental regulations and sustainability goals.

High-Level Risks:

1. **Financial Risk**: Potential cost overruns or insufficient funding can jeopardise project completion.
2. **Operational Disruptions**: Unforeseen issues such as construction delays or maintenance challenges.
3. **Public Acceptance**: Resistance from communities or low adoption rates could undermine success.
4. **Environmental Impact**: Negative environmental effects during construction or operation phases.
5. **Technological Failures**: Dependence on new technologies comes with the risk of system failures or cybersecurity threats.

By addressing these dependencies, uncertainties, and risks thoughtfully, Taranaki can develop a robust and efficient bus network that meets the needs of its growing population.

6 Confirming the Case for change

Based on the identified problems of Travel Choice, Inclusive Access and Environmental Sustainability, and reviewing the proposed Benefits and Investment Objectives, there is a compelling case for change and a need for the business case to progress to provide equity and transport choice for the residents of Taranaki.

Specifically, the case for change includes:

- Increase of 14% in ridership
- 60% of population have access to jobs within 30 minutes by public transport
- Decreased travel time across the network to destinations
- Reduction in transport emissions by a minimum of 10%

Effectively the change in the public transport network allows for more effective and efficient travel, where benefits will increase over time as ridership increases and the population of the Taranaki region increases.

7 Partner and stakeholder engagement

Extensive consultation has been undertaken with partners and key stakeholders. This is summarised as follows:

Table 7-1 : Partner and Stakeholder Engagement

Stage	Details
ILM Workshop	Key stakeholders including technical experts from Waka Kotahi, NPDC and TRC
Treatment and Optioneering Workshop	Key stakeholders including technical experts from Waka Kotahi, NPDC and TRC
Optioneering Session	Waka Kotahi, Councillors from NPDC, representatives of key community groups including disability sector group and bus advocate groups.
TRC Consultation	Consultation with TRC executive and councillors
Public Consultation	Two public consultation sessions were held on the options, and an additional workshop with Hawera as part of TRC's community engagement process.
NPDC Consultation	Consultation with Councillors on the emerging preferred option and potential partnering model for governance.

ECONOMIC CASE

Taranaki Public Transport SSBC

8 Economic Case

This Economic Case serves to identify a preferred fit for purpose public transport network for Taranaki. It follows on from the strategic case, strategic context and development of Problem Statements, Benefits, and Investment Objectives.

To achieve this, the economic case:

- Reviews previous and project related community and engagement outputs provided by TRC.
- Identifies a broad range of alternatives and options using the intervention hierarchy. This includes demand, supply, and productivity responses.
- Identifies a 'do minimum' and the assessment process leading into a shortlist of options that have the potential to address the problems and deliver against the investment objectives.
- Assesses the shortlist options and presents the results using the appraisal summary table (AST).
- Recommends and assesses an emerging preferred option.
- Summarises overall outcomes of the emerging preferred option.

8.1 Do Minimum Option

The Do Minimum option represents the minimum level of expenditure required to meet/maintain the minimum level of service, so that the identified problems do not get worse. It **DOES NOT** relate to the Do Minimum level of investment required to achieve the investment objectives.

The Do Minimum assumptions include:

- The existing bus fleet, network and service frequency and existing procurement contracts that include maintenance etc;
- Proposed improvements under the New Plymouth Integrated Transport Plan PBC are excluded as the PBC is yet to be approved; and
- For future years 2035 and 2053, Do Minimum scenarios from the Ngāmotu Strategic Transport Model have been adopted[9]. The forecast scenarios in the model were provided by NPDC.

It is noted that the transition of bus motive power is outside the scope of this SSBC, and is being considered via other workstreams. As such no costs or benefits associated with EVs for buses are considered. It is further noted that the Ngāmotu Strategic Transport Model and New Plymouth Integrated Transport Plan PBC have both been considered in developing the alignment, but have not had a fundamental influence on the planning of the bus network.

8.2 Option development and assessment methodology overview

Figure 8-1 below provides an overview of the optioneering process. It is worth noting that stakeholder and community feedback was an integral part of the process. The process adopted was developed to be fit-for-purpose and is consistent with the NZTA's Business Case approach. It is informed by the previous work undertaken and the feedback received from community engagement. The result of the optioneering process was to inform a preferred option to be developed into the recommended option.

[9] Refer to *'Ngāmotu Strategic Transport Model, Forecasting Report'*, Beca Ltd, January 24

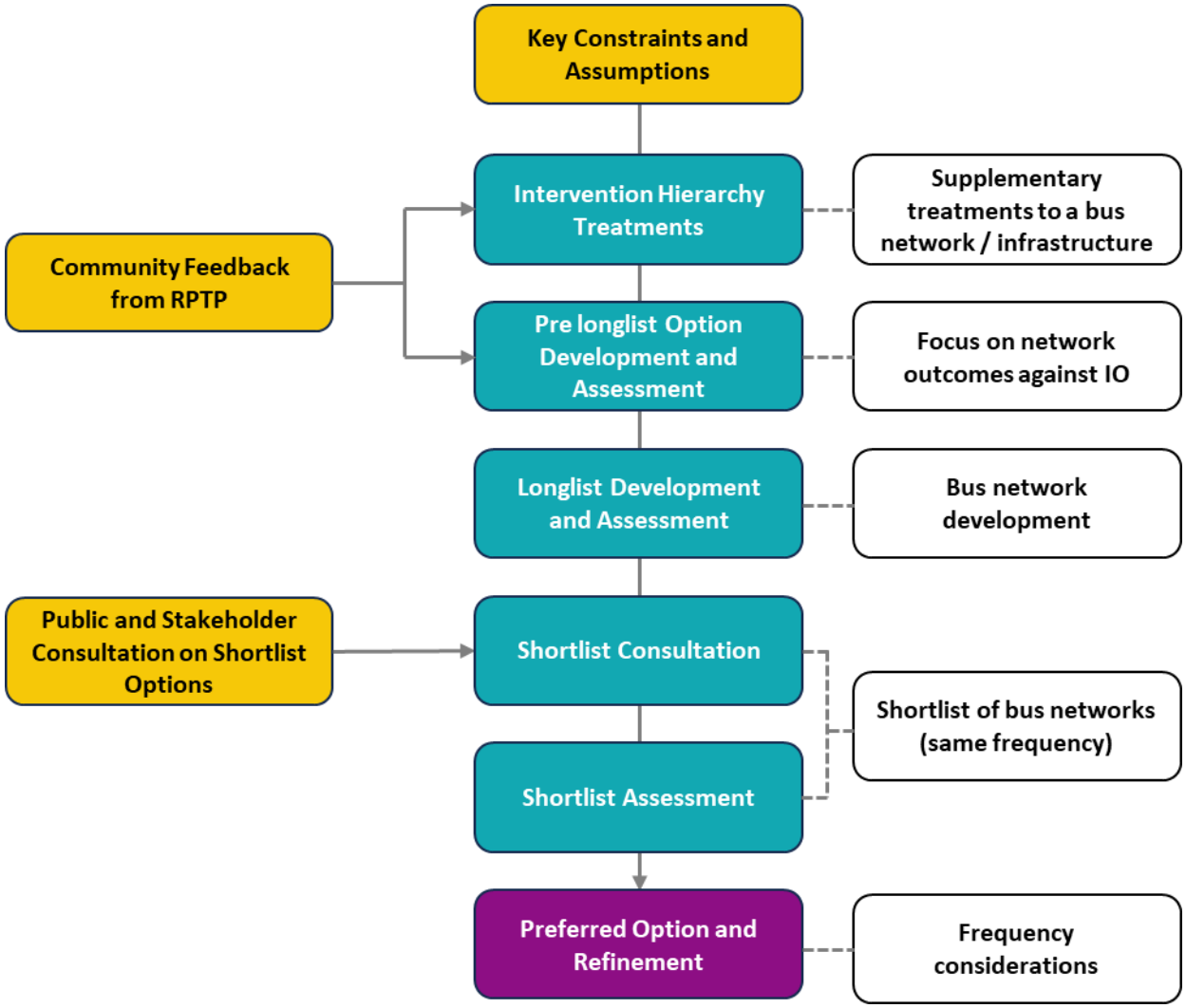


Figure 8-1 : Overview of the option development and assessment

For context, although this business case has considered a range of treatments through the intervention hierarchy, the key decision of this business case is specifically on the network and frequency with consideration given to the key constraints, effectiveness, fundability, and servicing needs of the community. Through the process of considering the intervention hierarchy a range of actions that sit outside the scope of this business case, but which could enhance the attractiveness and effectiveness of the region's public transport network, were identified (e.g. restrictions on car parks, or congestion charging). These actions have been noted in the Management Case as matters to be addressed via other work. More details on each stage of the process are provided in the following sections.

8.3 Key constraints and assumptions

The following provides a summary of the key constraints and assumptions for the Project which have influenced the optioneering process:

- **Total Project cost** – There is limited funding availability within the current NLTP. The total Project cost including timing of implementation needs to be realistic and account for this.
- **Road network** – Changes in the bus network are limited to the existing road network.

- **Bus vehicle fleet** – It is assumed that upgrades of the current diesel fleet to electric buses will happen over time and are outside of this business case. This SSBC does not consider the potential emissions reductions from future electric bus upgrades.
- **New Plymouth Integrated Transport Plan PBC network and upgrades** – As the PBC is yet to be approved, the proposed public transport improvements and other interventions have been excluded when considering the 'Do Minimum' (as noted above). It is considered that the proposed improvements in the PBC will influence and lead to greater mode shift.
- **Land-use and population growth** – The land-use and population growth assumptions are as per that adopted within the strategic transport model. If growth occurs quicker than anticipated, the bus routes and service frequencies can be adjusted in the future to respond.

8.4 Intervention Hierarchy Treatments

8.4.1 NZTA Intervention Hierarchy

To enable value for money, and to enable low-cost investment is considered ahead of more expensive physical infrastructure and technology investment, NZTA developed the Intervention Hierarchy. As shown in **Figure 8-2** below, concepts from the hierarchy were used to develop the options as this will be a combination of using this hierarchy for the existing infrastructure and addition of new infrastructure. This shows that the preferred option is the lower cost integrated planning intervention, with the least preferred option being a higher cost new infrastructure intervention.

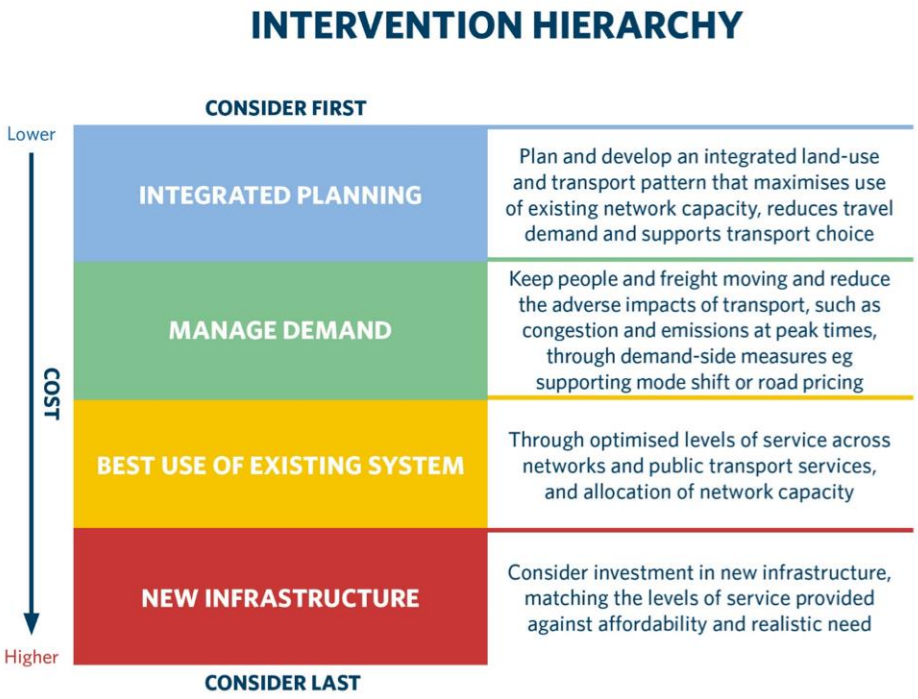


Figure 8-2 - Waka Kotahi Intervention Hierarchy

With the Intervention Hierarchy front of mind, a stakeholder workshop was held on 8th February 2024. The Workshop included representatives from NZTA, New Plymouth District Council, Taranaki Regional Council, and the consulting team.

Together the team and stakeholder group considered the Problem Statements, Benefits, and Investment Objectives, and developed a list of base treatments for each intervention type.

It is noted that the majority of these treatments, especially those within integrated planning, managed demand, and best use of existing systems – with the exception of bus stops and shelters which are required for new parts of the network – are time based and can be considered as 'add-ons' to the network at a future point in time.

Noting the above, each individual treatments were assessed to fall into the following categories:

- Sits outside of this specific business case process/ considered as other programmes of works.
- To be discounted.
- Included to be considered as 'add-ons' to the network. These have been allowed for in the Management Case following the selection of a preferred network.

Full details can be found in **Appendix B – Intervention Hierarchy.**

8.5 Pre-longlist Option Development and Assessment

The pre-longlist option development centred around the investment objectives with each option focusing on different outcomes. The intention is for the options to guide the development of a network that had a focus on the different outcomes i.e. differing response to the investment objectives.

Six options were developed and were assessed using the NZTA Waka Kotahi Early Assessment Sifting Tool (EAST). Four options were progressed for further development and assessment with two options discontinued. This is summarised in **Table 8-1** below.

Full details of the EAST Assessment may be found in **Appendix B – EAST**.

Table 8-1 : Pre-longlist Options and EAST Summary

Option	Details	Progress	Rationale
Option 1: Do Minimum	Existing bus network and frequency.	**Y**	As this is the Do Minimum it is taken through automatically
Option 2: Access (IO2) Emphasised	The focus for this option is enabling the largest number of residents to have access to bus services. It is based on a coverage network, where the greater and more accessible (e.g. number of residents living within 400m of a bus stop is emphasised over enabling the largest number of people to use the network. In short, a wide network with longer routes, possible feeder buses, and a focus on areas in need (social deprivation).	**Y**	No fatal flaws or any other reasons identified to not proceed with the option.
Option 3: Throughput (IO1) Emphasised	The focus for this option is on maximising the number of people who utilise the bus network. Rather than looking at the greatest coverage, the option looks at key high priority corridors where more frequent services take people between key destinations.	**Y**	No fatal flaws or any other reasons identified to not proceed with the option.

Option	Details	Progress	Rationale
Option 4: Environmental – mixed access and throughput emphasised	The focus for this option is reducing C02 Emissions via VKTs – so blends access to the network and throughput together. The environmental focus is specific for the IOs and looks at treatments from an environmental perspective rather than specifically a passenger perspective. By doing this it enables a broad range of options and treatments to be considered.	**N**	Similar to balanced option. However, by looking at environmental outcomes first the option does not provide a strong outcome for the community. The option is also similar to Option 2 with no real difference to VKTs so based on this the option is also considered to not be suitable to take forward as it becomes redundant.
Option 5: Balanced	The focus of the balanced option is to look at access (coverage), throughput (patronage) and environmental outcomes equally. Key parts of each of the components, such as targeted connecting into specific areas, prioritising high quality services where they will have the most benefit, and CO2 and VKT reductions are all key considerations in building the option from treatments	**Y**	No fatal flaws or any other reasons identified to not proceed with the option.
Option 6: Ambitious	The ambitious option is exactly that. Ambitious! Nothing is off the table, and cost is not a key consideration. High quality options such as BRT, building new Park and Ride sites, as well as actively discouraging private vehicles are all key components. See this as an option where you are not constrained by dollars or politics - anything can be done to create the 'perfect utopia' of a public transport system.	**N**	Although this option will have the greatest alignment with the IOs, affordability will deem this option infeasible in this current condition. However, a list of potential interventions has been included in the Management Case and Appendix B should this be reconsidered in the future.

Based on the above, three options were taken forward for further assessment were as summarised in **Table 8-2**.

Table 8-2 : Longlist Options

Current Option	New Option Number
Option 2 – Access Emphasized	**Option 1 – Access**
Option 3 – Throughput Emphassed	**Option 2 – Throughput**
Option 5 – Balanced Emphasized	**Option 3 - Balanced**

8.6 Longlist Development and Assessment

The section outlines the longlist network option development and assessment undertaken.

8.6.1 Option Development

A workshop was undertaken on 3rd April 2024 with various stakeholders including New Plymouth District Council staff and Councillors, along with community representatives for public transport users and the mobility impaired sector to develop the options that progressed through from the EAST assessment.

Participants were asked to draw maps for what they thought the network could look like for each of the options considering the investment objectives. They were also asked to identify locations of interest and/or destinations of importance for people. These were then collated on a map viewer to be further developed into options for assessment. Examples of these are shown in **Figure 8-3** and **Figure 8-4**.

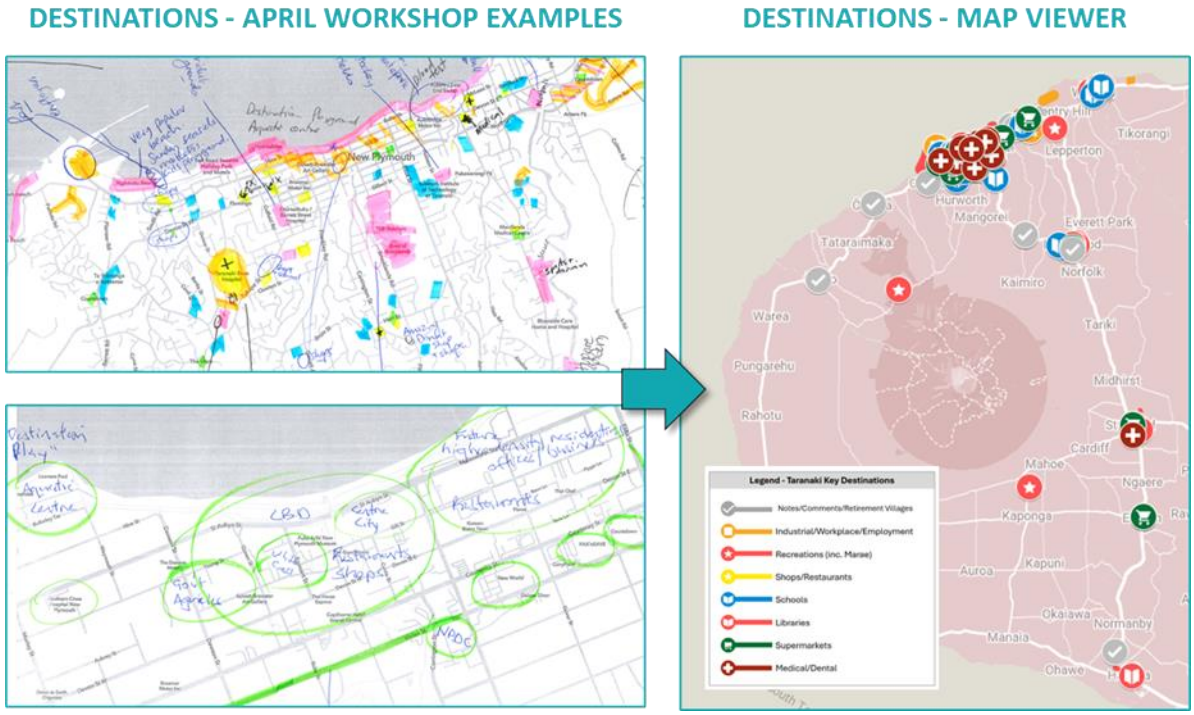


Figure 8-3 : Longlist Development Workshop - Destination to Map Viewer Example

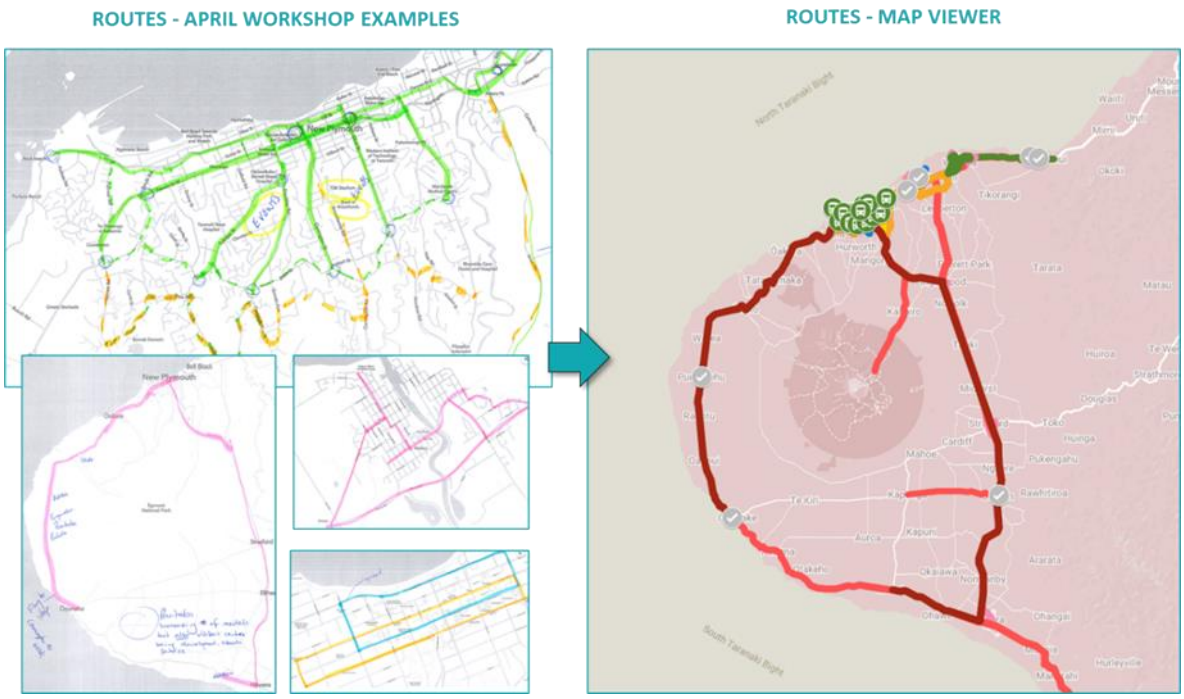
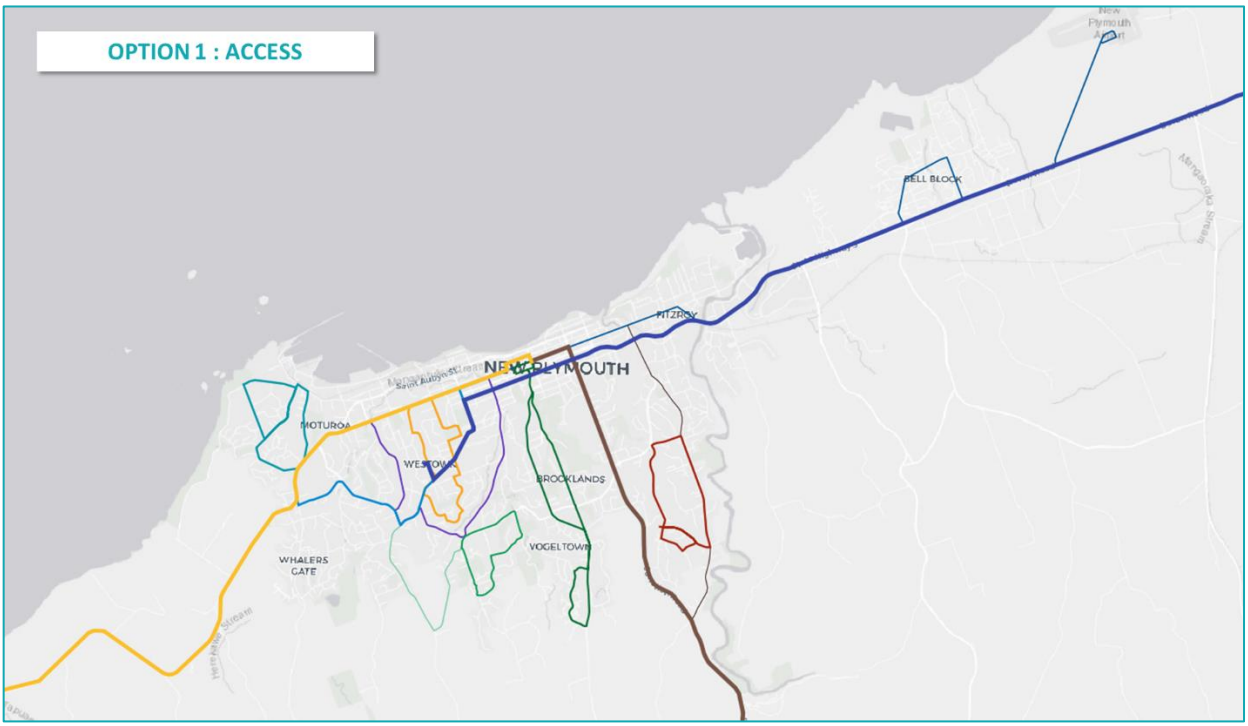


Figure 8-4 : Longlist Development Workshop - Routes to Map Viewer Example

Each of the long list options were then developed based on the inputs from the workshop with a focus on the outcomes sought for each option. These are shown below. Note that all options provide for the sub-regional services to the outer areas such as Stratford, Inglewood and Hawera.

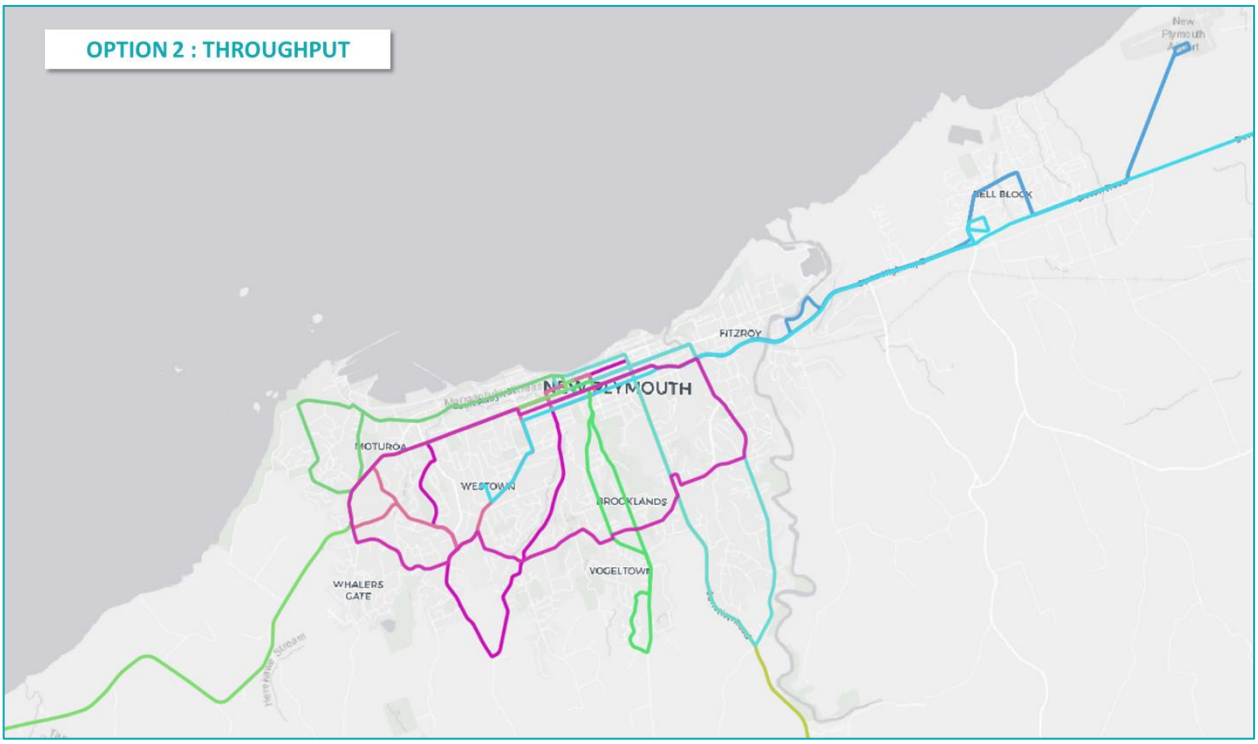
Option 1: Access

This option focuses on providing coverage enabling the largest number of residents to have access to bus services.



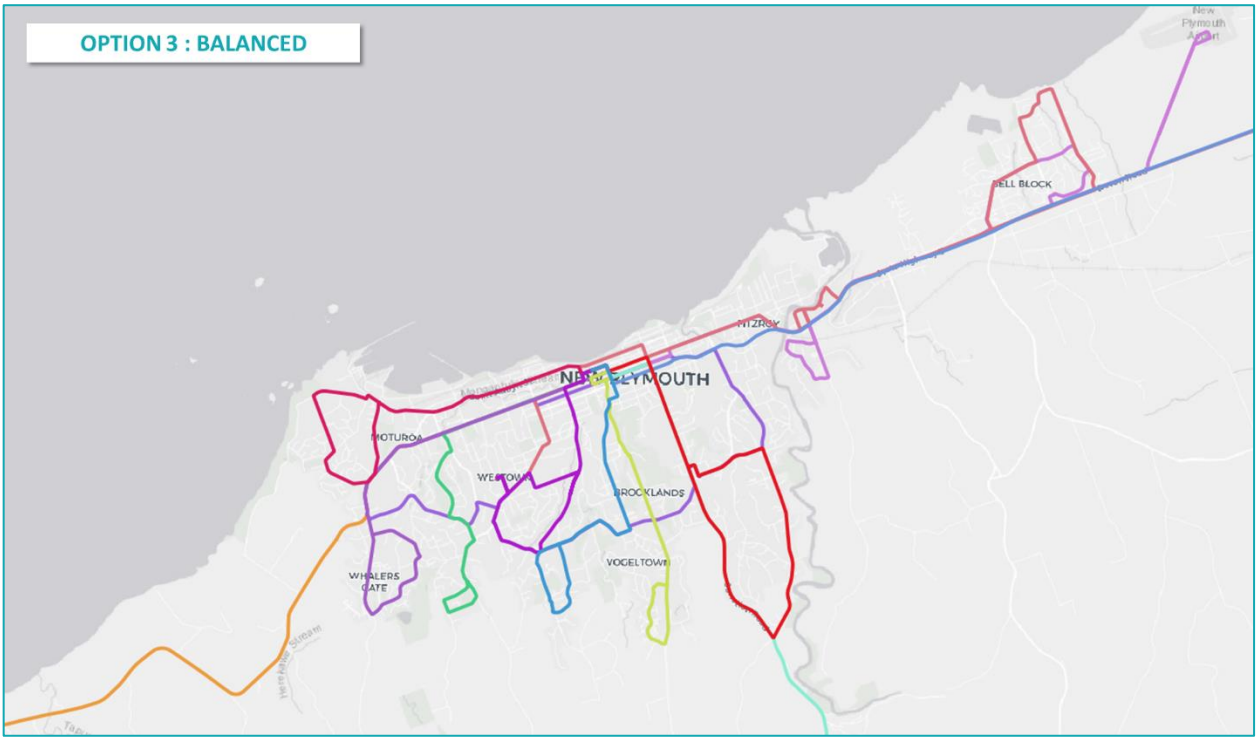
Option 2: Throughput

The focus for this option is on maximising the number of people who utilise the bus network.



Option 3: Balanced

This option is a balance between access and throughput.



8.6.2 Option Assessment

A Multi Criteria Assessment framework (MCA) was used to assess the long list of options against the primary criteria detailed in **Table 8-3**. A plus 3 minus 3 MCA scoring range was used, based on the following criteria which are grouped into three areas: Investment Objectives, Assessment of Effects, and Delivery, Maintenance and Operations.

Table 8-3 : MCA Criteria

Key Areas of the MCA Framework and Assessment
Investment Objectives
Assessment of Effects • Te Ao Māori (note this was unscored at long list and confirmed at short list) • Climate Change Mitigation • Climate Change Adaptation • Social and Cultural Impacts • Potential Value for Money • Consentability • Property Impacts • Potential affordability • Compatible with EV fleet and existing bus run times • Current and future land use
Delivery, Maintenance and Operations (DM&R) • Safety in Design • Technical • Operations and Maintenance • Timeframe for Delivery
Assessment Scores: Each criterion was assessed using the information available to assign a score on a scale from -3 (significantly adverse impact) to +3 (significantly positive impact).
Weighting and Sensitivity Testing: Each key area is weighted at 33% for the baseline. Throughout the MCA several weightings and sensitivity tests were undertaken with 50% being applied to each of the key areas. All scenarios generally resulted in the same outcome.

The outcome of the MCA including the sensitivity testing is summarised in **Table 8-4**, with details provided in **Appendix C– MCA Assessment.** It is noted at this stage the assessment is focused on the network and does not account for service frequency as such all options assume the same frequency.

Table 8-4 : Summary of MCA Assessment

Criteria	Do Minimum	Option 1	Option 2	Option 3
IO 1	1	2	3	3
IO 2	1	3	2	3
IO 3	1	1	2	3
Te Ao Māori	0	0	0	0
Climate Change Mitigation	0	0	0	0
Climate Change Adaptation	0	0	0	0
Social and Cultural impacts	-1	2	1	2
Potential Value for Money	1	1	2	3
Consentability	0	0	0	0
Potential Affordability in relation to Costs	1	-1	2	1
EV Fleet and Bus Network	2	1	2	2
Link with other future Land Use	-1	1	1	2
Safety in Design	2	1	-1	0
Technical	1	-1	0	-1
Operations and Maintenance	0	-1	2	1
Timeframe for Delivery	1	1	1	1
Total	**8**	**11**	**17**	**21**

As indicated:

- Option 3 – Balanced Option scores the highest amongst all options. In particular, it scores the highest against the investment objectives and potential value for money.
- The Do Minimum option scores the lowest against the investment objectives and does not provide for future land use.
- Option 1 – Access Option scores the worst along with the Do Minimum option against investment Objective 3 and it is anticipated to be the least affordable given the coverage nature of the option.
- Option 2 – Throughput Option scores highest against Investment Objective 1 and second against Investment Objective 2 and 3.

Table 8-5 summarises the outcomes of the MCA including the sensitivity testing. As shown, Option 3 – Balanced Option scores the highest and Option 2 – Throughput is second in all scenarios. These two options were taken forward as the short-listed options for public consultation.

Table 8-5 : MCA Assessment Ranking

Group	Weighting	Do Minimum	Option 1	Option 2	Option 3
All	33/33/33	4	3	2	1
Investment Objectives/ Implementability/ DM&	50/25/25	4	3	2	1
Investment Objectives/ Implementability/ DM&	25/50/25	4	3	2	1
Investment Objectives/ Implementability/ DM&	25/25/50	3	4	2	1

8.7 Shortlist Consultation

There were two phases of consultation undertaken during the development of the short list as follows:

- **Phase 1: Hop on Board** – We collected feedback on ideas on specific bus services, frequency, and timetables to make bus travel more attractive and provide more travel choices. This was undertaken between 22 April and 6 May 2024.
- **Phase 2**: **Where to Next** – We asked the community to compare the two bus network options and tell us which one they preferred. This was undertaken between 22 May and 11 June 2024.

Options 2 and 3 were taken forward for public consultation. Taranaki Regional Council asked the community to compare the two bus network options and indicate which option they preferred. 326 responses were received, with 32% preferring the Throughput Option and 68% preferring the Balanced Option (see **Figure 8-5**).

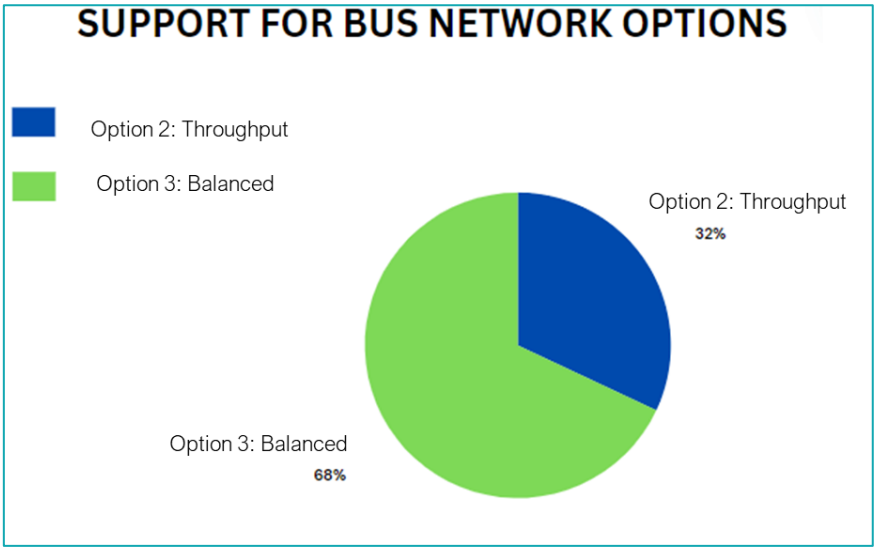


Figure 8-5: Public consultation feedback response results

Key feedback received includes the following:

- New and extended routes, particularly to better serve outlying areas and key destinations;
- Strong preference for direct, express services to reduce travel time and increase convenience for commuters and school students;
- Integration with major destinations and ensuring accessibility for all users;
- More frequent and reliable bus services;
- Between weekend and evening services, express routes, and more targeted services for specific groups;
- More frequent and regular bus services on weekends; and
- Enhancing access to recreational areas and commercial and social activities.

Specific to the options, and focused on the Balanced Option, the following comments were heard:

- Maintaining the level of service between Hawera and Taranaki Base Hospital
- Improvements to east-west throughput corridors (Route 5, Express, Airport to Whalers Gate)
- Returning bus routes to the underserved communities for key destinations including:
- Waitara Express (Waitara to CBD)Airport to Whalers Gate to provide a connection between Glen Avon, Bell Block, and the Airport
    - Airport to Whalers Gate to provide a connection between Glen Avon, Bell Block, and the Airport
    - Proposed Orbiter route to help provide the underserved communities with bus services
- Improved accessibility for the older community and to the hospital (Mangorei Route Option)
- Merrilands to Taranaki Base Hospital to serve the requirement communities in Merrilands

This led to the development of an additional option, Option 3a, which is a modification of the Balanced Option and illustrated in **Figure 8-6**.

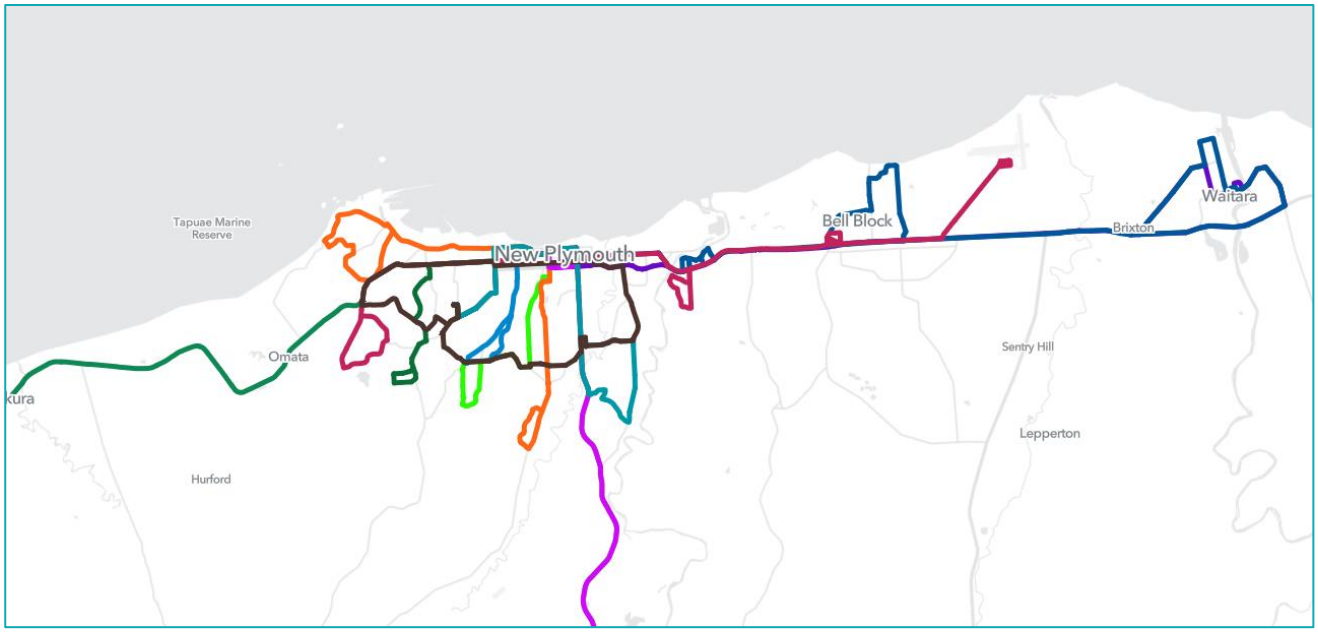


Figure 8-6 : Option 3a - Modified Balanced Option

Note: As detailed above, Option 3a (which is a refinement of Option 3 – Balanced Option) has been considered moving forward based on community engagement.

8.8 Shortlist Assessment

The Appraisal Summary Table (AST) was used to assess the three shortlisted options. A high level indicative BCR was assessed for each of the shortlisted options with the following assumptions:

- The operating cost was based on information provided by Taranaki Regional Council, considering route length and frequency and an operating cost of $3.9/km. With Option 3a being of similar length to the existing service and same frequency, the operating cost was assumed to be the same at $3.5M per year. The operating costs for Option 2 – Throughput and Option 3 – Balanced were derived from this value by comparing the total length in kilometres.
- The construction cost assumes construction of new bus stops required. An allowance of $25k per bus stop inclusive of a shelter has been used as per that provided by Taranaki Regional Council. A total of $2M has been assumed, which accounts for 60 new bus stops, contingency and preliminary and general costs required. It is worth noting that not all new bus stops will require a shelter, some will only require additional signs and markings to be installed which will cost in the order of $2k.
- The benefits of Option 3a have been derived from the traffic modelling outputs of the Ngāmotu Strategic Transport Model (Ngāmotu STM). Further details are provided in subsequent sections. It is noted that modelling was only conducted for this option, as it was believed that it could indicatively represent the benefits of the other options through additional catchment analysis.
- A catchment analysis was undertaken on the options to indicate the 'population'[10] that would be within 400m walking distance from the bus routes. The difference in population or catchment between the options was used to scale the benefit accordingly.
- All options considered the same level of frequency (the existing frequency).

Figure 8-7 to **Figure 8-9** shows the results of the catchment analysis for the three options. As can be seen, the difference between the options is minor especially between Option 3 and 3a. The Balanced options with a greater focus on coverage provides greater accessibility for people in the community.

[10] This uses the Census SA2 sectors for New Plymouth as an approximation to illustrate which zones will be within walking distance from a bus service. Note that if the majority of the zone is outside of the 400m, this is not included in the analysis.

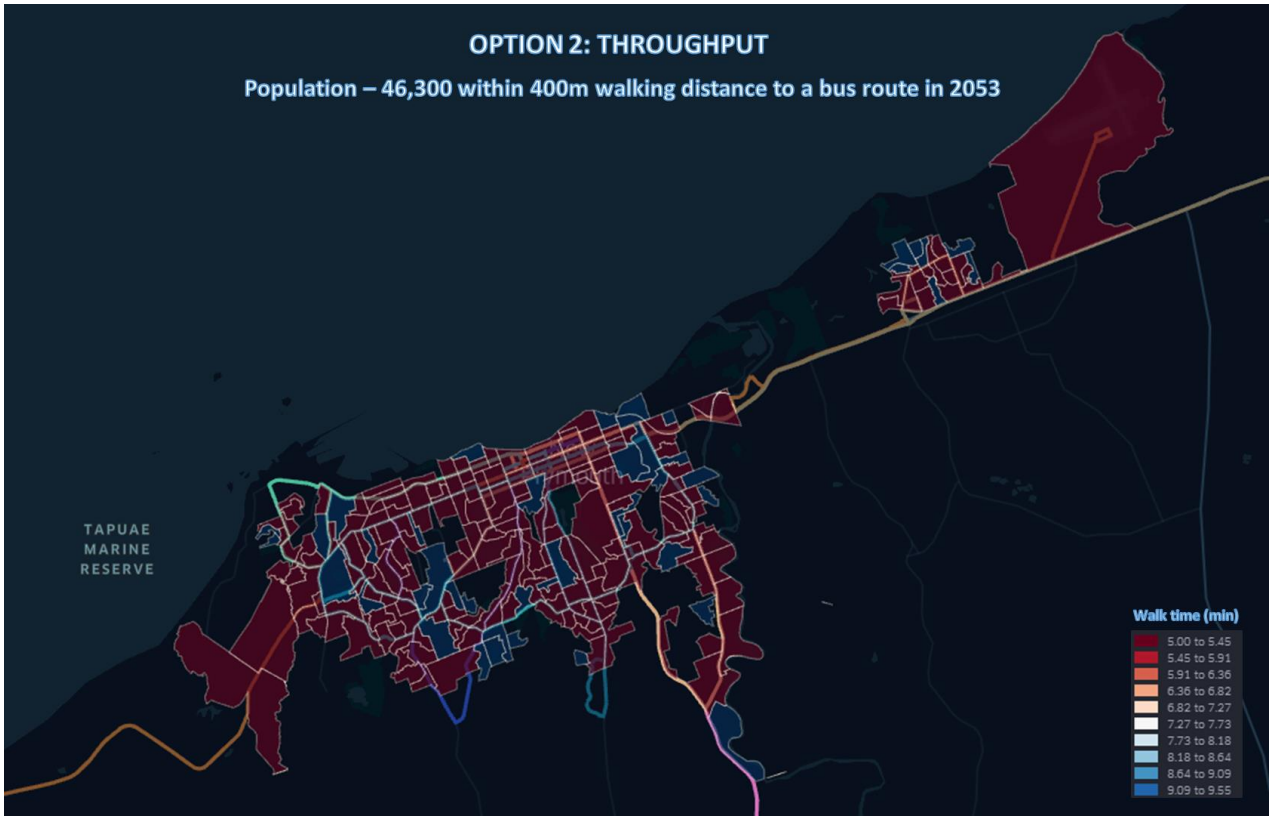


Figure 8-7 : Catchment Analysis for Option 2

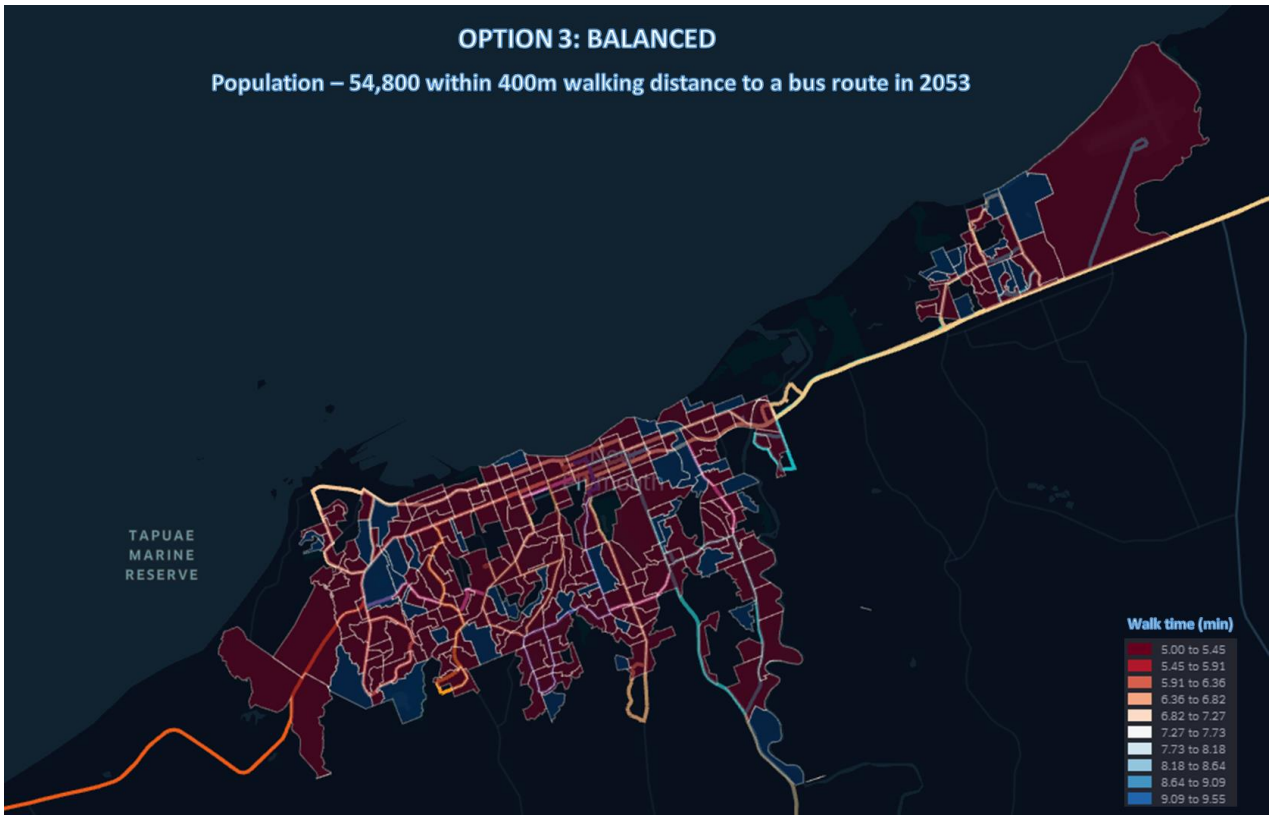


Figure 8-8 : Catchment Analysis for Option 3

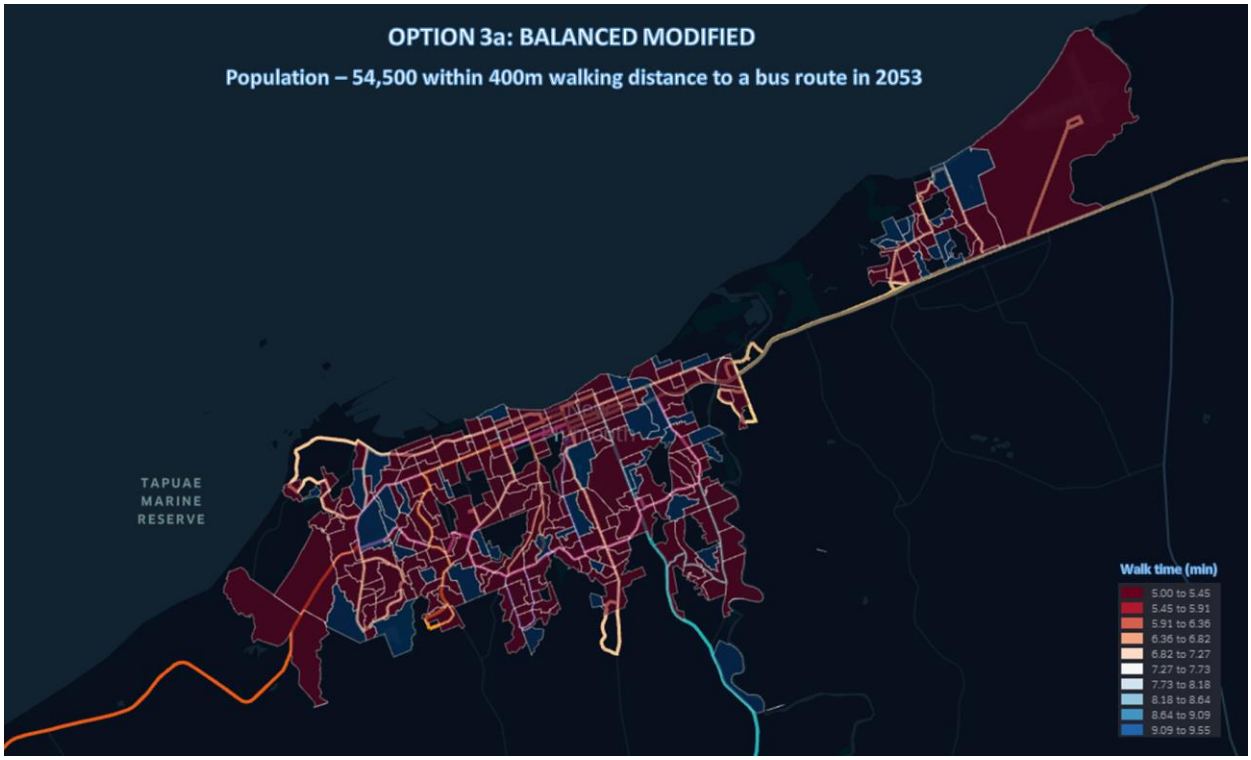


Figure 8-9 : Catchment Analysis for Option 3a

The high-level assessed BCRs are summarised in **Table 8-6.** As indicated, the Balanced Option is anticipated to generate the greatest benefits based on the same frequency as it has a wider reach, although a slightly greater cost.

Table 8-6: Shortlist Option Indicative BCR

Option	Indicative Annual Operating Cost ($M, undiscounted)	40-Year Discounted Benefit ($M)	40-Year Discounted Cost ($M)	Indicative BCR
Option 2 – Throughput	$2.8	55.0	52.9	1.0
Option 3 – Balanced	$2.9	63.9	55.2	1.2
Option 3a – Balanced Modified	$3.5	63.5	66.2	1.0

Although Option 3 will provide the greatest BCR, it does not consider additional services that the community asked for during consultation. The provision of additional services that allow the community to access essential services easily, and provide greater access to the underserviced areas, reduces the BCR but will result in a higher level of community acceptance and support. As such, Option 3A is proposed as the preferred network option to take forward. As noted, no consideration of EV fleet costs or benefits has been undertaken at this time as procurement contracts are not yet completed.

Appendix D – AST provides details of the AST tables.

With this preferred network option, further staging options were developed based on different investment scenarios and levels of ambition. These are further discussed below.

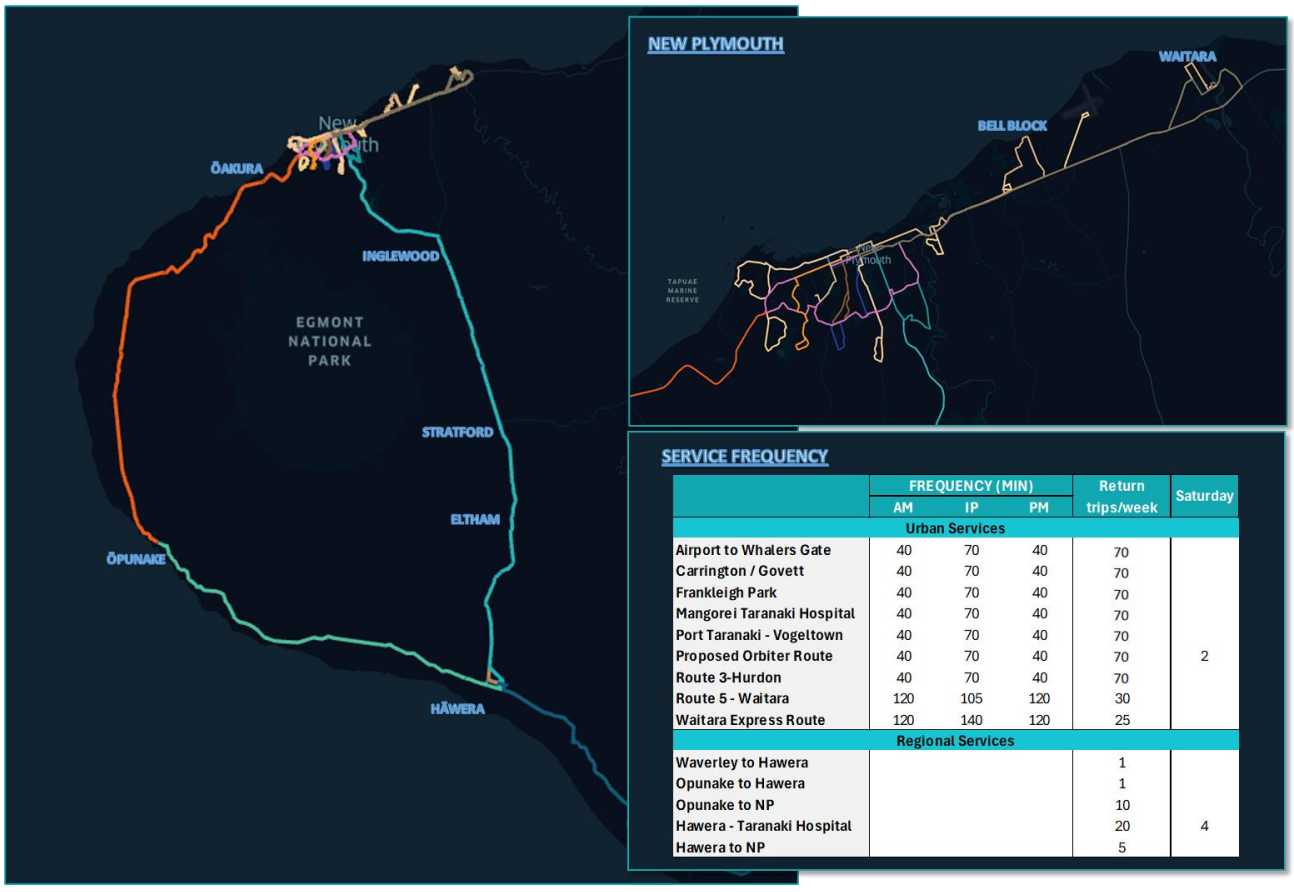
Appendix E – Optioneering Details provides supplementary information on the optioneering undertaken.

9 Preferred Option

The preferred option is **Option 3a**, the publicly modified balanced option, which includes the following changes that reflect public feedback received through the consultation process:

- Maintaining the level of service between Hawera and Taranaki Base Hospital.
- Improvements to east-west throughput corridors (Route 5, Express, Airport to Whalers Gate).
- Returning bus routes to the underserved communities for key destinations including:
    - Waitara Express (Waitara to CBD)
    - Airport to Whalers Gate to provide a connection between Glen Avon, Bell Block, and the Airport
    - Proposed Orbiter route to help provide the underserved communities with bus services
- Improved accessibility for the older community and to the hospital (Mangorei Route Option)
- Merrilands to Taranaki Base Hospital to serve the retirement communities in Merrilands

The preferred Option network and frequency is shown in **Figure 9-1**.



	FREQUENCY (MIN)			Return trips/week	Saturday
	AM	IP	PM		
Urban Services					
Airport to Whalers Gate	40	70	40	70	
Carrington / Govett	40	70	40	70	
Frankleigh Park	40	70	40	70	
Mangorei Taranaki Hospital	40	70	40	70	
Port Taranaki - Vogeltown	40	70	40	70	
Proposed Orbiter Route	40	70	40	70	2
Route 3-Hurdon	40	70	40	70	
Route 5 - Waitara	120	105	120	30	
Waitara Express Route	120	140	120	25	
Regional Services					
Waverley to Hawera				1	
Opunake to Hawera				1	
Opunake to NP				10	
Hawera - Taranaki Hospital				20	4
Hawera to NP				5	

Figure 9-1 : Preferred Option Network

The frequency indicated above is referred to as the 'Bronze' option and is financially feasible at present as the cost is within the proximity of current funding envelopes. Further increases in frequency have been considered and will be staged over time as and when growth and funding become available in the future. For the ‘Silver’ option there is a slight increase in frequency in peak times on the urban routes and there is increase in Saturday services. For ‘Gold’, the frequency is further increased during the peak periods and increase in services on the weekend.

The frequency options for the preferred network are summarised in **Table 9-1** and **Table 9-2**. It is important to note that Bronze, Silver and Gold are stages of the preferred Option 3a.

Table 9-1 : Peak Frequency Options for Urban Services

	BRONZE			SILVER			GOLD		
	FREQUENCY (MIN)			FREQUENCY (MIN)			FREQUENCY (MIN)		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Urban Services									
Airport to Whalers Gate	40	70	40	30	70	30	15	30	15
Carrington / Govett	40	70	40	30	70	30	15	70	15
Frankleigh Park	40	70	40	30	70	30	15	70	15
Mangorei Taranaki Hospital	40	70	40	30	70	30	15	70	15
Port Taranaki - Vogeltown	40	70	40	30	70	30	15	70	15
Proposed Orbiter Route	40	70	40	30	70	30	15	70	15
Route 3-Hurdon	40	70	40	30	70	30	15	70	15
Route 5 - Waitara	120	105	120	60	105	60	30	105	30
Waitara Express Route	120	140	120	60	140	60	30	84	30

Table 9-2 : Number of Services per week and weekend services for each option

	BRONZE		SILVER		GOLD		
	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Sunday & Public Holidays
Urban Services							
Airport to Whalers Gate	70		80	4	165	12	12
Carrington / Govett	70		80		125	12	12
Frankleigh Park	70		80		125	12	12
Mangorei Taranaki Hospital	70		80		125	12	12
Port Taranaki - Vogeltown	70		80		165	12	12
Proposed Orbiter Route	70	2	80	4	125	12	12
Route 3-Hurdon	70		80		165	12	12
Route 5 - Waitara	30		40		65	12	12
Waitara Express Route	25		35		60	12	12
Regional Services							
Waverly to Hawera	1		1		2		
Opunake to Hawera	1		1		10	2	2
Opunake to NP	10		10		20	2	2
Hawera - Taranaki Hospital	20	4	20	4	20	4	4
Hawera to NP	5		5		40	8	8

For the purpose of the economic assessments the ‘Bronze’ frequency is the main assessment. However, the BCR for ‘Silver’ and ‘Gold’ frequency were also undertaken to understand the implications of higher investment levels.

9.1 Outcomes

The preferred option provides the following customer outcomes over the Do-Minimum:

- An estimated 14% increase in the overall daily bus patronage by 2035 with the ‘Bronze’ frequency. This will be further increased to a daily increase of 44% with the implementation of the ‘Gold’ frequency option.
- By 2053, approximately 54,500 people will be within a bus route. This is a 3,100 or 6% increase from the Do-Minimum.

- Reduction of 4,812 tonnes of CO_2 over 40 years with the ‘Bronze’ frequency, and a reduction of 13,335 tonnes with the ‘Gold’ frequency option as people are diverted away from private vehicles.
- A reduction in average travel time via public transport of 2 minutes (5%) between Glen Avon and the CBD, this increases to 6 minutes with the ‘Gold’ frequency. A 5 minute reduction (14%) between Marfell and the CBD and increase to 10 minutes with the ‘Gold’ frequency.
- The New Plymouth Airport is now accessible via public transport increasing travel choice for locals and travelers alike.

10 Economic Analysis

This section summarises the economic analysis undertaken for the preferred option. This economic evaluation has been undertaken in accordance with the NZTA Monetised Costs and Benefits Manual (MBCM), 2024. The economic assessment utilises the Ngāmotu Strategic Transport Model (Ngāmotu STM) v1.0. Appendix G provides further transport modelling information.

10.1 Key assumptions and cost

The key assumptions assumed in the economic analysis are shown in **Table 10-1**.

Table 10-1: Key economic assumptions

Assumption type	Assumptions
Base date	2023
Time zero	2024
Analysis period	40-year analysis period
Travel time benefits	Assessment of base and congested (CRV) travel time benefits from the Ngāmotu STM.
Vehicle operating costs	Assessment of base running vehicle operating costs (VOC) from the Ngāmotu STM.
Discount rates	Discount rate 4% applied to all annual benefits and costs, but sensitivity test for 2% and 6%.
Public transport benefits	Assessment of public transport costs from the Ngāmotu STM. The public transport reliability benefits are estimated as 50% of user benefits in all peaks as per that assumed in the New Plymouth ITF PBC. The same assumption has been applied for alignment.
Emissions	CO_2 benefits are calculated from VEPM 6.3 emission rates.

10.1.1 Cost

It is noted that this business case relates to a portion of the overall public transport budget for Urban and Regional Operating costs (school services are considered outside of this and will remain the same at the time of writing this business case).

With the above in mind, the following costs associated with the preferred option are:

- With the preferred option being of similar length and frequency as the existing, the existing operating cost of $3.5M per year or $3.9 per km has been assumed as per cost provided by TRC. The operating cost for the ‘Silver’ and ‘Gold’ frequency are $4.1M and $7.2M, respectively.
- The construction cost assumes construction of new bus stops required. An allowance of $25k per bus stop inclusive of a shelter has been used as per that provided by TRC. A total of $2M

has been assumed for all frequency options which accounts for 60 new bus stops, contingency and preliminary and general costs required. It is worth noting that not all new bus stops will require a shelter, some will only require additional signs and markings to be installed which will cost in the order of $2k.

- No maintenance cost has been assumed at this point as it is considered this cost will be minimal especially when compared with the overall operating cost.

10.2 Benefits

The key economic benefits generated by the preferred option is summarised in **Table 10-2**.

Table 10-2: Preferred Option Economic Benefits (NPV, $M)

Item	Bronze	Silver	Gold
Vehicle Travel Time Benefit	-1.6	3.0	12.1
Congestion Benefit	-9.3	4.0	7.6
Trip Reliability Benefit	-0.1	0.0	0.2
Vehicle Operating Cost	2.3	-1.6	0.5
Public Transport Benefits	71.6	98.7	204.3
Emission Benefit	0.6	0.8	1.6
PV Total net Benefits	**63.5**	**104.9**	**226.4**

Key observations:

- As expected, most of the benefits come from public transport benefits given the project is focused on improving the public transport network for all frequency options.
- There are some disbenefits to general traffic in the 'Bronze' option. Due to the strategic nature of the model when changes are small, their effect are not adequately captured by the model as it is dampened by model noise. However, even if we considered there were no disbenefits, the BCR will remain similar i.e. below 2.0 and will have no impact on the economic efficiency rating.
- The emission benefits are attributed to the overall decrease in vehicle demand across all the options.

10.3 Benefit Cost Ratio (BCR)

A more conservative approach than standard has been undertaken for the BCR analysis in which the total cost for the options were used for assessment purposes. This assumes there are no 'Do Minimum' costs. If the 'Do Minimum' costs were considered, the resulting BCR will be extremely high and somewhat unrealistic. For example, if the change in operating cost is small or remains the same but there are benefits with the change in route, this BCR will be considerably larger.

The base estimate BCRs are shown in **Table 10-3**. Overall, the preferred network option is expected to generate a BCR of 1.0 to 1.7 depending on the frequency option.

Table 10-3: Option Benefits, Costs and BCR

Option	40-Year Discounted Benefit ($million)	40-Year Discounted Cost ($million)	BCR
Bronze	63.5	66.2	1.0
Silver	104.9	75.3	1.4
Gold	226.4	134.1	1.7

The analysis has shown the Gold Option provides the strongest return on investment with a BCR of 1.7. It also indicates that the Silver frequency option is an important step change towards the aspirational frequency of Gold. Further, there will be opportunity in the future to revisit the network prior to increasing the frequency to improve the economic efficiency.

As noted, the BCRs in the above table underestimate the benefits of the Bronze option significantly when compared to cost. The Bronze option has very minor new costs for PT operation and infrastructure, and also provides significant benefits. In this scenario reassessing the BCR for the 'Bronze' option would result in a high BCR – above 33 – that would not appear credible when compared to other NZTA endorsed public transport business cases. Table 10-4 shows the BCR for the different frequency options if this approach was undertaken.

Table 10-4 : MBCM Calculated BCR

Option	40-Year Discounted Benefit ($million)	40-Year Discounted Cost ($million)	BCR
Bronze	63.5	1.9	33.7
Silver	104.9	12.9	8.1
Gold	226.4	69.9	3.2

For the purposes of this business case, we have therefore taken a conservative approach to reflect that the costs are substantially the same as the do minimum as per that shown in Table 10-3.

Whichever way we calculate the BCR, the Bronze Option is the only financially viable option at this point in time. This is due to the current funding constraints. It is noted that the BCR for the Silver and Gold option will be reassessed in the future using the latest NZTA guidelines at the time.

Appendix H – Economic Sheets provides details on the economic analysis undertaken including the reassessment of the BCR.

10.4 Incremental Benefit Cost Ratio

An incremental BCR was undertaken to understand whether the incremental cost of the 'Gold' frequency option is justified by the incremental benefits gained. The target incremental BCR of 1 is considered given that the BCR is less than 3.

Table 10-5 below shows the incremental BCR for the options. It indicates that the 'Gold' frequency option is above the target incremental BCR and is the preferred.

Table 10-5 : Incremental BCR

Option	Next-higher Cost Option	Incremental BCR	Above/Below Target incremental BCR
Bronze	**Silver**	3.8	Above
Silver	**Gold**	2.4	Above

10.5 Sensitivity analysis

Sensitivity analysis has been undertaken to understand the effect of key economic risks, which relate to changes in discount rate, costs, and benefits to determine their impact on the BCR. In this instance, a decision has been made to show the sensitivity analysis for all stages of the option. This serves to provide a complete picture of how each stage performs should a decision be made to move to Silver and Gold by the Joint Committee as referenced in the Management Case.

10.5.1 Discount Rate

The discount rate is the minimum rate of return expected from an investment. It represents how decision makers value outcomes in the future relative to those in the present. With a greater value placed on immediate outcomes for a high discount rate and long-term outcomes for a lesser discount rate. The sensitivity analysis has shown:

- A decrease in the discount rate to 2% and increase to 6% does not have a significant impact on the BCR ranges.
- The 'Gold' frequency option still provides the strongest return on investment.

Table 10-6: Discount Rate Sensitivity Testing.

Option	Discount Rate (%)	BCR
Bronze	2	0.9
	6	1.0
Silver	2	1.4
	6	1.3
Gold	2	1.7
	6	1.6

10.5.2 Construction / Operation Costs

The construction and operating costs have been tested by adjusting these by +/- 20% as shown in **Table 10-7**. This indicates:

- A decrease in the construction and operating costs by 20% is shown to increase the BCR.
- An increase in the construction and operating costs by 20% is shown to decrease the BCR.
- The 'Gold' frequency option still provides the largest return on investment.

Table 10-7: Construction and Operation Cost Sensitivity Testing.

Option	Construction / Operation Costs Change (%)	BCR
Bronze	-20	1.2
	+20	0.8
Silver	-20	1.7
	+20	1.2
Gold	-20	2.1
	+20	1.4

10.5.3 Benefit Cap

The benefits have been capped after 30 years of growth. This indicates a 30-year cap in benefits is not shown to change the BCR significantly (see **Table 10-8**).

Table 10-8: Benefit Cap Sensitivity Testing

Option	BCR
Bronze	1.0
Silver	1.3
Gold	1.7

10.5.4 Sensitivity Testing Summary

A summary of the BCR ranges for each of the options from the sensitivity testing is shown in **Table 10-9**. At the lower range of the BCR, the 'Silver' and 'Gold' frequency options provide a BCR greater than one, meaning the benefits are greater than the costs. At the higher range of the BCR, all options have a BCR greater than one, meaning the benefits are greater than the costs. The largest BCR is still shown to be the 'Gold' frequency option.

Table 10-9: Sensitivity Testing BCR summary

Option	BCR
Bronze	0.8 – 1.2
Silver	1.2 – 1.7
Gold	1.4 – 2.1

10.6 Investment Prioritisation Method

The NZTA Investment Prioritisation Method for the 2024- 27 National Land Transport Programme (NLTP) has been used to understand the potential investment prioritisation of the SSBC. Overall, the investment proposal has been assessed as priority order 5.

As noted in section 10.3 a conservative approach has been applied for developing the BCR and if full benefits and limited costs were considered a high BCR that may not be credible would be calculated. We considered as an alternative, capping the BCR at 3 or 5, however on the basis of being conservative have left this at one – given that minimal additional funding is being sought under the Bronze option.

Factor	Rating
GPS Alignment	**Medium -** The investment proposal has been assessed as medium as it responds to economic growth and productivity through 'operation of public transport services enabling access to employment and other economic opportunities. The preferred option is estimated to increase public transport patronage by 14% and is expected to at least maintain farebox recovery. The improvement in bus services will provide the opportunity to travel to the airport via public transport where previously this was only accessible by car. The improvements will also see a reduction in travel time via public transport to the New Plymouth CBD by up to 10 minutes from Marfell under the 'Gold' frequency and 6 minutes from Glen Avon.
Scheduling	**High -** The investment proposal has a high scheduling priority alignment via the Criticality factor. The current bus service contract, with an extension, are set to expire in April 2026 and there is a need to tender a new contract to enable service continuity. The successful operator will need to invest in supporting buses to enable the improvements. Any delay would have significant impact on the RPTP goals and community needs.
Efficiency	**Low** (BCR 1.0 – 1.7) This could be **High** if a BCR of 33.7 and **Medium** if 3 or 5 was adopted.
Priority order	5 If a higher Efficiency rating was adopted, the priority order could be as high as 3. However, minimal funding is being sought currently and the priority order will have minimal impact.

FINANCIAL CASE

Taranaki Public Transport SSBC

11 Financial Case

This section outlines the Financial Case of the preferred option including discussions around affordability and funding.

It is noted that this SSBC relates to a small component of the overall Public Transport Budget for Taranaki (around $7M but unavailable at the time of writing). The Public Transport Budget compromises several working categories such as operations, planning, total mobility, ticketing and technology.

Within this business case, TRC is considering a portion of the operations budget that relates to the New Plymouth urban and regional services but excludes the school operations. The total operations cost is approximate $5M (funding still to be determined). The urban and regional operations is 70% of the operations budget, and the New Plymouth and Regional School services comprise approximately 30% of the budget.

11.1 Whole of Life Cost

The cashflow for a 10-year period for the 'Bronze' option is shown in **Figure 11-1**. This assumes:

- The $2M for bus stop infrastructure is assumed to be within the first year however this cost is likely to be less given not all new bus stops will require shelters, and there is a possibility to recycle existing shelters and stops resulting in changes to the network.
- The public transport operating cost have been escalated over time using the latest CPI inflation rate of 3.3%[11] as an indicator. The annual operating costs are as per that outlined in Section 10.1.1.
- Given the small cost of additional maintenance of the new bus stops when compared with the operating costs, this has been excluded from the graphs.

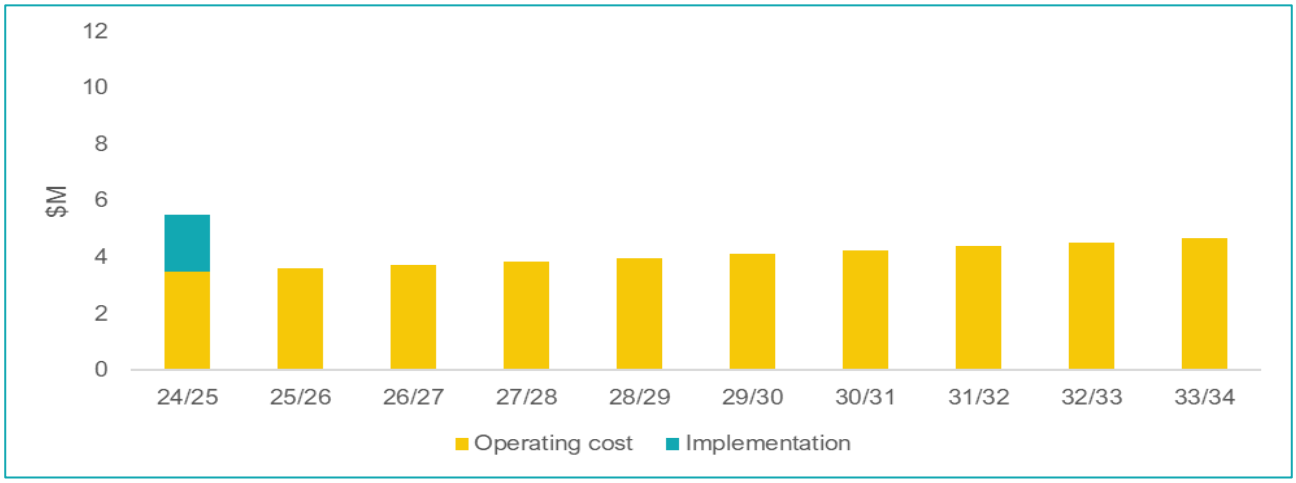


Figure 11-1 : Cost for FY 24/25 - FY 33/34

Figure 11-2 shows the cost required over time if the 'Silver' frequency and 'Gold' frequency are implemented in FY 27/28 and FY30/31, respectively. This shows an increase in operating cost required over time.

[11] https://www.stats.govt.nz/information-releases/consumers-price-index-june-2024-quarter/

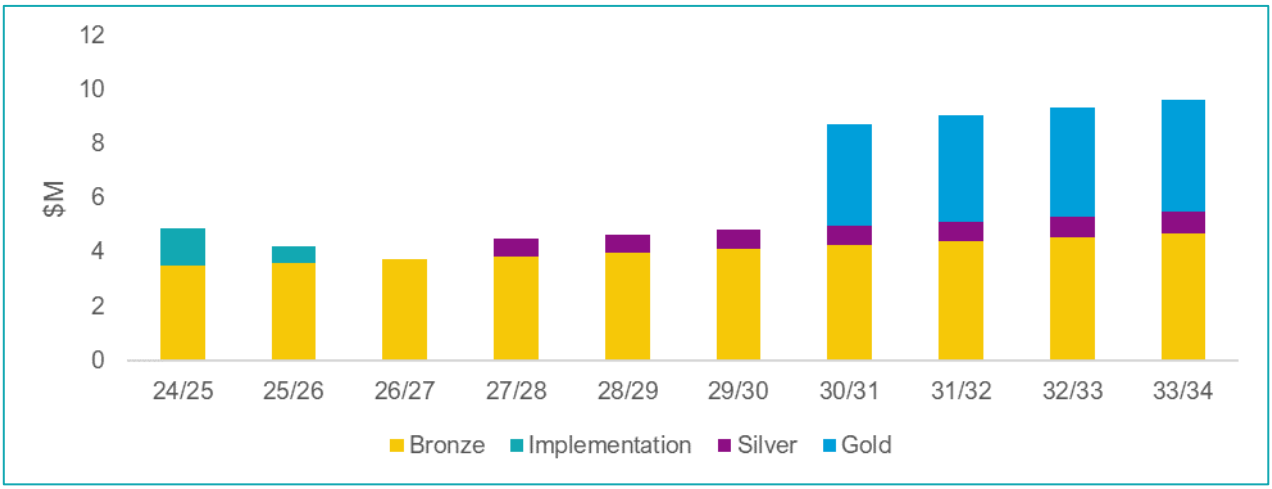


Figure 11-2 : Cost for FY 24/25 - FY 33/34 with implementation of 'Silver' and 'Gold' In Y3 and Y6

Figure 11-3 shows the cost over time for another scenario with the 'Silver' frequency and 'Gold' frequency implemented in years 10 and year 20, respectively. It is noted that the exact implementation date of 'Silver' and 'Gold' will be dependent on funding.

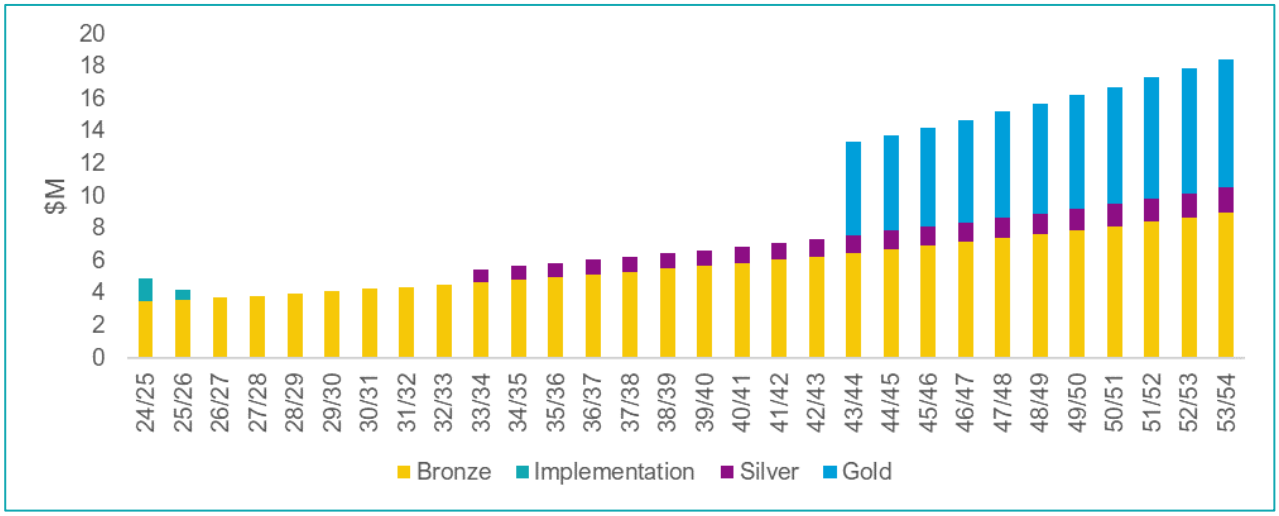


Figure 11-3 : Cost for FY 24/25 - FY 53/54 with implementation of 'Silver' and 'Gold' in Y10 and Y20

It is noted that maintenance costs have been considered to be consistent across options, and that assumptions are conservative. Without new procurement contracts in place no further assessments have been undertaken.

11.2 Funding

11.2.1 Funding sources

Potential funding sources are detailed in **Table 11-1**. This is subject to change as the project and procurement progresses.

Table 11-1 : Potential funding sources

Funding Source	Commentary
Passenger fares	The preferred option is expected to lead to higher patronage and consequently higher fare revenue. This fare box recovery will offset some of the cost of the preferred option. Any changes to fare levels would be considered outside of this business case with the next fare review expected to be undertaken as detailed in any updated proposed procurement contract.
Taranaki Regional Council	TRC funds public transport through a targeted rate with Total Mobility services funded through general rates. A level of funding was approved through the 2024/2034 long-term plan on the current funding arrangements with crown entities such as NZTA. It is also noted in the recent 2024-2034 LTP, $200,000 per annum in years 1, 2 and 3 have been provided to fund a trial of high frequency buses. This is outside the consideration of this business case. The staged approached of the increase in frequency is to achieve the desired outcomes in public transport once funding becomes available in the next LTP. The 'Bronze' option will allow the new contract to commence as needed at the end of 2024, allowing continuity of services for the community.
National Land Transport Fund (NLTF)	The 24/27 GPS allocation indicates a range of $400M to $750M in 2024/25 and increases by $20M each year to $500M to $850M by 2029/30 for activity class 'Public Transport Services'. The 2024 NLTP includes $22M for public transport. NZTA will not formally approve budget for investment without an approved business case. For this reason, the project is not currently included in any approved funding. However, for the 'Bronze' option the funding requirement will be as per the current funding commitments in the NLTP, and it is likely that this level of funding will be approved. This business case forms a case for further funding to increase frequency in the future when funding becomes available. Noting that an addendum to this SSBC will be undertaken to reconfirm the problems, investment objectives, benefits and costs etc.
Other supplementary funding sources (contributions that are additional to the above)	There are potentially other funding streams such as utilising parking revenue. However, the availability and amount are uncertain at this point. The ITF Programme and Modelling outputs from NPDC notes that a parking strategy study is scheduled as an action to undertake in the short term (next five years). These will be considered in future addendums as the network moves from 'Bronze' to 'Silver' and then 'Gold' frequency.

11.2.2 Funding share

The estimated funding split for the operational costs for the different frequency options are shown in **Figure 11-4** based on an assumed 40% farebox recovery. This has been assumed as this is the

proposed target under the Better Travel Choices Strategy 2024-2054[12]. It also assumes standard FAR (51% from the NLTF). Further assessments on funding can be considered in future addendums to this business case.

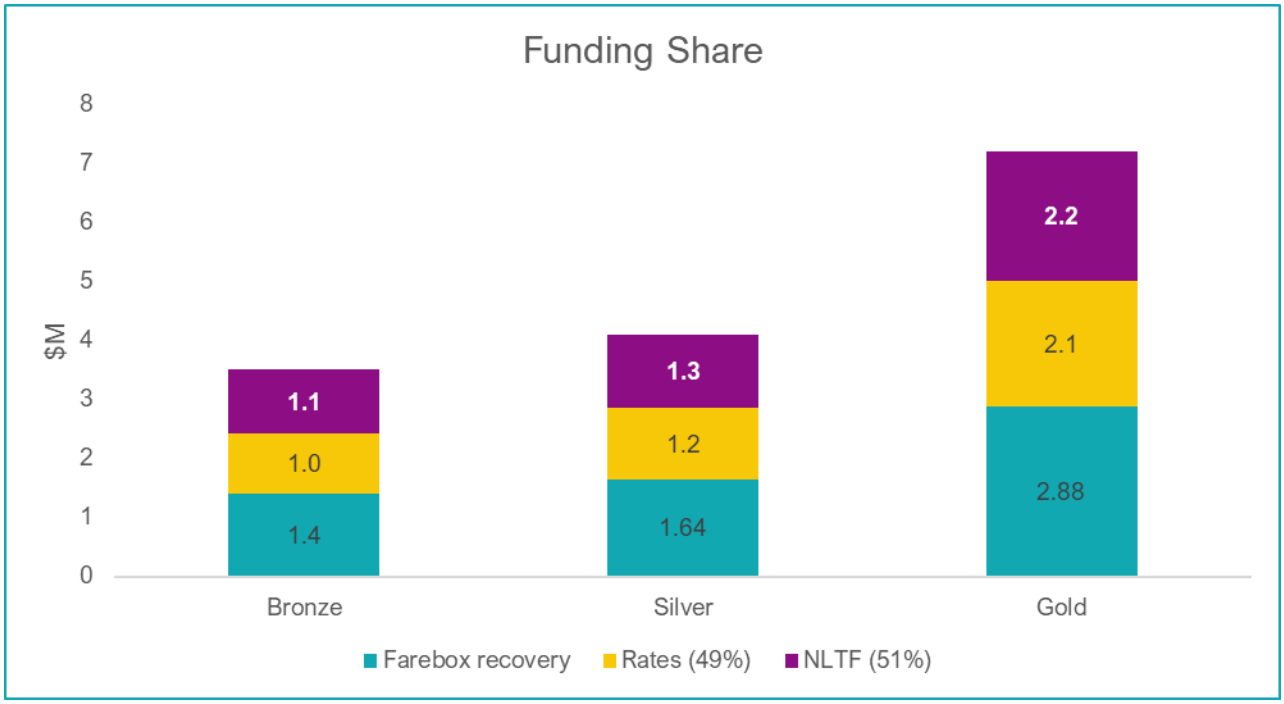


Figure 11-4 :Annual funding share based on frequency options

11.3 Funding risks and opportunities

The following is a high-level summary of key financial risks:

- **Inflation:** Inflation has been high over the last few years. Although this is decreasing there is still a risk that inflation may be higher than anticipated. As such, approved funding may not be sufficient.
- **Fare revenue:** This may be lower than projected and would impact the overall farebox recovery.
- **Funding approval:** There is a risk that funding for the 'Silver' and 'Gold' frequency may not become available over time. This will have an impact on the overall benefits that may be realised over time for the community.
- **NLTF Funding:** Risk NLTF is not available and alternative funding may need to be considered.

These risks and mitigations are further discussed in the Commercial Case.

a detailed look at the potential funding risks, opportunities, and mitigation measures is provided below.

[12] Table 17: Key Performance Indicators and Proposed Aspirational Targets *https://www.trc.govt.nz/assets/hero-images/Transport/Documents-Transport/TRC-Better-Travel-Choices-for-Taranaki-Strategy-Part-B-Regional-Public-Transport-Plan.pdf*

Funding Risks:

1. **Budget Overruns:** Project costs can exceed initial estimates due to factors like inflation, unexpected construction issues, or changes in scope.
    - **Mitigation Measures:** Conduct thorough feasibility studies and establish contingency funds. Regularly review and adjust budgets to reflect realistic projections.
2. **Limited Government Funding:** Reliance on government funding may pose risks if political priorities shift or budgets tighten.
    - **Mitigation Measures:** Diversify funding sources by seeking partnerships with private investors, applying for grants, and exploring public-private partnerships (PPPs).
3. **Economic Downturns:** Economic recessions can lead to reduced public and private sector investment.
    - **Mitigation Measures:** Develop flexible financial plans that include phased implementation, allowing adjustments based on available funds. Maintain strong fiscal management practices.
4. **Public Opposition to Fare Increases:** Resistance to fare increases can impact revenue streams.
    - **Mitigation Measures:** Engage in transparent communication with the public about the benefits of the bus network improvements and the necessity of fare adjustments. Implement incremental fare increases paired with service enhancements.
5. **Underutilisation of Services:** Lower-than-expected ridership can result in revenue shortfalls.
    - **Mitigation Measures:** Invest in marketing campaigns, enhance route planning, and ensure the service meets community needs. Offer introductory discounts and loyalty programs to encourage usage.

Funding Opportunities:

1. **Government Grants and Subsidies:** National and regional governments often provide grants and subsidies for transportation projects.
    - **Optimisation Measures:** Stay informed about available grants and application deadlines. Prepare comprehensive proposals that clearly demonstrate economic, social, and environmental benefits.
2. **Public-Private Partnerships (PPPs):** Collaborating with private entities can increase investment and share financial risks.
    - **Optimisation Measures:** Identify potential private partners early and structure agreements that align incentives. Ensure transparent and mutually beneficial terms.
3. **Green Bonds and Sustainable Financing:** Capitalising on the growing interest in sustainable finance can attract environmentally conscious investors.
    - **Optimisation Measures:** Develop projects that meet sustainability criteria and apply for green bonds or other sustainable financing options.
4. **Innovative Revenue Streams:** Explore non-traditional revenue sources such as advertising, leasing retail space at major bus stations, and offering premium services.
    - **Optimisation Measures:** Evaluate and implement diverse revenue-generating strategies that complement the core service.

By identifying and addressing these funding risks and leveraging opportunities, Taranaki can successfully develop robust and sustainable bus networks. The outlined mitigation measures ensure a balanced approach, fostering financial stability and project success.

Specific to this project, there is potential for:

- Modifying fares
- Changes to service patterns

This could ensure minimal investment while maximising outcomes.

11.4 Affordability

Given the current funding constraints, consideration has been given to staging the improvements (increases) in frequency over time.

The ‘Bronze’ option is estimated to have similar operating cost as the existing option and as such will require the same funding requirements as the current bus network. Minimal additional funding is sought and, as demonstrated through the Economic Case, it will provide greater benefits than the current network.

As funding becomes available and growth occurs, funding will be sought through an addendum to this SSBC for increased frequencies for the ‘Silver’ and ‘Gold’ options.

It is further noted that service improvements can be progressed even if some or all of the infrastructure spend is not committed. For example, routes can be put in place with bus stop and shelter infrastructure following after.

This approach allows for positive changes within the budget that currently exists.

In summary, from an affordability perspective, it is stressed that the preferred option can deliver positive service changes **without** significant investment to start, and that this can be improved with increased frequencies over time.

COMMERCIAL CASE

Taranaki Public Transport SSBC

12 Commercial Case

The Commercial Case serves to answers the following questions for procurement of public transport within Taranaki:

- Is procurement of the preferred option commercially viable?
- Can the market deliver the preferred option?

As this case shows, the answer to both questions, at this point in time, is a 'conditional' yes based on the following:

- There is budget for bus operations within the Local Transport Plan.
- There are existing contracts in place with a bus operator that have been in place for multiple years.
- Proposed costs and network changes are not significantly different to current – especially as the proposed implementation is staged.
- Changes by implementing the preferred option are minor in terms of network changes and public transport infrastructure required.
- There are potential changes by changing over to an Electric Vehicle Fleet – which will take place with the new contract commencing in 2026.

These unknowns result in the 'yes' being conditional. To support this 'yes', the Commercial Case demonstrates that the preferred option is able to be procured in a viable and cost-effective manner and that risk is distributed fairly. Supporting information includes details on:

- Understanding of current and future procurement contracts for bus services – particularly options that have been in place in New Zealand in the past and potential future options;
- Understanding the current market place and what is realistically achievable; and
- Providing opportunities for network changes.

Finally, the Commercial Case summarises how the proposed procurement is commercially attractive and delivered, and how that the delivery mechanism (procurement) allocates risk fairly.

12.1 Summary of Preferred Option Implementation

From an infrastructure planning, design and construction perspective, the proposed updates for the preferred options are not overly complex.

Chapter 8 provides further details on the proposed network. A map of the network is summarised in **Figure 12-1**.

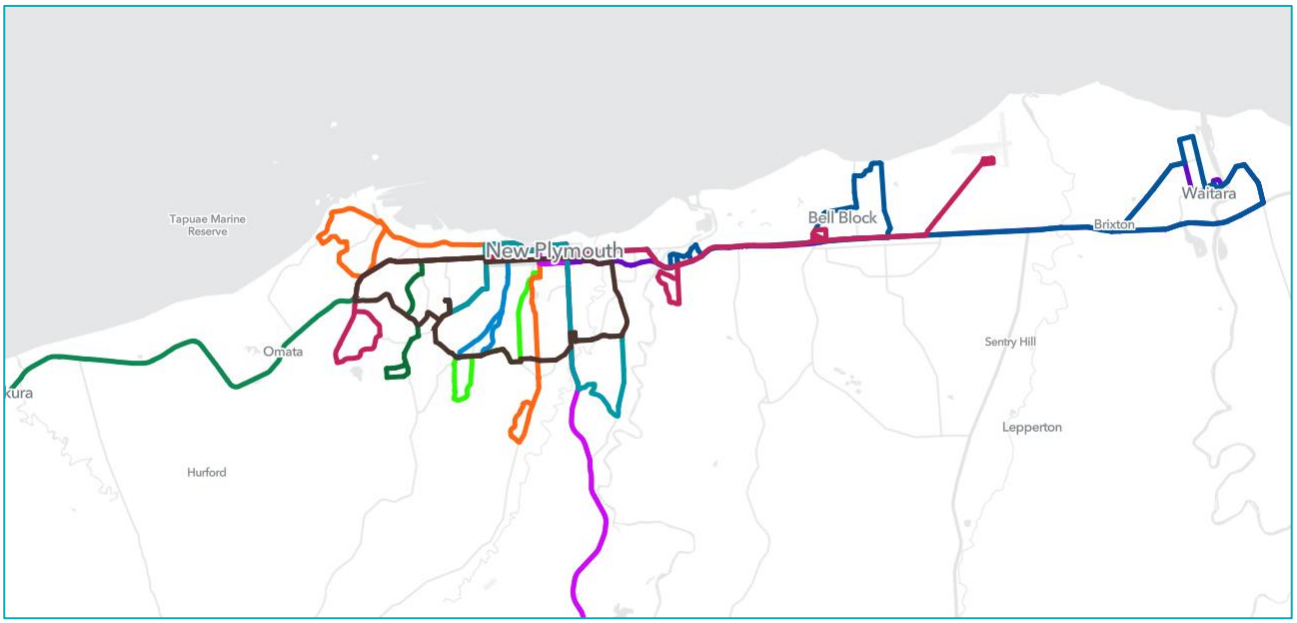


Figure 12-1 : Preferred Network Option

It is noted that the preferred option will be considered as a staged approach. The stages or options are listed as Bronze, Silver, and Gold. The network remains the same for each of the options, with the differences being that the service frequencies and hours of operation increase over time. A summary of the frequency options is provided in **Table 12-1**.

Table 12-1 : Frequency Changes

Option	Details
Bronze	Current headways with some increases on key corridors during peak hours (40 minutes)
Silver	30 min headways across the network during peak hours with key corridors having 15min headways
Gold	15min headways across the whole network during peak hours

In terms of the options, there are two components to commercial delivery as summarised in **Table 12-2**.

Table 12-2: Commercial Delivery Components

Component	Details
Infrastructure installation	• Infrastructure installation including bus stops and shelters for the new network
Procurement	• Procurement of bus services and operations including purchasing of vehicles

Breaking the option down to two parts serves to minimise disruption. However, keeping the public informed of changes, particularly about network changes, will be key.

12.2 Procurement/programme management strategies that might be required

TRC currently procures a bus operations contract with an operator for bus services in the Taranaki Region.

TRC will undertake the updating of procurement contracts leading into a new 2026 contract. The new contract, while not changed, will consider the proposed network, Ministry of Transport Requirements, the current Transport GPS, and will be flexible to allow changes in the network.

As of the completion of the business case (2 October 2024) the following is noted from a procurement perspective:

- A procurement plan will be established at the start of the contract – timeline for tendering will be included in this (around a one-year period).
- Procurement will consider proposed network and vehicle kilometres, purchases of buses and percentage of EVs.
- Increased service provision and provision items with variable rates e.g. three years or nine years to allow for changes.
- Provisional items and changes included.

In short, though there is a current mechanism for procurement, the new procurement is proposed to be for nine years and there is room for flexibility.

It is important to note the key timeframe of going to market late 2024 or early 2025 for procurement. Operators are then provided a year to consider changes with implementation then undertaken in April 2026.

12.3 The financial implications of the proposed procurement strategy

There are two financial considerations for this business case:

1. Operating costs via procurement
2. Infrastructure costs (in the form of bus stops and shelters)

These are summarised in more detail below.

12.3.1 Operational costs

RLTP provides details on operational costs strategically.

There are three options that can be considered with the preferred option – these are noted as Bronze, Silver, and Gold. The annual operational costs for these options in 2024 dollar values are as shown in **Table 12-3**.

Table 12-3 : Indicative Operational Costs per annum ($millions)

Option	Indicative Annual Operating Cost / year	NPV
Bronze	$3.5M	$66M
Silver	$4.1M	$75M
Gold	$7.2M	$134M

As previously noted, there is a staged approach that will increase over time, with procurement contracts providing flexibility.

12.3.2 Infrastructure Costs

With a change in network there are required infrastructure costs which are estimated to come in under $2M in 2024 dollars for the inclusion of new bus stops and shelters.

Stops and shelters are priced at $25k, so this allows for a maximum of 60 bus stops and shelters with a contingency built in.

This is a worst-case estimate, as there is an option to reuse shelters from existing network – that can be sought. Current funding being requested. It is proposed as follows.

Table 12-4 : Infrastructure Costs

Year	Number of Stops and Shelters	Cost
First year	60	$1,500,000
Contingency	Contingency	$500,000

Note: There is also a possibility to recycle current stops and shelters which would reduce the above price. The contingency also considers removal of existing bus stop and shelter infrastructure not required by the network changes.

Potential funding options are as shown in the table below.

Table 12-5: Potential Funding Options

Funding Option	Details
RLTP Budget	Noted $22M in NLTP
LTP Budget	To be provided when available
Parking Strategy Revenue	To be provided when available
Other revenue	To be provided when available

Additional infrastructure treatments can be considered in the future. The Business Case has identified a range of add on treatments and policy changes, and identified where they are compatible, where they can be considered as part of the business case, or where they can be considered through other avenues. Once the network is in place, the proposed new Joint Committee can make decision on these treatments that would enhance the network moving forward.

12.4 Risk allocation and transfers – charging mechanism and contractual arrangements

A list of potential risks is provided below. Details are included below on how potential risks in the subsequent phases will be allocated between public and private sectors. This should be reflected in contractual arrangements.

Procurement Process Risks

Table 12-6 : Procurement Process Risks

Risk	L	C	Rating	Mitigation	Owner
No competition for the tender	P	E	High	Request for information assists to identify the level of market interest	Taranaki Regional Council
Changes in government policy and funding priorities generates uncertainty	P	M	Medium	Continue to discuss the planned approach with NZ Transport Agency	Taranaki Regional Council
Delays in the procurement	A	E	High	Delays occurring as a result of factors outside of the team's control will impact on the timeliness of the contract award	Taranaki Regional Council

Risks in contract mobilisation and delivery

Table 12-7 : Contract Mobilisation and Delivery Risks

Risk	L	C	Rating	Mitigation	Owner
Insufficient resources or finances to deliver the services	P	M	Medium	Requirement for contract mobilisation plan to establish an agreed approach prior to contract starting	Contract manager
Service changes do not revitalise patronage	L	M	Medium	Approach will need to be flexible and responsive to demand and reviewed once underway	Contract manager
Transition to new electric bus technology	L	M	Medium	The contract mobilisation plan and zero emission plan will provide transparency. Questions in the RFP seek to confirm a good level of understanding prior to awarding the contract.	Consultant in charge of procurement and Contract Manager

Operational and procurement risks

Table 12-8 : Operational and procurement risks

Risk Category	Taranaki Regional Council	Potential Risk Allocation	Shared
Bus stop complexity			
Electric Buses			

Risk Category	Taranaki Regional Council	Potential Risk Allocation	Shared
Bus charging			
Operating cost changes			
Operating risks			
Waka Kotahi funding			
Change in price			
EV fleet availability			
NLTF funding availability			

12.5 Contracts and implementation timescales

The proposed contract will be consistent with central government bus procurement contract requirements.

These are proposed to be drafted in early 2025, as operators are required to have one year lead in time. It is noted that contracts are:

- Proposed to be in place for nine years

There is an opportunity to review yearly to ascertain network changes and specific fleet requirements.

- There is potential for the proposed Joint Committee as referenced in the Management Case

Note: This work is ongoing with an independent consultant for Taranaki Regional Council. This consultant has been consulted throughout development of the business case to ensure alignment

12.6 Capability and skills of team required to deliver the project.

This will be identified within the future procurement plan. Currently there is an independent consultant consultation helping manage this process.

12.7 Risk and uncertainty

Relevant risks for procurement and operation are captured in section 12.4. Additional risks and uncertainty are provided below.

Table 12-9 : Risks and uncertainty

Risk	Details	Mitigation
EV fleet availability	There is a shortage of EV buses around the world. This could impact	Staging of EV fleet adaption is a possible way forward

Risk	Details	Mitigation
	MoT requirements for EV fleet moving forward.	
Funding	Government funding is limited	Staged approach from bronze to silver to gold in terms of optioneering is currently proposed.

Further risks will be added at a future stage of the project once procurement is complete.

12.8 Consenting Plan and Strategy

No consenting plan or strategy is considered necessary for this particular business.

Installation of bus stops and shelters will be managed consistent with Taranaki Regional Council current arrangements with the relevant territorial authority.

12.9 Property Plan and Land Acquisition

No Land Acquisition is required as part of the business case recommended option

12.10 Required services

The required services include:

- Bus operations via a contract to service the proposed network with agreed headways (which is subject to change over time)
- Bus infrastructure instalment consistent with TRC construction requirements

It is noted that these services are currently being prepared for TRC by an independent consultant, and that this business case relies on information provided as part of this process.

12.11 Contract provisions

While specific contract provisions have not been included at this point in time, as they are due to be completed soon. The following comments are noted.

The following components should be considered by the consultant as procurement contracts are progressed and finalized.

Question	Answer
Will TRC be the main delivery agent for the preferred option?	Noted that TRC will be the main delivery agent.
What role will New Plymouth District Council have in the process – e.g. delivery and ongoing management or maintenance?	Yes, and this will also be further enhanced by the development of the Joint Committee
Procurement timeframes	Released by Early 2025, with commencement in early 2026 – noting that operators need one year lead in time.

Question	Answer
Procurement plan and alignment with New Zealand Transport Agency processes.	Independent consultant is currently working on this for TRC.
Partnering delivery model?	Independent consultant is currently working on this for TRC.
Timeframes for contract of supplier?	9-year term commencing 2026.
Market and supply assessment?	Independent consultant is currently working on this for TRC.
Procurement timeline Key stages include: • Pre-procurement • Tender • Evaluation • Post-evaluation	Independent consultant is currently working on this for TRC and it is noted it will be consistent with SPTF.
Will a single RFT process be utilized? E.g. for: • Provision and management of a suitable bus fleet (zero emissions) • Provision and management of driver workforce • Provision and management of personnel to support operation	Independent consultant is currently working on this for TRC and it is noted these will be included.
Contract provisions: • Contract mobilisation plan? • Zero Emissions Plan? • Quality Assurance Plan? • Annual business plans • Health and Safety Plan • Hand Over Plan	Independent consultant is currently working on this for TRC.
Supporting infrastructure: • Will new public transport infrastructure assets be delivered by New Plymouth District Council?	To consider via management case and ongoing governance model for public transport.

Question	Answer
• Could this be low cost/low risk programme? If so, no business case is required? • Maintenance – will that be through existing arrangements?	
Commercial risks: • Any council risks based on failure to raise revenue via fare or rates • Low profits equal low interests?	To be considered by Taranaki Regional Council as part of the procurement process.

MANAGEMENT CASE

Taranaki Public Transport SSBC

13 Management Case

The purpose of this management case is to put in place appropriate arrangements for the successful delivery of the business case – and future management and delivery. Specifically, the case helps to refine the preferred option together with the financial and commercial cases and summarizes the following:

- **Project governance**: How the project is proposed to be governed ensure the project has appropriate oversight
- **Risks and uncertainties:** Provides a summary of risks and uncertainties
- **Business changes:** How these will be owned and managed
- **Monitoring:** How activities will be monitored, specifically against assumptions, and where key trigger points are for project start and benefit realisation.

This is done by providing specific details on the following arrangements:

Table 13-1 : Details on Arrangements

Arrangement	Details
Programme Management and Governance	Details on the type of Governance system to be utilized, and if appropriate Programme Management system to be put in place
Project management	Details on the specific project management systems, how these may operate, if they are compliant with NZTA requirements and relevant roles
Change management	Processes in place to manage changes as they occur including mitigation measures
Benefits management	Details on benefit realisation
Risks and uncertainty management	List of potential risks and uncertainties and how they will be managed along with mitigation measures
Consenting strategy	Not required as part of this specific business case
Post-implementation evaluation	Details on evaluation after the new bus network is implemented

13.1 Programme Management and Governance

13.1.1 Programme Management

Traditional programme governance for this type of project is as follows:

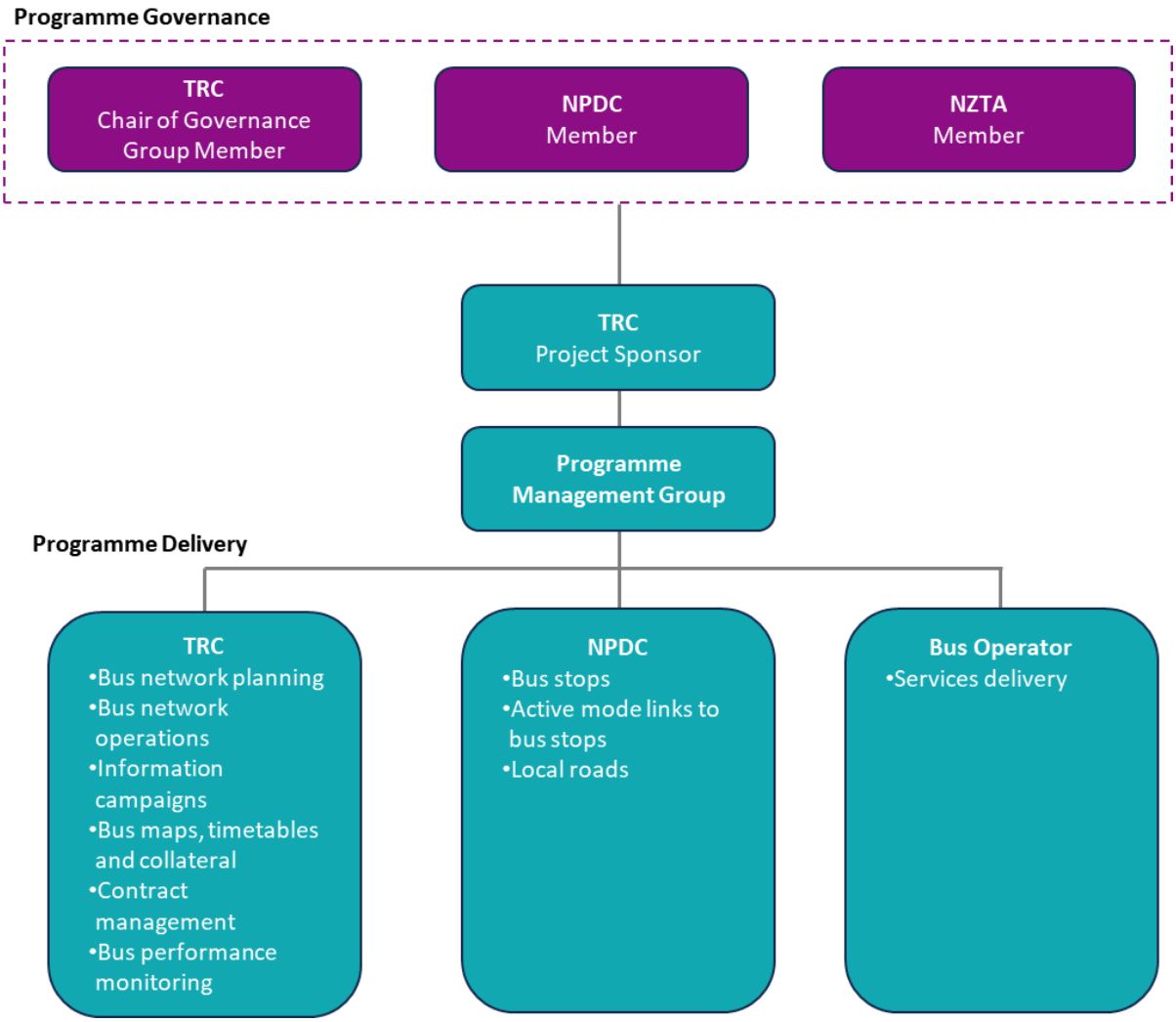


Figure 13-1 : Governance

While this can be considered as a base, governance arrangements and a joint committee between Taranaki Regional Council and the New Plymouth District Council are recommended given the significant interdependencies that exist between TRC's operational activities and NPDCs planning and infrastructure investment roles.

13.1.2 Governance

It is understood that a governance level Joint Committee is currently being developed with a Terms of Reference. As a minimum the committee is proposed to consist of the following members:

- Elected members of territorial authorities
- Elected members of the Taranaki Regional Council
- Other key stakeholders.

The establishment of such a committee has potential to achieve real change in the provision of public transport for the region by ensuring better alignment between planning and investment decisions that impact on the effectiveness of the public transport network.

Key purpose/outputs/understanding:

- Committee will create better alignment between respective council's functions for improving PT

- Provide better coordination between:
    - Land use development
    - Parking management
    - Public transport
    - Travel demand management
    - Infrastructure investment
- Committee utilized as a governance model to delegate and support:
    - Various interventions (bus stops, bus priority measures, and management of parking in and around the City Centre
    - Development of a refreshed public transport network

Note: At the time of this business case being prepared both Taranaki Regional Council and New Plymouth District Council had agreed in principal to the development of a Joint Committee, and the specific details were being discussed. Making decisions affecting public transport services and infrastructure together will increase the likelihood that the anticipated benefits of this business case are realised.

Once a Terms of Reference is developed it should be attached and referenced in this business case. The terms of reference will also include the option for assessing/considering treatments developed via the NZTA Intervention Hierarchy in section 8.4.1 of the SSBC and within Appendix A

13.2 Project management

From a project management perspective, there are already approved project management strategy, frameworks, and plans in place within the Taranaki Regional Council to manage changes effectively and appropriately to the network and infrastructure inclusion. This is as follows:

Table 13-2: Project Management Details

Component	Details
Network Changes	Procurement of bus services is currently being managed by TRC, and there is work being undertaken currently through an independent consultant to update procurement opportunities for the coming nine years. There is an assumption that the PT operator would monitor performance of the network and would work with relevant entities and NPDC to refine and adjust the network over time in response to changes in demand.
Infrastructure	Infrastructure will be managed through existing project management procedures: It is noted that TRC follow both the: • Transport Services project manual (SS011), and • Have their own approach which is based on a proven project management methodology. There are not considered to be major project management implications or consideration for this project as it involves two key steps:

Component	Details
	• Changing network from existing to recommend over 12 months to 18 months • Adding additional bus stop and shelters will be done in conjunction with updates (any planning requirements etc will be addressed on a corridor by corridor basis) To provide these updates the following actions will be undertaken: • NPDC and TRC will work together on staging and updates • The Governance group will be informed as network changes progress. • Relevant SM011 manual requirements will be followed as appropriate. Finally, it is noted that network changes won't be set up as a project, so will slowly and surely change routes and infrastructure.

Reporting arrangements

It is noted that the joint committee should receive regular network performance reports to allow it to determine if the network needs to be refined or if additional investment is required in order to achieve benefits. This links specifically to the benefit realisation plan as detailed below.

13.3 Stakeholder Engagement Plan

Extensive stakeholder engagement has already been undertaken throughout the business case to bring both stakeholders and the community on the journey as a new preferred bus network is proposed for New Plymouth and the wider Taranaki region.

This has specifically been undertaken in two phases as follows:

Table 13-3: Stakeholder Engagement Plan

Phase	Details
Phase 1: Hop on Board	The team collected feedback on ideas on specific bus services, frequency, and timetables to make bus travel more attractive and provide more travel choices – 22 April – 6 May 2024.
Phase 2: Where to Next	The team asked the community to compare two short listed bus network options and detail which one they preferred – between 22 May - 11 June 2024.

With the above in mind, it is noted that the community has a strong understanding of the proposed bus network changes. It is further noted that the changes proposed are operational changes to the network with associated infrastructure changes to support the new corridors. As such they are considered relatively minor in nature.

With the implementation of a new network, it is envisaged that TRC will develop a Stakeholder Engagement Plan to provide updates to the community on how the bus network is changing and when it will change. In short, genuine customer insight should drive monitoring and effectiveness of the network. The plan should target both stakeholder groups and the customers (and potential

customers) of the services so that TRC is able to respond to changes in customer expectations and adjust the programme accordingly. The plan should include the following 10 individual components:

Component	Details
Objectives	Clearly outline the goals of engaging with stakeholders. This could be to gather input, build support, foster partnerships, or ensure transparency.
Stakeholder Identification	Identify all relevant stakeholders. This includes individuals, groups, or organisations affected by or interested in your project or initiative. Categorise them based on their level of influence and interest
Stakeholder Analysis	Analyse stakeholders to understand their perspectives, interests, and potential impact on the project. Determine their needs, expectations, and concerns.
Engagement Strategies	Develop tailored strategies for engaging with different stakeholder groups. This may involve meetings, workshops, surveys, focus groups, or regular updates, ensuring that each approach is appropriate for the audience.
Communication Plan	Create a detailed communication plan outlining how and when information will be shared. Define the channels (e.g., email, social media, newsletters) and frequency of updates.
Roles and Responsibilities	Assign clear roles and responsibilities for managing stakeholder relationships. Identify who will lead the engagement efforts and who will act as the primary point of contact for each stakeholder group.
Timelines	Establish timelines for stakeholder engagement activities. Schedule key milestones, deadlines, and review points to keep the process on track.
Feedback Mechanisms	Implement mechanisms for feedback collection and analysis. This can include surveys, comment forms, or interactive sessions to ensure stakeholders have a voice and their input is considered.
Monitoring and Evaluation	Set up processes for monitoring and evaluating the effectiveness of the engagement plan. Track progress, measure outcomes, and make necessary adjustments based on feedback and results.
Risk Management	Identify potential risks related to stakeholder engagement and develop mitigation strategies. Prepare contingency plans for handling conflicts or challenges.

13.4 Change management

The Ministry of Transport requirements for public transport notes that by 2025, the Government will only allow zero-emission public transport buses to be purchased. It is further noted that the commitment targets complete decarbonisation of the public transport bus fleet by 2035.

The preferred option includes a new bus network which will have impacts on existing business and services.

Key changes are as follows:

Table 13-4 : Key Changes

Change	Impact	Arrangements and Mitigation Measure
Changes to bus routes	• More vehicle km travelled	• Any new bus contract to consider the new network
Changes to bus routes	• New Bus infrastructure – like bus stops	• Updating of Council PT Asset system
Changes to bus routes	• Driver training	• Driver training on new stops, routes, and layover
Increase in EV fleet	• Procurement of new buses	• Add into new procurement contract EV fleet *Note: Worldwide best ration is 80/20 EV to Diesel, but NZL policy doesn't allow for this.*
Change to EV fleet	• Charging stations and links to layover areas	• Consider charging infrastructure on route and at depots
Changes to bus routes and EV Fleet	• Changes to contract and prices	• Consideration of EV and charging along the route for current and future network
Staging of network	• Education and community engagement	• Public engagement

13.5 Outline Activity Plan

Normal approach is as follows:

Table 13-5:Activity Plan

Project	Covers	Timeframe
SSBC	Approval of network changes	September 2024
Pre-implementation	Staging and ascertain of bus stop's location	October 2024-25

Project	Covers	Timeframe
Procurement strategy put in place	Operation	Early 2025 to 2026 working with bus operators.
Implementation	Construction of bus stops etc	Implementation

Estimated programme for delivery of the bus network is as follows:

Table 13-6 : Estimated Programme for Delivery

Route Change	24/25	25/26	26/27	27/28
Route: New Plymouth Routes				
Route: Orbital				
Route: Regional Services				
Route: Hawera Service				

13.6 Benefits management

The following benefits have been identified and need to be monitored, and adjustments made to the network, if they are not being realised. There is also the potential by reviewing these benefits to consider other identified interventions (as detailed within the option development component of this business case) to achieve and realise greater benefits.

Table 13-7 : Benefit Management

Benefit	Key Performance Indicator	Non-monetized benefit measure	Target	Responsibilities
Benefit One: Improved Customer Experience				
KPI 1	Increased percentage of the population living within 500m of a bus stop.	Current percentage of population based on 2024 data (Remix)	Increase of 20% by 2030	TCC
KPI 2	Increased percentage of the population living within 500m of a bus with service frequency of at least 2 per hour	Current percentage of population based on 2024 data (Remix)	Increase of 10% by 2030	TCC

Benefit	Key Performance Indicator	Non-monetized benefit measure	Target	Responsibilities
KPI 3	Increased percentage of customer survey responses rating public transport as their mode of choice	2024 survey to be used as a base	Increase of 20% by first year	TCC
KPI 4	Increased proportion of population living within 30 minutes of a job by public transport	Current percentage of population based on 2024 data (Remix)	Increase of 25% by 2030	TCC
KPI 5	Improved travel time by public transport	Current corridors as of 2024 travel time	10% improvement within 1 year	TCC
KPI 6	Increased annual public transport patronage	Current 2024 ridership will be utilized	25% improvement by 2030	TCC
Benefit Two: Reduction in Greenhouse Gas Emissions				
KPI 7	Reduced transport emissions in Taranaki	Emissions based on current as of 2024	Net zero by 2050	TCC
KPI 8	Reduction in vehicle kilometres travelled (VKT) by private vehicles	VKT based on current as of 2024	Reduction of 20% by 2030	TCC
KPI 9	Increased public transport modeshare	Modeshare current as of 2024	Increase of 20% by 2030	TCC

Key required tasks moving forward at the next stage of the business case:

- Reassess KPIs at a future stage of the business case
- Undertake an ILM and update Problem Statements, Benefits and Investment Objectives at a future stage of the business case.
- Develop supporting evidence of the updated Problem Statements
- Undertake future economic assessments, especially for Silver and Gold options
- Updated Investment Prioritisation method

Monitoring

Monitoring patronage, demand (eg new houses on the network/changes in density etc) and adjusting levels of service accordingly is key to the success of this business case. This is where benefit realisation is key.

The business case acknowledges that over time the distribution of demand will change on the network and, especially with the adoption of the Bronze level of service in the first instance, an adaptive approach will be required to increasing levels of service and adjusting/refining routes as patronage rates rise and as urban form changes will be essential to achieve the investment objectives. It is important to monitor both demand (eg patronage) and supply side (increases in urban density or new greenfield housing in accordance with the Future Development Strategy) so that Council has a comprehensive understanding of changes that might require adjustments to either frequency or routes over time. It is suggested that the annual report examine these indicators and in tandem with recommendations from operators the Council consider minor tweaks or adjustments in level of service to respond to these changes whilst maintaining direction toward achieving the silver or gold levels of service over time. In addition, additional interventions can be considered as well.

13.7 Risk and uncertainty management

As with any project there are several key risks and uncertainties that may eventuate during the project.

An initial risk assessment has been undertaken with Taranaki Regional Council and Waka Kotahi. Several key risks were identified and allocated a risk rating along with possible consequences and mitigation measures.

The Project Manager is responsible for managing project risks and will maintain the risk register. Risks will allow for any specific requirements for risk management, planning and reporting through the Governance Group – and if required – back to Waka Kotahi.

Risk management moving forward will be consistent with TRC project risk framework. Add details.

Risks are provided below,

Table 13-8 : Risks and Uncertainty Management

Risk or Uncertainty	Risk Rating	Consequence and mitigation measures
Financial		Financial risk includes limited budget and also potential risk from requirements for fare box recovery. Staging is the mitigation measure for this risk. While the gold option is the preferred, the pathway to get there is through bronze and silver. In addition, by considering treatments separately via the joint committee, these can be considered and added over time.
Political		Public Transport is highly political in both the Taranaki Region and more generally within New Zealand. A way to address this will be through a clear multi partner governance group that can help align messages.

Risk or Uncertainty	Risk Rating	Consequence and mitigation measures
Cost estimate		At this stage the accuracy of costs, in particular for bus infrastructure such as stops and shelters, is unknown. Staging of the network and the ability to provide additional treatments and interventions in the future reduces the risk of ambiguity.
Safety during installation		Managed by Council processes
Property		Highly unlikely but there might be some minor property acquisition associated with bus stops
Delays on EV Buses		With MoT having a requirement from 2025 all new buses must be carbon neutral and Electric, there may be delays on the provision of these vehicles. Potentially requesting slower adoption of EV fleets will be a mitigation measure.
Funding risk		NLTF funding may not be available – alternative funding should be considered.

Note: Other risks will be added as the business case is updated. The list is current as of September 2024.

13.8 Consenting strategy

No consenting strategy is considered to be required as part of this project

13.9 Safety in Design

The majority of changes proposed are network and operational changes. As such there is no Safety in Design activity considered as part of this SSBC. Route changes have also been considered and will be further tested with operators during contract lead in times.

The only infrastructure to be included as part of the network change options includes:

- Installation of bus stops and shelters.

As these are minor in nature, and as TRC already has processes in place to manage their installation, it is proposed that these are managed on an ad hoc basis during implementation.

13.10 Road Safety Audit

As the recommended option is based on service changes, No Road Safety Audit has been undertaken as part of this SSBC.

Any installation work in terms of bus stops and shelters is considered to be minor in nature and will be considered during implementation.

13.11 Parallel Estimate

It is noted that there is no parallel cost estimate being undertaken as part of this SSBC. This is as the option is majority service changes that will be managed via procurement.

A peer review is being undertaken as part of this business case.

13.12 Economic Peer Review

No economic peer review has been undertaken as part of this SSBC. This is as minimal funding increases are being sought at this point in time.

13.13 Cost Management

The Project Manager is responsible for on budget delivery of infrastructure costs. Operational costs are set within in a bus procurement contract.

The bus procurement contract is outside of this project, but will consider:

- Bus network kilometre length and frequency
- EV requirements as set by the New Zealand Government.
- Staging of the proposed bus network.

13.14 Post implementation evaluation

To be completed once bus contracts are finalized.

14 Conclusions

This SSBC sets out the rationale for investing in an improved public transport network in Taranaki. Based on the information provided throughout this document. Given the current funding constraints, it is recommended that a staged approach to increasing frequency over time is recommended to:

- Improve public transport for the community over time;
- Contribute to the visions sought under the RPTP; and
- Provide for growth in a sustained manner.

Therefore, the following approvals are sought:

- **Approval of the preferred network option** with minimal additional funding requested.
- **Acknowledgement and endorsement of a staged frequency approach** with 'Gold' being the desired frequency option where further funding will be sought when available. Noting that an addendum to this SSBC will be undertaken including an updated BCR.
- **Agreement to the establishment of a Joint Committee** between Taranaki Regional Council and New Plymouth District Council to facilitate and support the development of public transport moving forward.

Key required tasks moving forward at the next stage of the business case:

The following key tasks are noted:

- Reassess KPIs at a future stage of the business case
- Undertake an ILM and update Problem Statements, Benefits and Investment Objectives at a future stage of the business case.
- Develop supporting evidence of the updated Problem Statements
- Undertake future economic assessments, especially for Silver and Gold options
- Updated Investment Prioritisation method

A

Appendix A – Intervention Hierarchy Treatment

APPENDIX B - INTERVENTION HIERARCHY TREATMENTS

Intervention Hierarchy	Theme and Treatment	Outcome	Comments
Integrated Planning	New zoning allowing for no parking	Outside of this Business Case	Wider/broader policy review
Integrated Planning	By laws and enforcement strategy	Outside of this Business Case	Wider/broader policy review
Integrated Planning	Work with developers and KO to lift density along corridors	Outside of this Business Case	Wider/broader policy review
Integrated Planning	Council FDS	Outside of this Business Case	Wider/broader policy review
Integrated Planning	Reduce speed limits for private vehicles to make travel times for PT more competitive	Outside of this Business Case	Wider/broader policy review
Integrated Planning	Subdivision standards to include requirements for PT stops and infrastructure as part of consenting. Plus funding via Developer	Outside of this Business Case	Wider/broader policy review
Integrated Planning	Masterplanning and structure planning to consider PT	Outside of this Business Case	Wider/broader policy review
Integrated Planning	Working with other service providers to consider intermodal transport hubs, community service hubs	Outside of this Business Case	Wider/broader policy review
Manage Demand	Parking Pricing policy/ parking controls (time of day, enforcements)	Outside of this Business Case	Wider/broader policy review
Manage Demand	Congestion charging	Outside of this Business Case	Wider/broader policy review
Manage Demand	Fare policy / free fares	Outside of this Business Case	Fares will be reviewed as a separate process
Manage Demand	Licensing fees/ RUC	Outside of this Business Case	Wider/broader policy review
Manage Demand	Charging for use of Park and Ride facilities	Outside of this Business Case	Wider/broader policy review
Manage Demand	Staggering school hours to manage demand	Outside of this Business Case	Wider/broader policy review
Manage Demand	Employment travel plans	Outside of this Business Case	Wider/broader policy review
Manage Demand	Event management and planning - ways to encourage uses of PT	Outside of this Business Case	Wider/broader policy review
Manage Demand	WFH incentives	Outside of this Business Case	Wider/broader policy review
	Optimizing Road Infrastructure		
Best use of Existing Infrastructure	Reallocation of road space for bus lanes/ SVL	Proceed	To be considered through the management case
Best use of Existing Infrastructure	Shoulder running for buses	Proceed	To be considered through the management case
Best use of Existing Infrastructure	Signal optimisation i.e. bus priority at signals - AKA Bus Booster	Proceed	To be considered through the management case
Best use of Existing Infrastructure	Park and Ride facilities at existing key locations i.e. TSB Stadium	Proceed	To be considered through the management case
Best use of Existing Infrastructure	Last mile and first mile connection	Outside of this Business Case	Wider/broader policy review
Best use of Existing Infrastructure	Location of bus stops to existing amenities	Proceed	To be considered through the management case
Best use of Existing Infrastructure	Inlane bus stops	Proceed	To be considered through the management case
Best use of Existing Infrastructure	Bridge strengthening to accommodate electric buses	Outside of this Business Case	This will be considered after decisions are made on procurment, so will be considered within management case
	Customer service and road user experience		
Best use of Existing Infrastructure	Accessible buses	Proceed	To be considered through the management case
Best use of Existing Infrastructure	More bike rack on buses, e-scooter rack	Proceed	To be considered through the management case
	Technology		
New infrastructure	Ticketing systems	Proceed	To be considered through the management case
New infrastructure	Charging facitlies	Proceed	To be considered through the management case
New infrastructure	Wi-fi on buses	Proceed	To be considered through the management case
New infrastructure	Phone charging on buses	Proceed	To be considered through the management case
	Rural Community Services		
Manage Demand	Community shuttles	Proceed	To be considered through the management case
Manage Demand	Extended times for community services	Proceed	To be considered through the management case
	Network Design		
Manage Demand	Flexible hours of PT to match demand	Proceed	To be considered through the management case
Manage Demand	On demand services	Proceed	To be considered through the management case
Manage Demand	Increased frequencies	Proceed	To be considered through the management case
Manage Demand	Integrating and aligning MOE & TRC services	Proceed	To be considered through the management case
New infrastructure	Heavy Rail	Discontinue	Not considered at this time
New infrastructure	Integrated bus hubs/ transport centres	Discontinue	Wider/broader policy review
Manage Demand	New services within New Plymouth and outer townships	Proceed	To be considered through the management case
New infrastructure	BRT/Bus Ways	Discontinue	Not considered for this business case, however could be considered via futue policy direction
New infrastructure	New bus lanes -(road widening)	Discontinue	Not considered for this business case, however could be considered via futue policy direction
New infrastructure	New dedicated park and rides	Discontinue	Not considered for this business case, however could be considered via futue policy direction
New infrastructure	Light Rail	Discontinue	Population density insufficient for this to be feasible

B

Appendix B – EAST

Early Assessment Sifting Tool template

Early Assessment Sifting Tool: Excel template
The Early Assessment Sifting Tool (EAST) supports an initial coarse screening of alternatives and options. The EAST is designed to quickly and robustly rule out alternatives and options, allowing for a more manageable subsequent multi-criteria analysis exercise.

Project overview

Date:	15/04/2024
Project name:	Taranaki Public Transport Single Stage Business Case

Business case phase:	Single Stage Business Case
Problem/ opportunity statement:	The current bus services have largely been unchanged for the past 15 years. Services are complex and meandering, and with land use changes do r

Do-minimum:	The do minimum option includes current committed public transport (bus) projects or specific upgrades to both the network and vehicles that are currently approved for funding. It is not the do minimum required to mee the Investment Objectives for this Business Case.

Investment objective:	IO1 - Travel Choice: Where public transport is available, it is seen as the preferred mode of choice by 2050
Investment objective:	IO2 - Inclusive Access: A public transpoer service where 'no one is left behind' and connects more people to where they want to go
Investment objective:	IO3 - Environmental Sustainability: A public transport system that supports net carbon zero by 2050

Alternative or option details				Investment objective			Practical feasibility			Scheduling/ programming	Cost	Key risks and uncertainties	Climate change		Impacts on te ao Māori	Environmental and social responsibility		Fatal flaws		Other impacts		Summary of decision made	
Intervention types sourced from the intervention hierarchy[1]	Unique identifier	Name of alternative/option	Description of alternative/option	IO1 - Travel Choice: Where public transport is available, it is seen as the preferred mode of choice by 2050	IO2 - Inclusive Access: A public transpoer service where 'no one is left behind' and connects more people to where they want to go	IO3 - Environmental Sustainability: A public transport system that supports net carbon zero by 2050	Technical	Safety and design	Consentability				Mitigation	Adaptation		Identify	Mitigation Can these be avoided, remedied or mitigated?					Summary of decision made	Progress or discontinue this alternative/ option?
Integrated Planning	1	Do Minimum	The do minimum options includes current committed public transport (bus) projects or specific upgrades to both the network and vehicles that are currently approved with funding. It is not the do minimum required to meet the Investment Objectives for this Business Case.	2	1. Low	2	1. Green	1. Green	1. Green	0-2 years	< $1 million	While this is a do minimum option the key risk is that by not improving public transport the region moves further away from public transport and emission goals for the region.	Increase	No	To discuss with Iwi	No identifiable environmental, social or cultural effects	Yes	No environmental risks however from a social responsibility perspective a do minimum could put those in socially deprived area further at risk and create a wider divide between the haves and have nots.	No	As do minimum taken through automatically		No other impacts noted.	Progress	Yes
Best use of existing infrastructure	2	Access emphasized	The focus for this option is enabling the largest number of residents to have access to bus services. It is based on a coverage network, where the greater and more accessible (eg number of residents living within 400m of a bus stop is emphasized over enabling the largest number of people to use the network. In short a wide network with longer routes, possible feeder buses, and a focus on areas in need (social deprivation)	3	5. High	3	3.Amber	3.Amber	3.Amber	2-5 years	$5-$50 million	Key risk is a network is created where it has a high level of coverage but isn't an effective or useable transport system. This would result in people not utilizing the stem.	Reduce	No	To discuss with Iwi	No identifiable environmental, social or cultural effects	Yes	No environmental or social responsibility considerations from a 'coverage' based approach.	No	No fatal flaws		No other impacts noted.	Progress	Yes
Best use of existing infrastructure	3	Throughput emphasized	The focus for this option is on maximizing the number of people who utilize the bus network. Rather than looking at the greatest coverage, the option looks at key high priority corridors where more frequent services take people between key destinations.	5. High	3	3	3.Amber	3.Amber	3.Amber	2-5 years	$1-$5 million	A patronage based system by itself can be focused on moving a high number of people on a few select corridors, but not catering for the wider community who are away from these key locations.	Reduce	No	To discuss with Iwi	No identifiable environmental, social or cultural effects	Yes	The option focuses slightly more on people throughput than coverage - so potential for social responsibility issues as the network may not go to where people need it.	No	No fatal flaws		No other impacts noted.	Progress	Yes
Managing demand	4	mixed access and throughput emphasized	The focus for this option is reducing C02 Emissions via VKTs - so blends access to the network and throughput together. The environmental focus is specific for the Ios and looks at treatments from an environmental perspective rather than specifically a passenger perspective. By doing this it enables a broad range of options and treatments to be considered.	3	3	4	2.Amber/green	2.Amber/green	2.Amber/green	2-5 years	$5-$50 million	With a focus on Emissions over people movement a system could be created that doesn't specifically serve the needs of the community.	Reduce	No	To discuss with Iwi	No identifiable environmental, social or cultural effects	Yes	Potential issues for those living in deprived areas of Taranaki - the option has a focus on emissions over specific community needs.	Yes	Not consistent with GPS		No other impacts noted.	Discontinue	No
Best use of existing infrastructure	5	Balanced	The focus of the balanced option is to look at access (coverage), throughput (patronage) and environmental outcomes equally. Key parts of each of the componets, such as targeted connecting into specific areas, propritising high quality services where they will have the most benefit, and CO2 and VKT reductions are all key considerations in building the option from treatments.	4	4	4	2.Amber/green	2.Amber/green	2.Amber/green	2-5 years	$5-$50 million	Balancer can be difficult to get right, so careful considreration needs to go into balancing options.	Reduce	No	To discuss with Iwi	No identifiable environmental, social or cultural effects	Yes	No identifiable risks as this is a balanced option.	No	No fatal flaws		No other impacts noted.	Progress	Yes
New Infrastructure	6	Ambitious	The ambious option is exactly that. Ambitious! Nothing is off the table, and cost is not a key consideration. High quality options such as BRT, building new Park and Ride sites, as well as actively discouraging private vehicles are all key componets. See this as an option where you are not constrained by dollars or politics - anything can be done to create the 'perfect utopia' of a public transport system.	5. High	5. High	5. High	5. Red (difficult/complex)	5. Red (difficult/complex)	5. Red (difficult/complex)	5+ years	$50+ million	Build out that does not meet the needs of the community, and new infrastructure that doesn't deliver the highest benefits for indiviudal users.	Reduce	No	To discuss with Iwi	No identifiable environmental, social or cultural effects	Yes	The financial risk creates social responsibility implications.	Yes	Not feasible in current market		No other impacts noted.	Discontinue	No

C

Appendix C – MCA Assessment

Options		Investment Objectives						Scores	Impacts							
		Investment Objective 1		Investment Objective 2		Investment Objective 3			Te Ao Māori		Climate Change Mitigation		Climate Change Adaptation		Social and Cultural Impacts	
Ref No.	Option Description	Comments	Score	Comments	Score	Comments	Score	Base Score - No Weighting	Comments	Score	Comments	Score	Comments	Score	Comments	Score
New Plymouth network																
1	Do Minimum Option - Status quo based on consulted future public transport network	The agreed public transport network (assumption is committed) - based on consultation is an improvement on how the PT network currently operates - with an orbital and more practical connections. KP1: 1: No difference in percent of population living within 500m of a bus stop KPI 2: No differen	**1.0**	The option provides a step before leaving no one behind with a slightly more extensive network than what is currently proposed: KP1: 1: No difference in percent of population living within 500m of a bus stop KPI 2: No differen KP{ 3: Measured in management case	**1.00**	does input toward emission reduction with an updated network. KPI 7: Reduced transport emissions in Taranaki - limited change to current based on VKTs although no EV benefits considered KPI 8: Reduction in vehicle kilometers travel (VKT) by light vehicles - around a 5% change	**1.00**	**3.0**	To be completed by Iwi	**0.0**	No differences from a climate change perspective between options = consider removing criteria	**0.0**	There is no difference between options from a climate change adaptation perspective	**0.0**	Creates more social impacts by providing a base network that is not as connected as the other options	**-1.0**
2	Option 2 - Accessibility Option	While there is a positive in terms of making PT the mode of choice, the key focus of the network is more to provide coverage rather than making the specific public transport network the mode of choice: KP1: 85-90% of population living within 500m of a bus stop (Remix data) KPI 2: No key difference at no	**2.0**	This option serves to connect up a wider cross section of the community by providing great 'access' or 'coverage' the included treatments also provide greater accessibility, and the networks are as close to a 400m bus stop from every dwelling as possible. KP1: 85-90% of population living within 500m of a bus stop	**3.0**	There are some benefits in terms of higher ridership, but as the network is not as effective as a combined or throughput there is of a benefit than other options. KPI 7: Reduced transport emissions in Taranaki - 5-10% change - noting that EVs not considered KPI 8: Reduction in vehicle	**1.0**	**6.0**	To be completed by Iwi	**0.0**	No differences from a climate change perspective between options = consider removing criteria	**0.0**	There is no difference between options from a climate change adaptation perspective	**0.0**	Positive social and cultural impacts by connecting people to where they want to go and connecting via multiple modes to different locations	**2.0**
3	Option 3 - Through Put Option	As this option focuses on moving people effectively and efficiently on key corridors this option scores well against IO1 KP1: 1: This is around 50% of population - not high but you expect that with a throughput network KPI 2: From reviewing data in	**3.0**	there are benefits but as the network is smaller these are offset. KP1: 1: This is around 50% of population - not high but you expect that with a throughput network KPI 2: From reviewing data in remix ther is an increase of	**2.00**	Greater ridership equals great emission reduction. This option with a focus on moving people more effectively has moderate positive impacts KPI 7: Reduced transport emissions in Taranaki - 10% noting EVs not considered KPI 8: Reduction in vehicle	**2.00**	**7.0**	To be completed by Iwi	**0.0**	No differences from a climate change perspective between options = consider removing criteria	**0.0**	There is no difference between options from a climate change adaptation perspective	**0.0**	Connects well by high quality networks but does not score as high as other options because of the lack of a coverage network.	**1.0**
5	Option 5 Balanced Option	Combines the best parts of Option 2 and 3 - creates good accessibility to the network and faster corridors: KP1: 1: 80% of population within 500m of a bus stop KPI 2: 60% of population within 500m of a high frequency bus stop (there is some sensitivty around this as services can be	**3.0**	Focuses on leaving no one behind in the key areas and to key destinations as confirmed through community consultation: KP1: 1: 80% of population within 500m of a bus stop KPI 2: 60% of population within 500m of a high frequency bus stop (there is	**3.00**	Emission reduction benefits KPI 7: Reduced transport emissions in Taranaki - Overall 10-20% reduction - but this does not include EV benefits KPI 8: Reduction in vehicle kilometers travel (VKT) by light vehicles - 10-20% reduction based on travel data from Remix	**3.00**	**9.0**	To be completed by Iwi	**0.0**	No differences from a climate change perspective between options = consider removing criteria	**0.0**	There is no difference between options from a climate change adaptation perspective	**0.0**	**T**his options combines accessibility with throughput and takes society where they need to go and connects the community to jobs and recreational activities	**2.0**

Options		and Critical Success Factors										Scores	Delivery, Maintenance & Operations								Scores	Total Scores
		Potential Value for Money		Consentability		Potential affordability		compatible with EV fleet and existing bus run times		Current future land use			Safety in Design		Technical		Operations and Maintenance		Timeframe for Delivery			
Ref No.	Option Description	Comments	Score	Comments	Score	Comments	Score	Comments	Score	Comments	Score	Base Score - No Weighting	Comments	Score	Comments	Score	Comments	Score	Comments	Score	Base Score - No Weighting	Total Score - No Weighting
New Plymouth netw																					0.00	0.000
1	Do Minimum Option - Status quo based on consulted future public transport network	When considering the balance between costs and benefits the option this ranks positively as the do minimum network provides more benefits than the current network	1.0	No key differences between options	0.0	As this option is a base option with several add one based on community consultation, there are considered to be no affordability implications	1.0	The network will work with both existing buses and also electric buses	2.0	Focus is on existing land use rather than the future growth scenarios - as such the option does not consider growth as well as other	-1.0	2.00	Construction relatively safe from a design perspective.	2.0	Relatively easy to deliver from a technical perspective as based off existing network	1.0	As a similar network to existing operations and maintenance is considered to be neutral	0.0	Can be done in under 2 years - with add on in 2-5 years	1.0	3.00	8.000
2	Option 2 - Accessibility Option	The option is positive, however with a wider network that is coverage based the return on investment is lower than for other options	1.0	No key differences between option	0.0	As a coverage based network there are potential negatives from an affordability perspective - particularly when considering cost of life - operating costs and maintenance costs are higher	-1.0	The option is compatible with EV fleet (based on Jacob report) and can also include smaller mini buses. Slightly lower score as a coverage network has some potential limitations in comparison to the other options	1.0	Links to future population growth	1.0	4.00	no major safety issues, but a broader network than previous so slightly less positive than do minimum	1.0	More technical as a larger network	-1.0	as a more broader network operations and maintenance are more expensive and more challenging	-1.0	Can be done in under 2 years - with add on in 2-5 years	1.0	1.00	11.000
3	Option 3 - Through Put Option	Provides a strong return on investment however limited uptake and connections to several communities impacts value	2.0	No key differences between option	0.0	As this option focuses on throughput with higher passenger numbers and less routes it ranks high from an affordability and return on investment perspective	2.0	The option is compatible with EV fleet (based on Jacob report) and can also include smaller mini buses	2.0	Strong links to future land use as well as existing land use	1.0	8.00	more safety considerations as higher frequency network with more stops etc.	-1.0	A relatively easier option as less corridors and higher frequencies	0.0	As a throughput option - operations and maintenance are considered to be easier and more cost effective as a smaller network	2.0	Can be done in under 2 years - with add on in 2-5 years	1.0	2.00	17.000
5	Option 5 Balanced Option	Performs well as balances the most important throughput and coverage considerations so balances cost and value well.	3.0	No key differences between option	0.0	This option ranks well from affordability as balances access and throughput - as the option is a slightly more extensive network it scores slightly less than option 3.	1.0	The option is compatible with EV fleet (based on Jacob report) and can also include smaller mini buses	2.0	Matches in with current and future land use and staging is a consideration	2.0	10.00	considered neutral as balances coverage, throughput and existing.	0.0	Slightly more complex than base option	-1.0	Positive from a operations and maintenance network as a balanced option	1.0	Can be done in under 2 years - with add on in 2-5 years	1.0	2.00	21.000

D

Appendix D – AST

Appraisal Summary Table Template

Date: 3/07/2020	**Evaluation Period: (baseline and forecast year) e.g 2020 - 2060** 2024-2064	**Option Name:** Option 2 - Throughput	**This is the preferred option** ☐

Problem/opportunity statement:	**Investment objectives:**	**How project gives effect to GPS:**	**How project gives effect to local community outcomes:**
Problem Statement 1: The speed, frequency, network configuration and infrastructure of the public transport services are inadequate which leads to limited public transport mode share. **Problem Statement 2:** Public transport services do not meet the needs of users, geographically, physically or socially resulting in limited accessiblity to economic, social and educational opporutnities. **Problem Statement 3:** Transport emissions in the region is high as a consequence of the current transport network and the form of the existing bus fleet.	**IO1:** Where public transport is available, it is seen as the preferred mode of choice by 2050. **IO2:** A public transport service where 'no one is left behind' and connects more people to where they want to go. **IO3:** A public transport system that supports net carbon zero by 2050.	Better travel options: Providing people with better transport options to access social and economic opportunities. Climate change: Developing a low carbon transport system that supports emission reductions, while improving safety and inclusive access. Improved freight connections: Indirectly supports imprrovement for freight as mode shift occurs removing private vehicles from the road.	The development of the options has had extensive consultation with the community to understand their needs and desires they wish to see on a public transport system.

1. Summary of Non-Monetised Impacts (Description)	**2. Summary of Financial Impacts (nominal, non-discounted)**		**3. Summary of Monetised Option Impacts (present value, discounted)**	
The key differences between the Do Min and this Option is a focus on throughput and simplifying routes.	Capital Costs	$2M	Total Monetised Benefits, excluding Wider Economic	$55M
			Total Monetised Benefits, including Wider Economic	Not Assessed
	Operating Costs	$2.8M	Total Economic Costs	$55.2M
			BCR (excluding WEBs)	1.0
	Total Financial Costs	$4.8M	BCR (including WEBs)	Not Assessed

Transport Outcomes	**Non-Monetised Impact:** (description in numerical or narrative terms)				**Monetised Impact:** (description in dollar terms in real terms, non-discounted)	
Name of Benefit	**Name of Measure:**	**Baseline:**	**Do Minimum Impact:**	**Option Impact:**	**Do Minimum Impact:**	**Option Impact:**
Healthy and safe people *(Please copy the row below to add an additional benefit or measure, and delete rows as appropriate)*						
3.1 Impact of mode on physical and mental health	3.2.1 Ambient air quality - NO2	Not assessed	718,339 tonnes of NO2 over 40 years	1,371 kg of No2 saved over 40 years	Not assessed	Not Assessed
Economic prosperity *(Please copy the row below to add an additional benefit or measure, and delete rows as appropriate)*						
5.1 Impact on system reliability	5.1.1 Punctuality - public transport	Not assessed	38 mins avg travel time via PT from Glen Avon to New Plymouth CBD. 36 mins avg travel time via PT from Marfell to New Plymouth CBD.	36 mins avg travel time via PT from Glen Avon to New Plymouth CBD. 31 mins avg travel time via PT from Marfell to New Plymouth CBD.	Not assessed	$61.8M (PV) in public transport benefits (travel time and reliablity)
Environmental sustainability						
8.1 Impact on greenhouse gas emissions	8.1.1 CO2 emissions	Not assessed.	2,490,4457 tonnes of Co2 over 40 years.	4,154 tonnes of Co2 saved over 40 years	$343M (PV) of CO2 emissions over 40 years	$0.5M(PV) of CO2 emissions saved over 40 years
Please copy the row above to add an additional benefit or measure, and delete rows as appropriate.						
Inclusive access						
10.2 Impact on mode choice	10.2.6 Spatial coverage - public transport - resident population	Not assessed	By 2053, approximately 51,400 people will be within 400m of a bus route.	By 2053, approximately 46,300 people will be within 400m of a bus route.	Not assessed	Not Assessed
10.2 Impact on mode choice	10.2.1 People - mode share	Not assessed	AM PT mode share is 2.7% and PM is less than 1%	Increase in public transport mode share of 0.3% expected.	Not assessed	Not Assessed
10.1 Impact on user experience of the transport system	10.1.1 People - throughput of pedestrians, cyclists and public transport boardings	Not assessed	By 2053, the daily bus patronage is estimated to be 3,139.	By 2053, the daily bus patronage will increase by 647 and 0.17 million annually.	Not assessed	Not Assessed
Please copy the row above to add an additional benefit or measure, and delete rows as appropriate.						

Rationale for option selection decision

This option was less preferred by the community and as such was not selected to proceed.

Appraisal Summary Table Template

Date: 3/07/2020	**Evaluation Period: (baseline and forecast year) e.g 2020 - 2060** 2024-2064	**Option Name:** Option 3 - Balanced	**This is the preferred option** ☐

Problem/opportunity statement:	**Investment objectives:**	**How project gives effect to GPS:**	**How project gives effect to local community outcomes:**
Problem Statement 1: The speed, frequency, network configuration and infrastructure of the public transport services are inadequate which leads to limited public transport mode share. **Problem Statement 2:** Public transport services do not meet the needs of users, geographically, physically or socially resulting in limited accessiblity to economic, social and educational opporutnities. **Problem Statement 3:** Transport emissions in the region is high as a consequence of the current transport network and the form of the existing bus fleet.	**IO1:** Where public transport is available, it is seen as the preferred mode of choice by 2050. **IO2:** A public transport service where 'no one is left behind' and connects more people to where they want to go. **IO3:** A public transport system that supports net carbon zero by 2050.	Better travel options: Providing people with better transport options to access social and economic opportunities. Climate change: Developing a low carbon transport system that supports emission reductions, while improving safety and inclusive access. Improved freight connections: Indirectly supports imprrovement for freight as mode shift occurs removing private vehicles from the road.	The development of the options has had extensive consultation with the community to understand their needs and desires they wish to see on a public transport system.

1. Summary of Non-Monetised Impacts (Description)	**2. Summary of Financial Impacts (nominal, non-discounted)**		**3. Summary of Monetised Option Impacts (present value, discounted)**	
The key differences between the Do Min and this Option includes a new service to the airport, an orbiter service and it seek so to provide a balance between throughput and coverage.	Capital Costs	$2M	Total Monetised Benefits, excluding Wider Economic	$63.9M
			Total Monetised Benefits, including Wider Economic	Not Assessed
	Operating Costs	$2.9M	Total Economic Costs	$55.2M
			BCR (excluding WEBs)	1.2
	Total Financial Costs	$4.9M	BCR (including WEBs)	Not Assessed

Transport Outcomes	**Non-Monetised Impact:** (description in numerical or narrative terms)				**Monetised Impact:** (description in dollar terms in real terms, non-discounted)	
Name of Benefit	**Name of Measure:**	**Baseline:**	**Do Minimum Impact:**	**Option Impact:**	**Do Minimum Impact:**	**Option Impact:**
Healthy and safe people *(Please copy the row below to add an additional benefit or measure, and delete rows as appropriate)*						
3.1 Impact of mode on physical and mental health	3.2.1 Ambient air quality - NO2	Not assessed	718,339 tonnes of NO2 over 40 years	1,597 kg of No2 saved over 40 years	Not assessed	Not Assessed
Economic prosperity *(Please copy the row below to add an additional benefit or measure, and delete rows as appropriate)*						
5.1 Impact on system reliability	5.1.1 Punctuality - public transport	Not assessed	38 mins avg travel time via PT from Glen Avon to New Plymouth CBD. 36 mins avg travel time via PT from Marfell to New Plymouth CBD.	36 mins avg travel time via PT from Glen Avon to New Plymouth CBD. 31 mins avg travel time via PT from Marfell to New Plymouth CBD.	Not assessed	$72.0M (PV) in public transport benefits (travel time and reliablity)
Environmental sustainability						
8.1 Impact on greenhouse gas emissions	8.1.1 CO2 emissions	Not assessed.	2,490,4457 tonnes of Co2 over 40 years.	4,838 tonnes of Co2 saved over 40 years	$343M (PV) of CO2 emissions over 40 years	$0.6M(PV) of CO2 emissions saved over 40 years
Please copy the row above to add an additional benefit or measure, and delete rows as appropriate.						
Inclusive access						
10.2 Impact on mode choice	10.2.6 Spatial coverage - public transport - resident population	Not assessed	By 2053, approximately 51,400 people will be within 400m of a bus route.	By 2053, approximately 54,800 people will be within 400m of a bus route.	Not assessed	Not Assessed
10.2 Impact on mode choice	10.2.1 People - mode share	Not assessed	AM PT mode share is 2.7% and PM is less than 1%	Increase in public transport mode share of 0.4% expected.	Not assessed	Not Assessed
10.1 Impact on user experience of the transport system	10.1.1 People - throughput of pedestrians, cyclists and public transport boardings	Not assessed	By 2053, the daily bus patronage is estimated to be 3,139.	By 2053, the daily bus patronage will increase by 762 and 0.2 million annually.	Not assessed	Not Assessed
Please copy the row above to add an additional benefit or measure, and delete rows as appropriate.						

Rationale for option selection decision

This option was most preferred by the community over the throughput option. However, there are aspects that stakeholders and the community would like to see which are missing but included in the modified option.

Appraisal Summary Table Template

Date: 3/07/2020	**Evaluation Period: (baseline and forecast year) e.g 2020 - 2060** 2024-2064	**Option Name:** Option 3a - Modified Balanced (**PREFERRED**)	**This is the preferred option** ☑

Problem/opportunity statement:	**Investment objectives:**	**How project gives effect to GPS:**	**How project gives effect to local community outcomes:**
Problem Statement 1: The speed, frequency, network configuration and infrastructure of the public transport services are inadequate which leads to limited public transport mode share. **Problem Statement 2:** Public transport services do not meet the needs of users, geographically, physically or socially resulting in limited accessiblity to economic, social and educational opporutnities. **Problem Statement 3:** Transport emissions in the region is high as a consequence of the current transport network and the form of the existing bus fleet.	**IO1:** Where public transport is available, it is seen as the preferred mode of choice by 2050. **IO2:** A public transport service where 'no one is left behind' and connects more people to where they want to go. **IO3:** A public transport system that supports net carbon zero by 2050.	Better travel options: Providing people with better transport options to access social and economic opportunities. Climate change: Developing a low carbon transport system that supports emission reductions, while improving safety and inclusive access. Improved freight connections: Indirectly supports imprrovement for freight as mode shift occurs removing private vehicles from the road.	The development of the options has had extensive consultation with the community to understand their needs and desires they wish to see on a public transport system.

1. Summary of Non-Monetised Impacts (Description)	**2. Summary of Financial Impacts (nominal, non-discounted)**		**3. Summary of Monetised Option Impacts (present value, discounted)**	
The key differences between the Do Min and this Option includes a new service to the airport, an orbiter service and modification to routes to reflect community feedback of the balanced option	Capital Costs	$2M	Total Monetised Benefits, excluding Wider Economic	$63.5M
			Total Monetised Benefits, including Wider Economic	Not Assessed
	Operating Costs	$3.5M	Total Economic Costs	$66.2M
			BCR (excluding WEBs)	1.0
	Total Financial Costs	$5.5M	BCR (including WEBs)	Not Assessed

Transport Outcomes	**Non-Monetised Impact:** (description in numerical or narrative terms)				**Monetised Impact:** (description in dollar terms in real terms, non-discounted)	
Name of Benefit	**Name of Measure:**	**Baseline:**	**Do Minimum Impact:**	**Option Impact:**	**Do Minimum Impact:**	**Option Impact:**
Healthy and safe people *(Please copy the row below to add an additional benefit or measure, and delete rows as appropriate)*						
3.1 Impact of mode on physical and mental health	3.2.1 Ambient air quality - NO2	Not assessed	718,339 tonnes of NO2 over 40 years	1,588 kg of No2 saved over 40 years	Not assessed	Not Assessed
Economic prosperity *(Please copy the row below to add an additional benefit or measure, and delete rows as appropriate)*						
5.1 Impact on system reliability	5.1.1 Punctuality - public transport	Not assessed	38 mins avg travel time via PT from Glen Avon to New Plymouth CBD. 36 mins avg travel time via PT from Marfell to New Plymouth CBD.	36 mins avg travel time via PT from Glen Avon to New Plymouth CBD. 31 mins avg travel time via PT from Marfell to New Plymouth CBD.	Not assessed	$71.6M (PV) in public transport benefits (travel time and reliablity)
Environmental sustainability						
8.1 Impact on greenhouse gas emissions	8.1.1 CO2 emissions	Not assessed.	2,490,4457 tonnes of Co2 over 40 years.	4,812 tonnes of Co2 saved over 40 years	$343M (PV) of CO2 emissions over 40 years	$0.6M(PV) of CO2 emissions saved over 40 years
Please copy the row above to add an additional benefit or measure, and delete rows as appropriate.						
Inclusive access						
10.2 Impact on mode choice	10.2.6 Spatial coverage - public transport - resident population	Not assessed	By 2053, approximately 51,400 people will be within 400m of a bus route.	By 2053, approximately 54,500 people will be within 400m of a bus route.	Not assessed	Not Assessed
10.2 Impact on mode choice	10.2.1 People - mode share	Not assessed	AM PT mode share is 2.7% and PM is less than 1%	Increase in public transport mode share of 0.4% expected.	Not assessed	Not Assessed
10.1 Impact on user experience of the transport system	10.1.1 People - throughput of pedestrians, cyclists and public transport boardings	Not assessed	By 2053, the daily bus patronage is estimated to be 3,139.	By 2053, the daily bus patronage will increase by 762 and 0.2 million annually.	Not assessed	Not Assessed
Please copy the row above to add an additional benefit or measure, and delete rows as appropriate.						

Rationale for option selection decision

Community feedback indicated that the 'Balanced' option was preferred over the throughput. This modified balanced option incorporates further feedback from stakeholders to provide an option that meets the community needs. Although, it doesn't provide the greatest BCR, the indicative BCR still suggests that it will be at least 1.0 with

E

Appendix E– Optioneering Details

Technical Note

By: Andrew Collings **Date:** 19 September 2024

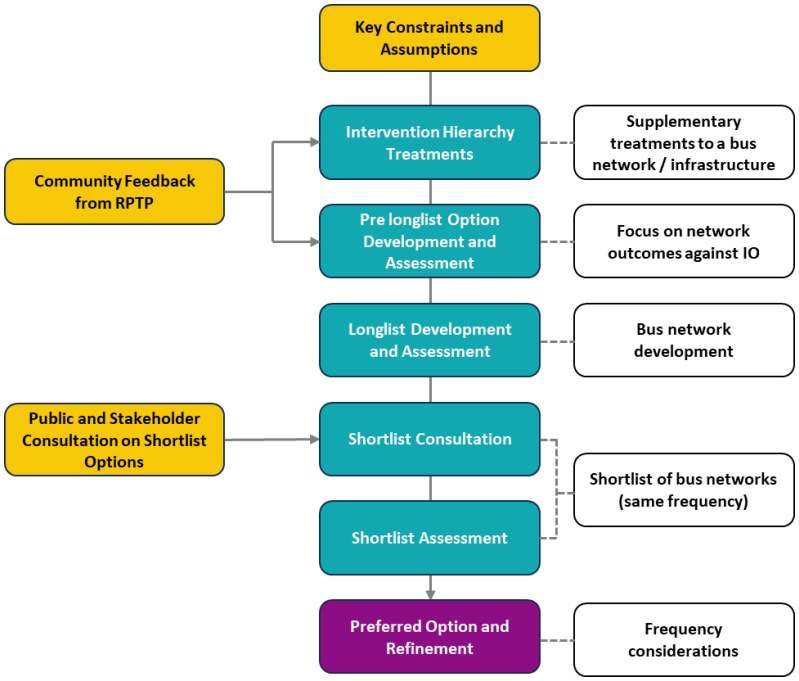
Subject: File Note **Our Ref:** 3815111

1 Introduction

This technical note outlines the optioneering process undertaken for the Taranaki PT SSBC and summarizes key steps and data sources utilized. Specifically:

- Different types of bus networks reviewed
- Summary of the three networks taken through optioneering: Coverage, Throughput and Balanced
- Summary of long List of Options
- Key stakeholders involved
- Options development process
- Data sources
- EAST assessment
- MCA assessment
- Preferred Option

2 Option Development process



3 Different types of public transport networks – general

When preparing options seven bus networks were considered at a strategic level. These are summarized as follows:

1. **Grid Network:** This network operates on a grid system, providing routes that intersect at regular intervals. It allows for flexibility and multiple transfer points, making it easy to navigate and access various destinations.
2. **Radial Network:** In this network, bus routes radiate out from a central point, often a city centre or a major hub. It's ideal for directing passengers to key locations but can sometimes require backtracking for cross-city travel.
3. **Linear Network:** This network runs in a straight line between two endpoints, covering main streets or significant thoroughfares. It's straightforward and efficient for getting from one end of the route to the other without many deviations.
4. **Circular Network:** Buses in a circular network follow a loop, stopping at various points along the way. This type ensures continuous service and is excellent for areas needing frequent coverage without back-and-forth travel.
5. **Hub-and-Spoke Network:** Similar to an airline model, this network has central hubs where various routes converge. Passengers can transfer between spokes (routes) at these hubs, facilitating easy connections across a wider area.
6. **Feeder Network:** Feeder routes connect local neighbourhoods to main routes or hubs. They complement larger transit systems by bringing passengers from outlying areas to central stations or high-frequency routes.
7. **Mixed Network:** A combination of different network types, mixed networks balance the benefits of each approach. This versatility ensures comprehensive coverage and adaptability depending on urban or suburban needs.

Utilizing the above as a base, and in consultation with key stakeholders, it was agreed that three high level networks could be considered.

Network	Details
Coverage	A coverage bus network is designed to provide widespread access to public transport, ensuring that a larger geographical area is serviced, even if this means less frequent service. The primary goal is to reach as many people as possible, especially in areas where population density is lower. **Key Points:** 1. **Widespread Access:** Ensures that public transport reaches a broad area, including suburban and rural regions, so more people can benefit from bus services. 2. **Inclusivity:** Focuses on inclusivity by providing transport options to communities that might otherwise be underserved or isolated. 3. **Basic Service Levels:** While the frequency might not be as high as in high-density areas, it ensures a basic level of service for all covered locations.

Technical Note

Network	Details
	4. **Community Connectivity:** Enhances connectivity by linking different parts of the region, making it easier for residents to access essential services, work, and social activities. 5. **Equity:** Aims to promote equity by ensuring everyone has access to public transport, regardless of where they live. A coverage bus network prioritises reaching as many people and places as possible, fostering greater accessibility and community cohesion across a wide area.
Throughput	A throughput network focuses on maximising the efficiency and speed of transporting large numbers of passengers along high-demand routes. It prioritises frequent, rapid services in densely populated or highly trafficked areas. **Key Points:** 1. **High Efficiency:** Maximises the movement of passengers quickly and efficiently, reducing travel times and congestion. 2. **Frequent Services:** Offers frequent services to meet high demand, ensuring minimal waiting times for passengers. 3. **Dense Corridors:** Concentrates on high-demand routes where passenger volumes are greatest, often in urban centres or major transit corridors. 4. **Capacity Focused:** Utilises high-capacity vehicles and infrastructure to handle large numbers of passengers comfortably and efficiently. 5. **Reliability:** Ensures dependable and timely services, enhancing the overall user experience and encouraging public transport use. A throughput network aims to deliver fast, frequent, and reliable transport solutions in high-demand areas, effectively meeting the needs of a significant number of passengers.
Balanced (or mixed)	A balanced bus network integrates both throughput and coverage strategies to offer comprehensive public transport services. It aims to efficiently move large numbers of passengers in high-demand areas while also providing widespread access across broader, lower-density regions. **Key Points:** 1. **Dual Focus:** Combines the efficiency and speed of a throughput network with the wide-ranging accessibility of a coverage network. 2. **High Demand Corridors:** Provides frequent, rapid services along busy routes to serve densely populated areas and major transit points. 3. **Broad Access:** Ensures that even suburban and rural areas receive reliable bus services, promoting inclusivity and connectivity. 4. **Optimised Resource Allocation:** Balances resources to maintain high service levels where demand is greatest while still reaching outlying areas. 5. **User Convenience:** Creates a seamless and convenient public transport experience for all users, regardless of their location. 6. **Community Benefits:** Enhances overall public transport utility by meeting diverse mobility needs, supporting both commuter efficiency and wide geographic coverage.

Network	Details
	A balanced bus network delivers the best of both worlds: it ensures quick, frequent service in high-traffic areas while extending reliable access to far-reaching communities, thereby meeting a broad spectrum of transportation needs.

3.1 Summary of options

Considering coverage, throughput and balanced networks the following six options were considered.

Option	Details
Option 1: Do Minimum	Existing bus network and frequency.
Option 2: Access (IO2) Emphasized	The focus for this option is enabling the largest number of residents to have access to bus services. It is based on a coverage network, where the greater and more accessible (e.g. number of residents living within 400m of a bus stop is emphasized over enabling the largest number of people to use the network. In short, a wide network with longer routes, possible feeder buses, and a focus on areas in need (social deprivation).
Option 3: Throughput (IO1) Emphasized	The focus for this option is on maximizing the number of people who utilize the bus network. Rather than looking at the greatest coverage, the option looks at key high priority corridors where more frequent services take people between key destinations.
Option 4: Environmental – mixed access and throughput emphasized	The focus for this option is reducing C02 Emissions via VKTs - so blends access to the network and throughput together. The environmental focus is specific for the IOs and looks at treatments from an environmental perspective rather than specifically a passenger perspective. By doing this it enables a broad range of options and treatments to be considered
Option 5: Balanced	The focus of the balanced option is to look at access (coverage), throughput (patronage) and environmental outcomes equally. Key parts of each of the components, such as targeted connecting into specific areas, prioritising high quality services where they will have the most benefit, and CO2 and VKT reductions are all key considerations in building the option from treatments
Option 6: Ambitious	The ambitious option is exactly that. Ambitious! Nothing is off the table, and cost is not a key consideration. High quality options such as BRT, building new Park and Ride sites, as well as actively discouraging private vehicles are all key components. See this as an option where you are not constrained by dollars or politics - anything can be done to create the 'perfect utopia' of a public transport system.

4 Development of options

4.1 Option development

Developing a comprehensive bus network for Taranaki centered on three key strategies: throughput, coverage, and balance. We crafted a system that meets the diverse needs of the community with efficiency and inclusivity.

Throughput Network: We identified high-demand routes connecting major hubs like New Plymouth, Stratford, and Hawera. By implementing high-frequency services, dedicated bus lanes, and larger capacity buses, we ensured quick, reliable transport along these vital corridors.

Coverage Network: We extended our reach to suburban and rural areas, ensuring that even the most remote parts of Taranaki have access to public transport. Flexible routes and numerous stops make it easy for residents in less densely populated areas to connect with the main network.

Balanced Network: We integrated the strengths of both the throughput and coverage networks. Core routes offer fast, efficient travel between key locations, while feeder routes connect outlying areas to these main arteries. Strategic transfer points and adaptive scheduling enhance overall convenience and accessibility.

Our balanced approach ensures Taranaki's bus network is both efficient and inclusive, making public transport a viable option for all residents. This development promises a brighter, more connected future for the region.

4.2 Coverage Bus Network

Benefits are as follows:

- Enhances mobility for all community members, reducing reliance on private vehicles.
- Promotes social equity by providing transportation to underserved areas.
- Encourages public transport usage by making it a viable option for more people.

A coverage network helps create a more inclusive and accessible public transport system, bridging gaps where traditional high-frequency routes might not reach.

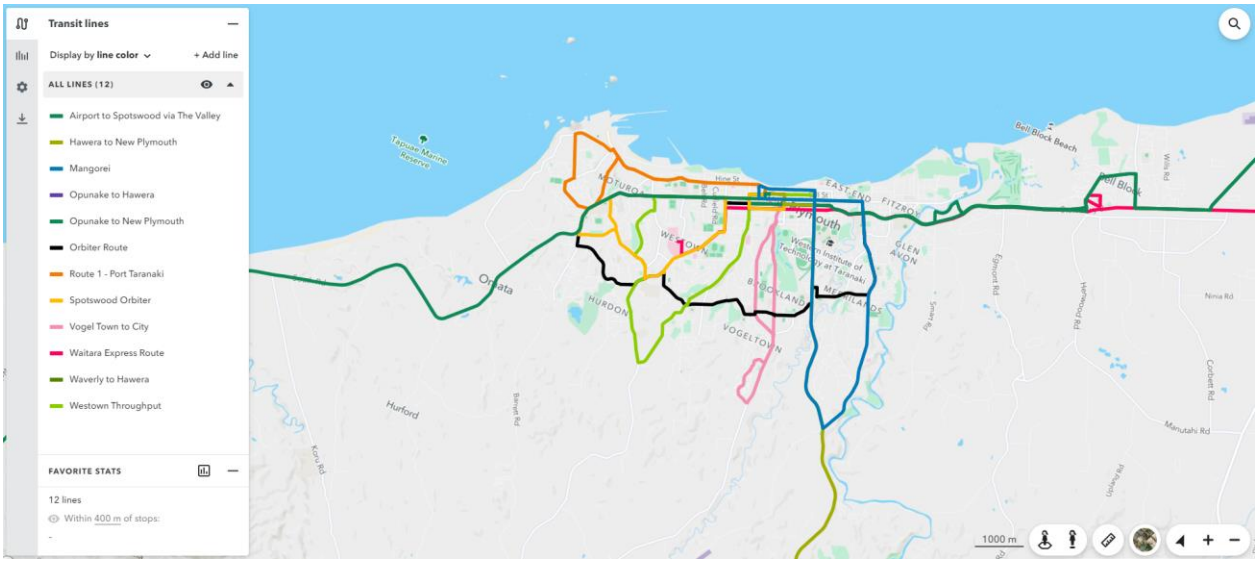
4.3 Throughput Network

A throughput bus network focuses on moving large numbers of passengers quickly and efficiently along high-demand routes. It prioritises speed, frequency, and direct connections between major destinations like business districts, educational institutions, and transport hubs.

Benefits:

- Dramatically reduces travel time for passengers travelling between major points.
- Improves the efficiency and attractiveness of public transportation in busy urban areas.
- Encourages more people to use public transport by offering a faster and more reliable alternative to private vehicles.

A throughput bus network is designed to handle the heavy passenger flow of densely populated or highly trafficked areas, ensuring that public transport remains a smart and efficient choice for commuters.



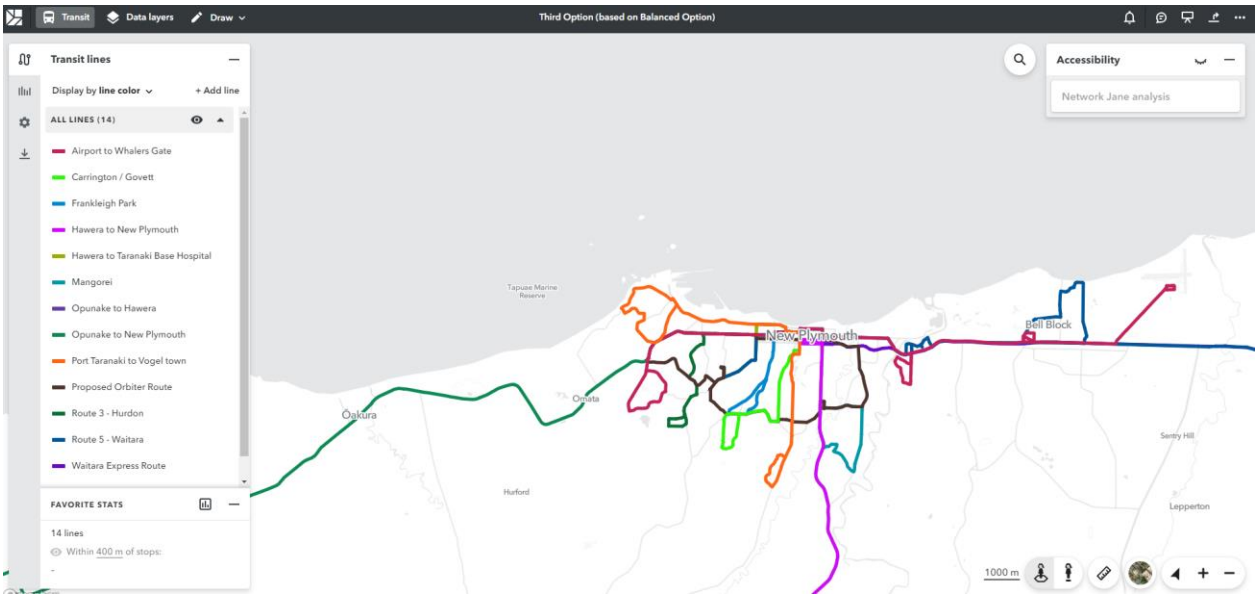
4.4 Balanced Network

A balanced bus network strikes a harmonious blend between throughput and coverage, aiming to deliver both efficient, high-capacity service on key routes and extensive reach to ensure accessibility for all areas. This approach ensures that passengers benefit from speedy travel on major corridors while still having access to public transport in less-served areas.

Benefits:

- Combines the strengths of both throughput and coverage networks, offering comprehensive and efficient service.
- Ensures that no area is left without access to public transport while providing rapid transit options for high-demand routes.
- Enhances overall passenger satisfaction by delivering both speed and reach, making public transport a more appealing option.

A balanced bus network is ideal for urban areas that need to cater to diverse travel needs, providing a robust solution that addresses both the urgency of high-volume routes and the necessity of wide-reaching coverage.



4.5 Key Stakeholders

The networks were developed in consultation with a range of key stakeholders.

Stakeholder	Involvement
Taranaki Regional Council	As owner of the project key departments and sections within the Council were involved in assisting with optioneering. Councillors signed off on key decisions.
New Plymouth District Council	NPDC staff were involved in key optioneering meetings as well as an ILM workshop. NPDC Councillors were also involved in optioneering briefings./
New Zealand Transport Agency	As a potential future funding partner NZTA were involved in all optioneering discussions.
Horizons Regional Council	Having recently updated their bus networks, Horizons provided expert input and critical thinking to potential bus network options.
Community	The community, and several interest groups include bus and disability groups, were included in network design workshops.

5 Background Data

To help develop networks, and to assess differences between networks a range of data sources were utilized.

These are summarized below.

5.1 Coverage comparison between options

A catchment analysis was undertaken on the options to indicate the 'population' that would be within 400m walking distance from the bus routes. It is noted that Census SA2 sectors for New Plymouth were used as an approximation to illustrate which zones will be within walking distance from a bus service. It should also be noted that if the majority of the zone is outside of the 400m, this is not included in the analysis.

Figure 1, Figure 2 and Figure 3 below shows the results of the catchment analysis for the options. The difference between the options is minor especially between Balanced Option and Balanced Modified Option. The balanced options with a greater focus on coverage provides greater accessibility for people in the community.

The bus catchment analysis is included in the Economic Case of the SSBC.

Figure 1: Throughput Option – population within 400m walking distance to a bus route in 2053

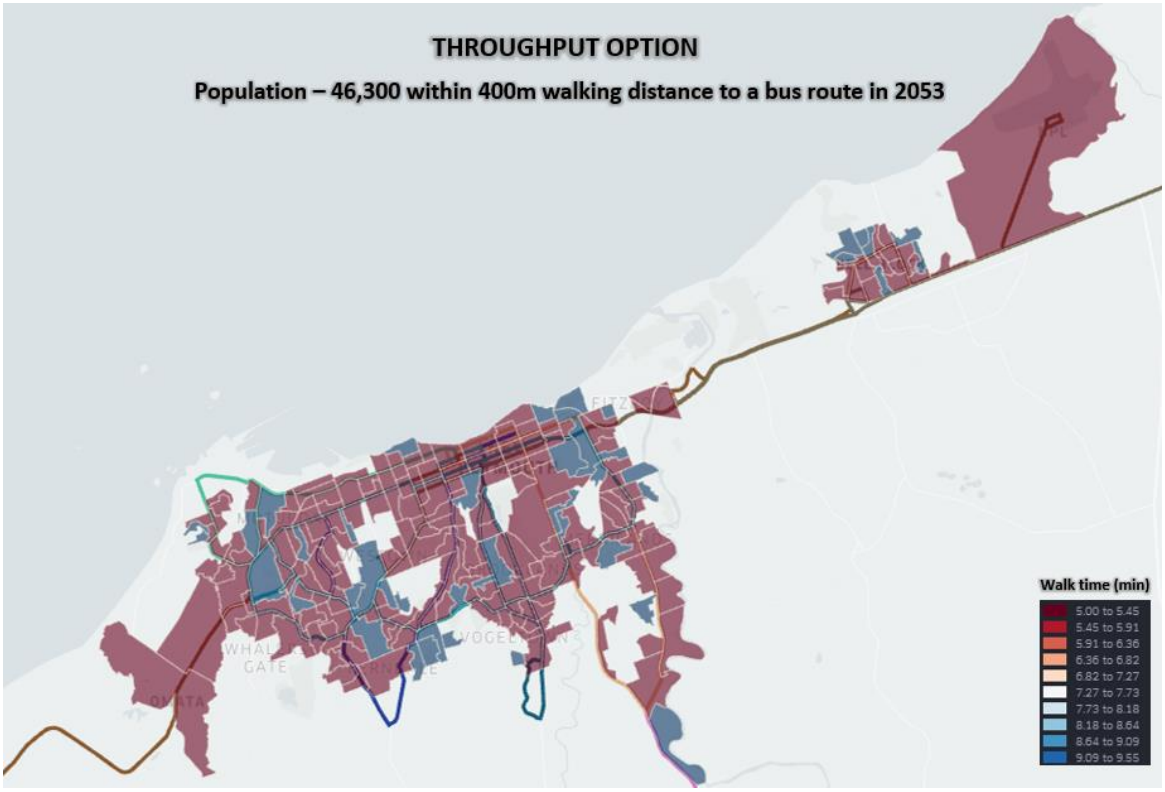


Figure 2: Balanced Option – population within 400m walking distance to a bus route in 2053.

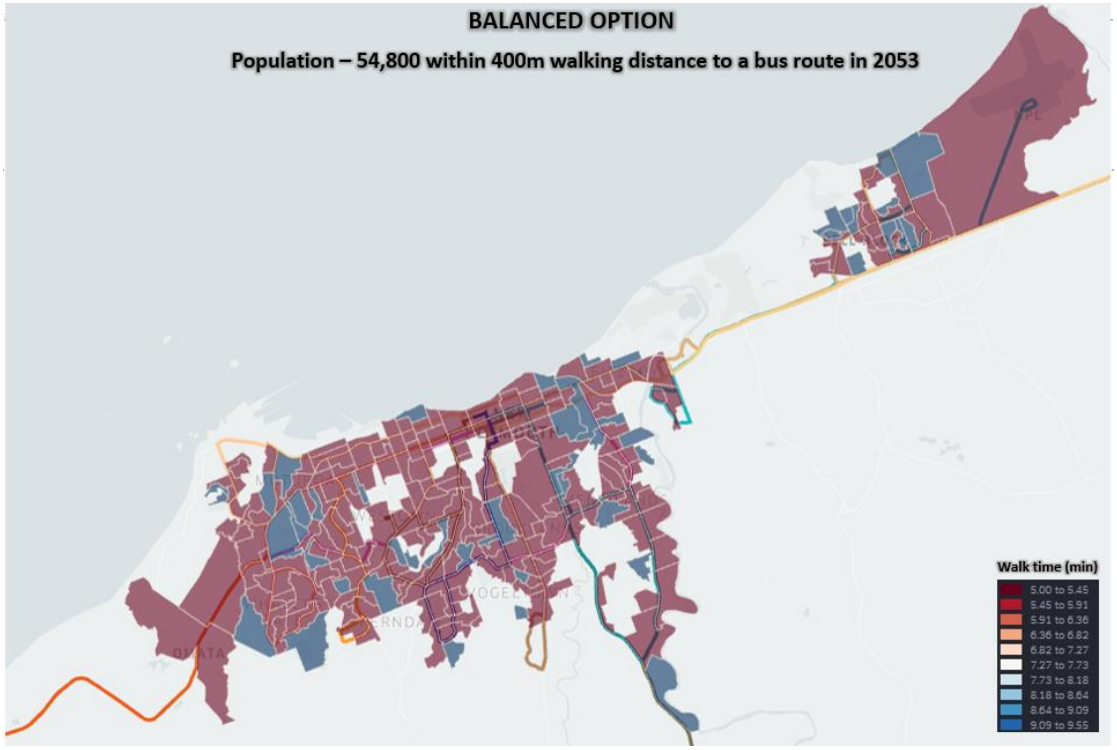
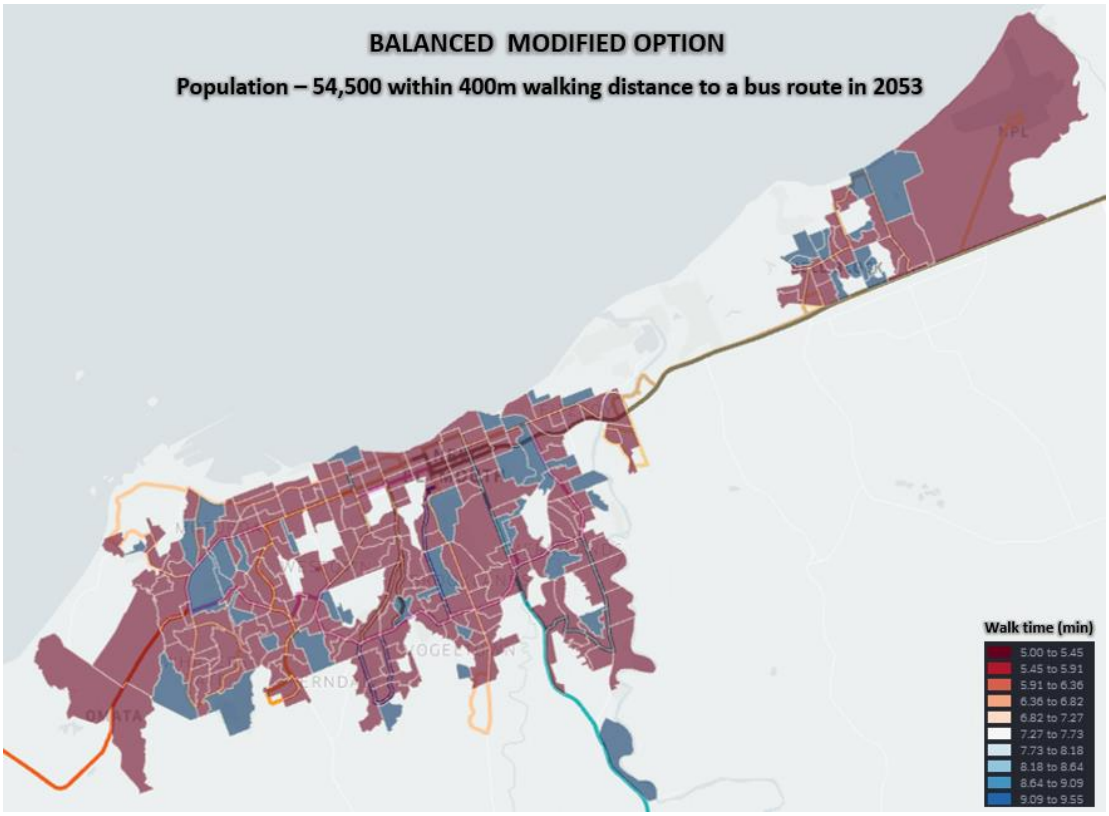


Figure 3: Balanced Modified Option – population within 400m walking distance to a bus route in 2053.



5.2 Remix Data for Option

Remix has a range of data layers and was utilized to ascertain differences between options. Key data layers reviewed is provided below.

Data Source Reviewed	Details
Population	Total populations, current and future were reviewed and compared between options. Coverage options provided greatest connection to population, while the throughput focused on key densities of population areas and connecting these populations to jobs. The balanced option considered both density and accessing the highest percent of population
Households per square km	Households per square kilometre is a measure of population density that indicates the number of households living within one square kilometre. It's a vital statistic used in urban planning, transport development, and resource allocation. Key Points: 1. **Population Density Indicator:** Helps understand how densely populated an area is, which in turn informs infrastructure needs. 2. **Urban vs Rural:** Higher households per square kilometre typically point to urban areas with more concentrated living spaces, while lower numbers indicate rural or suburban regions. 3. **Resource Planning:** Essential for planning public services like transportation, schools, healthcare, and utilities to ensure they meet the community's needs efficiently. 4. **Economic Insight:** Provides insights into the economic activities of an area, influencing business developments, housing markets, and more. 5. **Environmental Impact:** Informs sustainability and environmental impact assessments, helping to balance development with ecological preservation. Understanding households per square kilometre helps create well-planned, efficient, and sustainable communities. It's a key metric for making informed, strategic decisions that enhance the quality of life for residents.
Dwellings	Reviewing dwellings is vital for developing a successful bus network. It helps planners understand where people live and how to best serve their transportation needs. **Key Reasons:** 1. **Demand Identification:** Analysing dwelling locations reveals high-density residential areas, guiding route planning to maximise coverage and efficiency. 2. **Service Accessibility:** Ensures everyone has convenient access to public transport, reducing travel times and increasing ridership.

Data Source Reviewed	Details
	3. **Route Optimisation:** Helps design routes that connect neighbourhoods efficiently, balancing frequency with comprehensive coverage. 4. **Resource Allocation:** Guides the deployment of buses and scheduling to match the transportation demands of different residential areas. 5. **Community Growth:** Adapts to changing residential patterns, ensuring the bus network evolves with new developments and population shifts. 6. **Environmental Benefits:** Encourages public transport use over private cars, contributing to reduced traffic congestion and lower emissions. Understanding dwelling patterns allows for a well-planned, responsive bus network that meets community needs effectively. It ensures the network remains relevant, accessible, and sustainable, fostering a connected and thriving region.
Population and jobs	Population and jobs are crucial elements in developing an effective bus network. They directly influence route planning, frequency, and overall service design to meet community needs. **Population:** Knowing where people live helps planners identify high-demand areas and ensure that routes serve the greatest number of residents. High-population areas benefit from frequent services and shorter waiting times, enhancing overall convenience and usage. **Jobs:** Understanding job locations is essential for connecting residential areas with employment hubs. Efficient transport links between homes and workplaces reduce travel time and support economic activity by making it easier for people to get to work. Key Considerations: 1. **Demand Mapping:** Analysing population and job data reveals the busiest routes and peak travel times, enabling precise service allocation. 2. **Accessibility:** Ensures all community members have access to reliable transport, whether commuting to work or accessing other services. 3. **Economic Growth:** Facilitates job accessibility, attracting businesses and boosting the local economy by making it easy for employees to commute. 4. **Optimised Routes:** Balances the need for coverage and throughput, delivering efficient, inclusive services tailored to actual travel patterns. 5. **Sustainability:** Reduces reliance on private vehicles by providing a robust public transport option, promoting environmental sustainability. In summary, integrating population and job data into bus network development ensures that services are both efficient and inclusive. It promotes higher ridership, supports local economies, and enhances the overall quality of life in the community.
Employment	Reviewing employment is crucial for developing an efficient and responsive bus network. It focuses on connecting people to their workplaces, a primary reason for daily travel. **Key Benefits:**

Technical Note

Data Source Reviewed	Details
	1. **Peak Demand Insights:** Analysing employment data reveals peak travel times and high-traffic zones, helping shape routes and schedules to meet commuter needs. 2. **Route Efficiency:** Ensures that key employment hubs, such as business districts, industrial parks, and commercial areas, have direct and reliable bus services. 3. **Economic Vitality:** Facilitates easy access to jobs, boosting local economies by connecting workers with employers and supporting overall economic growth. 4. **Reduced Congestion:** Promotes the use of public transport over private vehicles, reducing traffic congestion and improving travel times across the network. 5. **Workforce Mobility:** Enhances mobility for the workforce, particularly for those without access to private vehicles, ensuring equitable access to employment opportunities. 6. **Sustainable Development:** Supports sustainable urban development by integrating transport planning with employment zones, leading to smarter, green urban growth. In summary, incorporating employment data into bus network planning ensures that the system effectively meets the daily commuting needs of the community. It enhances connectivity, supports economic activity, and contributes to a sustainable, efficient transport ecosystem.
Employed (residence)	Reviewing employment and residential addresses is essential for developing an effective bus network. It ensures the system meets the needs of its users by connecting where people live with where they work. **Key Points:** 1. **Demand Mapping:** Understanding where people live and work helps identify high-demand routes, ensuring buses serve the most travelled corridors efficiently. 2. **Optimised Routes:** By analysing residential and employment data, planners can design routes that provide direct and convenient connections between homes and workplaces. 3. **Peak Travel Times:** Insights into commuting patterns help schedule services to match peak travel times, reducing wait times and overcrowding. 4. **Accessibility:** Ensures that all community members, including those without private vehicles, have reliable access to jobs, education, healthcare, and other essential services. 5. **Economic Growth:** Facilitates easy and efficient commutes, supporting business operations and boosting local economies by enhancing workforce mobility.

Technical Note

Data Source Reviewed	Details
	6. **Community Connectivity:** Enhances overall community connectivity by linking neighbourhoods with employment hubs, making daily travel more seamless. 7. **Sustainability:** Promotes the use of public transport, reducing reliance on private cars, lowering traffic congestion, and contributing to environmental sustainability. Understanding both employment and residential locations ensures a bus network that is efficient, inclusive, and responsive to the community's needs. It supports economic vitality, reduces travel times, and fosters sustainable urban development.
Population base – Maori , Pacific Peoples, Median Age, Seniors, Adults, youth and other age brackets	Reviewing population and age is fundamental for developing a bus network that meets the diverse needs of the community. It ensures that services are tailored to the demographic makeup of the area. **Key Points:** 1. **Demand Identification:** Detailed population data highlights high-density areas, guiding route planning to serve the most people efficiently. 2. **Age-Specific Services:** Understanding the age distribution helps tailor services. For instance, areas with a higher number of school-aged children might need more buses during school hours, while regions with a larger elderly population may require more accessible buses and routes close to healthcare centres. 3. **Frequency Optimisation:** Analysing population and age helps determine peak travel times, enabling better scheduling that reduces waiting times and overcrowding. 4. **Accessibility:** Ensures that the network is inclusive, providing reliable transport options for all age groups, including children, working adults, and the elderly. 5. **Community Needs:** Different age groups have varying travel needs. By understanding the population's age structure, planners can ensure that the bus network supports commuting, education, healthcare visits, and leisure activities. 6. **Service Flexibility:** Adaptable services can be designed based on changing demographic patterns, ensuring the network evolves with the community. 7. **Sustainable Growth:** Encourages the use of public transport across all age groups, reducing reliance on private vehicles, cutting down traffic congestion, and promoting environmental sustainability. By reviewing population and age data, planners can create a bus network that is efficient, inclusive, and adaptable. This approach ensures that services meet the specific needs of different demographic groups, enhancing overall connectivity and quality of life for all residents.

Technical Note

Data Source Reviewed	Details
Students	Understanding student numbers is crucial for planning a bus network that effectively meets the needs of a vital segment of the community. Catering to students ensures the system supports education and fosters a reliable, convenient transport option for young people. **Key Points:** 1. **Peak Travel Times:** Knowing student numbers helps identify peak travel periods, allowing for better scheduling to match school start and end times, reducing wait times and overcrowding. 2. **Route Design:** Insights into where students live and go to school enable the creation of direct and efficient routes connecting residential areas with educational institutions. 3. **Safety:** Ensures that bus stops and routes are designed with safety in mind, particularly for younger students who may require safe and easily accessible boarding locations. 4. **Capacity Planning:** Accurate student data helps determine the number of buses needed, ensuring sufficient capacity during school commutes and avoiding overcrowded services. 5. **Accessibility:** Provides reliable transport for students, ensuring they can reach their educational facilities on time, which is essential for academic success. 6. **Economic Savings:** Offers a cost-effective and sustainable alternative to private car travel, saving families money and reducing the number of vehicles on the road. 7. **Community Integration:** Strengthens connections between schools and the broader community, promoting social inclusion and supporting extracurricular activities by providing reliable transport options for all students. Understanding student numbers ensures that a bus network is tailored to support the educational needs of the community. It provides safe, reliable, and efficient transport for students, contributing to their academic success and overall well-being.
Activity limitation	Understanding the percentage of people with mobility impairments is essential for planning a bus network that is inclusive and accessible to everyone. By catering to the needs of individuals with mobility challenges, the network can ensure equal access and support independence. **Key Points:** 1. **Accessibility:** Knowing the number of people with mobility impairments helps design routes and stops that are fully accessible, with features like low-floor buses, ramps, and tactile paving. 2. **Inclusive Design:** Ensures that every bus is equipped with priority seating, spaces for wheelchairs, and other necessary accommodations to serve all passengers effectively.

Technical Note

Data Source Reviewed	Details
	3. **Service Frequency:** Planning routes with frequent services ensures that people with mobility impairments are not left waiting for long periods, making travel more convenient and reliable for them. 4. **Safety:** Enhances safety by designing boarding and alighting processes that are easy and secure for those with mobility challenges, reducing the risk of accidents and injuries. 5. **Community Participation:** Facilitates greater participation in community activities, employment, and social engagements by providing reliable transport options for those with mobility impairments. 6. **Equity:** Promotes equity by ensuring that everyone, regardless of their physical abilities, has access to public transport, fostering a more inclusive society. 7. **Regulatory Compliance:** Helps meet legal requirements and standards for accessibility, ensuring that the bus network abides by relevant regulations and best practices. 8. **Sustainable Mobility:** Encourages sustainable travel options over private vehicles, contributing to lower traffic congestion and reduced environmental impact. By understanding the percentage of people with mobility impairments, planners can develop a bus network that is not only efficient but also prioritises inclusivity and accessibility. This approach supports the independence and well-being of all community members, making public transport a viable option for everyone.
Land uses and places of interest	Understanding land uses and places of interest is vital for developing a public transport network that efficiently serves the community and enhances connectivity. It ensures the network meets the diverse travel needs of residents and visitors. **Key Points:** 1. **Targeted Routes:** Identifying key land uses such as residential areas, commercial zones, recreational spaces, and industrial parks helps in designing routes that connect these high-demand locations effectively. 2. **Enhanced Accessibility:** Ensures that popular destinations like shopping centres, parks, hospitals, and cultural attractions are easily accessible, encouraging more people to use public transport. 3. **Optimised Schedules:** Knowledge of peak times for different places of interest allows for better scheduling and frequency adjustments, ensuring services meet demand during busy periods. 4. **Economic Boost:** Facilitates easy access to business districts and commercial zones, supporting local economies by connecting workers, customers, and businesses seamlessly. 5. **Tourism Support:** Provides reliable transport options to tourist destinations and cultural landmarks, enhancing visitor experience and boosting the tourism industry.

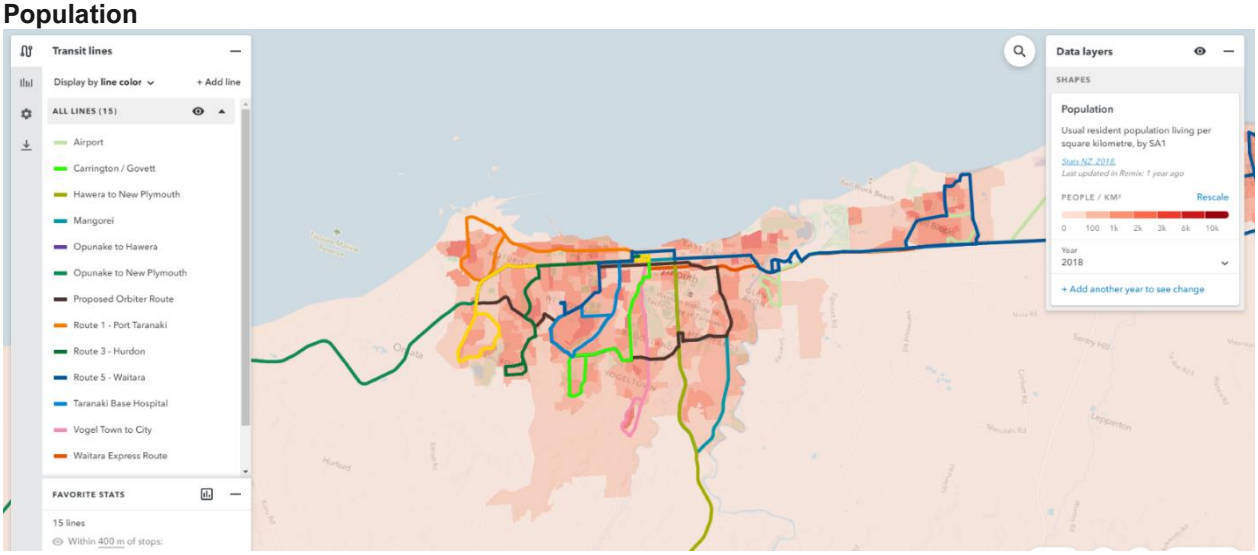
Data Source Reviewed	Details
	6. **Community Well-being:** Improves quality of life by ensuring essential services such as healthcare, education, and leisure facilities are reachable, promoting social inclusion and well-being. 7. **Sustainable Development:** Integrates transport planning with urban development, supporting sustainable growth and reducing the need for private vehicle use. 8. **Network Efficiency:** Helps create a streamlined and efficient public transport network by focusing on key areas of activity, reducing redundancies and improving overall service quality. Understanding land uses and places of interest ensures the public transport network is responsive, efficient, and beneficial for all. It enhances connectivity, supports economic and social activities, and promotes sustainable urban development, making it a cornerstone of a thriving community.
Road crashes	Understanding road crashes is crucial for bus network planning to ensure safety, reliability, and efficiency. By analysing crash data, planners can make informed decisions that enhance the overall quality of the transport system. **Key Points:** 1. **Safety Enhancement:** Identifying high-risk areas allows for targeted interventions such as improved signage, traffic calming measures, and safer bus stop placements, reducing the likelihood of accidents. 2. **Route Optimisation:** Data on crash hotspots helps in designing routes that avoid dangerous intersections and problematic road segments, ensuring smoother and safer journeys for passengers. 3. **Reliability:** Reducing crash risk improves the overall reliability of bus services, minimising delays caused by road incidents and ensuring punctuality, which boosts rider confidence and satisfaction. 4. **Cost Efficiency:** Preventing crashes reduces maintenance costs associated with bus repairs and infrastructure damage, freeing up resources for further network improvements and investments. 5. **Passenger Confidence:** A safe network encourages more people to choose public transport over private cars, promoting a higher ridership and contributing to less congested roads and cleaner environments. 6. **Emergency Response:** Understanding crash patterns enables better preparedness and quicker response times for emergencies involving buses, ensuring passenger safety and swift recovery of services. 7. **Driver Training:** Insights from crash data can inform driver training programmes, emphasising areas where extra caution is needed and promoting best practices for safe driving. 8. **Community Trust:** Demonstrating a commitment to safety through proactive measures builds community trust and supports a positive public perception of the bus network. Integrating road crash data into bus network planning ensures a safer, more reliable, and efficient transport system. It fosters confidence among passengers

Data Source Reviewed	Details
	and drivers, enhances overall service quality, and promotes a culture of safety within the community.

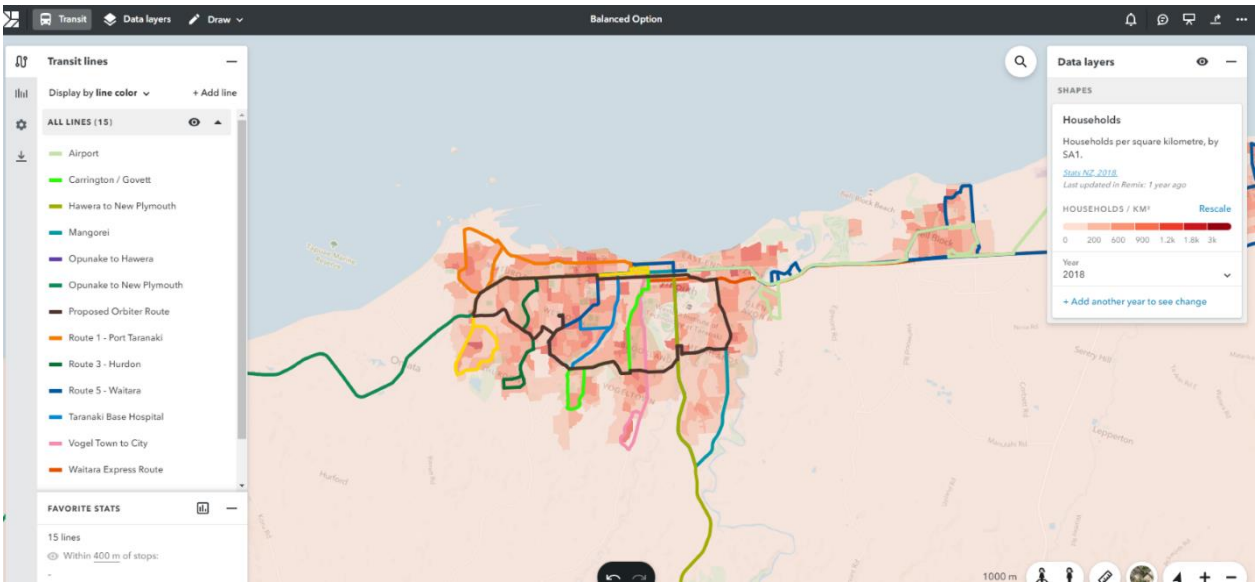
5.3 Summary of Remix Data

Data layers screen shots form Remix are provided below. These were utilized in both network development and assessments during the EAST and MCA.

Population

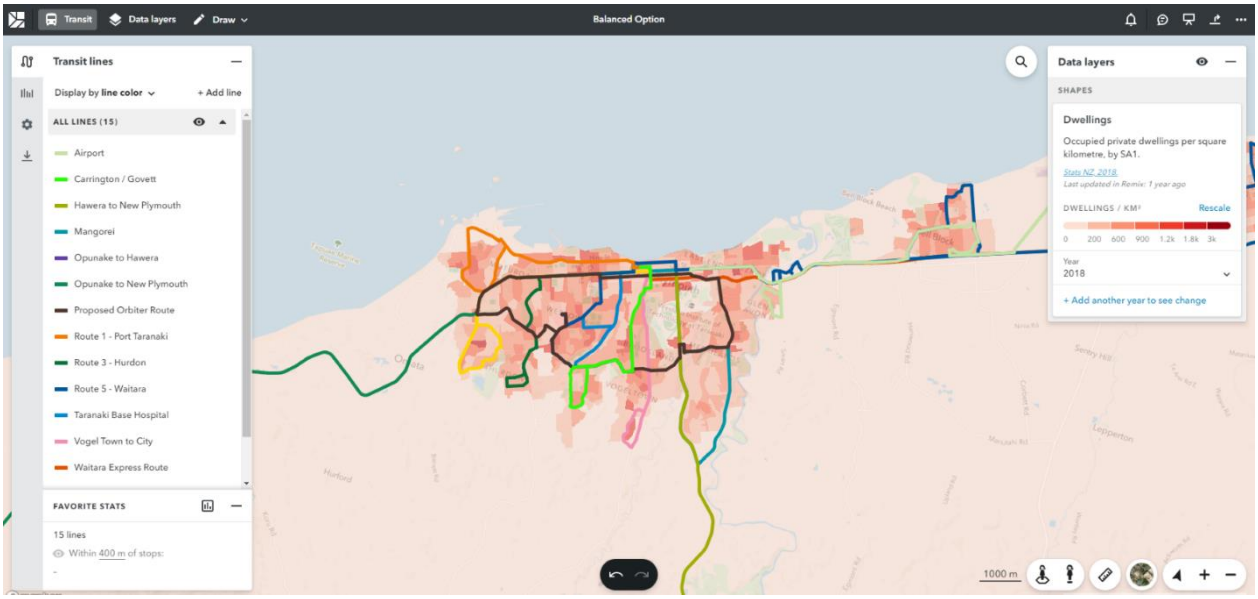


Households per square KM

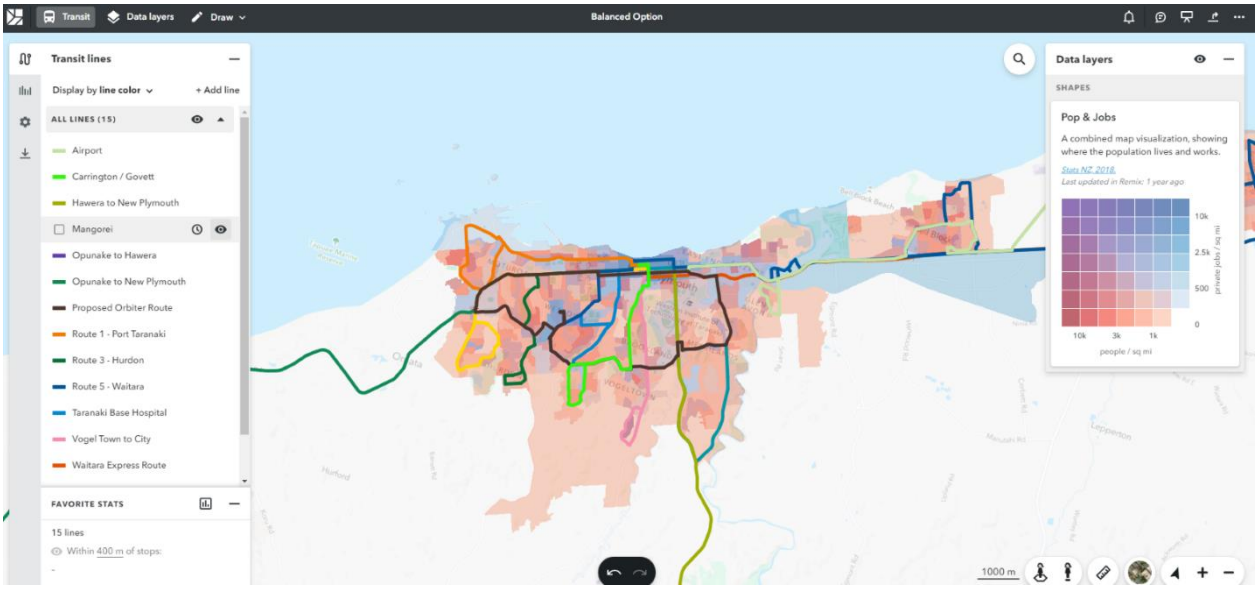


Technical Note

Dwellings

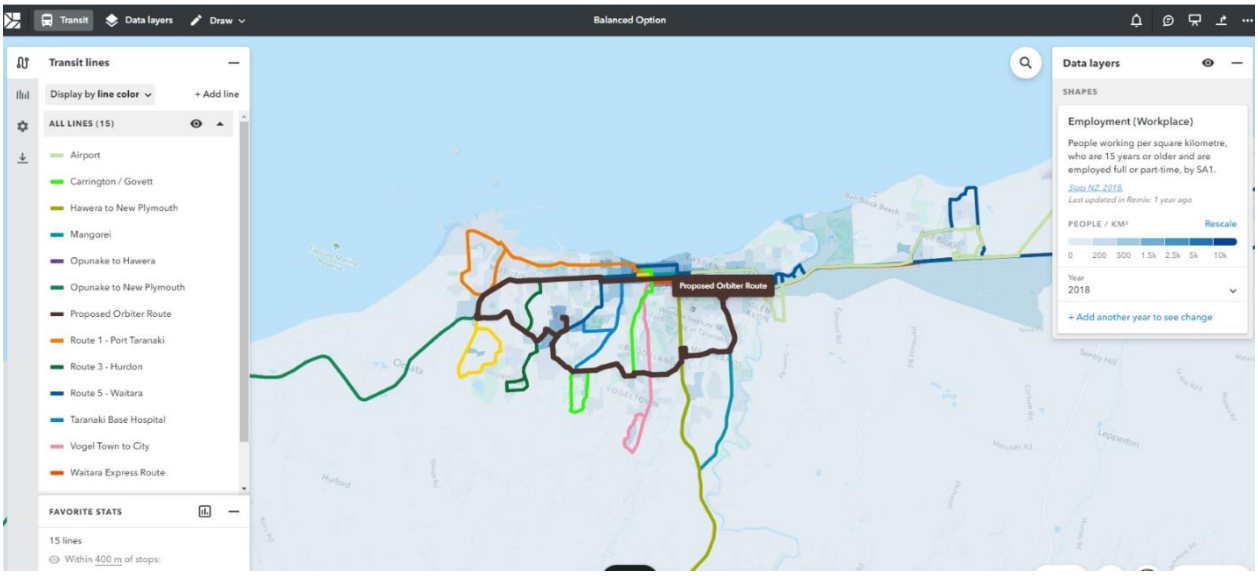


Population and Jobs

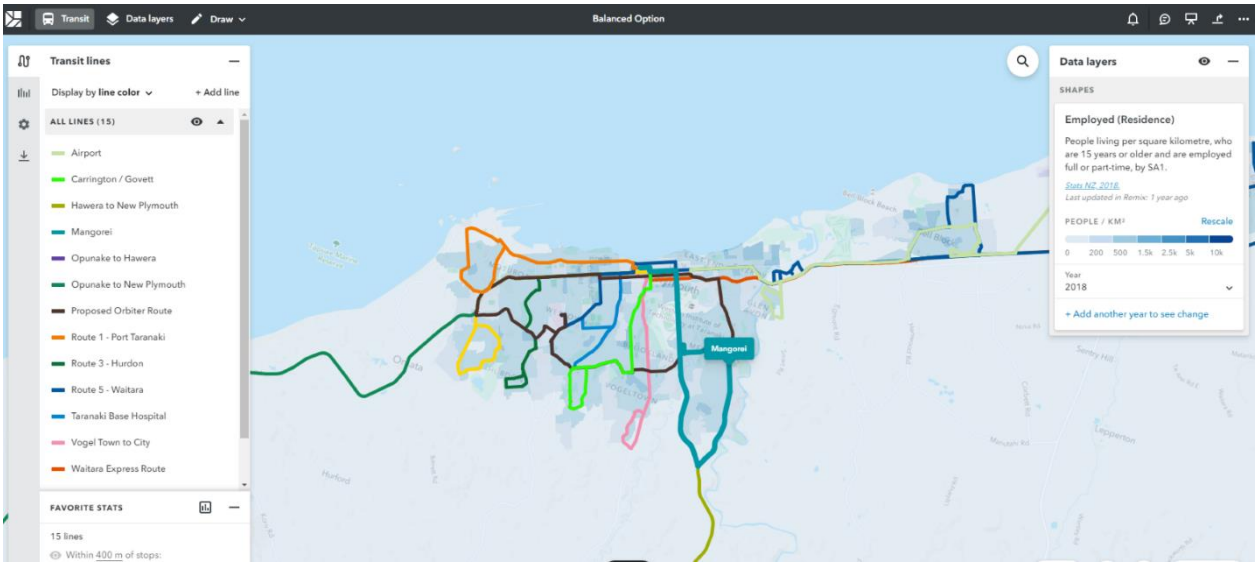


Technical Note

Employment and jobs



Employment – Residence



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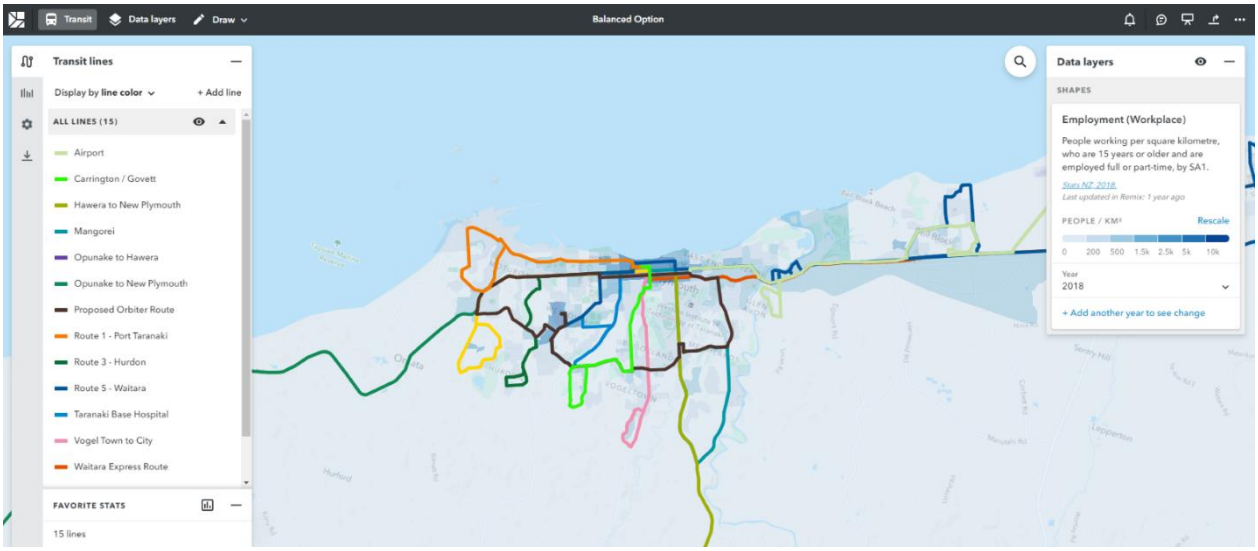
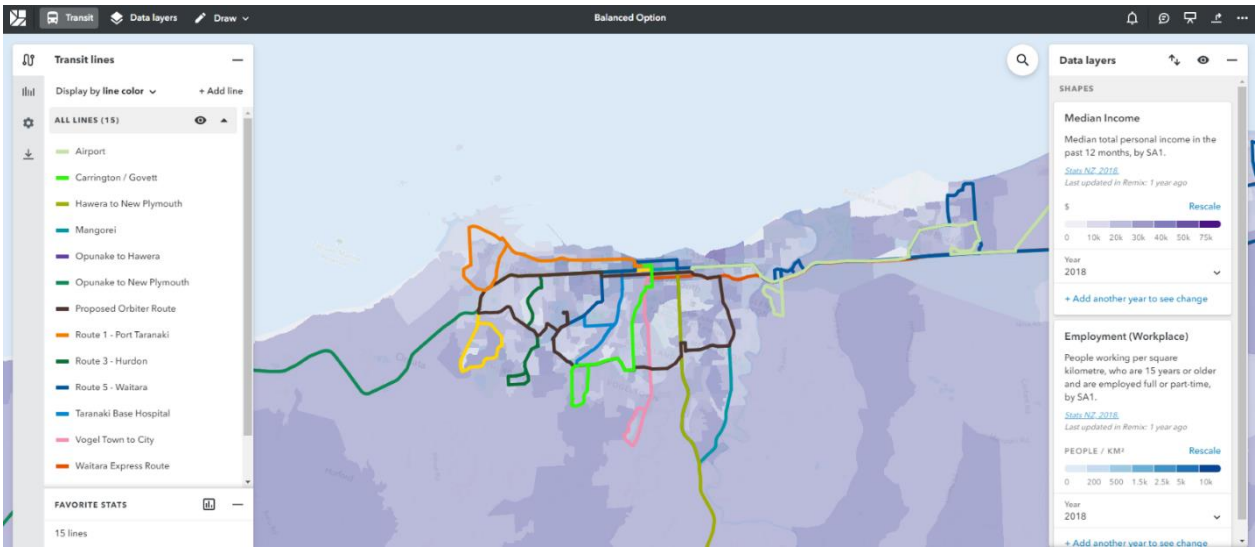
Employment Work Place

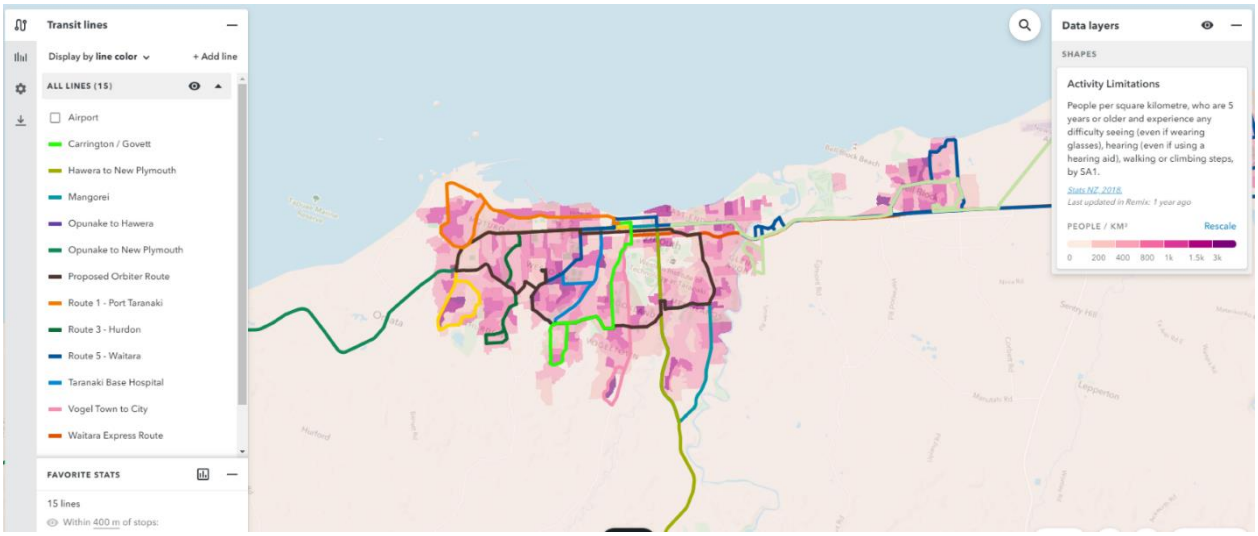


Median Income

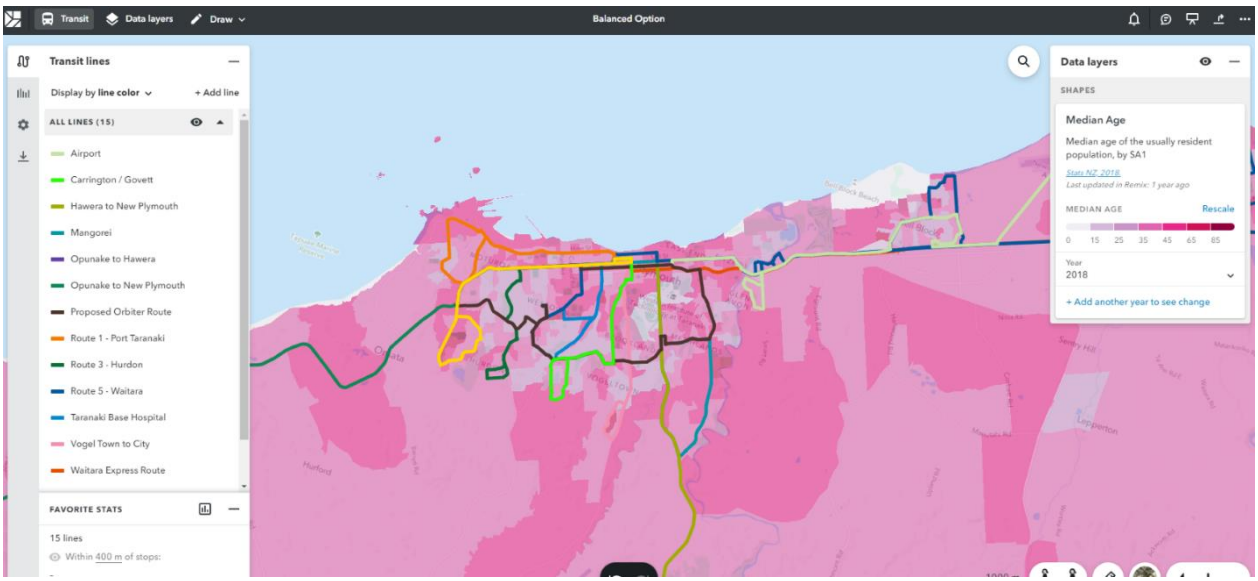


Technical Note

Movement limitations



Median age – and all age categories



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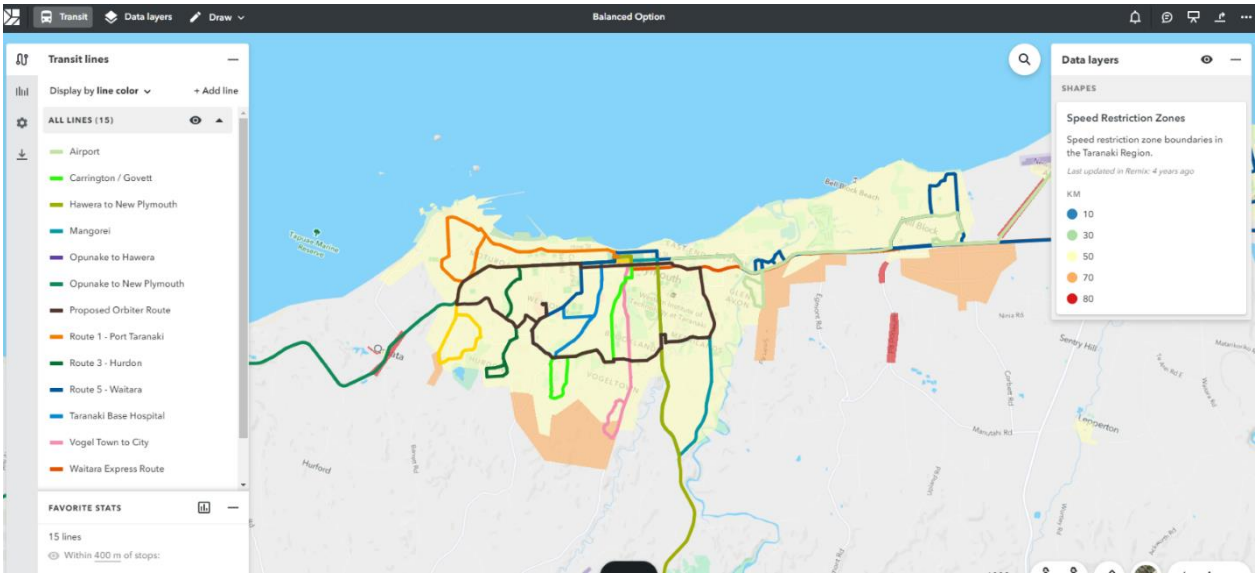
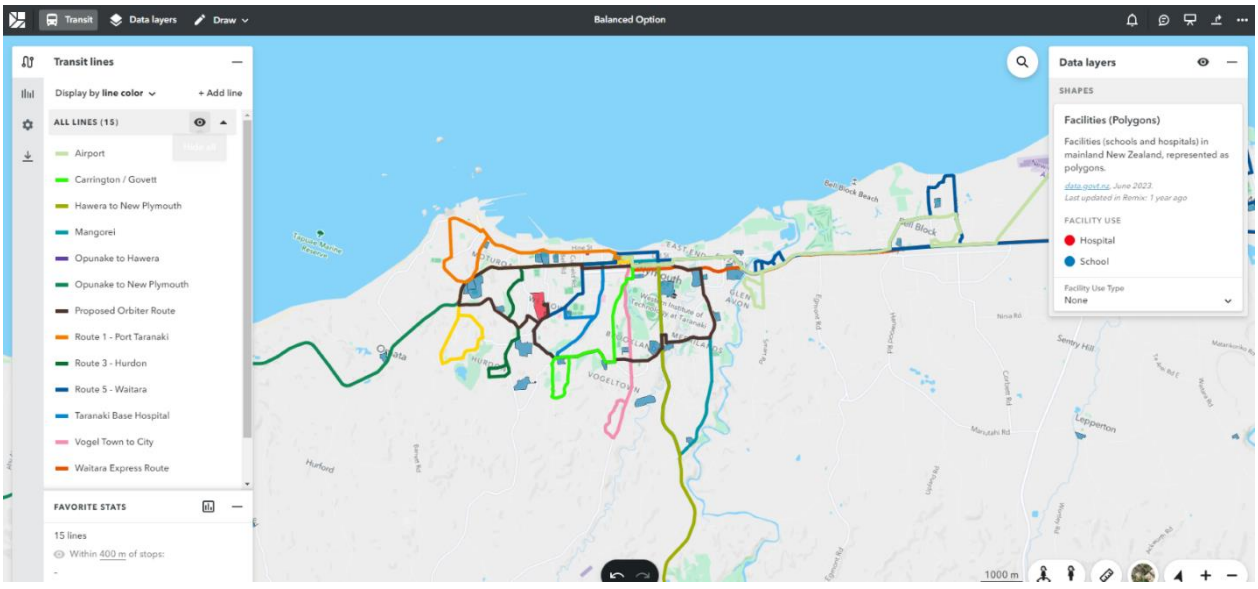
Speed Restrictions

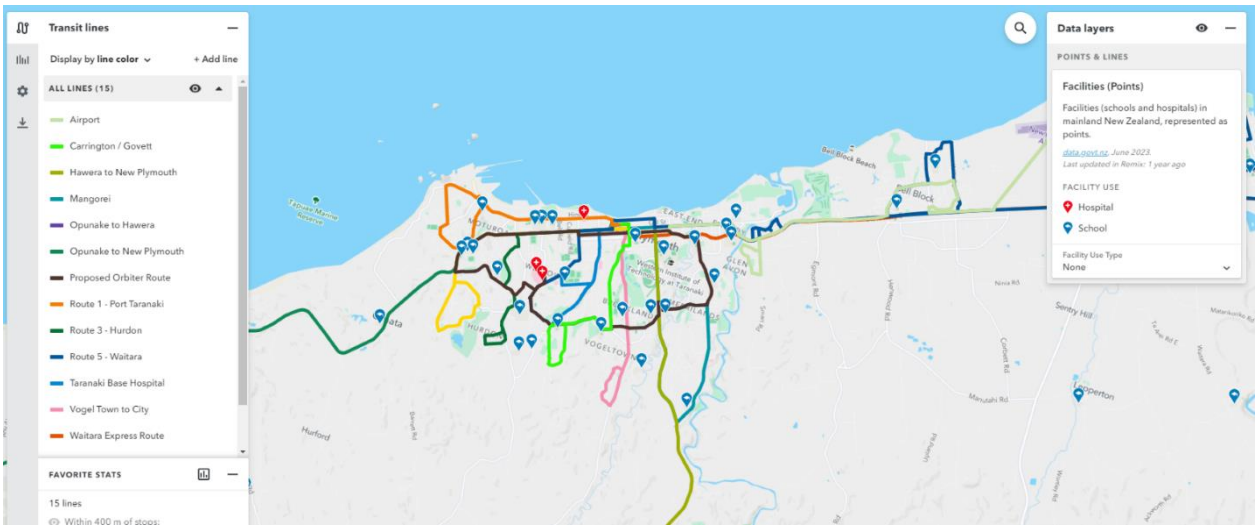


Facilities – eg schools hospitals

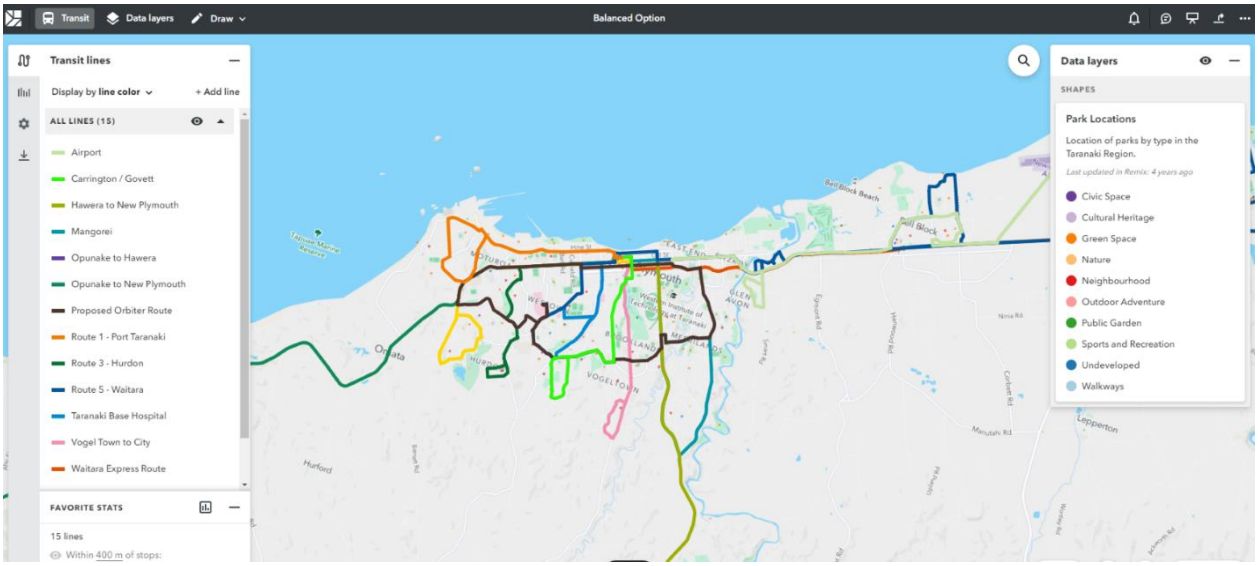


Technical Note

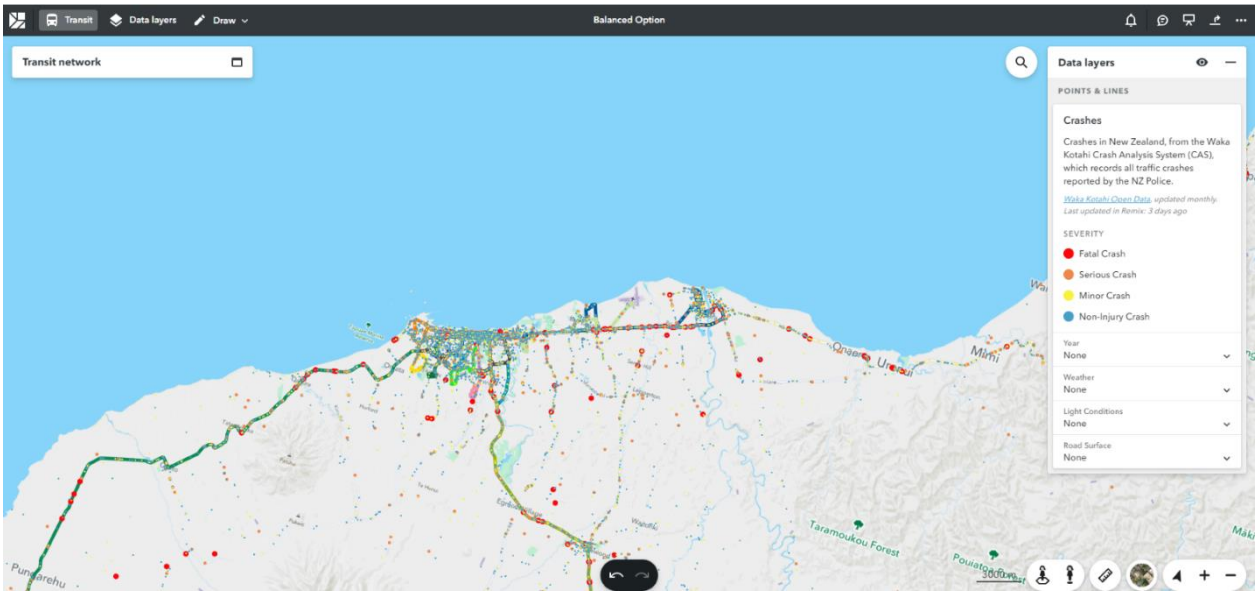
Community facilities



Parks



Crash Datra



6 EAST Assessment

The team utilized the Early Assessment Sifting Tool (EAST) developed by the New Zealand Transport Agency (NZTA) to streamline our project evaluation and decision-making processes. This tool enabled us to efficiently assess multiple public transport networks for Taranaki based on key criteria, ensuring that we prioritised projects with the greatest potential for positive impact.

Key Points:

1. **Structured Evaluation:** EAST provided a clear framework for evaluating projects, allowing us to systematically compare their benefits and feasibility.
2. **Focus on Outcomes:** The tool helped us focus on achieving desired community outcomes, such as improved safety, reduced congestion, and enhanced accessibility.
3. **Efficient Prioritisation:** By sifting through various options quickly, EAST enabled us to identify and prioritise high-impact projects, ensuring optimal allocation of resources.
4. **Stakeholder Engagement:** The structured approach facilitated transparent communication with stakeholders, building trust and gaining support for priority projects.
5. **Informed Decision-Making:** Utilising EAST ensured our decisions were data-driven and evidence-based, leading to more effective and sustainable transport solutions.
6. **Time and Cost Savings:** The efficiency of the EAST process saved valuable time and resources, accelerating project initiation and implementation phases.

By leveraging the Early Assessment Sifting Tool, we ensured a strategic, efficient, and outcome-focused approach to our public transport network planning. This proactive method has set a strong foundation for delivering impactful projects that best serve our community's needs.

Specifically, six options were reviewed as detailed below.

Option	Details	Progress	Rationale
Option 1: Do Minimum	Existing bus network and frequency.	**Y**	As this is the Do-Minimum so is taken through automatically
Option 2: Access (IO2) Emphasized	The focus for this option is enabling the largest number of residents to have access to bus services. It is based on a coverage network, where the greater and more accessible (e.g. number of residents living within 400m of a bus stop is emphasized over enabling the largest number of people to use the network. In short, a wide network with longer routes, possible feeder buses, and a focus on areas in need (social deprivation).	**Y**	No fatal flaws or any other reasons identified to not proceed with the option.
Option 3: Throughput (IO1) Emphasized	The focus for this option is on maximizing the number of people who utilize the bus network. Rather than looking at the greatest coverage, the option looks at key high priority corridors where more frequent services take people between key destinations.	**Y**	No fatal flaws or any other reasons identified to not proceed with the option.
Option 4: Environmental – mixed access and throughput emphasized	The focus for this option is reducing C02 Emissions via VKTs - so blends access to the network and throughput together. The environmental focus is specific for the IOs and looks at treatments from an environmental perspective rather than specifically a passenger perspective. By doing this it enables a broad range of options and treatments to be considered	**N**	Similar to balanced option. However by looking at environmental outcomes first the option doesn't provide a strong outcome for the community.
Option 5: Balanced	The focus of the balanced option is to look at access (coverage), throughput (patronage) and environmental outcomes equally. Key parts of each of the components, such as targeted connecting into specific areas, prioritising high quality services where they will have the most benefit, and CO2 and VKT reductions are all key considerations in building the option from treatments	**Y**	No fatal flaws or any other reasons identified to not proceed with the option.
Option 6: Ambitious	The ambitious option is exactly that. Ambitious! Nothing is off the table, and cost is not a key consideration. High quality options	**N**	Although this option will have the greatest alignment with the

	such as BRT, building new Park and Ride sites, as well as actively discouraging private vehicles are all key components. See this as an option where you are not constrained by dollars or politics - anything can be done to create the 'perfect utopia' of a public transport system.		IOs, affordability will deem this option infeasible in this current condition.

As can be seen two options were discontinued based on the EAST as they were deemed to have fatal flaws. A copy of the full EAST outcomes is attached.

7 MCA Assessment

We utilised Multi Criteria Analysis (MCA) to comprehensively assess a range of options for enhancing the public transport networks in Taranaki. This robust evaluation method enabled us to consider multiple factors simultaneously, ensuring a balanced and well-informed decision-making process.

Key Points:

1. **Holistic Evaluation:** MCA allowed us to assess each public transport network option against a variety of criteria, including cost, efficiency, environmental impact, accessibility, and community benefits.
2. **Balanced Decision-Making:** By weighing each criterion according to its importance, we ensured that our final decisions were balanced and reflective of the community's diverse needs and priorities.
3. **Subject Matter Experts:** The transparent nature of MCA facilitated active involvement from SMEs, helping to ensure that all perspectives were considered and fostering broader support for the chosen options.
4. **Data-Driven Insights:** MCA's structured approach provided data-driven insights, leading to more objective and evidence-based evaluations of each potential transport solution – data was obtained from Remix.
5. **Optimised Resource Allocation:** The analysis highlighted the most viable and impactful projects, enabling us to allocate resources efficiently and maximise the benefits for the Taranaki region.
6. **Future-Proof Planning:** By considering long-term implications and sustainability alongside immediate benefits, MCA helped us select options that are not only effective today but will continue to serve the community well into the future.

Using Multi Criteria Analysis, we navigated the complexities of public transport planning with precision and clarity. Our thorough and inclusive approach has laid the groundwork for a more efficient, accessible, and sustainable transport network in Taranaki, meeting the evolving needs of our community.

7.1 MCA Criteria

The following criteria were utilized in the MCA for the assessment:

1. Investment Objective One
2. Investment Objective Two

3. Investment Objective Three
4. Te Aoi Maori
5. Climate Change Mitigation
6. Climate Chagne Adaption
7. Social and Cultural Impacts
8. Potential Value for Money
9. Consentability
10. Potential Affordability
11. Compatibility with EV Fleet
12. Current and future land use
13. Safety in Design
14. Technical
15. Operation and Maintenance
16. Timeframe for Delivery.

We considered these in the following ways:

1. **Investment Objective One:** We prioritised options that directly support our primary investment objective of being the preferred mode of choice on key corridors by 2050. This involved utilizing Remix data, specifically land use, jobs and education information to compare how options scored.
2. **Investment Objective Two:** We evaluated options against leaving no one behind on the public transport network. This involved reviewing option configurations. A particular focus was on accessibility, and linking to data from Remix showing those who have potential physical impediments and where they live and where they need to go.
3. **Investment Objective Three:** Addressing our third investment objective, we looked at reduction in emissions. This related to journeys taking residents where they need to go, and also access to economic opportunities. Again Remix data sources and layers were utilized to assist with making these decisions on options.
4. **Te Aoi Māori:** Views were considered as part of the development of the network – however it is noted TRC will be undertaken further consultation in this space and seeking views as part of the addendum,
5. **Climate Change Mitigation:** Evaluating each option's potential to reduce greenhouse gas emissions, we aimed to support environmental sustainability and lower our carbon footprint.
6. **Climate Change Adaptation:** We assessed the resilience of transport options in the face of climate change impacts, ensuring durability and adaptability for future conditions.
7. **Social and Cultural Impacts:** Understanding the broader social and cultural implications, we reviewed options that positively influence the community's well-being and social cohesion. Remix data was heavily relied on

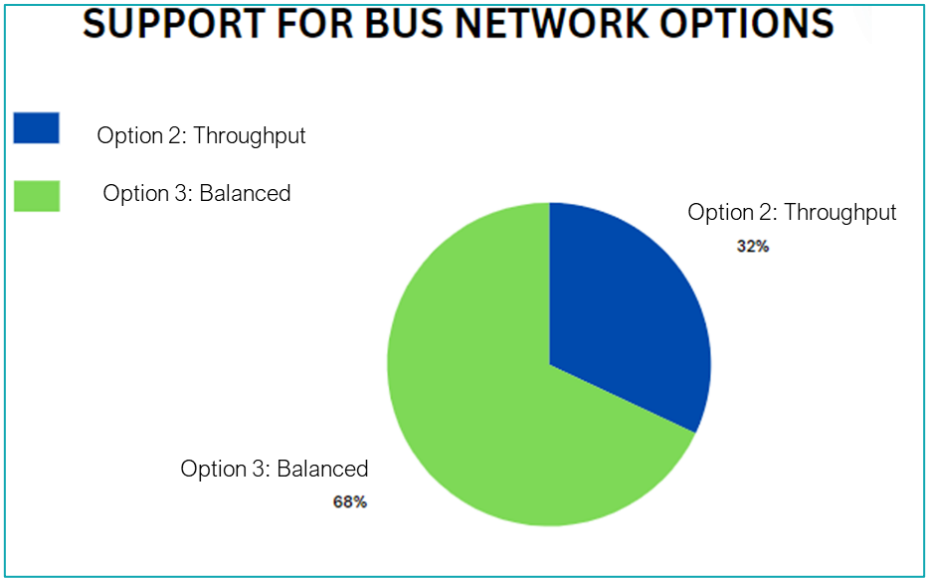
8. **Potential Value for Money:** We analysed cost-effectiveness, selecting options that provide substantial benefits relative to their investment requirements. NZTA data and NLTP budgets were a key consider of this.
9. **Consentability:** Considering regulatory and community acceptance, we assessed options for any key differences. It is noted that there were not significant differences between options as the options were primarily network based with minimal infrastructures.
10. **Potential Affordability:** We evaluated financial feasibility to ensure that options are economically viable and sustainable within our budget constraints.
11. **Compatibility with EV Fleet:** Reviewed previous Jacobs report to ascertain what networks could work with an EV fleet.
12. **Current and Future Land Use:** We aligned transport planning with existing and projected land uses, rating options on promoting efficient urban development and connectivity.
13. **Safety in Design:** Consideration across all options
14. **Technical Feasibility:** We considered technical aspects, choosing options that are practical, reliable, and achievable with current technologies.
15. **Operation and Maintenance:** We evaluated operational efficiency and maintenance needs, aiming for solutions that are straightforward and cost-effective to manage.
16. **Timeframe for Delivery:** Timely implementation was a key factor, leading us to prefer projects that can be delivered promptly while maintaining quality and effectiveness.

Full details are provided in the MCA Spreadsheet which is attached in a separate Appendix. All relevant information was obtained from Remix. A summary of the options is provided below.

Group	Weighting	Do Min	Option 1	Option 2	Option 3
All	33/33/33	4	3	2	1
Investment Objectives/ Implementability/ DM&	50/25/25	4	3	2	1
Investment Objectives/ Implementability/ DM&	25/50/25	4	3	2	1
Investment Objectives/ Implementability/ DM&	25/25/50	3	4	2	1

8 Short List

From the above consultation and further assessments were undertaken on the short list. The overwhelming support was also for Option 3 – Balanced. Key feedback resulted in minor modification for the options.



9 Endorsement of the preferred option

Following the above an updated preferred option was provided and Councilors provided endorsement of this option, as reflected in approvals of attached memos for the business case. These are attached in an additional Appendix.

F

Appendix F – Memo to Councillors and Key Optioneering Meeting Minutes


Beca
Taranaki PT SSBC
Optioneering Workshop
make
everyday
better.

Agenda

- Purpose of the workshop
- Scene setting - Summary of strategic case and current status of the project
- Workshopping:
  - Intervention Hierarchy
  - Themes
  - Options
- Summary and next steps

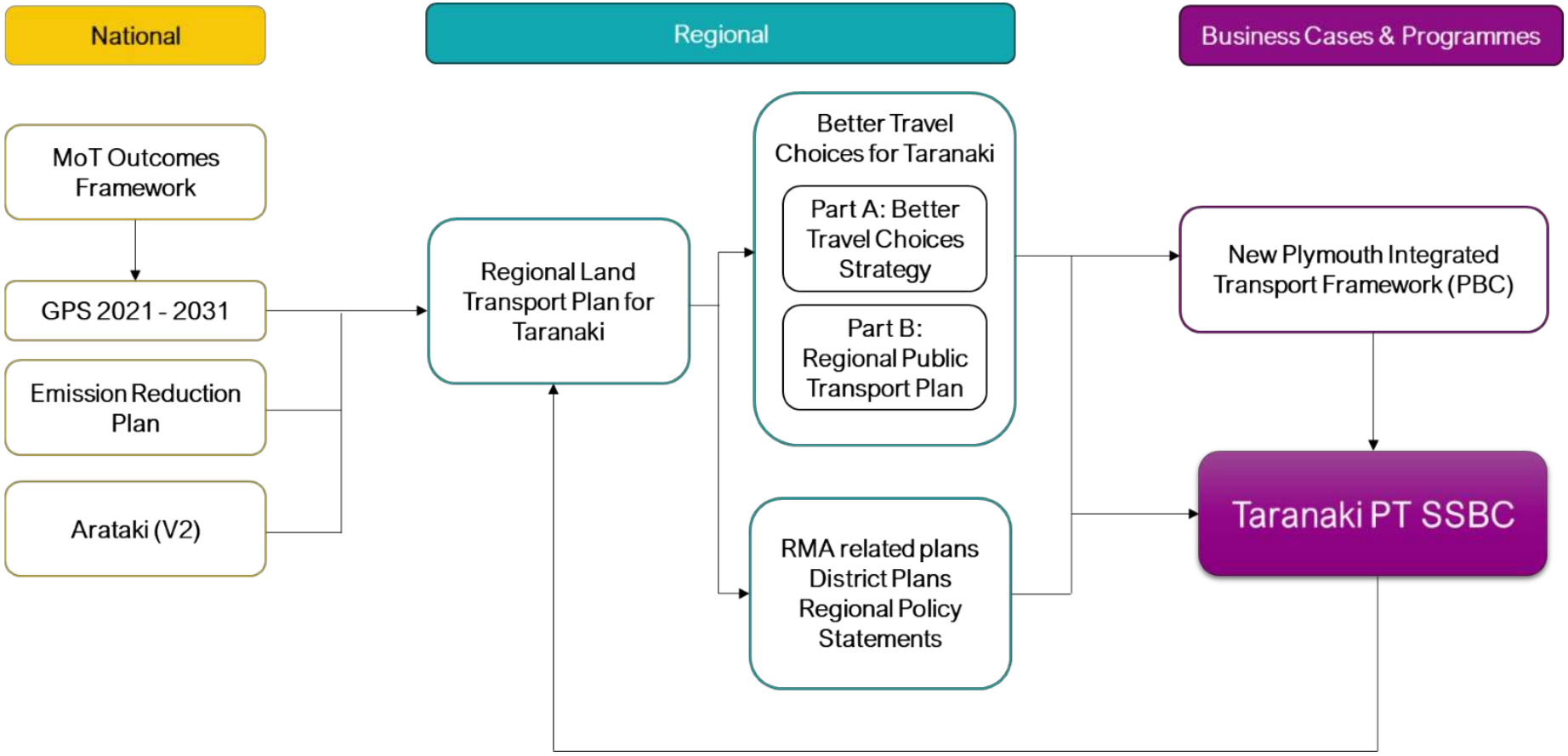
Purpose of the Workshop

Purpose of the optioneering workshop

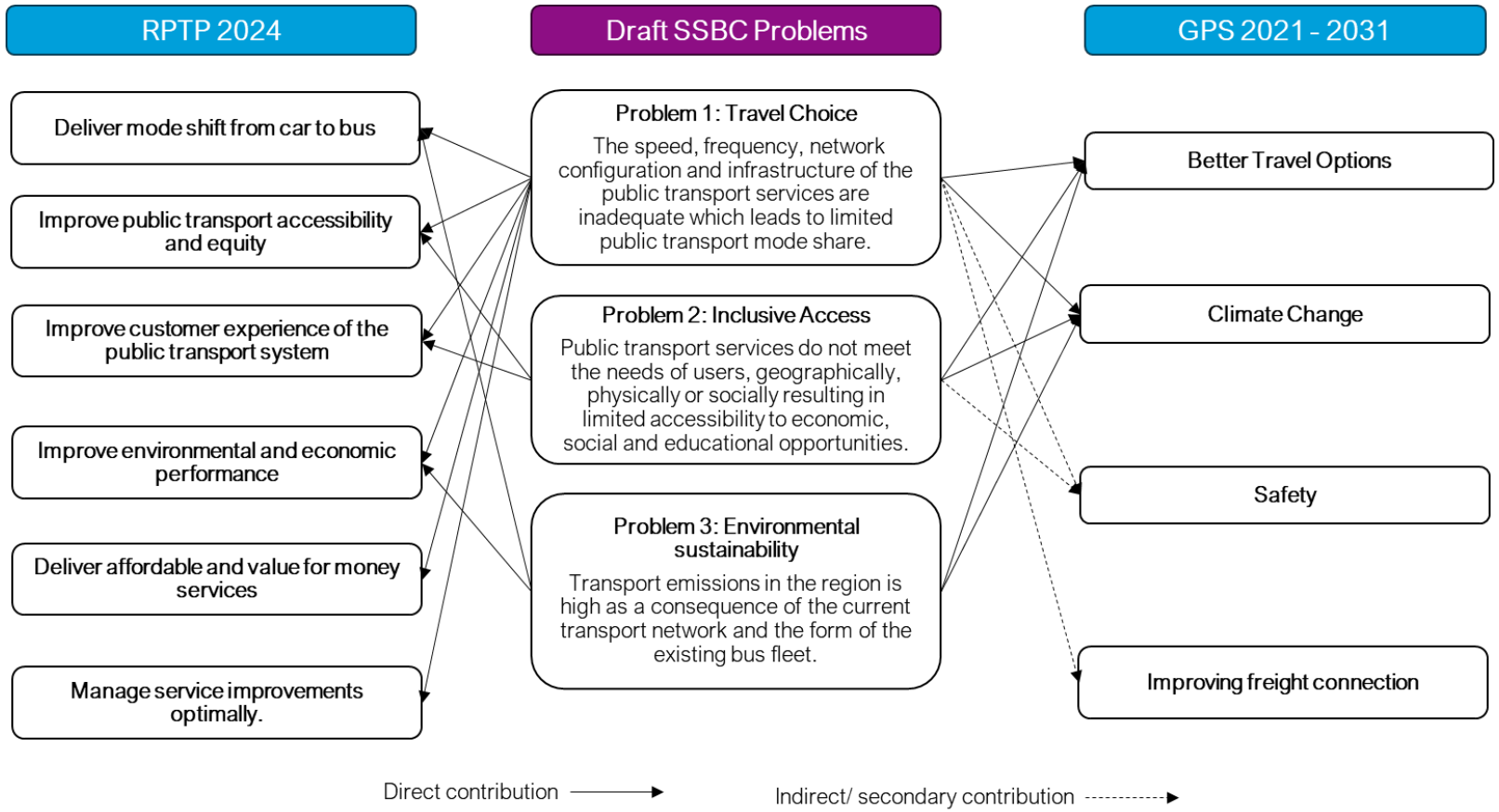
- Workshop and agree interventions
- Workshop and agree themes
- Workshop long list of options
- Minute and seek agreement on options

Scene Setting

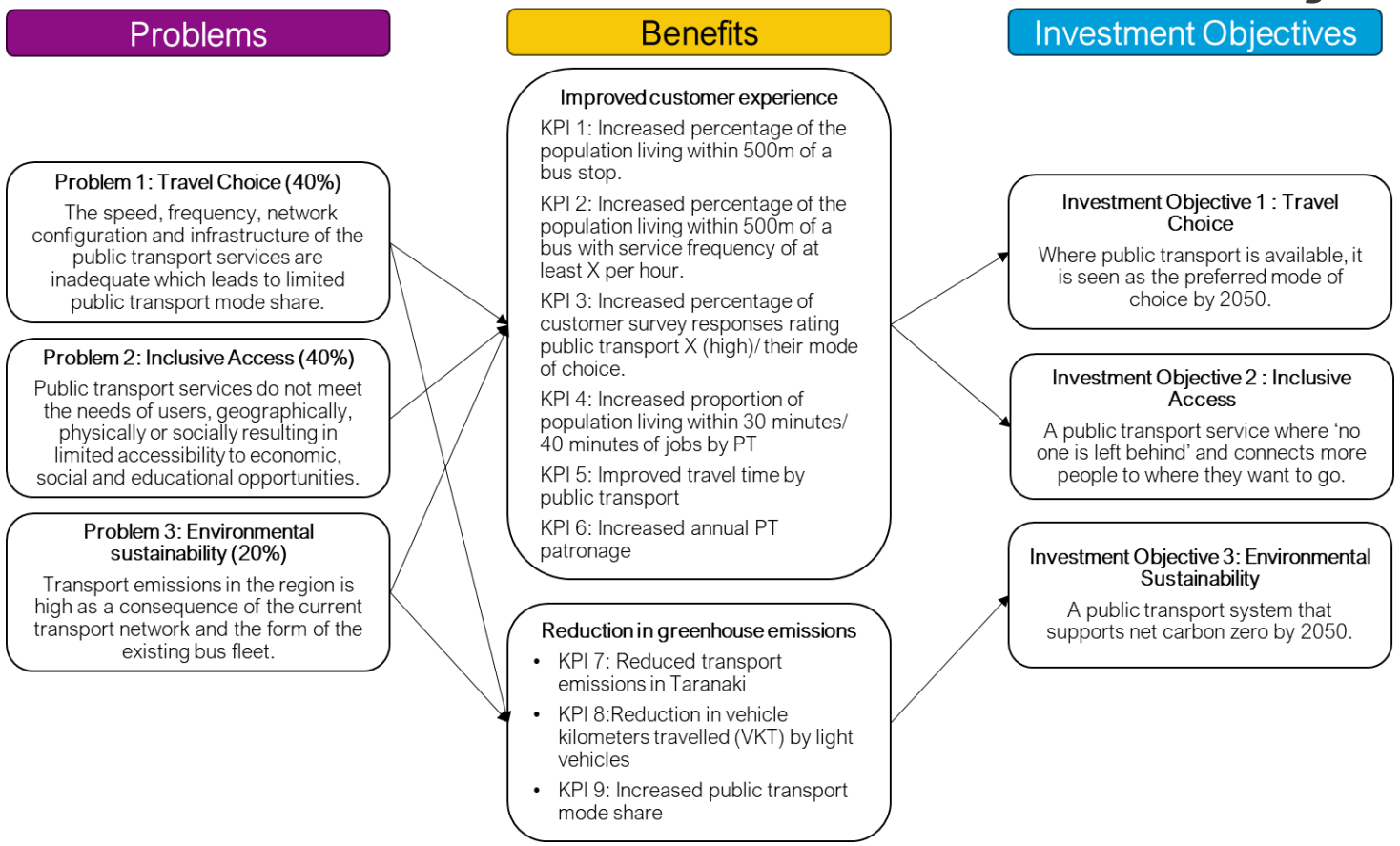
PT SSBC - Strategic Alignment



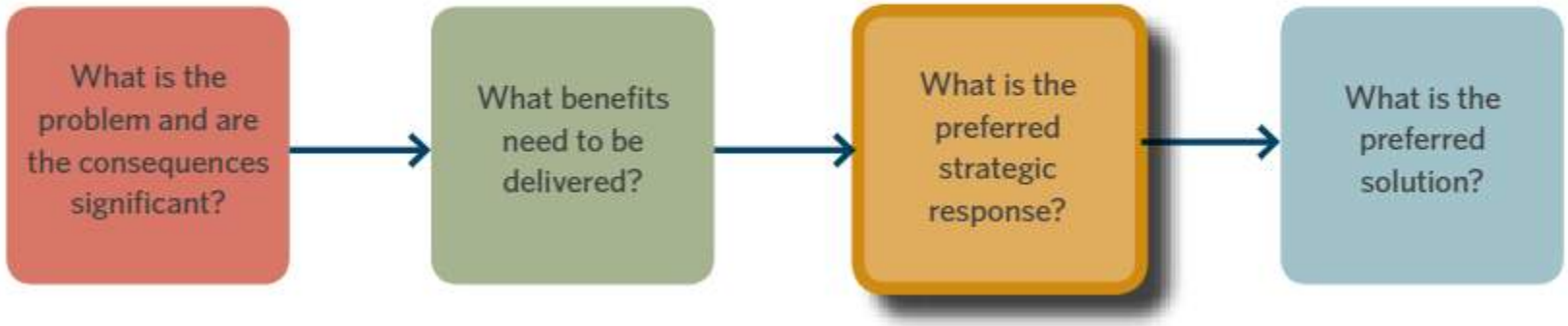
Problem Statements



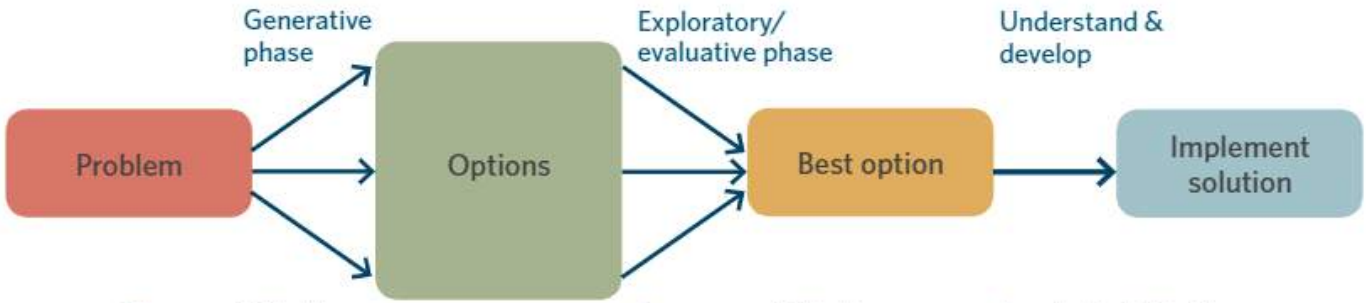
Problems, Benefits and Investment Objectives



The line of enquiry common to all business cases



A cognitive model for creative problem-solving



Divergent thinking

Used to generate possible options

Characterised by:

» associative richness

» de-focused, suggestive or intuitive thought

Using: cognitive flexibility, working memory

Convergent thinking

Used to focus on the best option

Characterised by:

» analytical thinking

» focused, evaluative, cause-and-effect thinking

Using: inhibitory control

Analogical thinking

Used to understand the new idea (using existing concepts)

Characterised by:

» relational reasoning

Using: relational processing, inhibitory control, semantic memory

A problem of ice, bears, and honey pots

In studies of the most creative work groups, there are nearly always three things present. The first is a team that works well together. The second is laughter, suggesting a connection between humour and creativity. And the third is a level of informality. All three of these were present in one of the most creative brainstorming sessions ever held by a major utility company, Pacific, Power and Light (PP&L). The following story relates how a flash of insight on one of their brainstorming sessions solved one of the organisation's most costly, difficult and unsolvable problems.

PP&L was the electric utility responsible for providing power to the North West Cascade Mountain area of the United States. This area faces severe weather in spring and autumn each year resulting in heavy ice deposits on power transmission lines. Lines frequently come down under the weight of the ice.

The company's method of removing the iced lines was to send linesmen through the snow and up the icy pylons and to physically shake the ice off the lines. It was a long, arduous, costly and unpleasant way of dealing with the problem.

A brainstorming session was held to look at what could be done.

The PP&L group spent a whole morning looking at the problem but got nowhere. Frustrated and running out of ideas, the group decided to take a coffee break.

During coffee, Bill, a linesman, had everyone in fits of laughter.

'Last week I was chased by a bear. It even climbed a pylon after me.'

As the laughter died down, someone suggested, 'Why don't we get the bears to climb for us?'

'How?'

'We could put honey pots on top of the pylons.'

'No, the raccoons would get there first.'

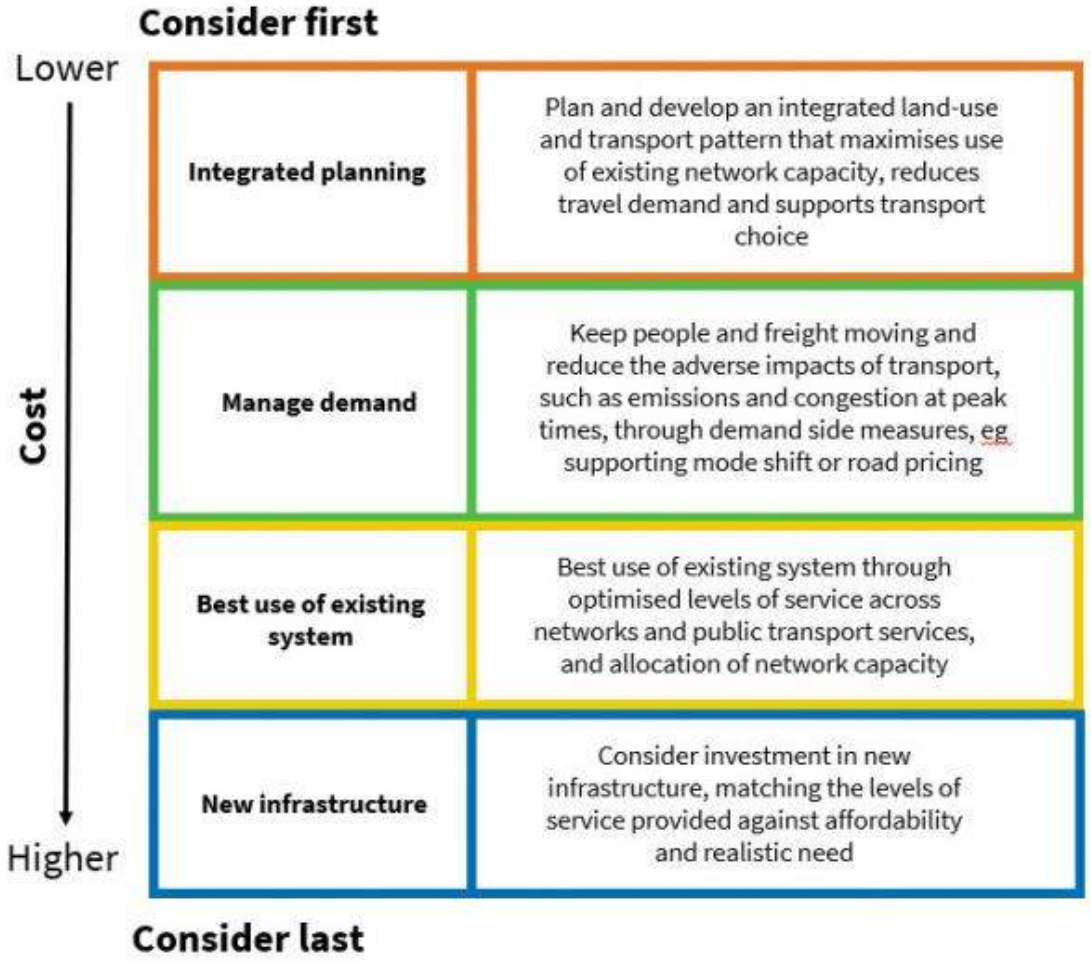
'Anyway we'd need helicopters to put the pots in place and they'd frighten the bears,' said one of the secretaries. 'I remember the vibrations from helicopters in the Vietnam war when I was a nurse.'

There was silence as everyone realised they'd struck gold.

It became standard practice in PP&L to use hovering helicopters to remove ice from frozen cable lines through the downforce from their swirling rotor blades.

(Adapted from http://www.managetrainlearn.com/page/group-creativity)

Intervention Hierarchy



Integrated Planning

- Interventions:

Manage Demand

- Interventions

Best use of existing system

- Interventions

New Infrastructure

- Interventions


2 CITYLINK
PLEASE SIGNAL DRIVER
Citylink
tranzit
9 The Valley
Citylink
0800 87 22 67

Themes

Themes

- **Demand:** Focuses on reducing the need for something. Potential options could include more compact land uses, work travel planning to spread peak demand, flexible working options and so on.
- **Productivity:** Focuses on optimizing existing assets or services. Potential options could include use of high-productivity freight vehicles, increasing seating on buses and trains, or optimizing traffic control measures to increase network throughput.
- **Supply:** Focuses on the physical capacity of assets or services, for example road infrastructure or bus services.

Demand

- Option Themes

Productivity

- Option Themes

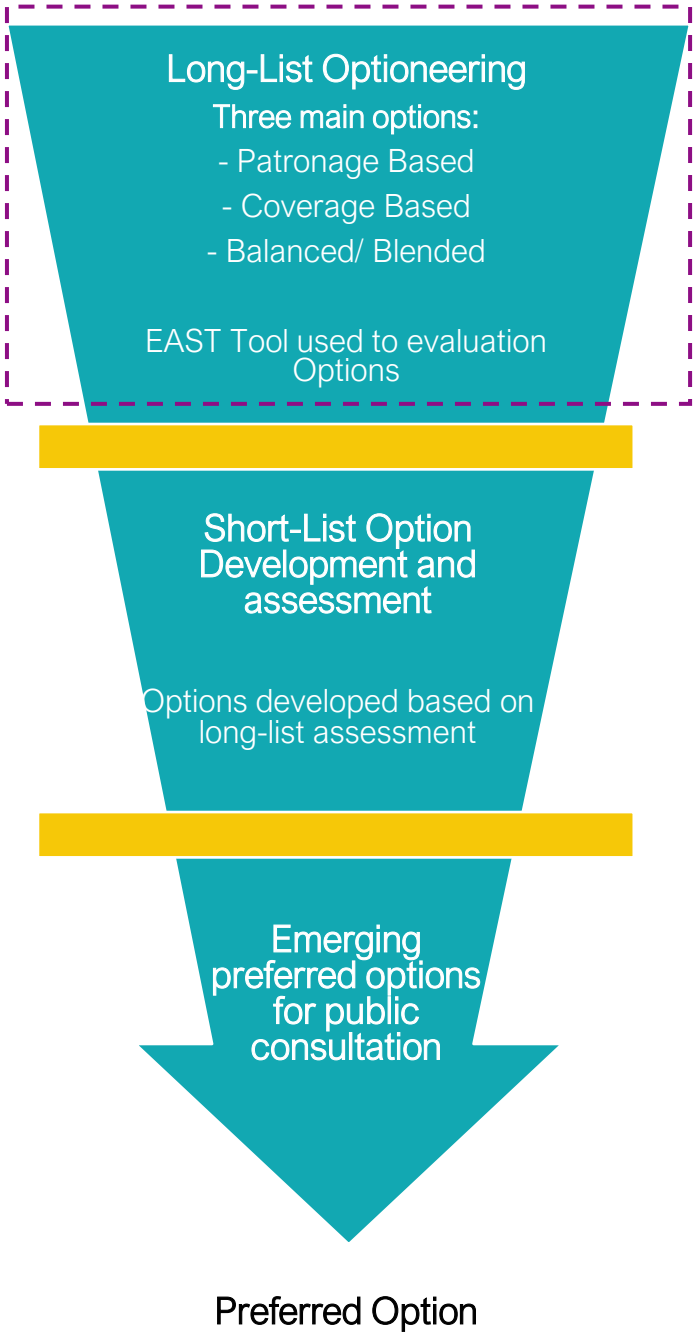
Supply

- Option Themes

Option development

Proposed Option Build Up

- Do minimum
- Patronage Based
- Coverage Based
- Blended Options



Opt 1 - Patronage Based

- 1a – High: Direct routes to/from 80% key destinations and densely population areas only
- 1b – Med: Direct routes to/from 50% key destinations and 50% densely population areas only
- 1c – Low: Direct routes to/from 30% key destinations and 30% densely population

Opt 2 - Coverage Based

- 1a – High: High coverage i.e 90% of the population is within 500m of a bus stop.
- 1b – Med: Medium coverage i.e. 70% - 80% of the population is within 500m of a bus stop
- 1c – Low: Low coverage i.e. 50% of the population is within 500m of a bus stop.

Opt 3 – Balanced/ Blended Options

Options		Coverage		
		High	Med	Low
Patronage	High	3a	3d	3g
	Med	3b	3e	3h
	Low	3c	3f	3i

Community feedback will feed into the evaluation process

- Network form options:
  - Radial
  - Through-route
  - Hub & spoke
  - Grid Network

Summary and next steps

Summary and next steps

- Minuting workshop and seeking approval
- Timeframes

Elected Members Briefing

29TH JULY 2024

Agenda

- Introduction
- Purpose of Briefing
- Summary of Engagement
- Business Case Process
- Economics and Funding
- Next Steps

1: Introduction

1: Introduction

- The team is currently finalizing the Taranaki Regional Council Public Transport Single Stage Business Case
- A large volume of work has been completed with stakeholders and the community taken on the journey
- Today we will present this information, and ask Councillors and the Executive a simple question:
    - Do you endorse the Emerging Preferred Option for the future Public Transport network in Taranaki?

This is a key stage of the project where you as a Council make a decision on nine months of work for this business case, and agree on the future direction of public transport.


EMERGENCY EXIT
EMERGENCY EXIT
Electric
0%
Emissions
ebus
Taking Taranaki
forward

2: Purpose

2: Purpose

- Provide a summary of the community engagement undertaken
- Provide details on the Business Case process undertaken
- Provide outcomes of the business case and emerging preferred option
- Seek endorsement of the emerging preferred option from Councillors and Council Executive prior to completing the business case

3: Community Engagement

3: Summary of Community Engagement – *Tell me what you want?!!!*

- **Phase 1: Hop on Board** – We collected feedback on ideas on specific bus services, frequency and timetables to make bus travel more attractive and provide more travel choices. 22 April - 6 May 2024.
- **Phase 2: Where to Next** - We asked the community to compare the two bus network options and tell us which one they preferred. 22 May - 11 June 2024.
- Engagement Activities: 7 Local pop-up events, Social pinpoint, Facebook.

Identified network problems from the community?

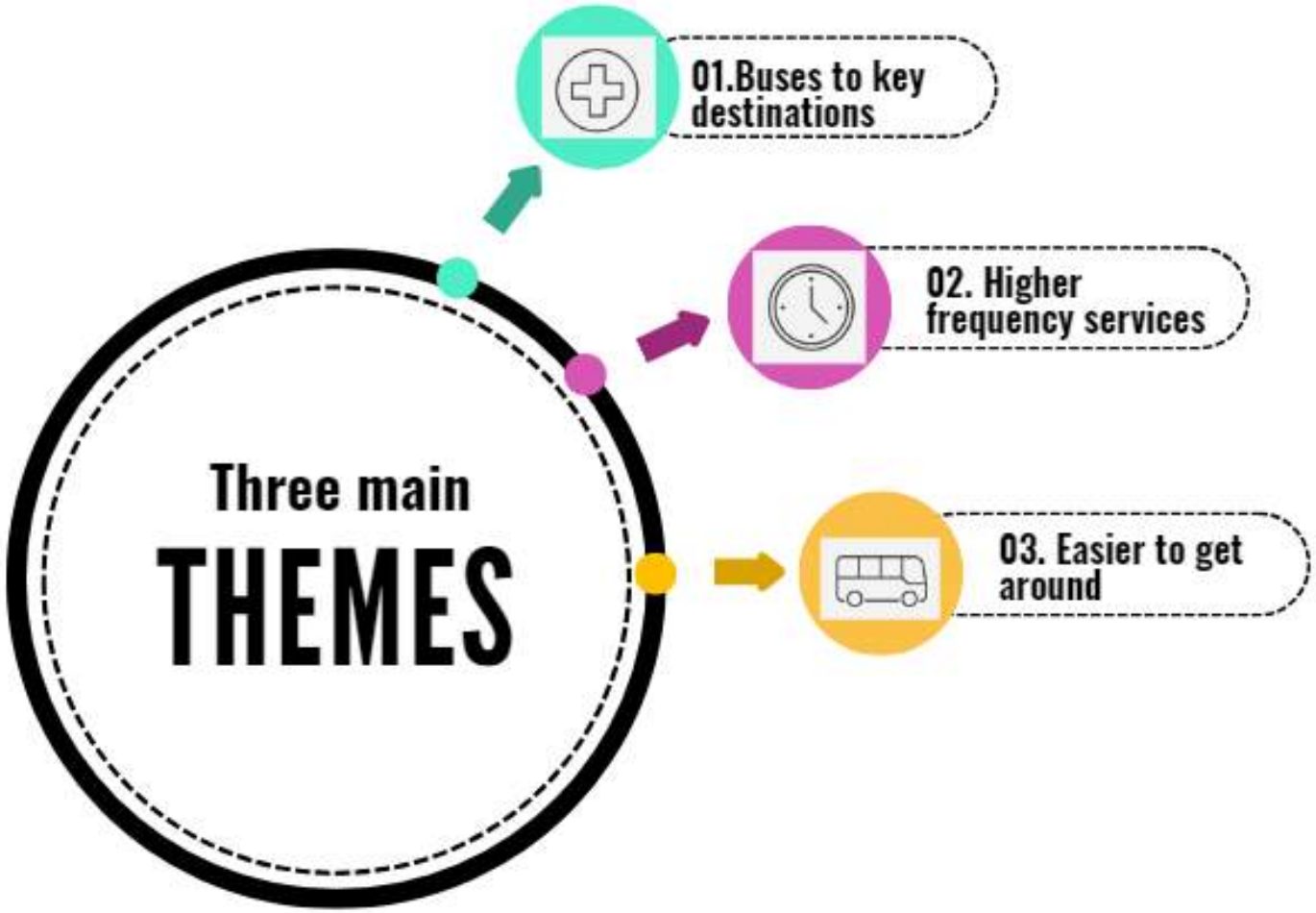
- Public Transport does not take people where they want to go
- Public Transport is not frequent enough
- Urban routes are loopy

Hop on Board: Engagement Activities

We asked the community about specific bus services, frequency and timetables to make bus travel more attractive and provide more travel choices

- 7 pop up events held in April and May with over 175 people coming along to share their ideas on the bus network.
- We were listening at Ngamotu Beach, Ōpunake, Waitara, Inglewood, Hāwera, Stratford, New Plymouth.
- Busiest event was at the Seaside Markets at Ngamotu Beach with 100 people keen to talk about our bus network.
- 390 submissions received.

Hop on Board: Main Themes



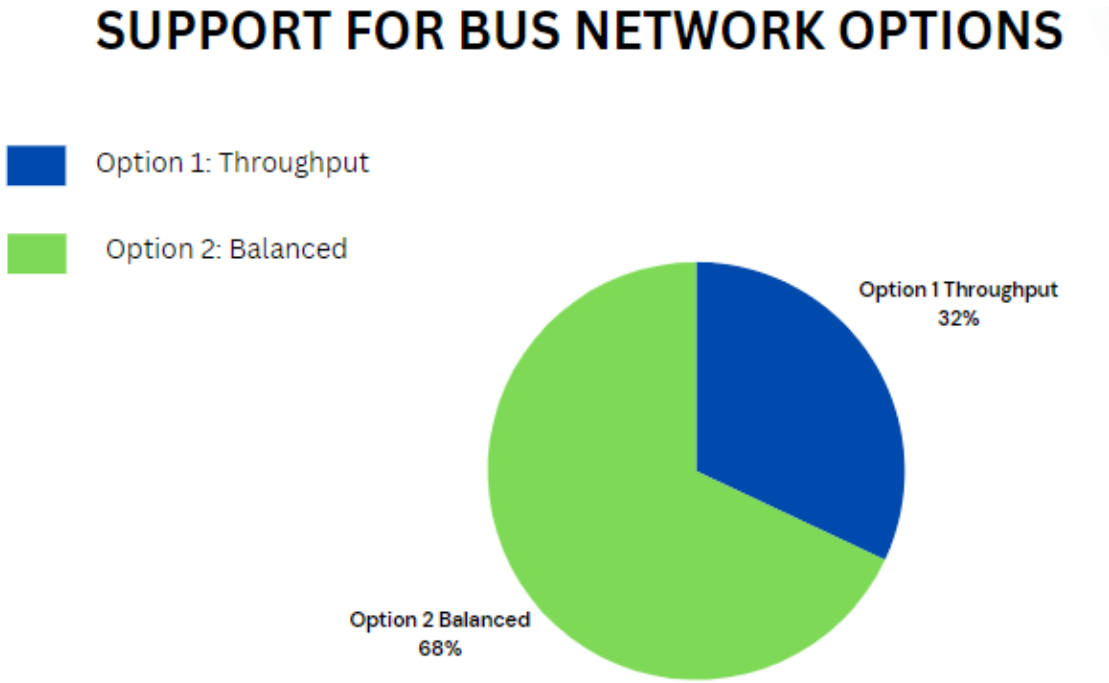
We developed both bus network options with these three themes front of mind

Hop on Board: Sub Themes

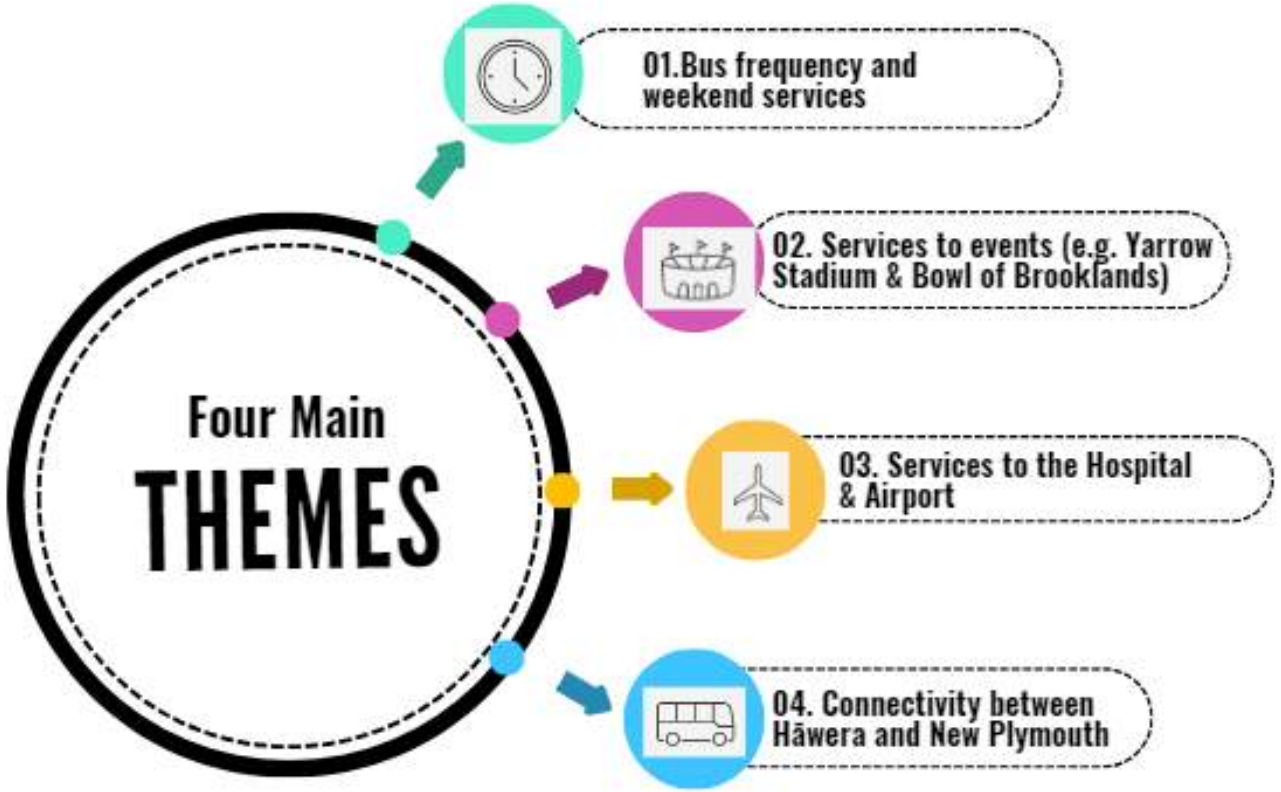
- New and extended routes, particularly to better serve outlying areas and key destinations.
- Strong preference for direct, express services to reduce travel time and increase convenience, especially for commuters and school students.
- Integration with major destinations and ensuring accessibility for all users
- Need for more frequent and reliable bus services, with adjustments to accommodate school schedules, work shifts, and regional connectivity.
- Better weekend and evening services, express routes, and more targeted services for specific groups such as students and hospital staff.
- Strong desire for more frequent and regular weekend bus services
- Enhancing access to recreational areas, facilitating transport for older adults, improving late-night services for social activities, connecting to the airport and ensuring accessibility to medical centres and supermarkets

Where to Next: Engagement Summary

We asked the community to compare the two bus network options and tell us which one they preferred. We had 326 responses.



Where to Next: Main Themes



The community also shared their thoughts on individual bus routes and changes to those routes.

What we Heard, What we Did

We listened to the community feedback and made the following refinements to Option 2 Balanced:

- Maintaining the level of service between Hāwera and Taranaki Base Hospital.
- The importance of the east-west throughput corridors (Route 5, Express, Airport to Whalers Gate)
- Returning bus routes to the underserved communities for key destinations including:
  - Waitara Express (Waitara to CBD)
  - Airport to Whalers Gate to provide a connection between Glen Avon, Bell Block, and Airport
  - Proposed Orbiter route help provide the underserved communities with bus services
- Improving accessibility to our older community and to the hospital (Mangorei Road route)
  - Merrilands to Taranaki Base Hospital to serve the retirement communities in Merrilands.

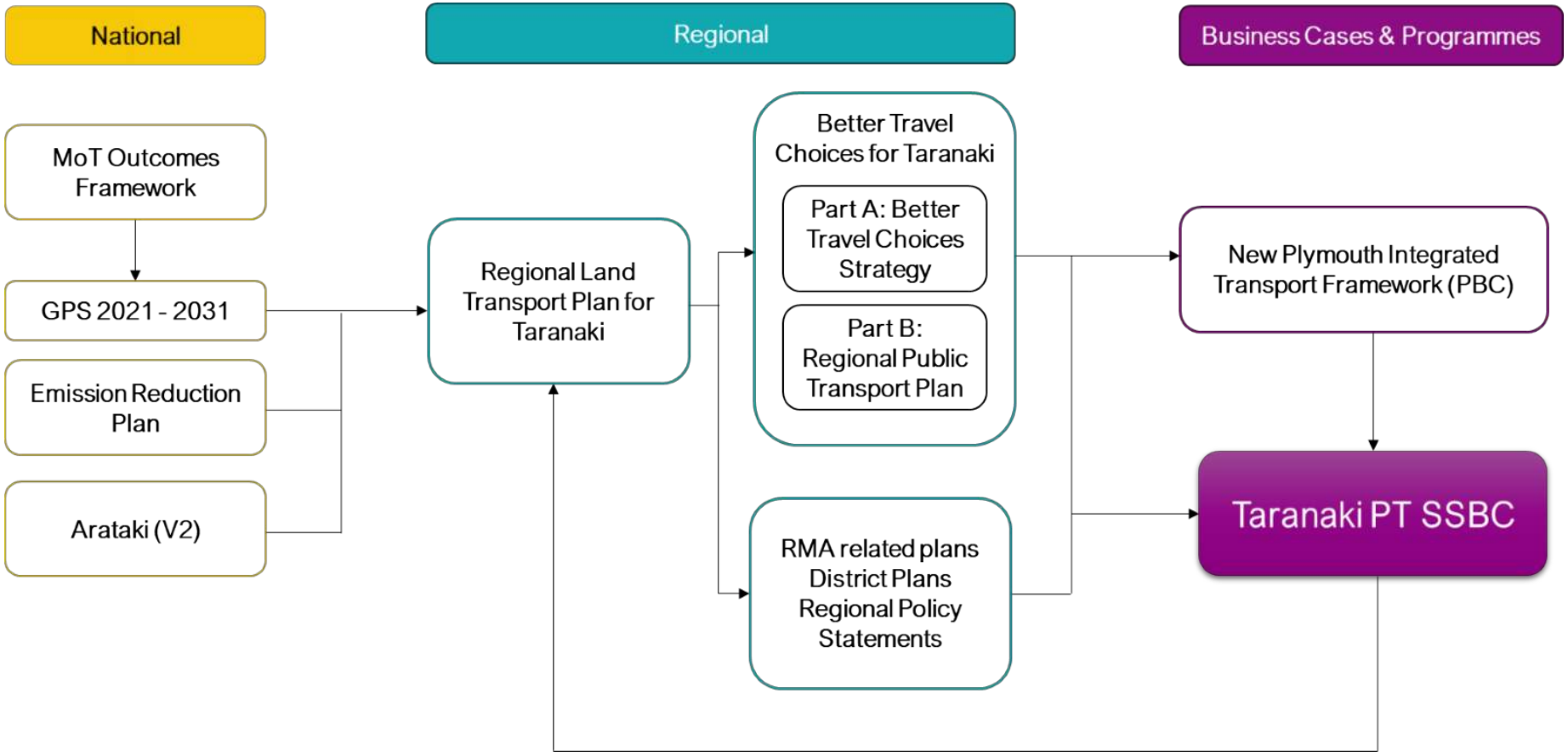
The refined Option 2 represents the emerging preferred network option.

Key Funding Partners Engagement

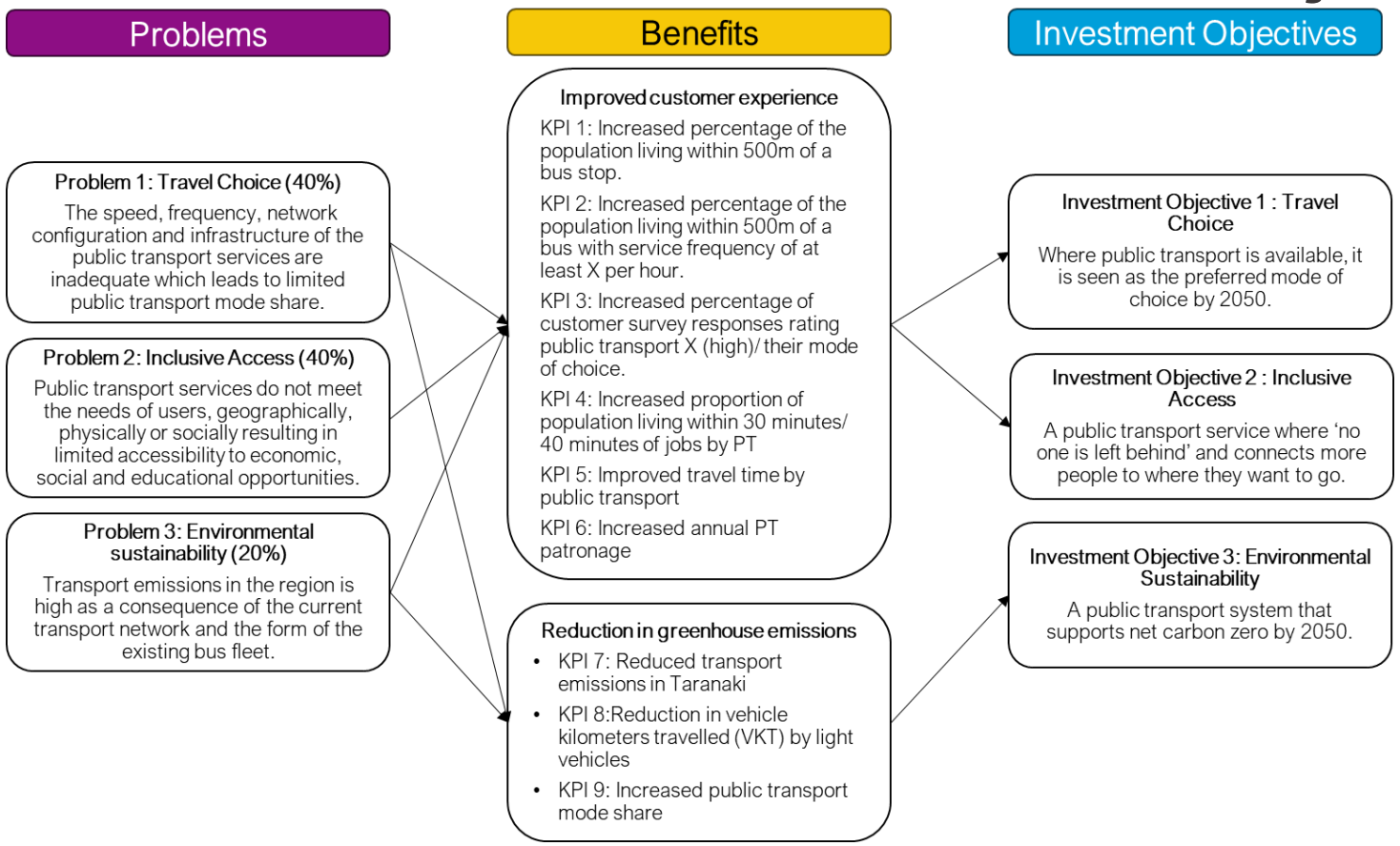
- Both New Zealand Transport Agency Waka Kotahi (NZTA) and New Plymouth District Council (NPDC) staff have been involved in the Integrated Transport Framework Programme Business Case as part of technical teams, Elected members attended option development workshops.
- NZTA has indicated that they are satisfied with the process that has been followed but cannot confirm funding
- NPDC has formally recorded their support for the work including a request for a new partnership-based governance model, a commitment to advocating alongside TRC for funding, noting the infrastructure requirements to support delivery etc.

4: Busine[redacted] Case Process[redacted] Recap

PT SSBC - Strategic Alignment



Problems, Benefits and Investment Objectives



Current Status of the Business Case

- Strategic Case completed
- Economic Case – 70% completed including EAST and MCA (to be finalized at preferred option selection)
- Economics and Costing completed
- Financial Case, Commercial Case and Management Cases 90% complete and to be finalized after this decision

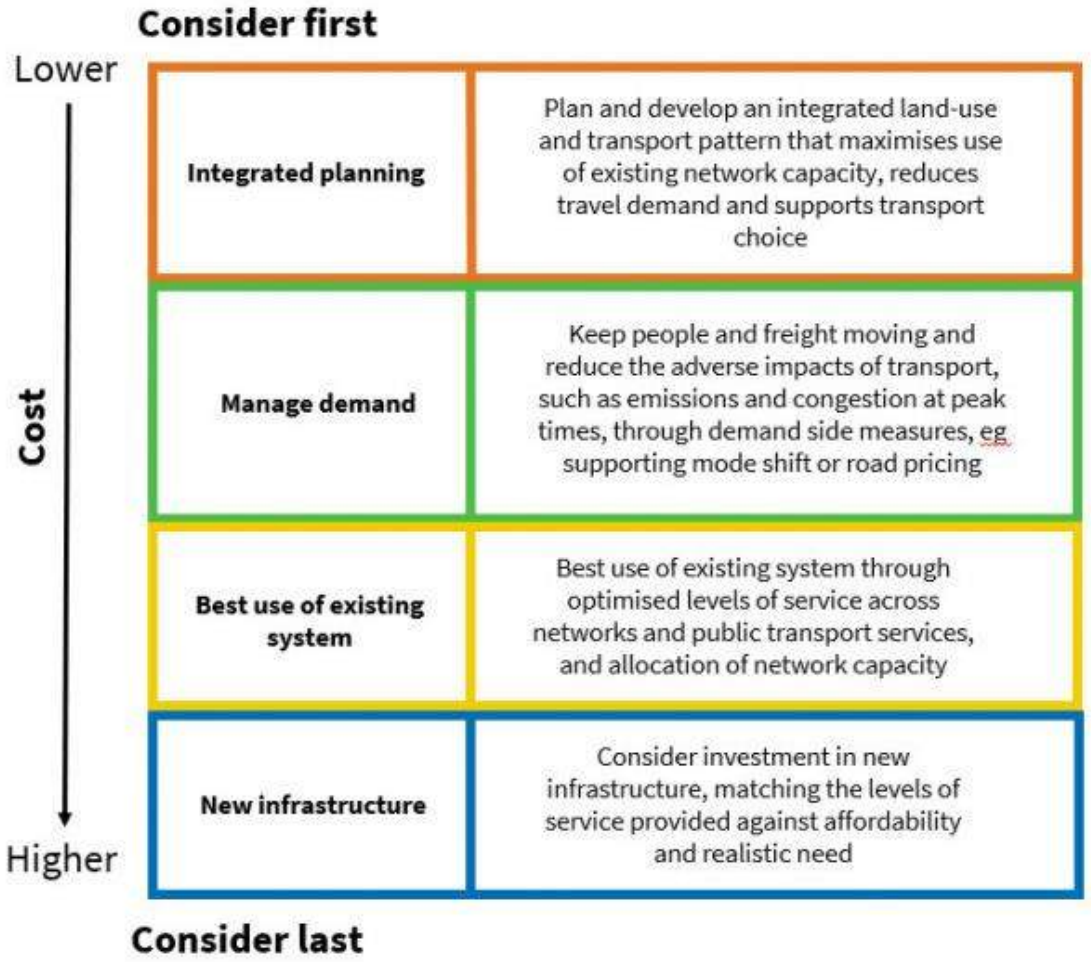
- Decision Point: Council endorsement on the emerging preferred option to finalize the Business Case

Matters that the final business case will address

- Proposed new partnership governance model for public transport improvement
- Funding model to enable introduction of early trials using mix of TRC, NPDC and NZTA funding
- Implications for procurement model
- Options for staged implementation should funding not be available
- Integration with other planning and infrastructure investments (eg bus hubs, masterplans for Waitara, FDS, out of sequence land developments)

Optioneering process -recap

Interventions



Option	Details	Progressed
Option 1 – Do minimum	The do minimum options includes current committed public transport (bus) projects or specific upgrades to both the network and vehicles that are currently approved with funding. It is not the do minimum required to meet the Investment Objectives for this Business Case.	Noted
Option 2 – Access IO2 emphasized	The focus for this option is enabling the largest number of residents to have access to bus services. It is based on a coverage network, where the greater and more accessible (eg number of residents living within 400m of a bus stop is emphasized over enabling the largest number of people to use the network. In short, a wide network with longer routes, possible feeder buses, and a focus on areas in need (social deprivation)	No – as a coverage network is not feasible based on EAST and MCA
Option 3 – Throughput IO1 Emphasized	The focus for this option is on maximizing the number of people who utilize the bus network. Rather than looking at the greatest coverage, the option looks at key high priority corridors where more frequent services take people between key destinations.	Yes – Throughput passed through MCA
Option 4 – Environmental – mixed access and throughput Emphasized	The focus for this option is reducing C02 Emissions via VKTs - so blends access to the network and throughput together. The environmental focus is specific for the los and looks at treatments from an environmental perspective rather than specifically a passenger perspective. By doing this it enables a broad range of options and treatments to be considered.	No – Change in political landscape
Option 5 – Balanced	The focus of the balanced option is to look at access (coverage), throughput (patronage) and environmental outcomes equally. Key parts of each of the components, such as targeted connecting into specific areas, prioritising high quality services where they will have the most benefit, and CO2 and VKT reductions are all key considerations in building the option from treatments.	Yes – Option included best of throughput and coverage
Option 6 – Ambitious – Everything Emphasized	The ambitious option is exactly that. Ambitious! Nothing is off the table, and cost is not a key consideration. High quality options such as BRT, building new Park and Ride sites, as well as actively discouraging private vehicles are all key components. See this as an option where you are not constrained by dollars or politics - anything can be done to create the 'perfect utopia' of a public transport system.	No – based on price and the need to provide value for money this option did not progress.

Process – Part One

1. Intervention Hierarchy undertaken with key stakeholders including NPDC and NZTA and relevant parts of TRC
2. Treatments were also undertaken with Key stakeholders as above
3. Six options were agreed with stakeholders to cover a broad range of options from do minimum to a do maximum (treatments considered)
4. EAST and MCA were undertaken which showed Option 2, 4 and 6 were not feasible (based on coverage, environment and budget)
5. Option 1 kept as do minimum and Option 3 and 5 were mapped as a network – based on earlier consultation

Process – Part Two

6. An extra step was taken regarding mapping – these were shared with Horizons as they had recently undertaken a similar process – there was also a link the RPTP work and to the PBC currently being undertaken
7. Budget – and recommendation from NZTA– also influenced network
8. There inputs resulted in a slightly refined network that maximized value for money, and while based on throughput allowed for community connections
9. The two options which are referred to as Throughput and Balanced (which in reality is a Throughput option with additional community connections.)
10. These options were presented to the Community – the 'Balanced' option was noted as preferred – 32% to 68%
11. The consultation resulted in an amendment of the network to the Balanced.

It is the updated Balanced option that is the Emerging Preferred Option we are asking Council to endorse today. Through Put and Balanced Option shown below – then the Emerging preferred

Option 1 - Throughput

- Highly efficient network that gets commuters where they need to go faster.
- 12 direct, high frequency services on main routes. For some in our community, the nearest bus route may be further away.
- A ‘turn up and go’ service means people don’t need to worry about checking a timetable – they can just head to their nearest bus stop knowing it’s just a short wait for the next bus.
- Aim to run buses every 15 minutes at peak times, subject to funding.

Option 1: Pros and Cons

Pros	Cons
High frequency, direct services. The goal is 15 minutes at peak times.	Fewer bus routes than Option 2.
Maximises the number of people who can get to key destinations quickly and efficiently.	Reduced accessibility for some passengers, who live in or want to travel to, areas further away from the key corridors.
Loop services. Merrilands, Spotswood and the Orbiter route will have buses travelling both clockwise and anti-clockwise, cutting down unnecessary travel time to get where you need to go.	
Airport service.	

Option 2 - Balanced

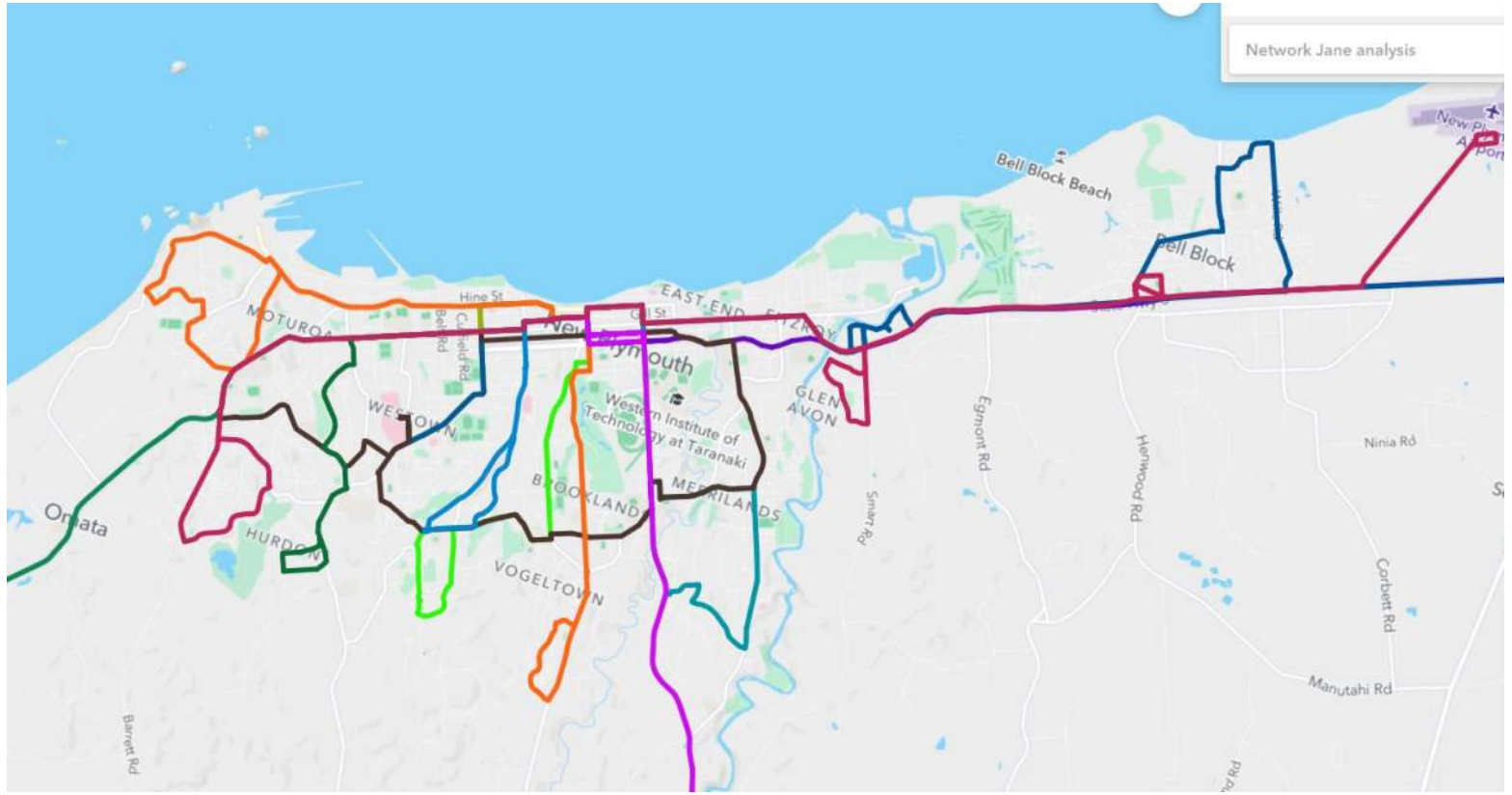
- Faster connections to key destinations, but also has more route coverage which means that you have better access to where you want to go.
- 15 routes and will reach destinations that Option 1 does not, such as Glen Avon. Focuses on the destinations requested in recent public consultations such as supermarkets, medical and social services and sports facilities. We've taken this feedback on board.
- Aims for a 15-30 minute frequency at peak times, subject to funding.

Option 2: Pros and Cons

Pros	Cons
More bus routes than the current network and Option 1.	Less frequent services than Option 1.
Better connections to some residential areas, while still having higher priority routes with more frequent services.	
Focus on getting people to key destinations e.g. supermarkets, medical and social services and sporting facilities.	
Better transfer options between routes to more easily move around the network.	
Orbiter will have buses travelling both clockwise and anti-clockwise cutting down unnecessary travel time to get you where you need to go.	
Airport service.	

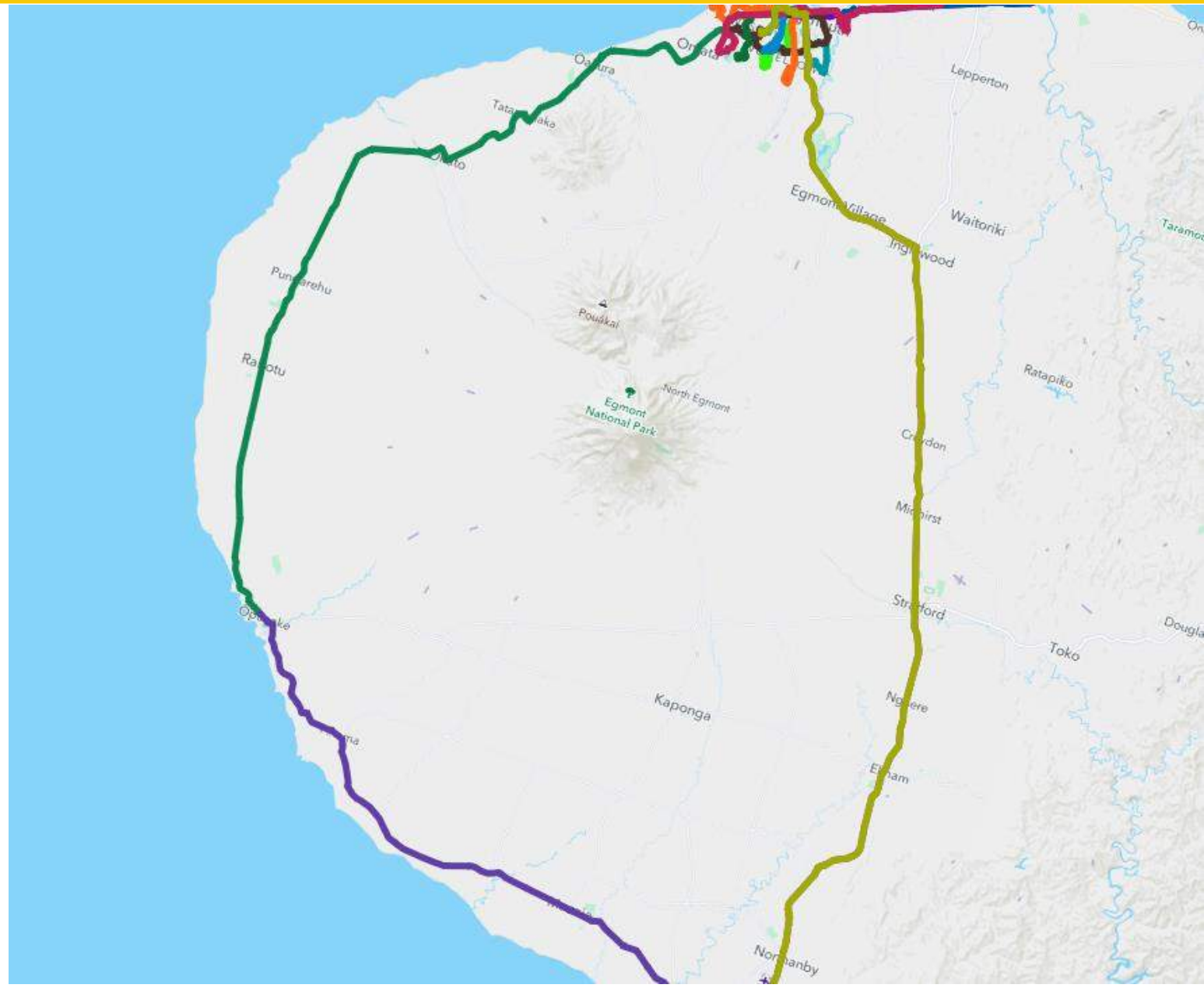
Emerging Preferred Option

- Throughput based options
- Connecting key communities in New Plymouth and providing connections to the wider Taranaki region
- Responsive to current and future land use
- Cost effective and offering value for money



Regional Emerging Preferred

Added Hāwera to Taranaki Base Hospital run alongside Hāwera to New Plymouth CBD.



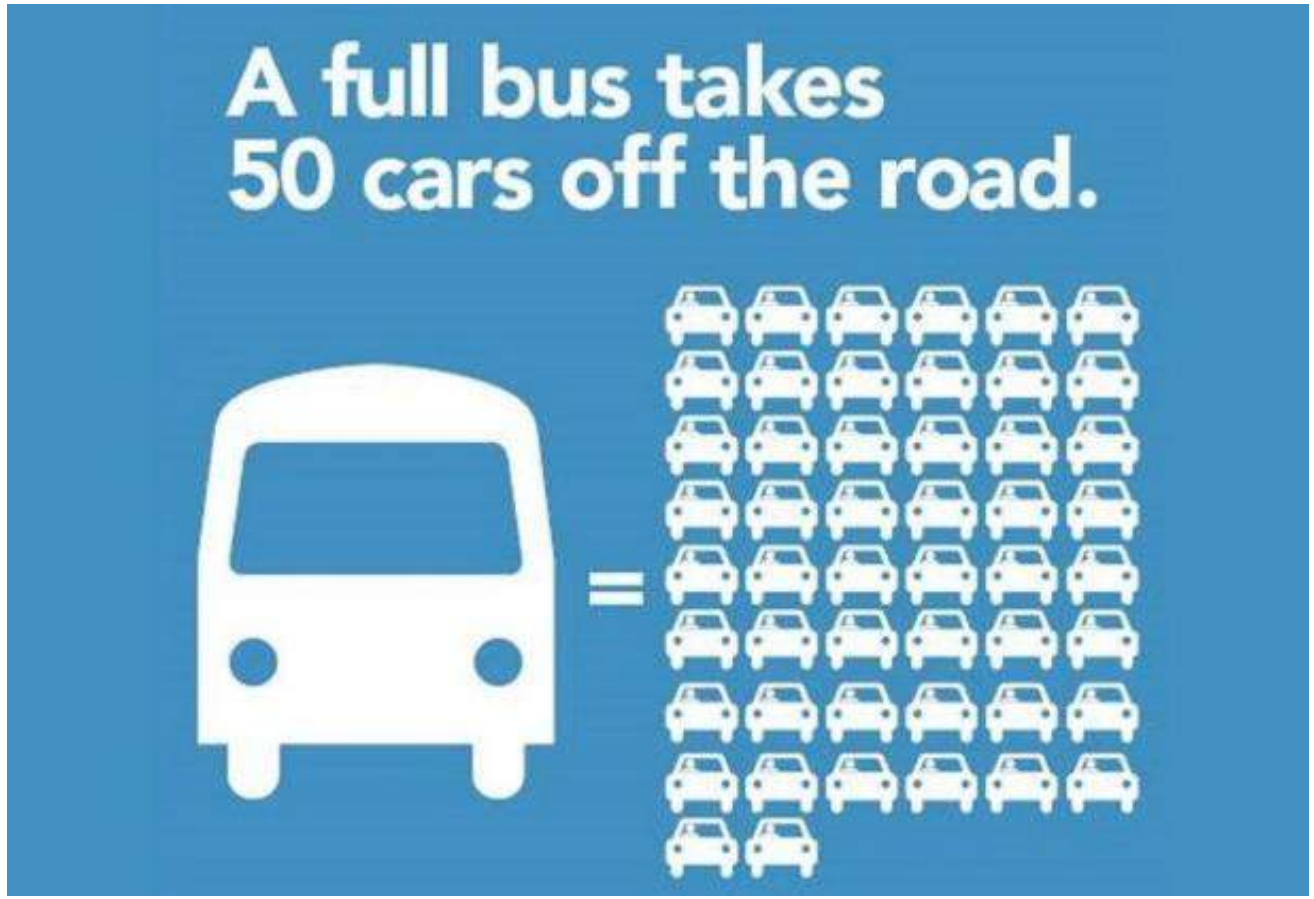
How the Option stacks up

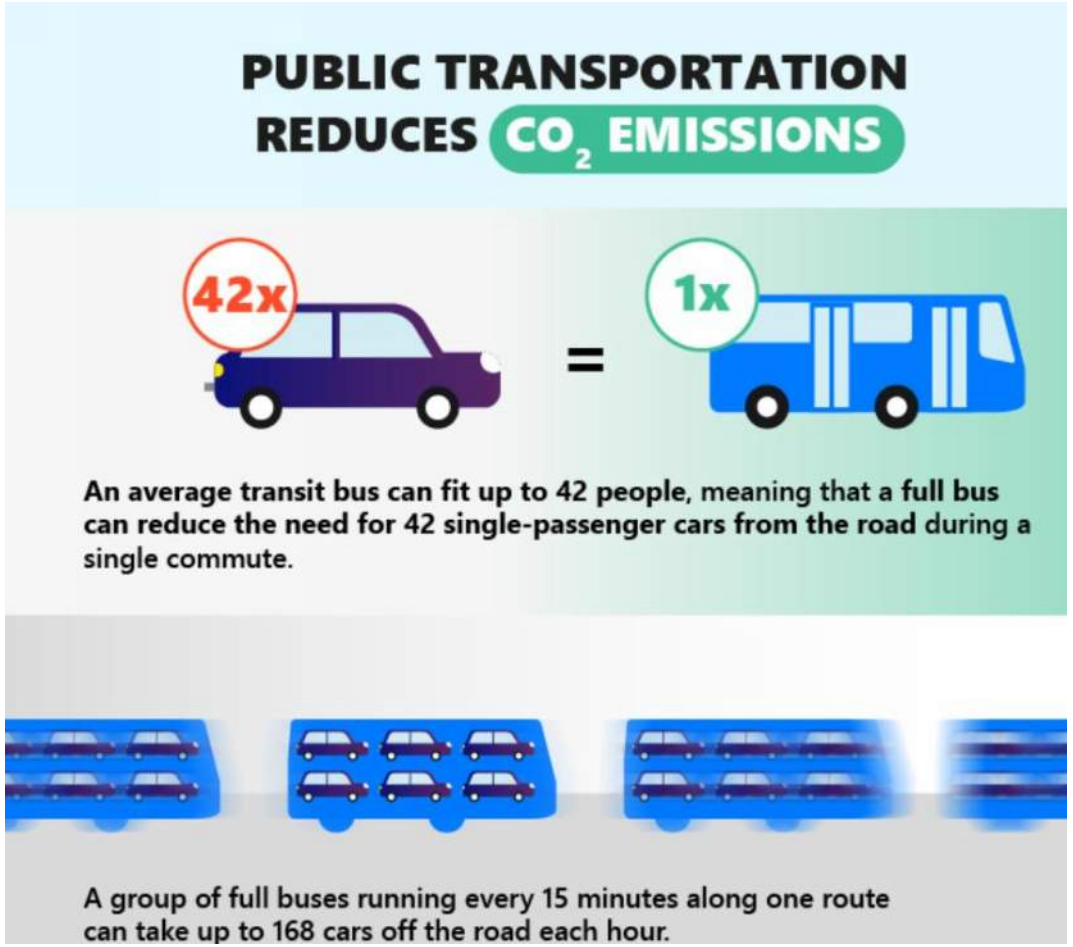
Economics/BCRs and Cost

Option	Indicative BCR Range	Indicative Operating Cost / year	Indicative Total Cost (NPV)*
Bronze	0.7-1.3	$3.5M	$66M
Silver	0.6-1.0	$6.8M	$127M
Gold	1.2-2.2	$7.2M	$134M

**The NPV is the difference in value of the costs and benefits discounted over 40 years as used for economic analysis*

Beca


A full bus takes
50 cars off the road.
=


PUBLIC TRANSPORTATION
REDUCES CO_2 EMISSIONS
42x
=
1x
An average transit bus can fit up to 42 people, meaning that a full bus can reduce the need for 42 single-passenger cars from the road during a single commute.
A group of full buses running every 15 minutes along one route can take up to 168 cars off the road each hour.

Next Steps

Developing principles to support new partnership-based governance model

Aligning with TRC procurement strategy development

Clarify infrastructure requirements to feedback into PBC

Developing KPIs and triggers to enable staged implementation of services if necessary

Questions

Executive, Audit and Risk (EAR) Committee Meeting

9 SEPTEMBER 2024

Agenda

- Purpose
- Further Information Requests
- Strengthening Collaboration
- The Preferred Option
- Peer Review
- Alignment with Policy
- Next Steps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1: Purpose

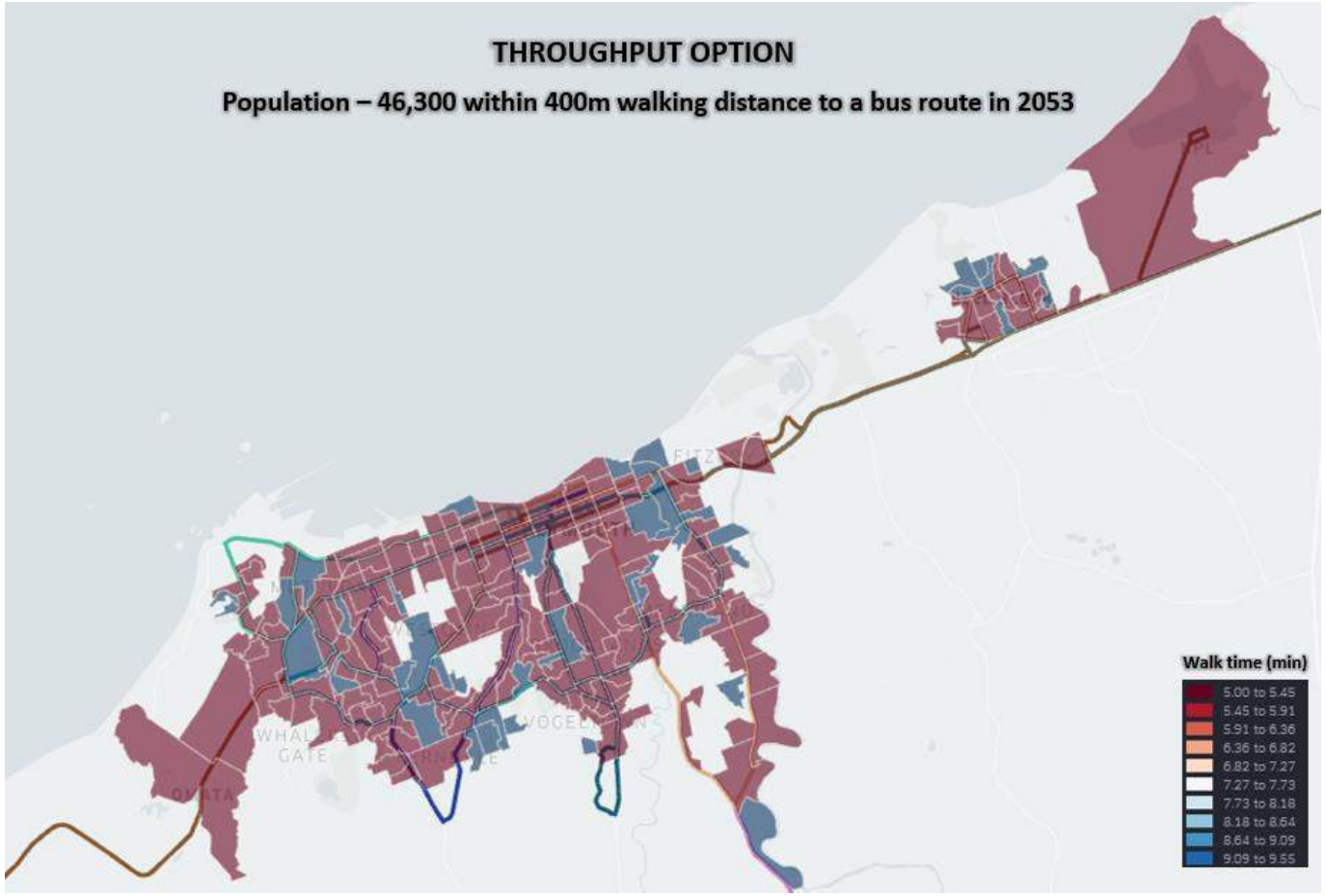
1: Purpose

- Update on further information requests.
- How we are working with NPDC
- Summary of the Preferred Option
- Summary of the independent Peer Review
- Alignment with Policy
- Request for approval of the final SSBC subject to further minor amendments to address technical matters raised in the peer review
- Outline of the Next Steps

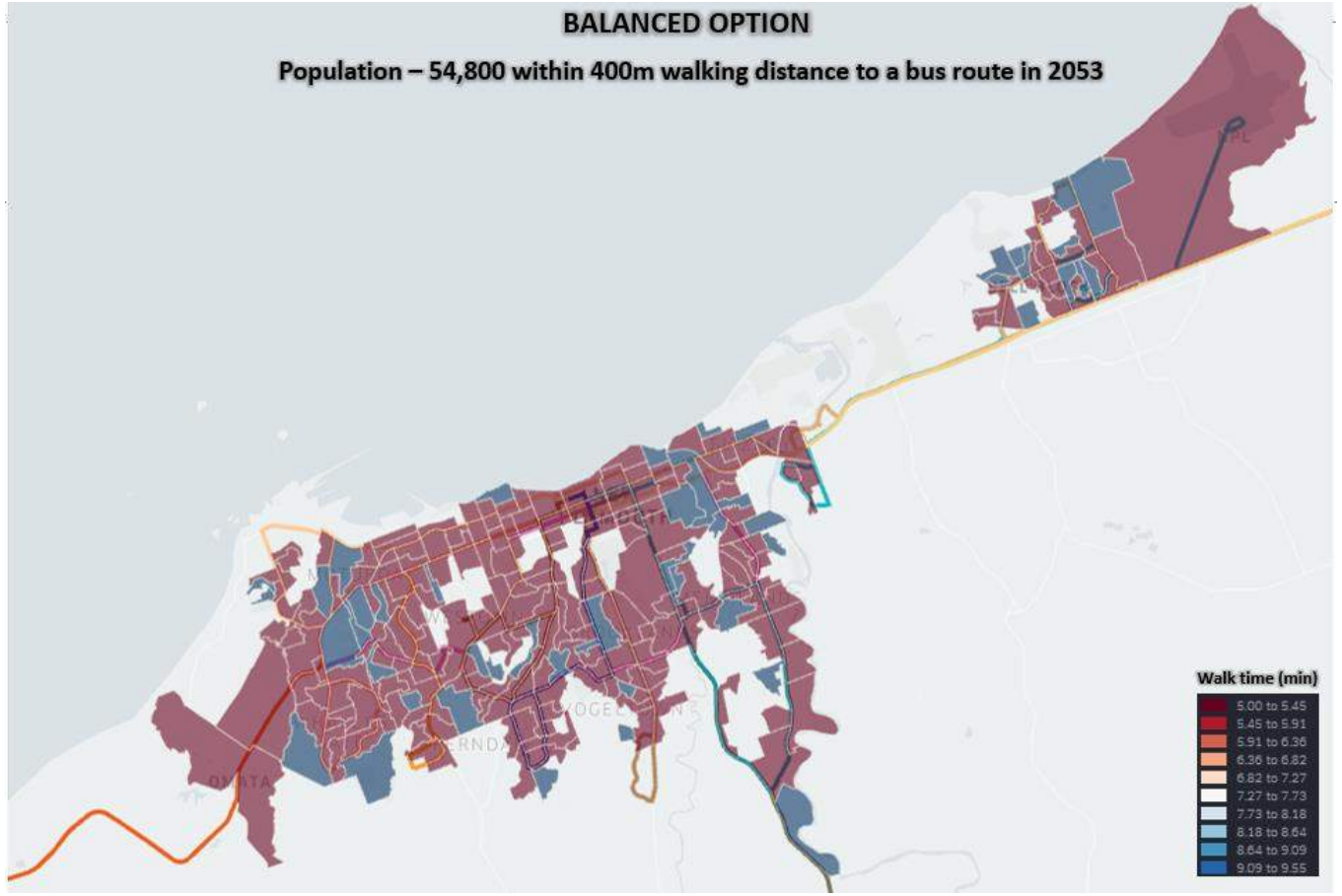
Beca

2: Further Information

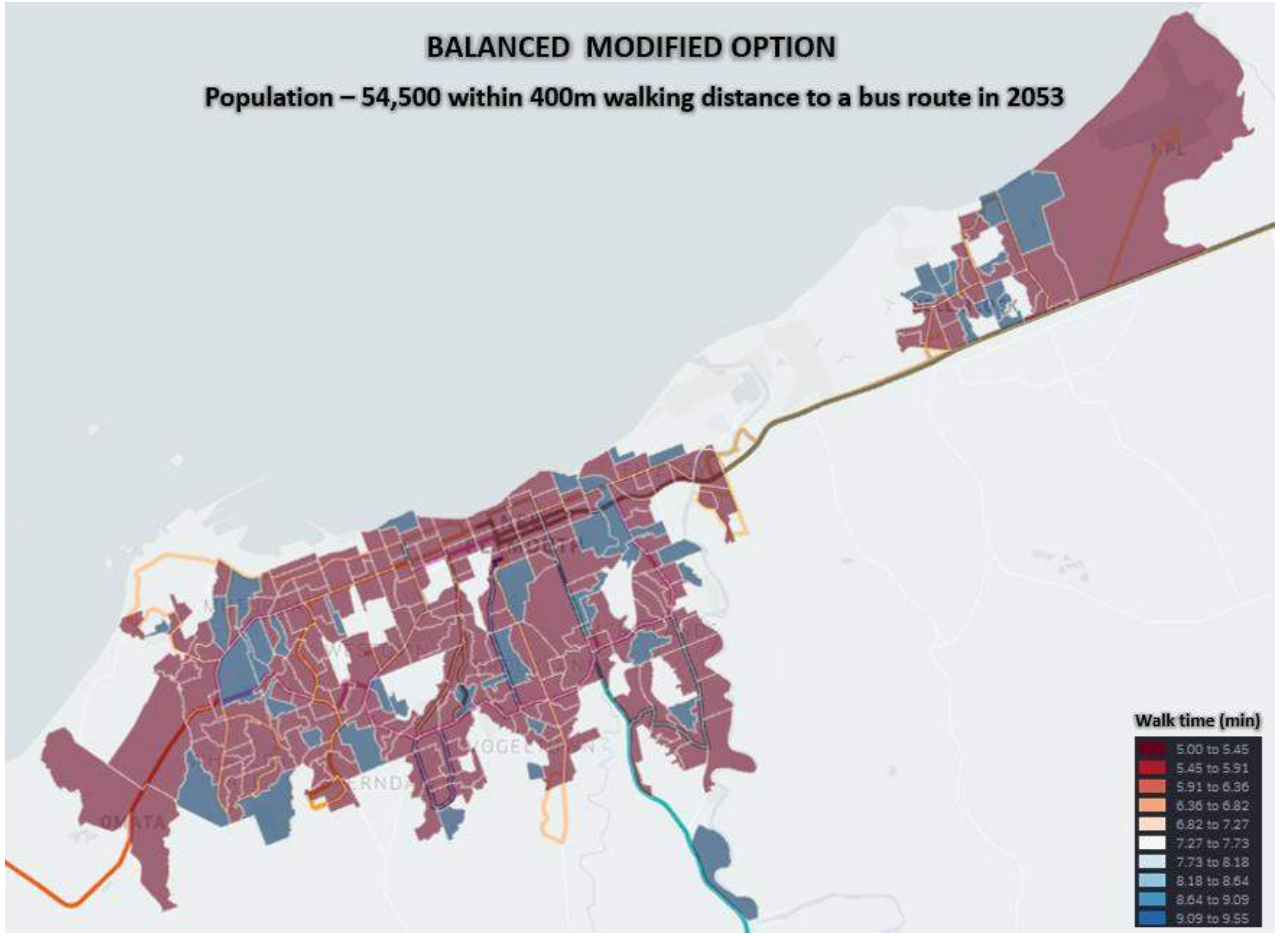
Bus Catchment Map - Throughput



Bus Catchment Map – Balanced



Bus Catchment Map – Balanced Modified



Indicative BCRs for the short list options

Option	Indicative Annual Operating Cost ($M, undiscounted)	40-Year Discounted Benefit ($M)	40-Year Discounted Cost ($M)	Indicative BCR
Throughput	$2.8	55.0	52.9	1.0
Balanced	$2.9	63.9	55.2	1.2
Balanced Modified	$3.5	63.5	66.2	1.0

Predicted Patronage of the Bus Network

- ‘Gold’ frequency option: Estimated 90% increase in the overall daily bus patronage by 2035.
- ‘Bronze’ frequency option: Estimated 25% increase in the overall daily bus patronage by 2035
- By 2053, approximately 54,500 people will be within a bus route. This is a 3,100 or 6% increase from the Do-Minimum.

2: Strengthening Collaboration

Strengthening Collaboration with NPDC

- Meeting on 13th August 2024 with NPDC General Manager Operational Excellence and three Councillors. The purpose was to step through the optioneering process and explain how the preferred network was determined.

- A **Joint Committee** between TRC and NPDC for all transport related projects is in the process of being established.

- NPDC will have an opportunity year on year to influence the bus network and engagement with NPDC will continue.

Taranaki Regional Council

Te Kaunihera-ā-Rohe o Ngāmotu New Plymouth District Council

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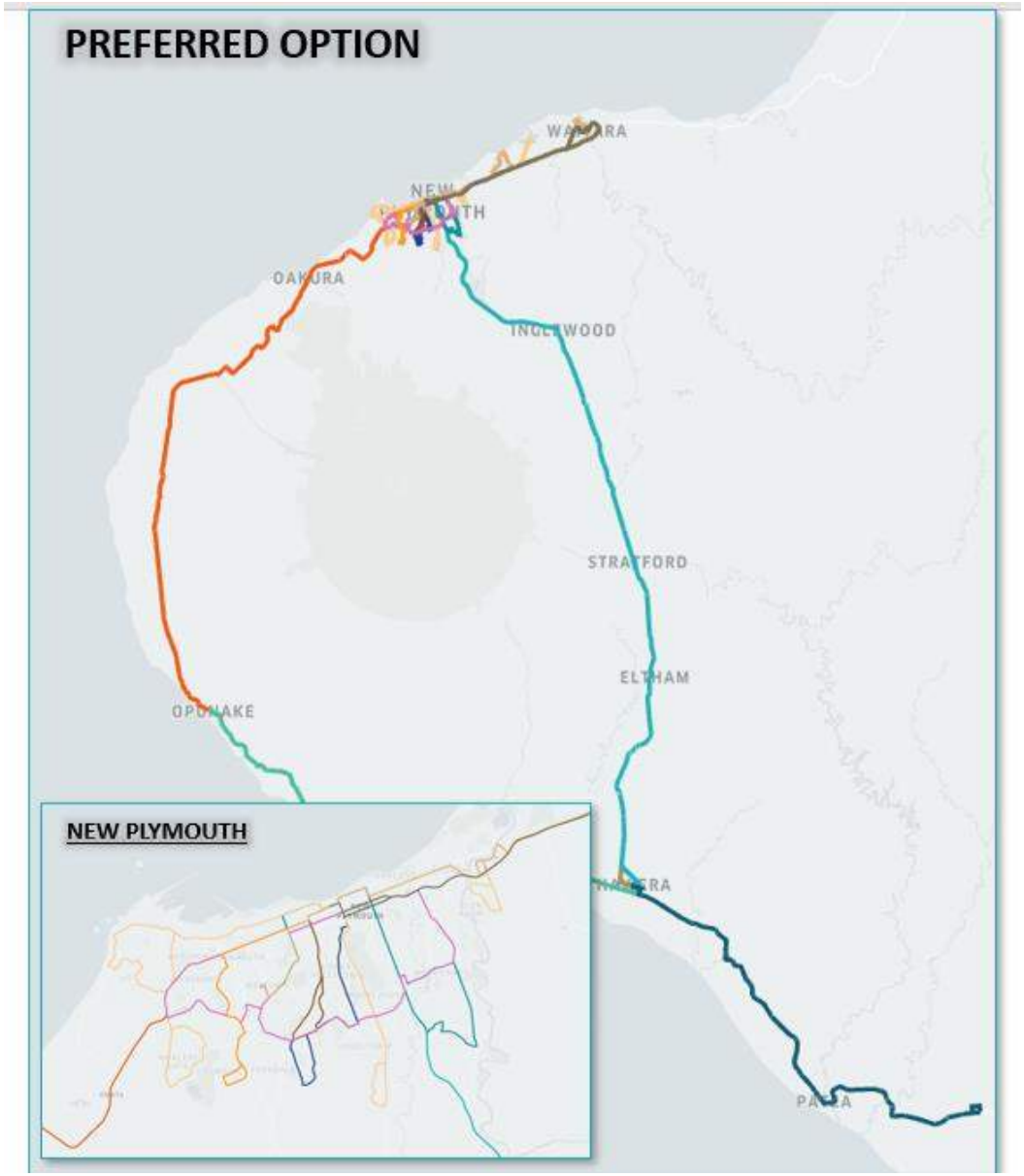
2: The Preferred Option

The Preferred Option



The Preferred Option - Outcomes

‘Gold’ frequency option: Estimated 90% increase in the overall daily bus patronage by 2035.

‘Bronze’ frequency option: Estimated 25% increase in the overall daily bus patronage by 2035.

By 2053, approximately 54,500 people will be within a bus route. This is a 3,100 or 6% increase from the Do-Minimum.

Reduction of 4,812 tonnes of CO2 over 40 years, a reduction of 13,335 tonnes with the ‘Gold’ frequency option.

Gold option: A reduction in average bus travel time of 6 minutes between Glen Avon and the CBD. A 10-minute reduction between Marfell and the CBD.

Bronze option: A reduction in average bus travel time of 2 minutes between Glen Avon and the CBD. A 5 -minute reduction between Marfell and the CBD.

The New Plymouth Airport is now accessible via public transport increasing travel choice for locals and travellers alike.

Bronze option is a step on the way towards the desired Gold option – our long term goal.

The Preferred Option – Staging and Funding

- Three frequency options have been considered for the preferred option - referred to as Bronze, Silver and Gold.
- **Gold is the desirable preferred with 15 minute headways during the peak periods for the Urban routes and increased services on the weekends.** Bronze and Silver options are considered for staging, based on current funding constraints.
- **'Gold'** being the desired frequency option where further funding will be sought when available.

	BRONZE		SILVER		GOLD		
	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Sunday & Public Holidays
Urban Services							
Airport to Whalers Gate	70		80	4	165		12
Carrington / Govett	70		80		125		12
Frankleigh Park	70		80		125	12	12
Mangorei Taranaki Hospital	70		80		125	12	12
Port Taranaki - Vogeltown	70		80		165	12	12
Proposed Orbiter Route	70	2	80	4	125	12	12
Route 3-Hurdon	70		80		165	12	12
Route 5 - Waitara	30		40		65	12	12
Waitara Express Route	25		35		60		
Regional Services							
Waverly to Hawera	1		1		2		
Opunake to Hawera	1		1		10	2	2
Opunake to NP	10		10		20	2	2
Hawera - Taranaki Hospital	20	4	20	4	20	4	4
Hawera to NP	5		5		40	8	8

Same as current schedule

30 min during peaks

15 min during peaks

Increased weekend & regional services

3: Independent Peer Review

Independent Peer Review

- A peer review of the SSBC was determined to be required by the NZ Transport Agency and has been completed by an independent peer review.
- The peer reviewer is of the opinion *"that the process and recommendations of the business case are robust and appear to be a sensible approach to investing in PT in the Taranaki Region"*
- There were five key observations from the peer review and minor comments which were editorial or seeking additional information that the peer reviewers felt the NZ Transport Agency would need to make a decision on investment for additional funding.
- The SSBC is being finalised to include the peer review comments. We are asking for approval of the working version of the Taranaki Public Transport SSBC dated 28th August 2024
- A final SSBC will be published to address the remaining comments from the peer review and any comments from this meeting.
- The approval of the finalised SSBC will be delegated to the Chair of the EAR Committee.

3: Alignment with Policy

What the Government Policy Statement (GPS) says about Public Transport

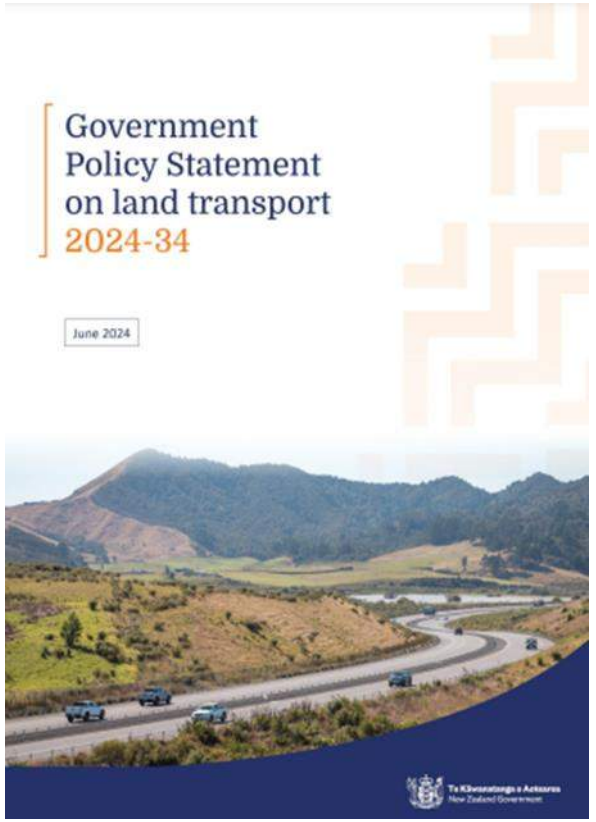
The four strategic priorities are:

1. Economic Growth and Productivity
2. Increased Maintenance and Resilience
3. Safety
4. Value for money

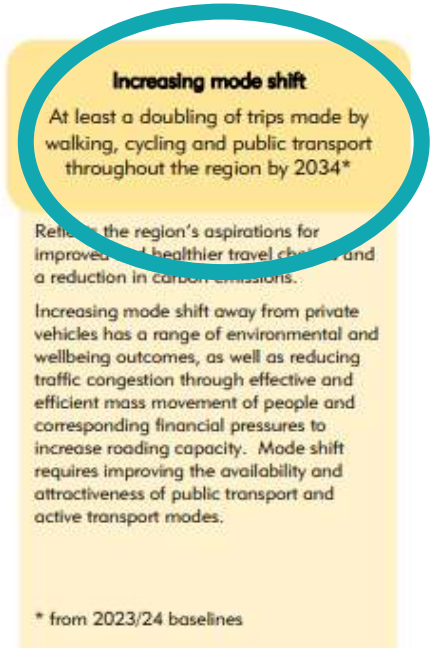
Effective public transport provides commuters with more choice and helps to reduce travel times, congestion and emissions.

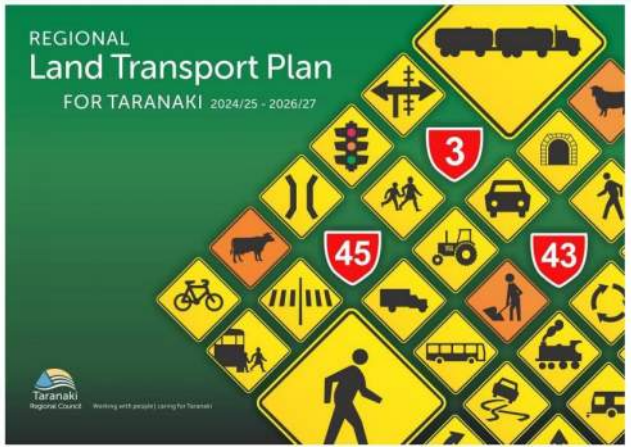
The GPS states existing public transport services will continue to be funded where they are cost effective, achieve value for money and where outcomes are less congestion and increased patronage.

The outcomes sought within the SSBC are well aligned with supporting economic growth and productivity which is the overarching strategic priority. It also highlights further improvements will increase these benefits further.



Regional Land Transport Plan (RLTP) (2024/25 – 2026/27)





- Increasing mode shift is one of three headline targets in the Taranaki Regional Land Transport Plan (RLTP) for the next ten years (until 2034).
- The RLTP aspires to at least double the trips made by public transport throughout the region by 2034 from the 2023/24 baseline.
- Both Bronze and Gold frequency options will contribute to the targets of doubling public transport trips by 2034.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3: Next Steps

Next Steps

1. Progress procurement process.

2. Establish the TRC and NPDC **Joint Committee** for transport related projects.

3. Begin planning for the implementation of the new bus network

4.Continue to update ERA Committee regularly. Next update in November on procurement.


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Question

Questions

Minutes of Meeting

Workshop 2 Minutes 8 Feb 2024

Held 8 Feb 2024 at 10am

at New Plymouth District Council

Present:	Megan Taylor (MT)	Robert Broadnax (RB)
	Andrew Collings (AC)	Cheryl Gazley (CG)
	Stuart Knarston (SK)	Shawn Scott (SS)
	David Brown (DB)	Lisa Grindlay (LG) *(Online)*
	Fiona Ritson (FR) (*Online)*	Kuan-Wen Sang (KS)

Apologies:

Distribution: All of the above

Item	Action

1 Introduction
• **AC** - Provided a brief introduction and then set out the purpose of the workshop – long list optioneering to agree:
  ○ Interventions and themes
  ○ Long list options developed from the above.
• **AC** - Noted that agreement on options would be done after the workshop.
• **AC** – Provided recap on the strategic alignment and problems, benefits, and investment objectives from last workshop.
• **AC** - Provided explanations of the different intervention hierarchy treatments:
  ○ Integrated planning
  ○ Manage demand
  ○ Best use of existing
  ○ New Infrastructure.
• **RB** asked the group for ideas on the different intervention hierarchy treatments for the project starting with integrated planning. Discussion of treatments are documented below.	

2 Intervention Hierarchy – Integrated Planning The following interventions were raised: • New zoning allowing for no parking - this is already in the NPDC District Plan. • By laws and enforcement strategy. • Work with developers and KO to lift density along corridors. • Council FDS – reduce fewer greenfield developments via three-year review. Staging of land release is a key component. • Reduce speed limits.	

Item	Action

• Substandard standards to include requirements for PT stops and infrastructure as part of consenting. Plus, funding via Developer Contributions (DC).
• Master planning and structure planning to consider PT.
• Working with other service providers to consider:
  ○ Community service hubs closer to housing areas/ rural centres
  ○ Intermodal transport hubs.	

3 Intervention Hierarchy – Manage Demand The following interventions were raised. • Parking policy and pricing • Congestion charges • Fare policy/ free fares • Licensing fees/ RUC • Charging for use of Park and Ride facilities • Staggering school hours to manage demand • Employee travel plans • Flexible hours of PT to match demand • Event management and planning – ways to encourage uses of PT • WFH incentives • On demand services • Community shuttles • Increasing frequencies.	
4 Intervention Hierarchy – Best use of existing infrastructure The following interventions were raised: • Bus priority measures – road space reallocation to special vehicle lanes (T2, T3, bus), shoulder running for buses, signal optimisation i.e., bus priority at signals / prioritising bus movements • Parking controls – time of day, cameras, enforcement (part of planning policy i.e., integrated planning hierarchy) • Park and ride facilities and key locations i.e., TSB stadium, Yarrow stadium • "Last Mile and first mile' connection considerations – i.e., making stops accessible with pedestrian facilities to enable access to stops • Location of bus stop to existing amenities i.e., police station, public toilets etc • Accessible buses • More bike racks on buses, e-scooter racks • Inline bus stops • Bridge strengthening to accommodate electric buses • Integrating and aligning MOE & TRC services • Heavy rail • Walking and cycling connections on council reserves.	

Item	Action
5 Intervention Hierarch – New Infrastructure The following interventions were raised: • Integrated bus hubs/ transport centres • New services within New Plymouth and outer townships • Bus ways/ BRT • Bus lanes • Dedicated Park and Rides • Technology – Ticketing, charging facilities, Wi-Fi, and phone charging on buses • Double decker buses • Light rail • Community transport i.e., extended times.	

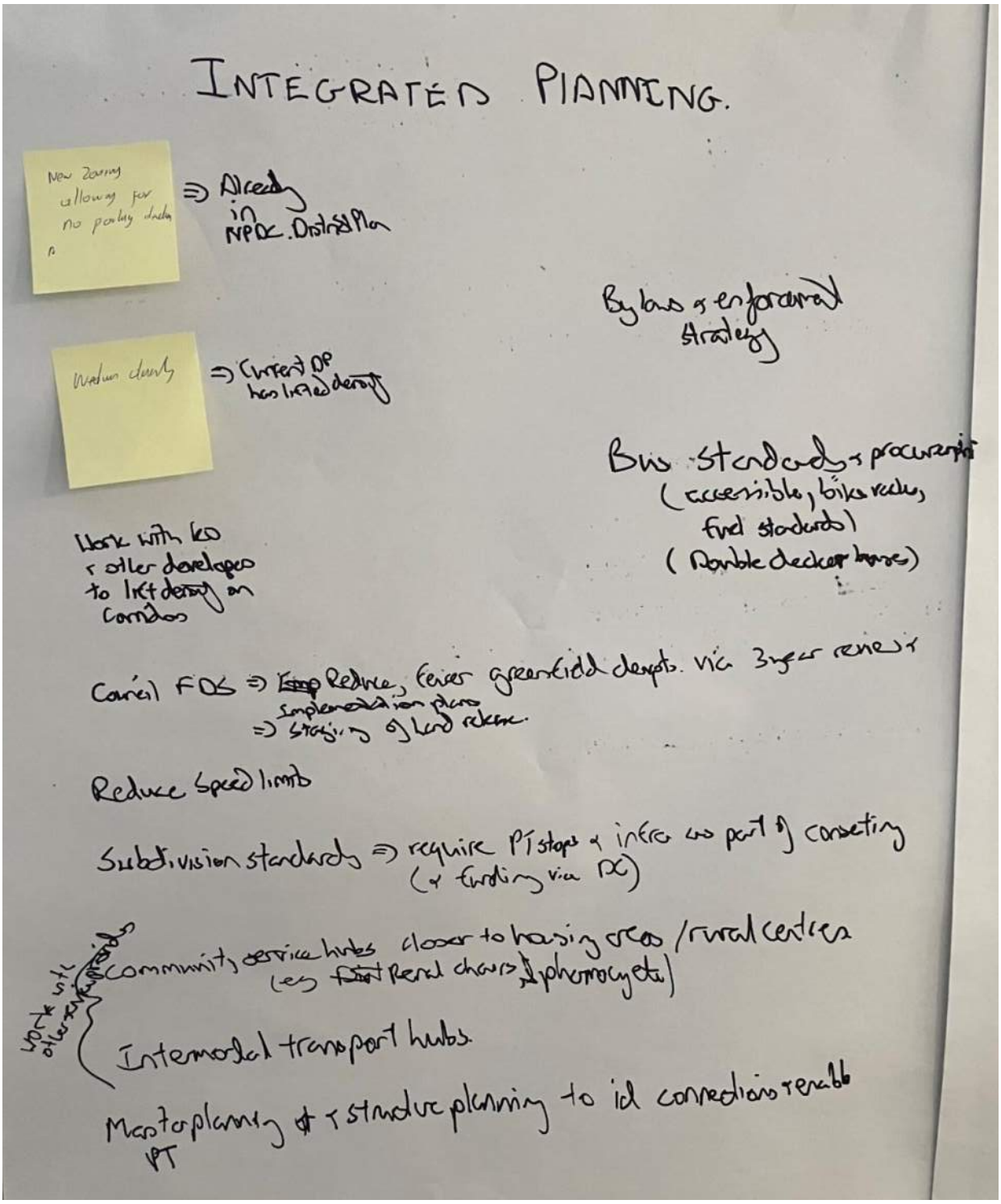
6 Long list option development
• Themes were developed through the intervention hierarchy treatments as follows:
  ○ Planning and Policy Interventions
  ○ Optimising roading infrastructure
  ○ Customer service and user experience
  ○ Technology
  ○ Rural community services
  ○ Network design.
• Discussions around the treatments for each theme on a sliding scale was white boarded. (See Appendix 1).
• It was agreed the team will put together a matrix of the different intervention hierarchy against the themes to present the options.
	Team will refine the long-list option as per that discussed in the workshop and share with workshop attendees

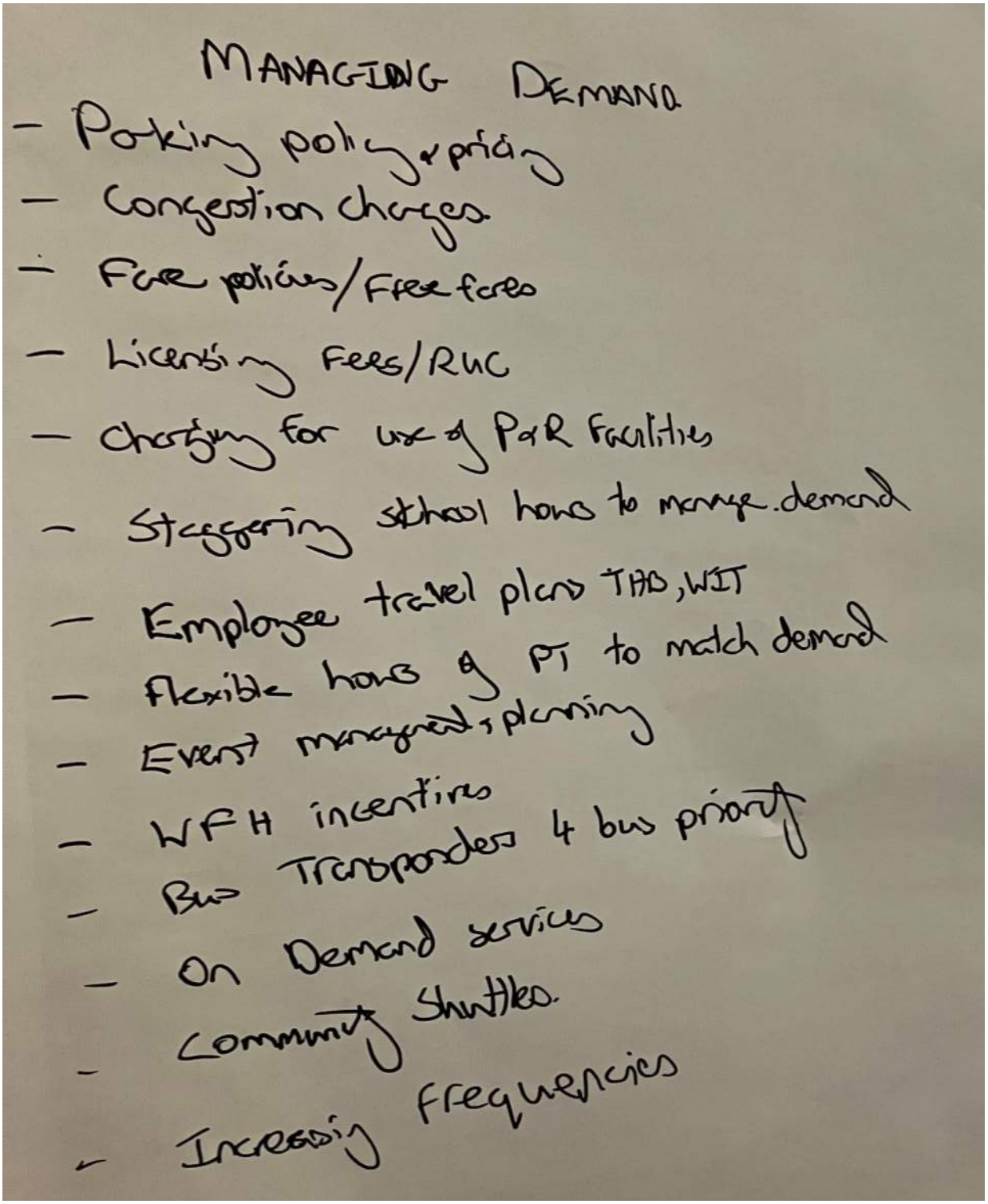
7 AOB • There was discussion around funding options i.e., will it be through increased rates or PPP with other parties. It was noted this will be discussed and agreed within the management case.	

Minuted by: Kuan-Wen Sang

Reviewed by: Andrew Collings

Appendix 1 – Workshop Notes



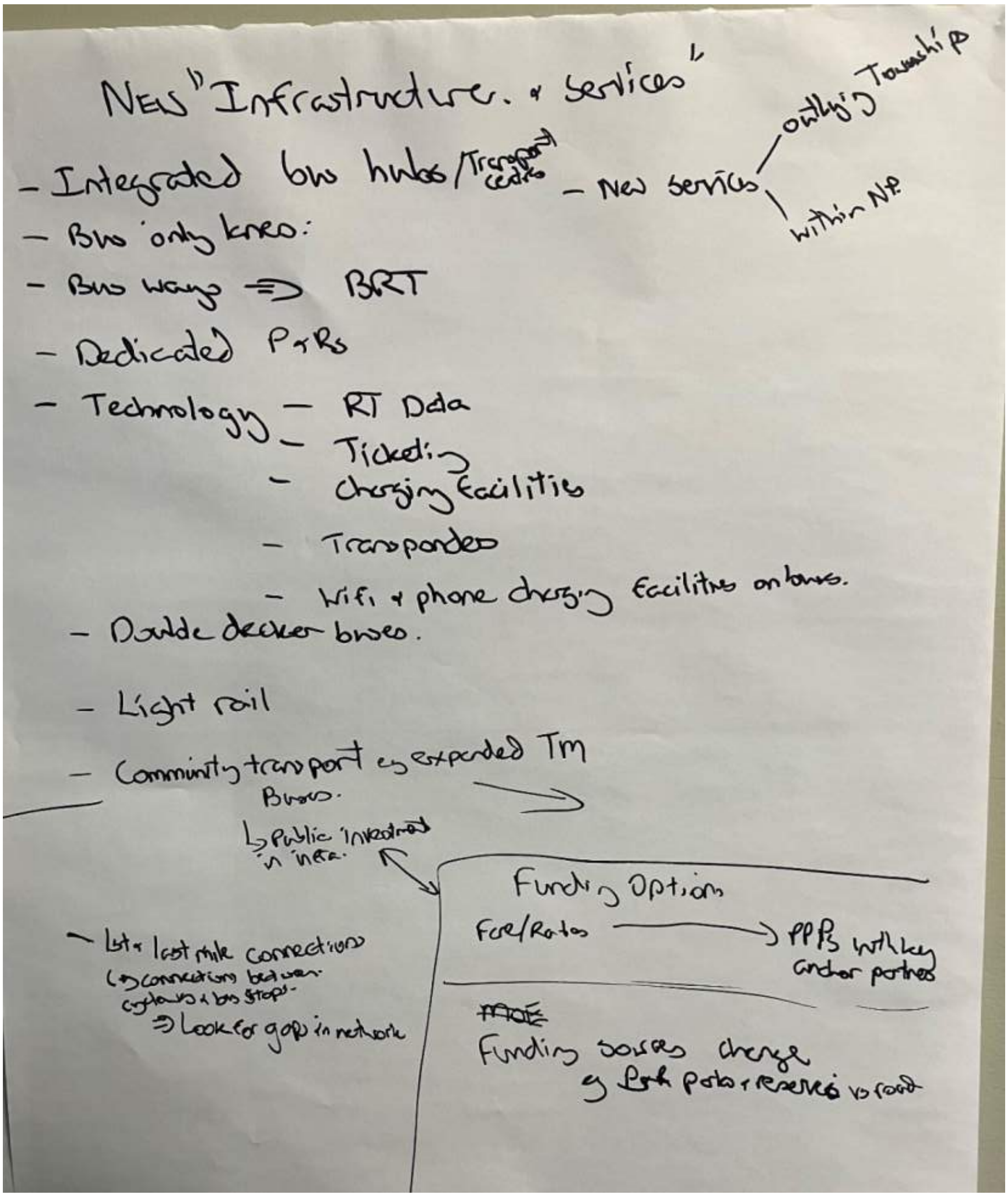

MANAGING DEMAND
- Parking policy & pricing
- Congestion charges
- Fare policies/Free fares
- Licensing Fees/RUC
- Charging for use of P&R Facilities
- Staggering school hours to manage demand
- Employee travel plans THB, WIT
- Flexible hours & PT to match demand
- Event management planning
- WFH incentives
- Bus Transponders 4 bus priority
- On Demand services
- Community Shuttles
- Increasing Frequencies

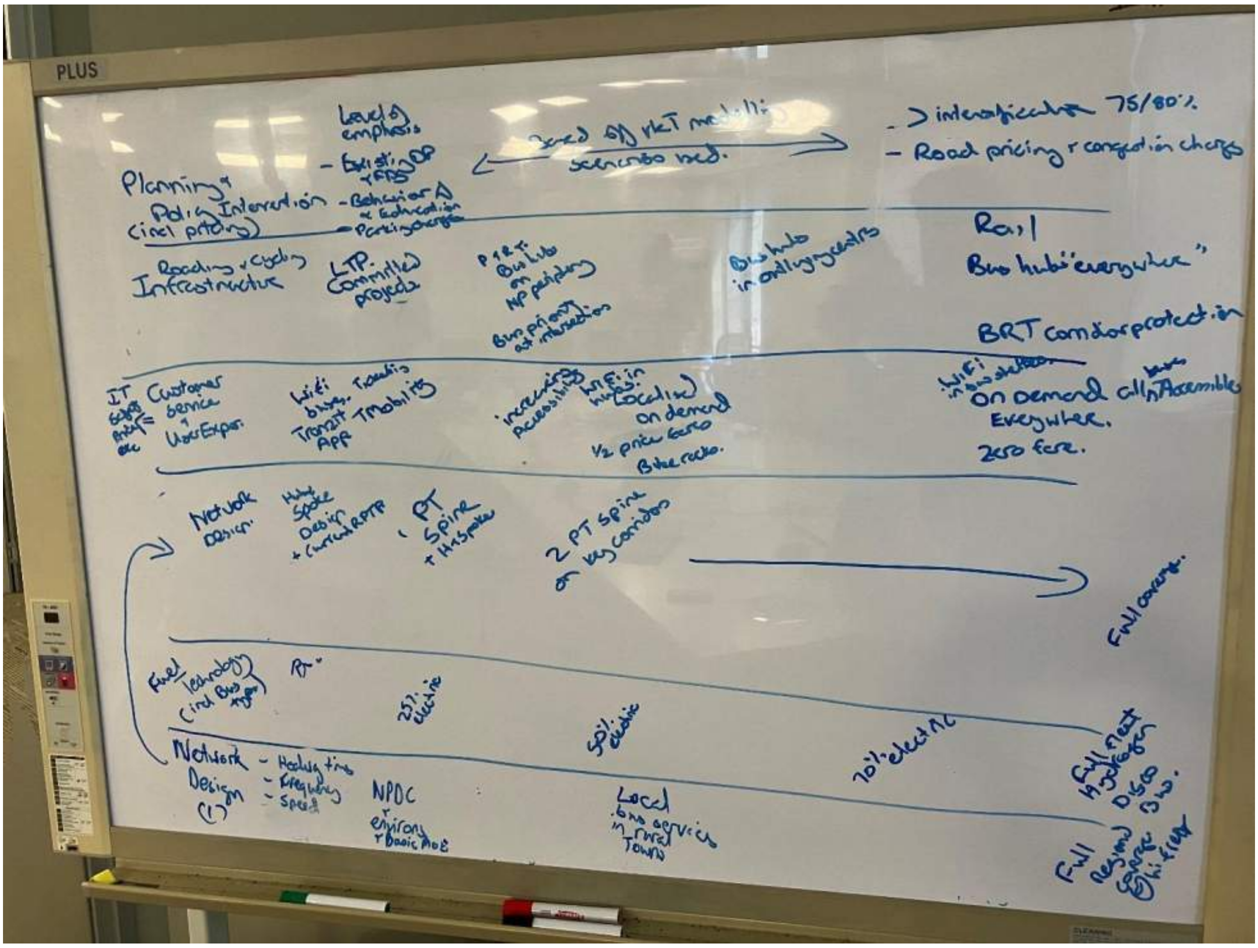
Best use of existing Infra.

- Road space re-allocation } Bus priority
- Transponders & signal phasing }
- T3 lanes
- Shoulder running
- Parking controls } eg Time of day, cameras. enforcement ⇒ Link back to first circled
- P&R Facilities eg TSB stadium, Yarrow Stadium.

- Pedestrian facilities to enable access to bus stops.
- Link bus stops to existing community facilities. eg police station, public toilets etc
- making stops accessible & foot paths. - for mobility impaired
- Accessible buses
- more bike racks on buses, surf board racks, e-scooter racks, etc
- Inline bus stops
- Bridge strengthening for electric buses

- Integrating & Aligning MOE & TRC services & infrastructure (& MOH)
- Heavy Rail
- W&C connections on council reserves.


New "Infrastructure & Services"
- Integrated bus hubs/Transport centres
- New services
outlying Township
within NP
- Bus only lanes:
- Bus ways => BRT
- Dedicated P&Rs
- Technology
- RT Data
- Ticketing
- Charging facilities
- Transponders
- Wifi & phone charging facilities on buses.
- Double decker buses.
- Light rail
- Community transport eg expanded TM Buses.
Public investment in infra.
Funding Options
Fare/Rates
PPPs with key anchor partners
Funding sources change
- 1st & last mile connections
=> Look for gaps in network


PLUS
Level of emphasis
Planning & Policy Intervention (incl pricing)
- Road pricing + congestion charge
Roading + Cycling Infrastructure
LTP Committed projects
Bus priority at intersections
Rail
BRT corridor protection
Customer service + User Exper.
Transit APP
increasing accessibility
on demand
1/2 price fares
Bike racks
On Demand
Everywhere.
Zero fare.
Network Design
Hub Spoke Design
PT Spine
2 PT spine on key corridors
Full coverage.
Fuel Technology (incl Bus types)
25% electric
50% electric
70% electric
Network Design
- Frequency
- Speed
NPDC
Local bus service in rural Towns
Full

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Date: 28 August 2024

Subject: **Public Transport Business Case, Single Stage Business Case**

(SSBC) Author: Cheryl Gazley

Approved by M J Nield, Director - Corporate Services

Document: 3291343

Purpose

1. The purpose of this memorandum is to provide information to update the Executive, Audit and Risk (EAR) Committee on the progress of the Taranaki Public Transport Single Stage Business Case (SSBC).

2. On 29 July 2024 the EAR Committee provided comments on, and endorsed, "Option 2: Balanced Updated" as the emerging preferred option for the Taranaki bus network. This preferred option has been included in the SSBC.

3. The SSBC is being finalised following an independent peer review and the working version dated 28th August 2024 is attached as Appendix 1 and presented for approval subject to further minor amendments to address technical matters raised in the peer review (1).

Executive summary

4. A SSBC has been prepared to present a case for investment in improved public transport services and infrastructure in Taranaki. The aspiration is to have a public transport system that connects people to where they want to go and is the preferred mode of choice within the Taranaki region.

5. At the 29 July 2024 EAR Committee meeting bus network options "Option 1: Throughput", "Option 2: Balanced "and Option 2: Balanced Updated" were presented for comment.

6. Endorsement was received from the Committee on Option 2: Balanced Updated as the emerging preferred option. Further information was requested on the following three items:

    a. Maps showing future populations around bus stops and the difference between the network options;
    b. Bus patronage / ridership details; and
    c. Indicative BCRs for the short list options.

7. These three information requests have been included in the SSBC.

8. TRC is strengthening their collaboration with New Plymouth District Council (NPDC). NPDC and TRC met on 13 August 2024 to explain the optioneering and the decision making process to arrive at the preferred network option.

9. At the meeting it was agreed that the ideas for minor refinements to the network could be made via the establishment of a Joint Committee between Taranaki Regional Council and New Plymouth District Council to facilitate and support the development of public transport. TRC and NPDC have taken positive steps toward working together and will continue to do so at this level.

10. The preferred option (Balanced Modified) has been included in the SSBC. The Business Case recognizes the constrained funding environment and the importance of community feedback in providing a bus service that is people centric.

11. We have received comments from TRC's procurement advisors and TRC officers which we have addressed in the SSBC.

12. An independent peer review of the SSBC was determined to be required by New Zealand Transport Agency Waka Kotahi (NZ Transport Agency) and has been completed. The independent peer reviewer is of the opinion "that the process and recommendations of the business case are robust and appear to be a sensible approach to investing in PT in the Taranaki Region".

13. The peer review comments were received on Sunday 25th August 2024 and the agenda closing date was Wednesday 28th August 2024. As such, the five key observations from the peer review are still being worked through and the SSBC hasn't been fully finalised. However, the SSBC attached in Appendix 1 is the latest working version dated 28th August 2024. The remaining changes arising from peer review will not affect the recommendations of the SSBC as they are focused on enhancing the clarity of the SSBC.

14. The five key observations from the peer review are as follows:

    1) Make it clearer that the Bronze Option is being recommended and that none or very limited funding is being requested at this stage.

    2) Make it clearer that the Bronze Option is a step on the way towards the Gold Option which is a long-term strategic aspiration that will have decision points along the way.

    3) It would be beneficial to make some changes to the problem and benefit statements and KPIs. However, this could be noted as an update to the benefits management and further stages and no need to re-work the option assessment.

    4) Presentation of the preferred option would be clearer as Option 3, then Option 3A (Bronze, Silver and Gold) as stages of the preferred long-term strategy.

    5) Make the parameters of the SSBC scope with other workstreams by TRC or partners (i.e NPDC's Programme Business Case) and assumptions and interdependencies clearer.

15. There were also minor comments which were editorial or seeking additional information that the peer reviewers felt the New Zealand Transport Agency would need to make a decision on additional investment funding.

16. A final SSBC will be published once the remaining comments from the peer review and any comments from this meeting are received. It is recommended that the approval of the finalised SSBC be delegated to the Chair of the EAR Committee.

17. Following delegated EAR Committee approval of the SSBC the next steps are:

- The finalised SSBC will be presented to the Ordinary Council Meeting for final approval on 24th September 2024.
- The SSBC will be presented to NZ Transport Agency Waka Kotahi for endorsement during October 2024.

18. The approval of the SSBC enables TRC to move into the procurement phase for our new bus network.

Recommendations

That Taranaki Regional Council:

receives the presentation update on the Taranaki Public Transport SSBC and subject to addressing the remaining comments arising from the Peer Review, and this meeting, **approves** the working version of the Taranaki Public Transport SSBC dated 28th August 2024. The **approval** of the finalised SSBC will be delegated to the Chair of the EAR Committee.

determines that it has complied with the decision-making provisions of the Local Government Act 2002 to the extent necessary in relation to this decision; and in accordance with section 79 of the Act,

determines that it does not require further information, further assessment of options or further analysis of costs and benefits, or advantages and disadvantages prior to making a decision on this matter.

Discussion

19. It is noted that the bus network options were given a different naming convention during the public consultation period to make it simpler for the community to understand the different options. The progression of the different naming conventions are shown in the table below to provide clarity and consistency with the SSBC.

Original Option Naming in SSBC	**Revised Option Naming in SSBC**	**Public Consultation Naming**	**Naming following public engagement + EAR Committee Meeting presentations (29/07/24)**	**Short Listed Options Naming in SSBC**
Option 2 – Access Emphasized	Option 1 – Access			
Option 3 – Throughput Emphasized	Option 2 – Throughput	Option 1 – Throughput	Option 1 – Throughput	Option 2 **– Throughput**
Option 5 – Balanced Emphasized	Option 3 - Balanced	Option 2 - Balanced	Option 2 Balanced	Option 3 **Balanced**
			Option 2A Balanced Updated	Option 3A **Balanced Modified**

Further Information Requests

20. Further information was requested at the 29 July 2024 EAR Committee meeting, this information is discussed below and is included in the SSBC.

Maps showing coverage around bus stops and the difference between the bus network options

21. A catchment analysis was undertaken on the options to indicate the 'population' that would be within 400m walking distance from the bus routes. It is noted that Census SA2 sectors for New Plymouth were used as an approximation to illustrate which zones will be within walking distance from a bus service. It should also be noted that if the majority of the zone is outside of the 400m, this is not included in the analysis.
22. Figure 1, Figure 2 and Figure 3 below shows the results of the catchment analysis for the options. The difference between the options is minor especially between Balanced Option and Balanced Modified Option. The balanced options with a greater focus on coverage provides greater accessibility for people in the community.

Figure 1: Throughput Option – population within 400m walking distance to a bus route in 2053

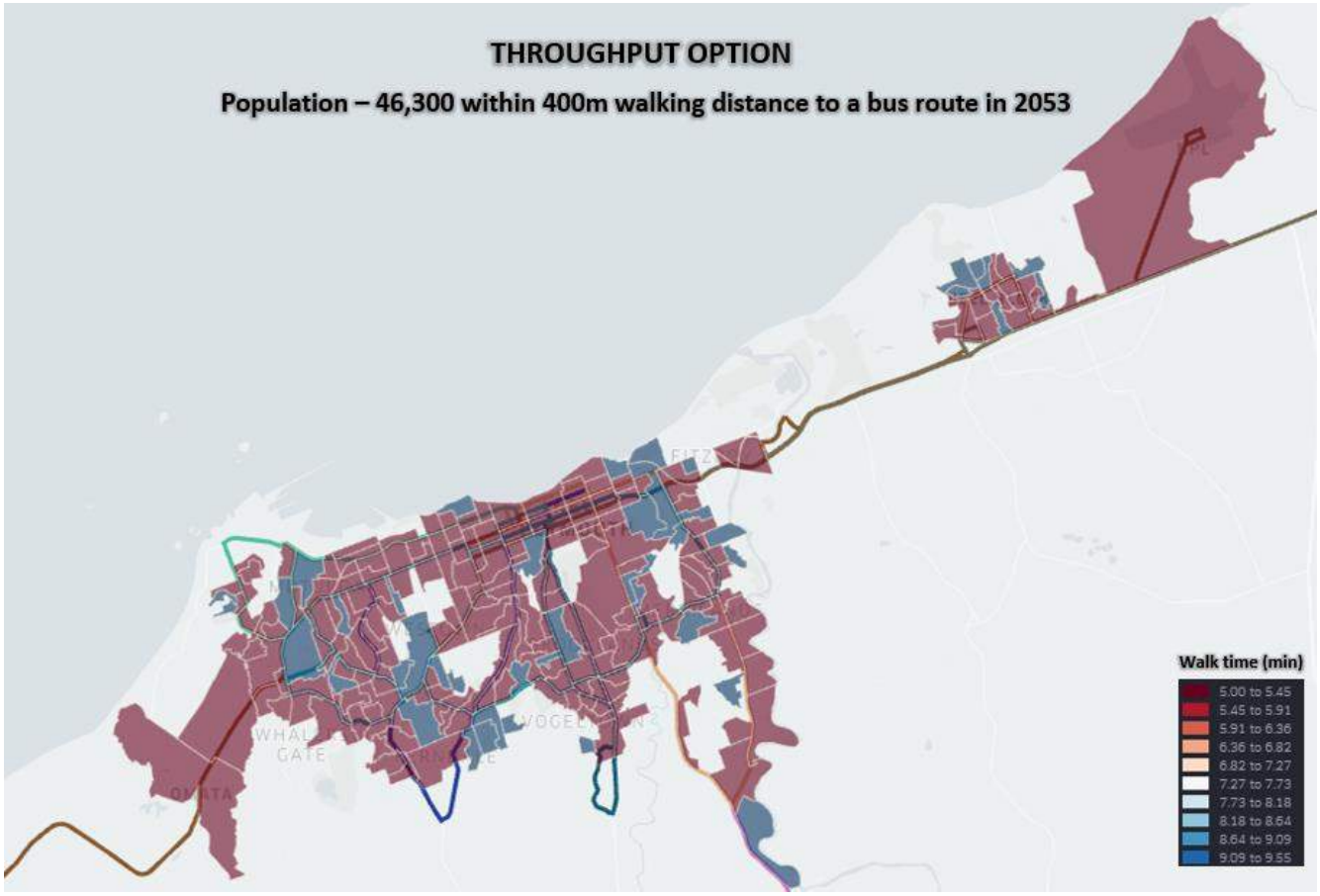


Figure 2: Balanced Option – population within 400m walking distance to a bus route in 2053.

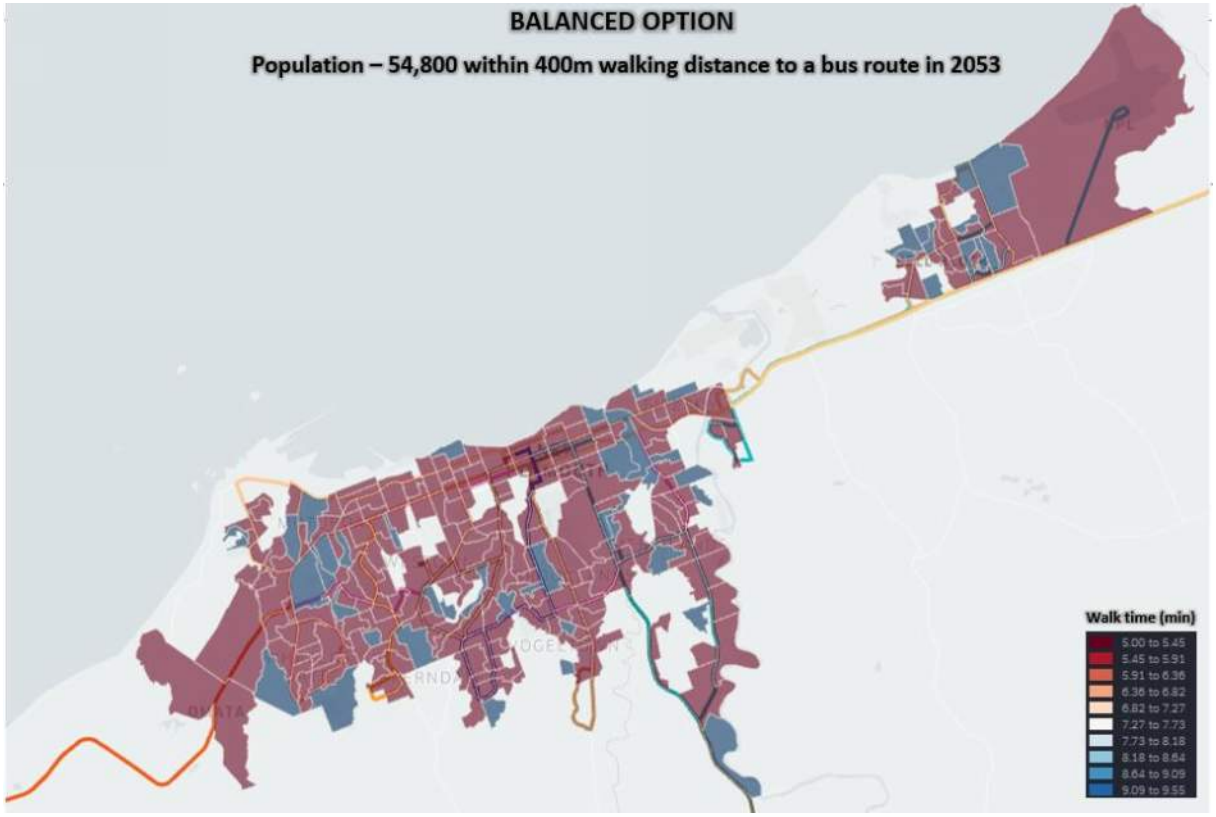
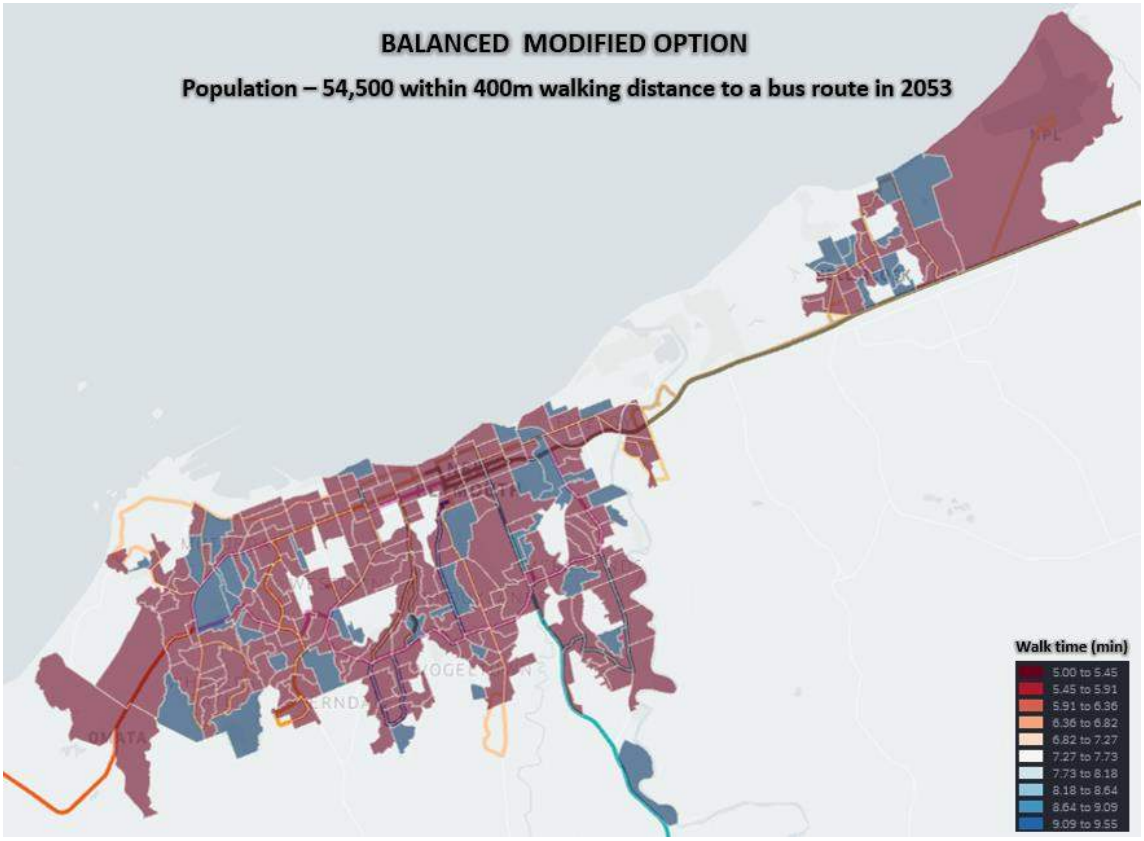


Figure 3: Balanced Modified Option – population within 400m walking distance to a bus route in 2053.



23. The bus catchment analysis is included in Chapter 7: Economic Case of the SSBC.

Indicative BCRs for the short list options

24. The indicative Benefit Cost Ratios (BCRs) for the short list options have been prepared and are included in the SSBC.

Option	Indicative Annual Operating Cost ($M, undiscounted)	40-Year Discounted Benefit ($M)	40-Year Discounted Cost ($M)	Indicative BCR
Throughput	$2.8	55.0	52.9	1.0
Balanced	$2.9	63.9	55.2	1.2
Balanced Modified	$3.5	63.5	66.2	1.0

25. Although the Balanced option will provide the greatest BCR, it does not consider additional services that the community asked for during consultation. The provision of additional services that allow the community to access essential services easily, and provide greater access to the underserviced areas reduces the BCR but will result in a higher level of community acceptance and support. As such, the Balanced Modified is proposed as the preferred network option.

26. It is noted that the $3.5M operating cost is only a portion of the TRC PT budget and this excludes school services. The total operating budget currently sits over $7M.

27. The BCRs are included in Chapter 7: Economic Case of the SSBC.

Predicted Patronage of the Bus Network

28. The predicted patronage of the preferred network option is below and is included in the Chapter 7: Economic Case of the SSBC.

29. The Bronze option is a step on the way towards the desired Gold option – our long term goal.
30. While Gold is our long term preferred option, Bronze is the achievable and implementable stepping stone to achieve this long term goal.

- 'Gold' frequency option: Estimated 90% increase in the overall daily bus patronage by 2035.
- 'Bronze' frequency option: Estimated 25% increase in the overall daily bus patronage by 2035

- By 2053, approximately 54,500 people will be within a bus route. This is a 3,100 or 6% increase from the Do-Minimum.

Strengthening Collaboration with NPDC

31. To strengthen our collaboration with New Plymouth District Council (NPDC) a meeting was held on 13th August 2024 with the General Manager Operational Excellence and three Councillors. The purpose of this meeting was to step through the optioneering process and explain the preferred network was determined.

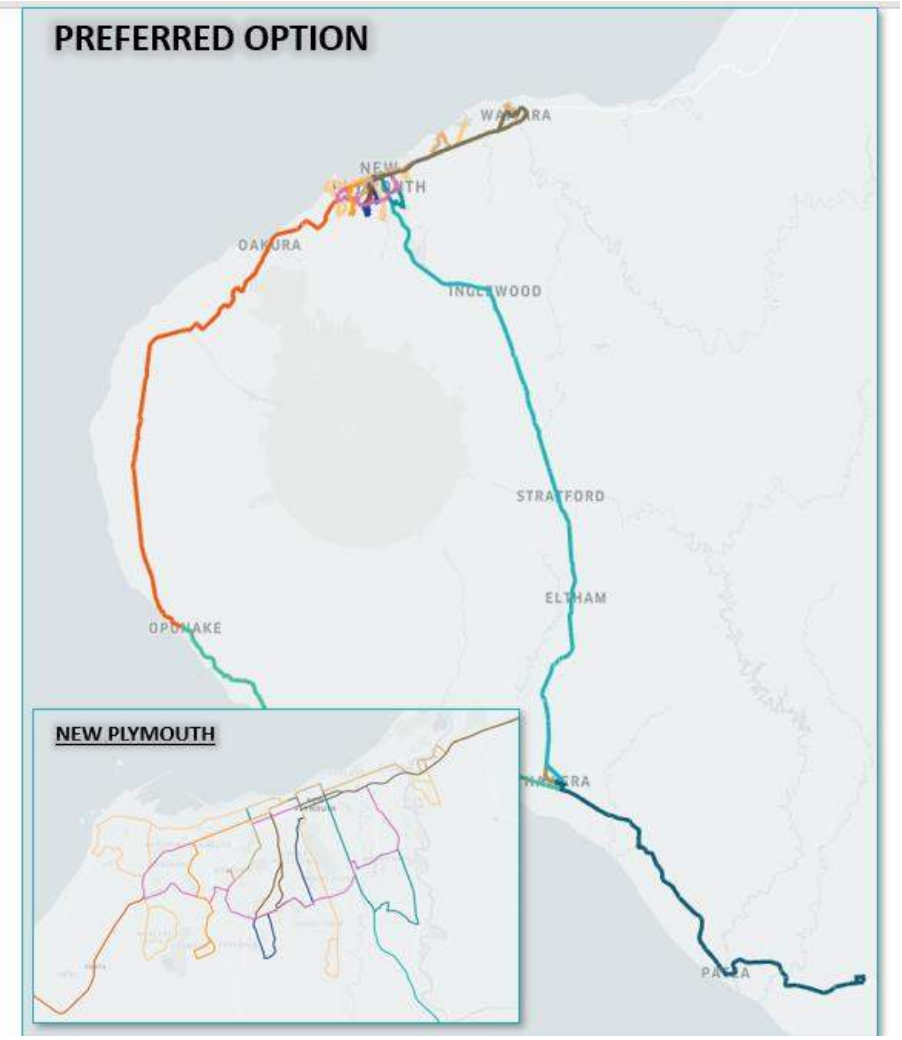
32. A Joint Committee between Taranaki Regional Council and New Plymouth District Council for all transport related projects is in the process of being established. Chapter 12: Management Case of the SSBC has been updated to reflect. TRC have provided draft terms of reference to NPDC for the Committee.

33. NPDC will have an opportunity year on year to influence the bus network and engagement with NPDC will continue.

The Preferred Option

34. In developing the preferred option, the SSBC recognized the constrained funding environment and the importance of community feedback in providing a service that is people centric. Thus, following community engagement of the short-listed options, the Balanced Modified Option was proposed. This was further assessed to be the preferred option which was taken forward.

Figure 3: The Preferred Option (Balanced Modified)



Outcomes Achieved

35. The preferred option provides the following customer outcomes over the Do-Minimum.

- 'Gold' frequency option: Estimated 90% increase in the overall daily bus patronage by 2035.
- 'Bronze' frequency option: Estimated 25% increase in the overall daily bus patronage by 2035
- By 2053, approximately 54,500 people will be within a bus route. This is a 3,100 or 6% increase from the Do-Minimum.
- Reduction of 4,812 tonnes of CO2 over 40 years, a reduction of 13,335 tonnes with the 'Gold' frequency option. [1]
- Gold option: A reduction in average bus travel time of 6 minutes between Glen Avon and the CBD. A 10-minute reduction between Marfell and the CBD.
- Bronze option: A reduction in average bus travel time of 2 minutes between Glen Avon and the CBD. A 5 -minute reduction between Marfell and the CBD.

[1] This comparison is made solely focused on the network and diesel buses and doesnt account for electric buses

- The New Plymouth Airport is now accessible via public transport increasing travel choice for locals and travellers alike.

Staging and Funding of the Preferred Option

36. Three frequency options have been considered for the preferred option - referred to as Bronze, Silver and Gold. **Gold is the desirable preferred** with 15 minute headways during the peak periods for the Urban routes and increased services on the weekends. Bronze and Silver options are considered for staging, based on current funding constraints. The difference in the frequency of services for each option is presented below in Figure 3.

37. 'Gold' being the desired frequency option where further funding will be sought when available. We will continue to discuss options for additional funding from NZ Transport Agency to continue to progress toward the Gold standard.

Figure 4: Frequency Options for the Preferred Option

	BRONZE		SILVER		GOLD		
Same as current schedule	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Return Trips/ week	Saturday	Sunday & Public Holidays
Urban Services							
Airport to Whalers Gate	70		80	4	165		12
Carrington / Govett	70		80		125		12
Frankleigh Park	70		80		125	12	12
Mangorei Taranaki Hospital	70		80		125	12	12
Port Taranaki - Vogeltown	70		80		165	12	12
Proposed Orbiter Route	70	2	80	4	125	12	12
Route 3-Hurdon	70		80		165	12	12
Route 5 - Waitara	30		40		65	12	12
Waitara Express Route	25		35		60		
Regional Services							
Waverly to Hawera	1		1		2		
Opunake to Hawera	1		1		10	2	2
Opunake to NP	10		10		20	2	2
Hawera - Taranaki Hospital	20	4	20	4	20	4	4
Hawera to NP	5		5		40	8	8

30 min during peaks

15 min during peaks

Increased weekend & regional services

BCR Costs

38. The overall estimated annual operating cost and BCR for the preferred different frequency option is shown in the table below.

Option	Annual Operating Cost ($million, undiscounted)	40-Year Discounted Benefit ($million)	40-Year Discounted Cost ($million)	BCR
Bronze	$3.5	63.5	66.2	1.0
Silver	$6.8	104.9	126.8	0.8
Gold	$7.2	226.4	134.1	1.7

39. The analysis has shown the Gold Option provides the strongest return on investment with a BCR of 1.7. It is noted the increase in cost in the 'Silver' option is estimated to be greater than the monetised

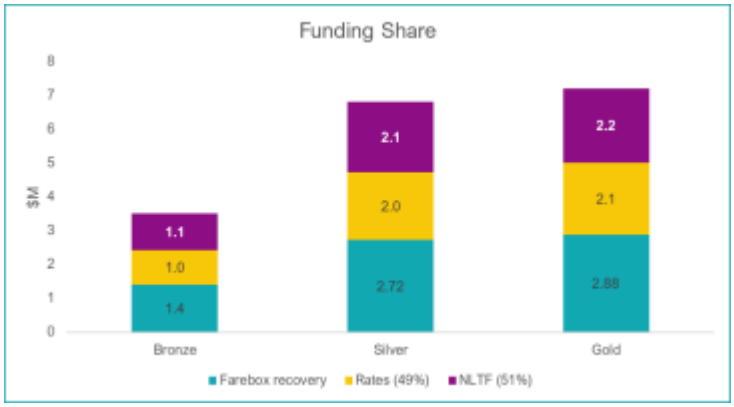
benefits. However, the evaluation excludes non-monetised benefits that would also arise from the increase in frequency such as increased customer satisfaction and in facilitating growth in a sustainable manner. Despite the lower BCR, the 'Silver' frequency is an important step change towards the aspirational frequency of 'Gold'.

40. For context, a BCR over 1 means an investment stacks up and is financially viable. Some public transport projects have a BCR less than 1 and are still acceptable on the basis that they are considered to be providing additional benefit to the community that can't be quantified via the BCR calculation method. The Bronze option (BCR of 1) is considered to be high relative to other similar business cases. A BCR of 1.7 is exceptionally high and shows the impact of a combination of services (routes that connect the community to jobs and where they need to go efficiently), minimizing infrastructure requirements and promoting fleet efficiencies.

Funding Share

41. The estimated funding split for the operational costs for the different frequency options (Gold, Silver, Bronze) are shown below based on an assumed 40% farebox recovery. It also assumes standard Funding Assistance Rates (FAR) (51% from the National Land Transport Fund (NLTF). For context, the current TRC farebox recovery is approximately 31% which is quite high for a regional public transport service. Therefore, an assumed future 40% farebox will be a positive outcome.

Figure 5: Funding Share



Procurement

42. Procurement contracts leading into a new 2026 contract are being updated. This contract will consider the proposed network, Ministry of Transport Requirements, the current Transport GPS, and will be flexible to allow changes in the network.

43. The following is noted from a procurement perspective:

- Procurement will consider proposed network and Vehicle Kilometres, purchases of buses and percentage of Electric Vehicles (EVs)
- Increased service provision and provision items with variable rates e.g. three years or nine years to allow for changes.

- Provisional items and changes included. It is anticipated that there will be feedback from operators during procurement planning.

44. It is planned that procurement will go to market in September 2024 giving operators a year to consider changes, with implementation commencing in April 2026. The new procurement is proposed to be for nine years, and there is room for flexibility.

45. At the November 2024 EAR Committee meeting an update on procurement will be provided.

Alignment with Regional Land Transport Plan (RLTP)

46. Increasing mode shift is one of three headline targets in the Taranaki Regional Land Transport Plan (RLTP) for the next ten years (until 2034). The RLTP aspires to at least double the trips made by public transport throughout the region by 2034 from the 2023/24 baseline. Both Bronze and Gold frequency options will contribute to the targets of doubling public transport trips.

Significance

47. In terms of the Significant and Engagement Policy, the decision is determined as being not significant, the consequences or impacts of the issue, assets, or other matters, does not affect a large number of residents and ratepayers to a moderate extent.

48. These criteria have also been considered, however, not triggered; the extent to which there is, or is likely to be a change in the level of service in carrying out any significant activity, and the extent to which there is, or is likely to be a change in the way in which any significant activity is carried out.

49. This is supported by the extensive community engagement which has been undertaken over the past 15 months and has informed the options and decision requested to be made by the Committee. The engagement process was detailed in Appendix 2 of the last meeting. As such it is considered no further community engagement is needed at this point in the Business Case. We will continue to engage with our partners and key stakeholders as we progress the SSBC as well as this Committee. It is noted that further engagement will be undertaken upon implementation of any new public transport service.

Financial considerations—LTP/Annual Plan

50. The financial impacts of implementing the council's decisions will need to be assessed. The issues to be considered are level of farebox recovery, amount of funding available from our investment partner NZTA, and the Council's preferences around the level of local contribution through targeted rates. We will work through these options for consideration through the 2025 - 2026 annual plan process.

51. The phasing of the rollout of the preferred option will be totally dependent on these financial considerations. One of the tools available to assist in addressing the financial considerations is the time frame in which the options are implemented. That is, if funding sources are not available then the option can be implemented over a longer timeframe.

Policy considerations

52. This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the Local Government Act 2002, the Resource Management Act 1991 and the Local Government Official Information and Meetings Act 1987.

Iwi considerations

53. This memorandum and the associated recommendations are consistent with the Council's policy for the development of Māori capacity to contribute to decision-making processes (schedule 10 of the Local Government Act 2002) as outlined in the adopted Long-Term Plan and/or Annual Plan. Similarly, iwi involvement in adopted work programmes has been recognised in the preparation of this memorandum.

54. Since the last EAR meeting TRC has connected again with Te Aranga o Taranaki via the iwi secretariat. The bus network map of the preferred option was provided and the changes made as a response to the public consultation was highlighted. We again welcomed the opportunity to work collaboratively and whether there was any feedback on the bus network.

55. We will continue to use best endeavors and will always welcome the opportunity to work collaboratively on the bus network together with our iwi partners.

Community considerations

56. This memorandum and the associated recommendations have considered the views of the community, interested and affected parties and those views have been recognised in the preparation of this memorandum.

57. The community feedback has significantly shaped the preferred option and the updated Balanced option is the preferred option which has been included in the SSBC seeking approval.

Legal considerations

58. This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Appendices/Attachments

Appendix 1: Taranaki Public Transport SSBC [Working version as at 28th August 2024, including 1. comments from TRC's Procurement advisors and TRC officers 2. Some amendments that begin to address the five key observations from the independent peer review 3. Excluding other minor amendments arising from the Peer Review]

Appendix 2: 9th September 2024 EAR Committee Presentation

Appendix 3: Email from the independent Peer Review of Taranaki Public Transport SSBC

Minutes of Meeting

Taranaki PT SSBC - ILM Workshop 30 Nov 2023

Held 30 November 2023 at 10am

at New Plymouth District Council

Present:	Megan Taylor (MT)	Robert Broadnax (RB)
	Andrew Collings (AC)	Cheryl Gazley (CG)
	Stuart Knarston (SK)	Shawn Scott (SS)
	Jo Limmer (JL)	Lisa Grindlay (LG) *(Online)*
	David Brown (DB)	
Apologies:	Denise Houston (DH)	
Distribution:	All of the above	

Item	Action
1 Introduction and Purpose • **AC** – Provided a brief introduction and then set out the purpose of the workshop – specifically to gather feedback on the problems, benefits and investment objectives. • **AC** – Provided a summary of the strategic policy context information noting that this will most likely require future updating with the change in government. However, it was noted that the key principles are likely to remain similar i.e. VKT reduction. AC also noted that the team is keen to include policies/ documents that are still under development. • **MT –** The New Plymouth Integrated Transport Framework PBC (PBC) is still a live document and is waiting for approval. • **SS** – The GPS 2024/2027 is a draft document and to be withdrawn and the SSBC should be working with GPS 2021/2023.	**Team to change GPS references within the Strategic Case based on SS coment**
2 Problem Statements **AC** provided an overview of the PBC problem statements which forms the base for the draft SSBC problem statements and detailed graphically how they link to the strategic documents. **General Comments:** • **SS** – need to remember the PBC is for NP and the PS needs to consider it regionwide. • There are a number of co-funder opportunities that could be included in the financial case of the SSBC. **Problem 1: Travel Choice**	**Team will reword the problem statements based on the discussion and reissue for comments.** **Team to start compiling a table of possible co-funders for**

Item	Action

• **RB** – asked what the group thought the problems are in the region , is it commuter travel , education or other? Will people use PT outside the commuter peak?
• **CG** – **Commuters:** Commuter is important, and student is also important. Noted that the school services do very well and are full. From the submissions for Better Travel Choices, some of the key themes coming through are that buses are not frequent enough outside of the peak hours. There are people who travel to the industrial areas such as that in Bell Block that would like to take PT but its not accessible enough. Notes there was a trial service for Englewood to service the area which was cancelled recently as uptake was low.
• **CG** – **Network model:** The coverage vs ridership model was one of the questions raised through submission. How can this be dealt with?
• **LG** responded to say that coverage or ridership model will be dependent on understanding the community and what works for them. LG also spoke of the WK PT plan under development and the inclusion of community PT buses as part of this plan.
• **RB** – **Land Use Integration:** suggested whether land use integration could play a part in the problem statements i.e. to key destinations. and a network configuration that supports land use / settlement pattern.
• **RB** also noted that the Waikato has a network that is based off both coverage and ridership.
• **SS** notes that TRC has no influence over land use as the district plan will dictate.
• **RB** suggests that maybe the PS could be worded to say that a network configuration that supports the land use/ settlement plan.
• **RB** asks whether infrastructure is part of the problem to be considered.
• **CG** - Suitability of infrastructure is something to be considered as bus stops are seen as the 'shop window' for the buses.
• **RB** provided a summary of the key themes of the discussion:
  ○ Frequency and availability outside of core hours are important:
  ▪ There are different travel patterns.
  ▪ Dispersed industrial employment nodes.
  ▪ Shift works such as those at Bell Block
  ○ Services are inadequate – doesn't meet the needs of potential customers i.e to key designations such as the airport
  ○ Suitability of infrastructure to be included into problem
 	
<u>Problem 2: Inclusive Access</u>
 	
• **SS** noted the problem statement is relatively sound but could include 'equity'.
• **RB** – As part of the evidence base, the SSBC could bring in social deprivation index, car ownership information to support the problem/ equity story.
• **SS** – Agreed there are lots of problems for those less advantaged which will benefit from PT. Example of older vehicles which are also environmentally friendly.
• **SK** notes that funding will not be possible if the services are not frequent enough and needs to be considered if services are provided for specific areas.
	the financial case

Item	Action
• The group discussed inclusion of total mobility i.e. services provided to health services. • **LG** suggested total mobility could be reviewed (i.e. what community health services are in place to support those needs access to health care) but not part of the PT scheme. • **MT** spoke of the aged and youth community information that is in the PBC - this would be useful for the SSBC. • **CG** said the services need provide consideration for MOE as MOE will pull out of the corridors if these are provided for. • **RB** provided a summary and suggested to include 'education' into the problem statement. • Include current MOE bus services map as part of the evidence base. **Problem 3: Environmental Sustainability** • **RB** summarized the draft problem statement and asked whether electrification of the fleet should be part of the solution. • **CG** notes that a study is being undertaken by Jacob to look at electrifying the fleet. • Suggested problem statement update "Transport emissions in the region is high as a consequence of the form of the current network and form of existing fleet." **Weighting for problem statements** • **RB** asked the group what they thought the weighting for the problem statements should be. • **SS** shared accessibility (PS 2) would be the most important. • **LG** thought they feel quite equal though accessibility may be more important. • The group agreed the starting position should be 40% (PS1), 40% (PS2) and 20% (PS3) and to be updated if required.	
3 Benefits • **RB** – provided an overview of the benefits and suggested an equitable benefit could be included i.e. instead of improved PT accessibility this could be reduce equitability. • **CG** – be a bit more specific on the wording of the accessibility, could mean different things for different people. • Benefit ideas were discussed by the group: ○ 'Transport disadvantaged' KPIs to be included in customer experience. 'The ability to be cared for at home', forming a community sentiment, liveability – benefit for PT to stay in the community, reducing trips	**Team will include KPI and measures with the benefits as part of the updated issue for comments.**

Item	Action
4 Investment Objectives The group agreed the draft investment objectives should be revised to be similar to the below: - **Investment Objective 1**: Where public transport is available, it is seen as the preferred mode of choice by 2050. - **Investment Objective 2**: The investment objective should be about the ability to travel to the places people wishes to go and that 'noone is left behind' - **Investment Objective 3**: Link back to the emission reduction goal by 2050	**Team will update based on the discussion and reissue for comments.**
• **A.O.B** • There was discussion around: ○ The first and last mile to be considered in the SSBC as this is key for PT in the region. ○ consideration for access to rural maraes, urupas and other cultural elements to be included. ○ **LG** – in the regions its all about travelling within the community and in between. Inter-regional travel / options to come into scope..(?) ○ **CG** – public consultation has indicated support for a service to and from the airport. ○ **MT** – consideration of key destinations and connecting to them. ○ **CZ** mentioned parents getting kids to sports is a big thing , need to consider sport hubs as a destination ○ **AC** community sentiment and feedback needs to be considered in optioneering	

Minuted by: Kuan-Wen Sang

Reviewed by: Andrew Collings

G

Appendix G – Transport Modelling Tech Note

File Note

By:	Ali Danesh	**Date:**	01 October 2024
Subject:	Taranaki Public Transport SSBC Project	**Our Ref:**	3815111
Reviewed by:	Subramanyam Uppuluri		

1 Purpose

The Taranaki Regional Council has commissioned Beca Ltd (Beca) to undertake the Taranaki Public Transport Single Stage Business Case (PT SSBC). For this project, Beca has tested three bus service headways, i.e., Bronze, Silver, and Gold.

This technical note summarises the model inputs, assumptions and results. We used the Ngāmotu Strategic Transport Model (Ngāmotu STM) for this modelling work. The model years and scenarios are as follows:

- Base year – 2018
- Do Minimum Scenario – 2035 and 2053
- Option Scenarios – 2018, 2035 and 2053 for Bronze, Silver and Gold PT headways.

2 Option Scenarios

The base year 2018, Do Minimum Scenarios for 2035 and 2053 from the Ngāmotu STM were used as starting points for this modelling work. The Ngāmotu STM includes public buses and school bus services.

For this modelling work, the public bus routes are updated and tested for bronze, silver, and gold headways for 2018, 2035, and 2053.

3 Model Input and Assumptions

3.1 Land Use Inputs

The land use inputs for the Taranaki PT SSBC modelling work are derived from the Ngāmotu STM land use assumptions. The land use forecast predicts a 21% increase in the population of the New Plymouth urban area represented in the model area between 2018 and 2035 and a 34% increase by 2053, shown in **Table 1**.

Table 1 Land Use Assumptions

Model Year	Population	Households	Employment
2018	67,900	27,800	28,300
2035	82,000	32,000	33,300
2053	91,500	36,900	37,400
Growth 2018-2035 (%)	21%	15%	18%
Growth 2018-2053 (%)	35%	33%	32%

3.2 Network Assumptions

The network assumptions are based on the Ngāmotu STM Do Minimum scenarios from the *Ngāmotu Strategic Transport Model Forecasting Report (dated 22 January 2024)*. The network interventions are summarised in **Table 2**.

Table 2 Do Minimum Network assumptions for forecast years

S. N	Projects	2035	2053
1	Free Speed Reduction to 30 km/hr on Gover Street, Fillis Street, Liardet Street from Gover Street / Rogan Street to Molesworth Street / SH44	✓	✓
2	Free Speed Reduction to 30 km/hr on all school frontages	✓	✓
3	Signalisation at Tukapa Street / Sanders Avenue	✓	✓
4	Upgrade of Intersection Layout at Mangorei Road/ Rimu Street Intersection	✓	✓
5	Signalisation at Lorna Street / Devon Street	✓	✓
6	Single Lane Roundabout at Parklands Avenue / Mangati Road	✓	✓
7	Realignment of Airport Drive to connect with Parklands Avenue	✓	✓
8	Single Roundabout at Belair Avenue / Ōmata Road	✓	✓
9	Two-Lane Junction Bridge (one Lane per Direction)	✓	✓
10	Signalisation at SH3 / Henwood Road Interchange	✓	✓
11	Signalisation at Nugent Street / Henwood Road	✓	✓
12	New Connection and Intersections between Egmont road and Henwood road via Bishop Road	✓	✓
13	Two-Lane Corbett Road Bridge (one Lane per Direction)	✓	✓
14	Upgrade of Road Network and Intersections on Mangorei Road (Tupuhi Place to Mangorei School)	✓	✓
15	Upgrade the Intersection Layout at Egmont Road/ SH3		✓
16	New Connection and Intersections from Colson Road to Henwood Road		✓

3.3 PT Network

3.3.1 PT services and Frequencies

Table 3 summarises the public bus service and headway for the 2018 Base scenario derived from the *Ngāmotu Strategic Transport Model Development Report (dated 20 October 2023)*.

Table 3 Public bus service and headways in minutes (2018 Base scenario)

Route No	Route Name	Inbound services			Outbound services		
		AM	IP	PM	AM	IP	PM
3101	Inglewood – New Plymouth	120	140	120	120	140	120
5001	City (Ariki St)- Moturoa	30	70	40	30	70	40
5002	Blagdon/Whalers Gate-Whalers Gate	30	70	40	30	70	40
5003	Lynmouth/Marfell-Lynmouth/Marfell	30	0	0	0	70	40
5004	Westown/Hurdon-Westown/Hurdon	30	70	40	30	70	40

File Note

Route No	Route Name	Inbound services			Outbound services		
		AM	IP	PM	AM	IP	PM
5005	Frankleigh Park/Ferndale-Frankleigh Park/Ferndale	30	70	40	30	70	40
5006	Vogeltown/Brooklands-Vogeltown/Brooklands	30	70	40	30	70	40
5007	Welbourn/Highlands Park	30	70	40	30	70	40
5008	Merrilands/Highlands Park	30	70	40	30	70	40
5009	Fitzroy/The Valley/Glen Avon-Fitzroy/The Valley/Glen Avon	30	84	40	30	84	40
5020	Waitara (via Bell Block)-Waitara/Bell Block	120	140	120	120	140	120

The PT services and headway for 2035 and 2053 Do Minimum Scenarios are the same, as provided in **Table 4** and derived from *the Ngāmotu Strategic Transport Model Forecasting Report (dated 22 January 2024)*.

Table 4 Public bus service and headways in minutes (2035 and 2053 Do Minimum scenarios)

Route No	Route Name	Inbound services			Outbound services		
		AM	IP	PM	AM	IP	PM
3101	Inglewood – New Plymouth	120	140	120	120	140	120
5001	City (Ariki St)- Moturoa	30	70	40	30	70	40
5002	Blagdon/Whalers Gate-Whalers Gate	30	70	40	30	70	40
5003	Lynmouth/Marfell-Lynmouth/Marfell	30	0	0	0	70	40
5004	Westown/Hurdon-Westown/Hurdon	30	70	40	30	70	40
5005	Frankleigh Park/Ferndale-Frankleigh Park/Ferndale	30	70	40	30	70	40
5006	Vogeltown/Brooklands-Vogeltown/Brooklands	30	70	40	30	70	40
5007	Welbourn/Highlands Park	30	70	40	30	70	40
5008	Merrilands/Highlands Park	30	70	40	30	70	40
5009	Fitzroy/The Valley/Glen Avon-Fitzroy/The Valley/Glen Avon	30	84	40	30	84	40
5020	Waitara (via Bell Block)-Waitara/Bell Block	60	70	60	60	70	60
Express	CBD-Waitara Express	30	-	30	30	-	30

Table 5 to **Table 7** present the public bus services and the headways for Bronze, Silver and Gold scenarios respectively. School bus services remain unchanged and are consistent with the Ngāmotu STM model scenarios used in this Taranaki PT SSBC modelling work.

Table 5 Public bus service and headways in minutes (Bronze)

Route No	Route Name	Inbound services			Outbound services		
		AM	IP	PM	AM	IP	PM
R1	Airport to Whalers Gate	40	70	40	40	70	40
R2	Carrington / Govett	40	70	40	40	70	40
R3	Frankleigh Park	40	70	40	40	70	40
R4	Mangorei Taranaki Hospital	40	70	40	40	70	40
R5	Port Taranaki - Vogeltown	40	70	40	40	70	40
R6	Proposed Orbiter Route	40	70	40	40	70	40

File Note

Route No	Route Name	Inbound services			Outbound services		
R7	Hurdon	40	70	40	40	70	40
R8	Waitara	120	105	120	120	140	60
R9	Waitara Express	120	140	120	60	210	120
R10	Hawera to New Plymouth	--	420	--	--	420	--
R11	Hawera - Taranaki Hospital	--	140	120	120	140	--
R12	Opunake to New Plymouth	120	420	--	--	420	120

Table 6 Public bus service and headways in minutes (Silver)

Route No	Route Name	Inbound services			Outbound services		
		AM	IP	PM	AM	IP	PM
R1	Airport to Whalers Gate	30	70	30	30	70	30
R2	Carrington / Govett	30	70	30	30	70	30
R3	Frankleigh Park	30	70	30	30	70	30
R4	Mangorei Taranaki Hospital	30	70	30	30	70	30
R5	Port Taranaki - Vogeltown	30	70	30	30	70	30
R6	Proposed Orbiter Route	30	70	30	30	70	30
R7	Hurdon	30	70	30	30	70	30
R8	Waitara	60	140	60	60	140	60
R9	Waitara Express	60	105	60	60	105	60
R10	Hawera to New Plymouth	--	210	--	--	420	--
R11	Hawera - Taranaki Hospital	--	140	120	120	140	--
R12	Opunake to New Plymouth	120	420	--	--	420	120

Table 7 Public bus service and headways in minutes (Gold)

Route No	Route Name	Inbound services			Outbound services		
		AM	IP	PM	AM	IP	PM
R1	Airport to Whalers Gate	15	30	15	15	30	15
R2	Carrington / Govett	15	70	15	15	70	15
R3	Frankleigh Park	15	70	15	15	70	15
R4	Mangorei Taranaki Hospital	15	70	15	15	70	15
R5	Port Taranaki - Vogeltown	15	30	15	15	30	15
R6	Proposed Orbiter Route	15	30	15	15	30	15
R7	Hurdon	15	70	15	15	70	15
R8	Waitara	30	105	30	30	105	30
R9	Waitara Express	30	84	30	30	84	30
R10	Hawera to New Plymouth	--	60	--	--	60	--
R11	Hawera - Taranaki Hospital	--	140	120	120	140	--

Route No	Route Name	Inbound services			Outbound services		
R12	Opunake to New Plymouth	60	210	--	--	210	60

3.3.2 Station Qualities

The PT stop and station quality parameters are documented in **Table 10-1** of "*Ngāmotu Strategic Transport Model: Model Development Report* ". The station qualities are consistent with the Ngāmotu STM, as shown in **Table 8** below.

Table 8 PT Station Quality

Parameter	Value
Initial wait time	As per the wait curve
Transfer wait time	As per the transfer wait curve
Wait perception factor	2
Transfer penalty	10 min
Transfer penalty perception factor	2

3.3.3 PT Fare

The PT fare remains unchanged and is consistent with the Ngāmotu STM.

3.3.4 Parking Cost

The parking cost is agreed to be unchanged from Ngāmotu STM, as shown in **Table 9.**

Table 9 Parking cost for different trip purposes

Location	Zones	HBW	HBE	Others
CBD	152, 153, 356-358, 360	$10	$0	$3

4 Model Results

The following model outputs were extracted from the Ngāmotu STM:

- Network statistics, including total VKT, total hours travelled, average trip length and vehicle emission (CO_2), are shown in **Table 10**.
- Forecast travel demand and mode share are provided in **Table 11**. Note that the mode share comparison is obtained by multiplying the vehicle trips with an occupancy factor of 1.2 to convert them to passenger trips.
- Daily vehicle and PT flow difference plots are provided in **Appendix A** and **Appendix B.**

Table 10 Road network vehicle statistics

Scenario	Average Daily VKT	Average Daily VHT	Average Daily Delays VHT	VKT / Person	Vehicle Trips / Person	Average Trip Length (km)	CO_2E Kg/day
2018 - Base	1,387,799	28,642	4,409	20.3	3.3	6.1	294,511
2018 – Bronze	1,387,799	28,642	4,409	20.3	3.3	6.1	294,511

File Note

Scenario	Average Daily VKT	Average Daily VHT	Average Daily Delays VHT	VKT / Person	Vehicle Trips / Person	Average Trip Length (km)	CO_2E Kg/day
2018 - Silver	1,387,799	28,642	4,409	20.3	3.3	6.1	294,511
2018 - Gold	1,387,799	28,642	4,409	20.3	3.3	6.1	294,511
2035 - Do Min	1,656,446	36,449	7,163	20.1	3.2	6.2	289,188
2035 – Bronze	1,652,189	36,305	7,113	20.0	3.2	6.2	288,483
2035 - Silver	1,650,337	36,255	7,096	20.0	3.2	6.2	288,212
2035 - Gold	1,644,519	36,057	7,017	19.9	3.2	6.2	287,234
2053 – Do Min	1,875,134	44,858	11,640	20.4	3.3	6.2	140,460
2053 – Bronze	1,871,346	44,478	11,343	20.3	3.3	6.2	140,270
2053 - Silver	1,868,869	44,382	11,296	20.3	3.3	6.2	140,147
2053 - Gold	1,864,211	44,171	11,182	20.2	3.3	6.2	139,935

Table 11 Forecast daily demand

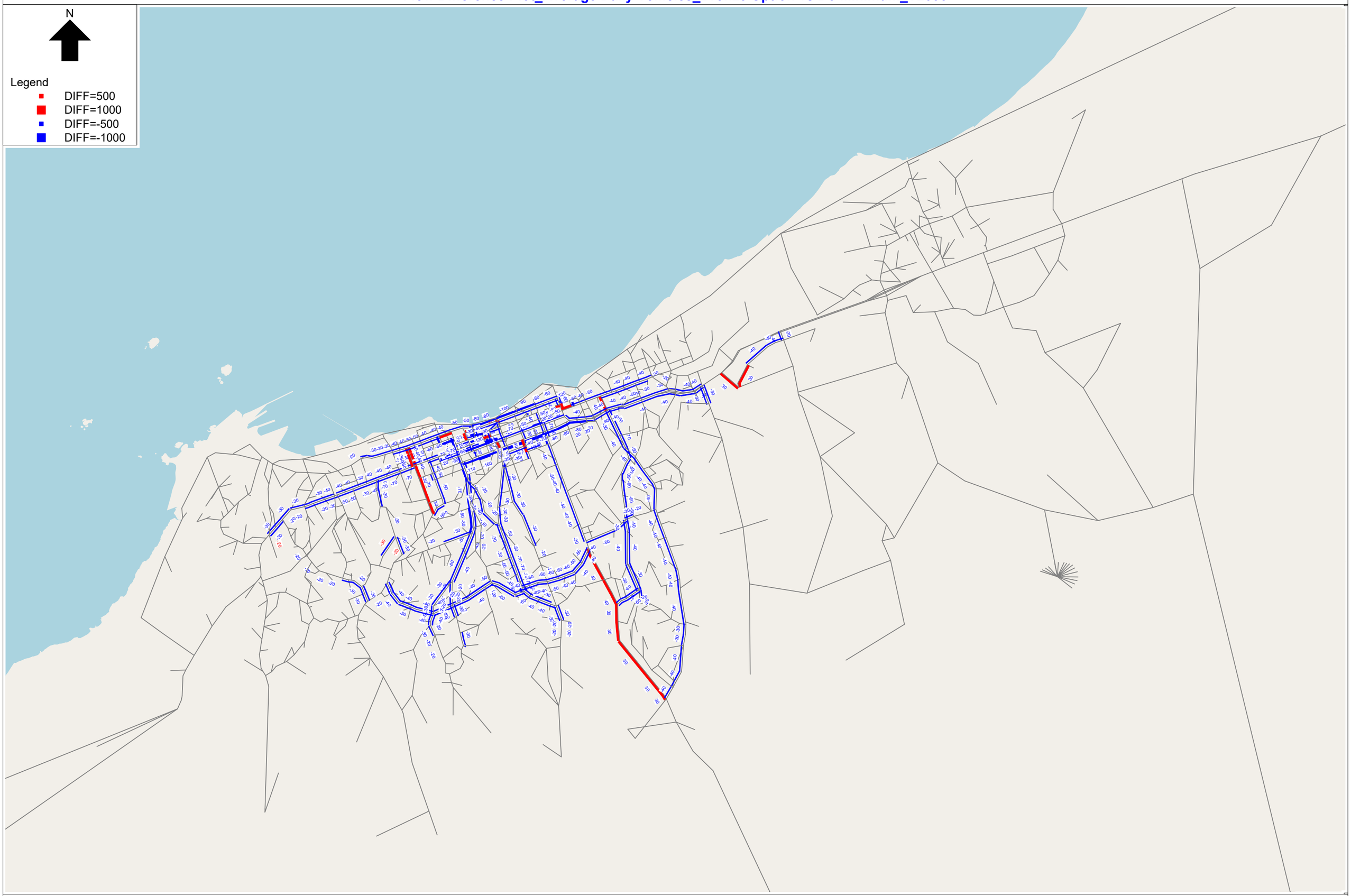
Scenarios/ Measure	Demand by mode			Mode Share		
	Vehicles (vehicle trips)	PT (person trips)	Cycle (person trips)[1]	% Car	% PT	% Cycle
2018 - Base	226,263	2,945	3,780	97.6%	1.1%	1.4%
2018 – Bronze	226,263	2,945	3,780	97.3%	1.4%	1.4%
2018 - Silver	226,263	3,636	3,780	97.2%	1.5%	1.4%
2018 - Gold	226,263	4,033	3,780	96.8%	1.8%	1.3%
2035 – Do Min	267,694	3,636	5,533	97.2%	1.1%	1.7%
2035 – Bronze	266,933	3,879	5,533	97.0%	1.3%	1.7%
2035 - Silver	266,658	4,119	5,533	96.9%	1.4%	1.7%
2035 - Gold	265,531	5,128	5,533	96.6%	1.8%	1.7%
2053 – Do Min	303,053	4,033	6,789	97.1%	1.1%	1.8%
2053 – Bronze	302,214	4,409	6,789	96.9%	1.3%	1.8%
2053 - Silver	301,897	4,689	6,789	96.8%	1.4%	1.8%
2053 - Gold	300,599	5,844	6,789	96.4%	1.8%	1.8%

[1] Cycle demand are obtained from Ngāmotu STM from the 2018 Base scenario, and forecast year (2035/2053) scenarios are extracted from Do Minimum scenarios.

A

Appendix A – Vehicle Flow Difference Plots

Flow Difference Plot_Average Daily Vehicles_Bronze Option vs Do Minimum_Y2035



C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2035\Third_Bronze\Compare_ADT.net

Flow Difference Plot_Average Daily Vehicles_Silver Option vs Do Minimum_Y2035

C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2035\Third_Silver\Compare_ADT.net

Flow Difference Plot_Average Daily Vehicles_Gold Option vs Do Minimum_Y2035

N

Legend

- DIFF=500
- DIFF=1000
- DIFF=-500
- DIFF=-1000

C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2035\Third_Gold\Compare_ADT.net

Flow Difference Plot_Average Daily Vehicles_Bronze Option vs Do Minimum_Y2053

N

Legend

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- DIFF=1000
- DIFF=-500
- DIFF=-1000

C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2053\Third_Bronze\Compare_ADT.net

cube

Flow Difference Plot_Average Daily Vehicles_Silver Option vs Do Minimum_Y2053

N

Legend

- DIFF=500
- DIFF=1000
- DIFF=-500
- DIFF=-1000

C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2053\Third_Silver\Compare_ADT.net

cube

Flow Difference Plot_Average Daily Vehicles_Gold Option vs Do Minimum_Y2053

N

Legend

- DIFF=500
- DIFF=1000
- DIFF=-500
- DIFF=-1000

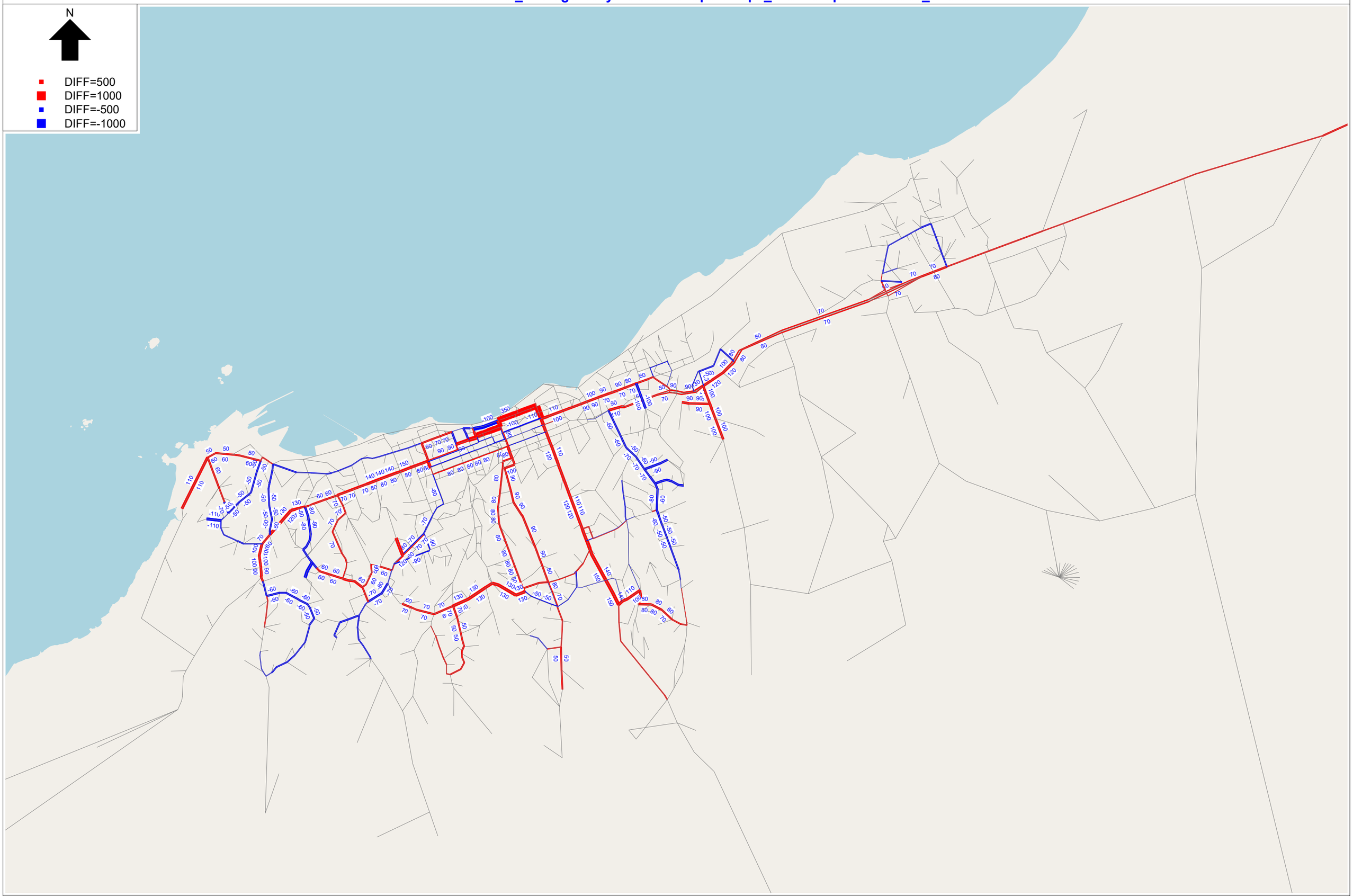
C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2053\Third_Gold\Compare_ADT.net

cube

B

Appendix B – PT Flow Difference Plots

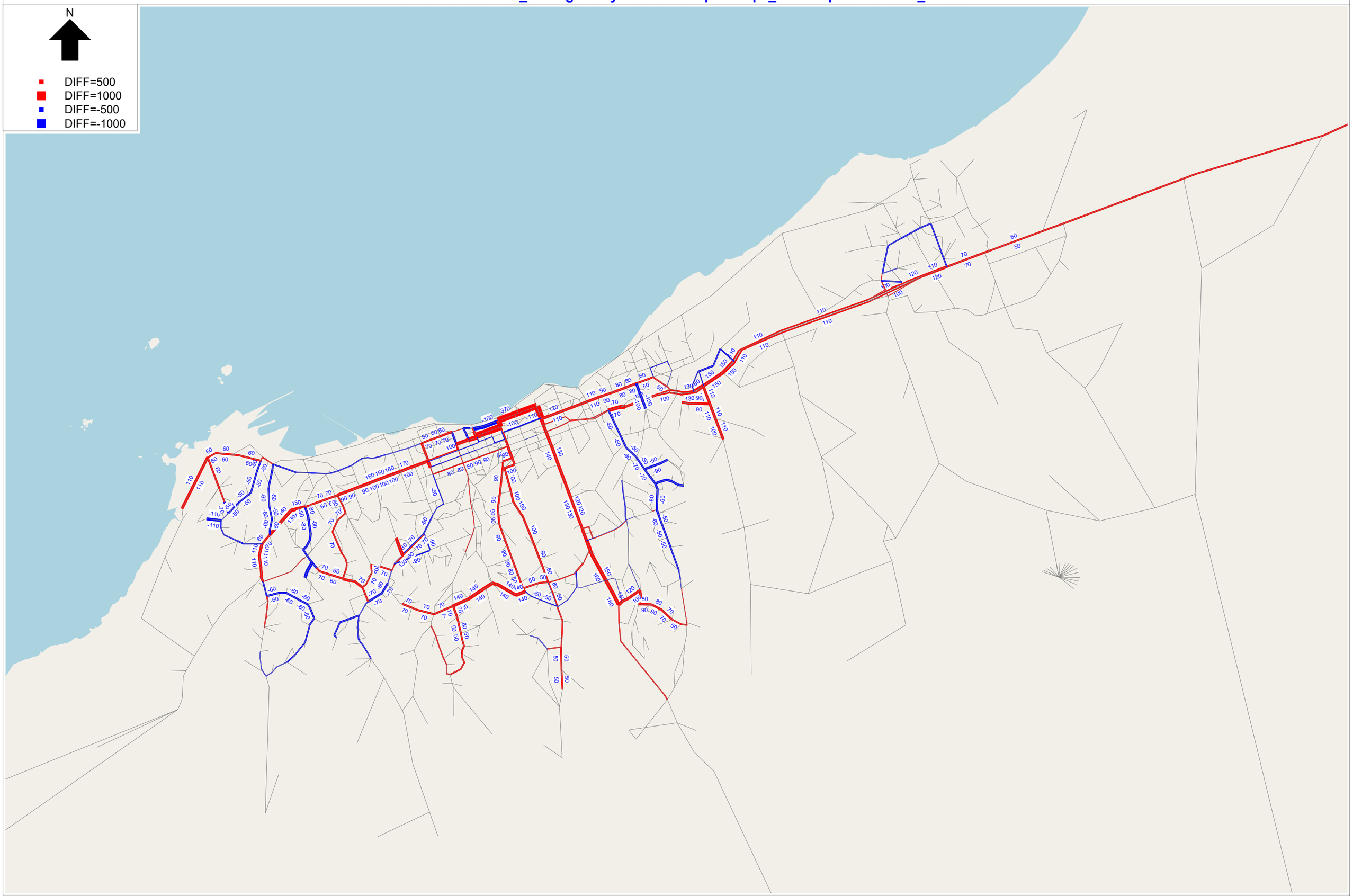
Flow Difference Plot_Average Daily Public Transport Trips_Bronze Option vs Base_Y2018



C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2018\Third_Bronze_PTOff\BvsF_PT_ADT.NET

cube

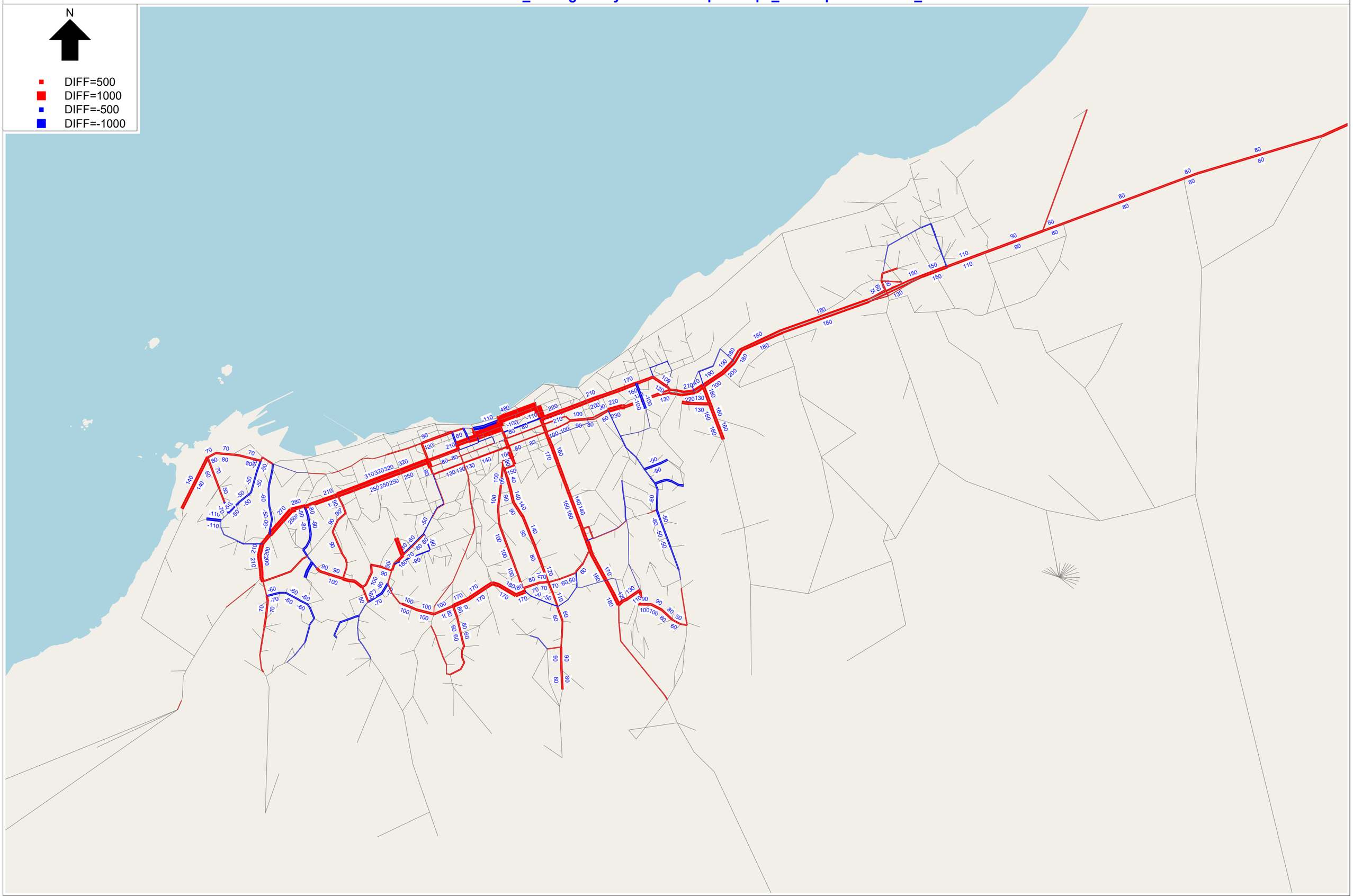
Flow Difference Plot_Average Daily Public Transport Trips_Silver Option vs Base_Y2018



C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2018\Third_Silver_PTOff\BvsF_PT_ADT.NET

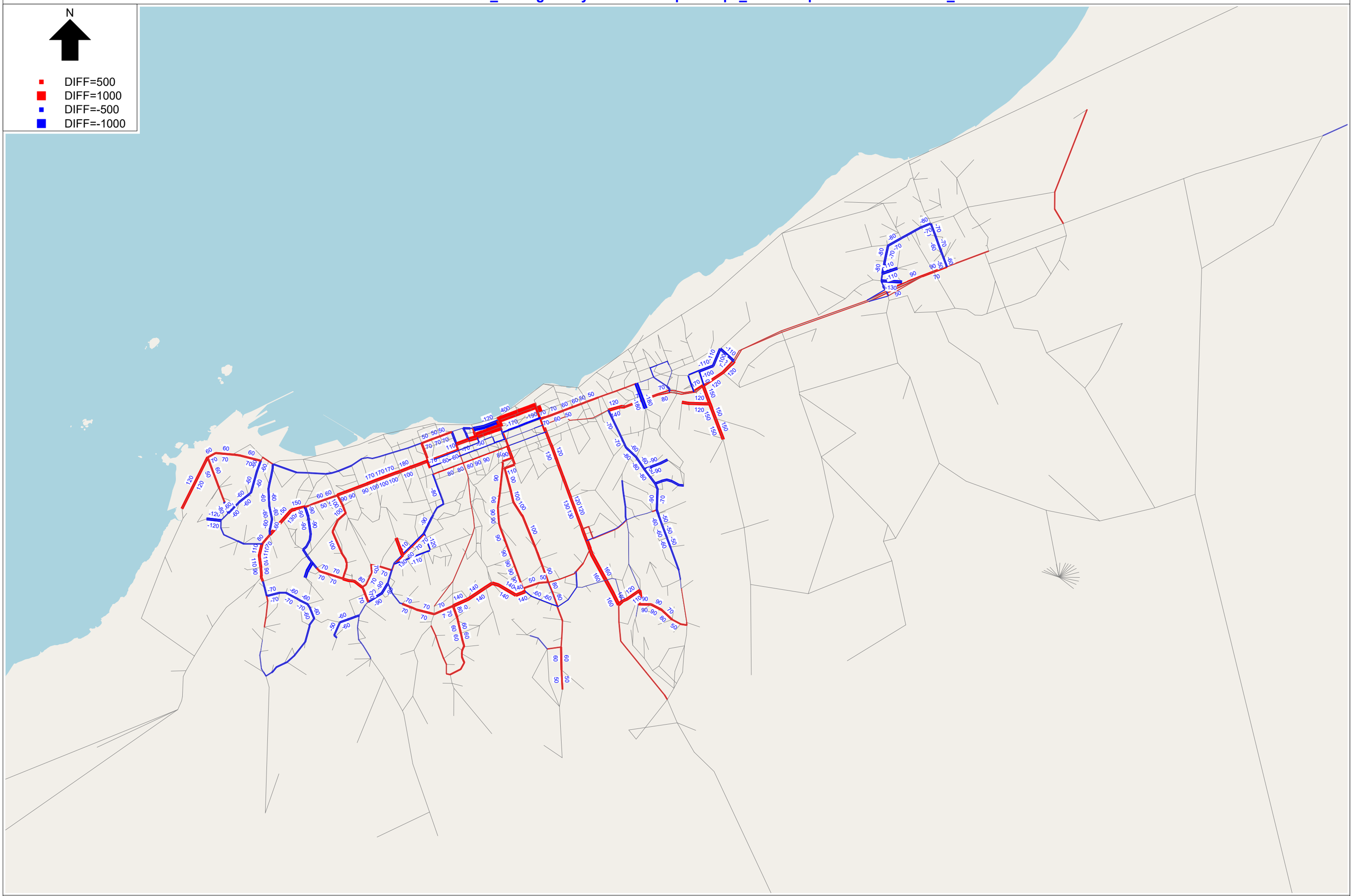
cube

Flow Difference Plot_Average Daily Public Transport Trips_Gold Option vs Base_Y2018



C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2018\Third_Gold_PTOff\BvsF_PT_ADT.NET

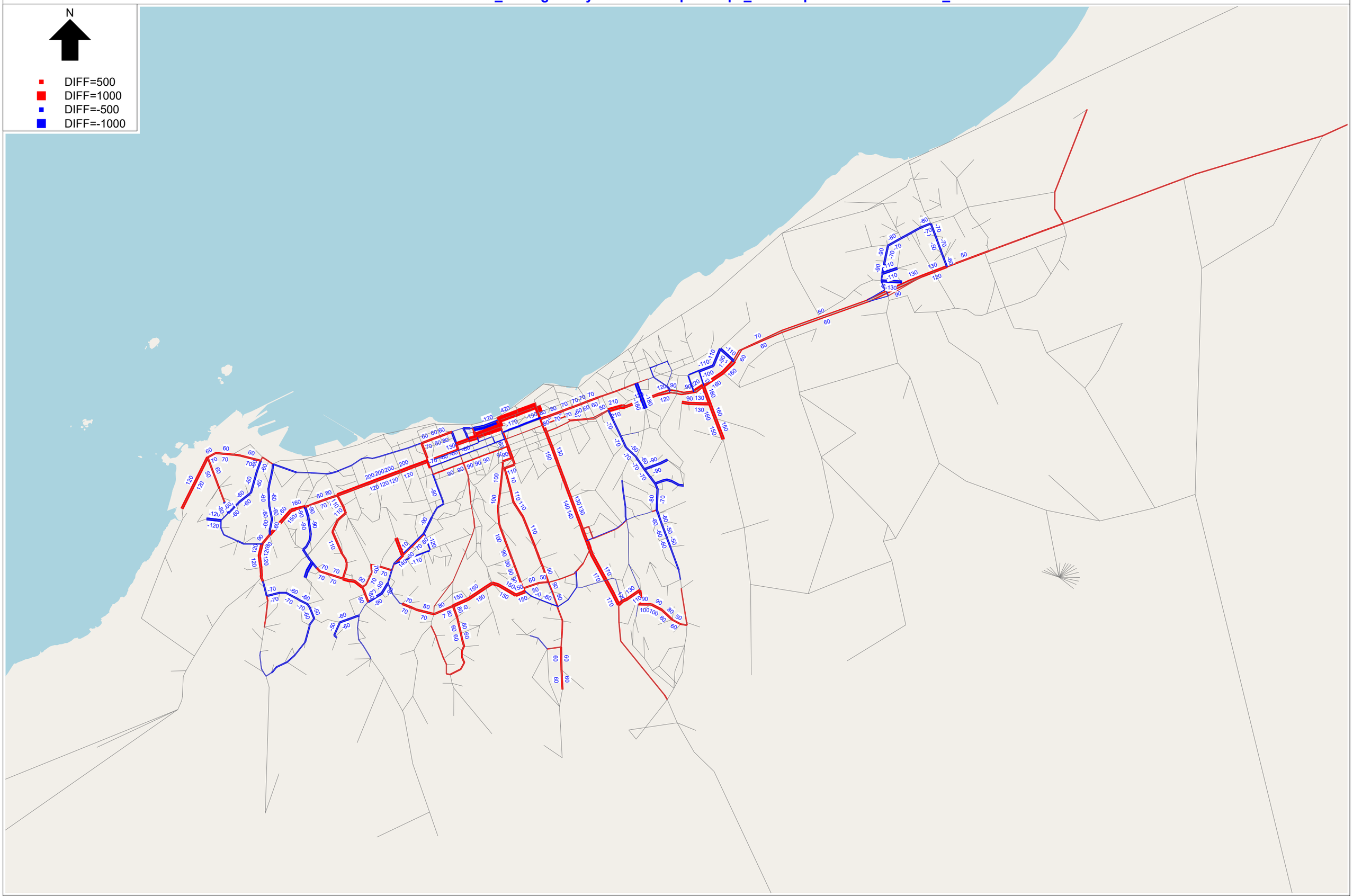
Flow Difference Plot_Average Daily Public Transport Trips_Bronze Option vs Do Minimum_Y2035



C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2035\Third_Bronze\BvsF_PT_ADT.NET

cube

Flow Difference Plot_Average Daily Public Transport Trips_Silver Option vs Do Minimum_Y2035



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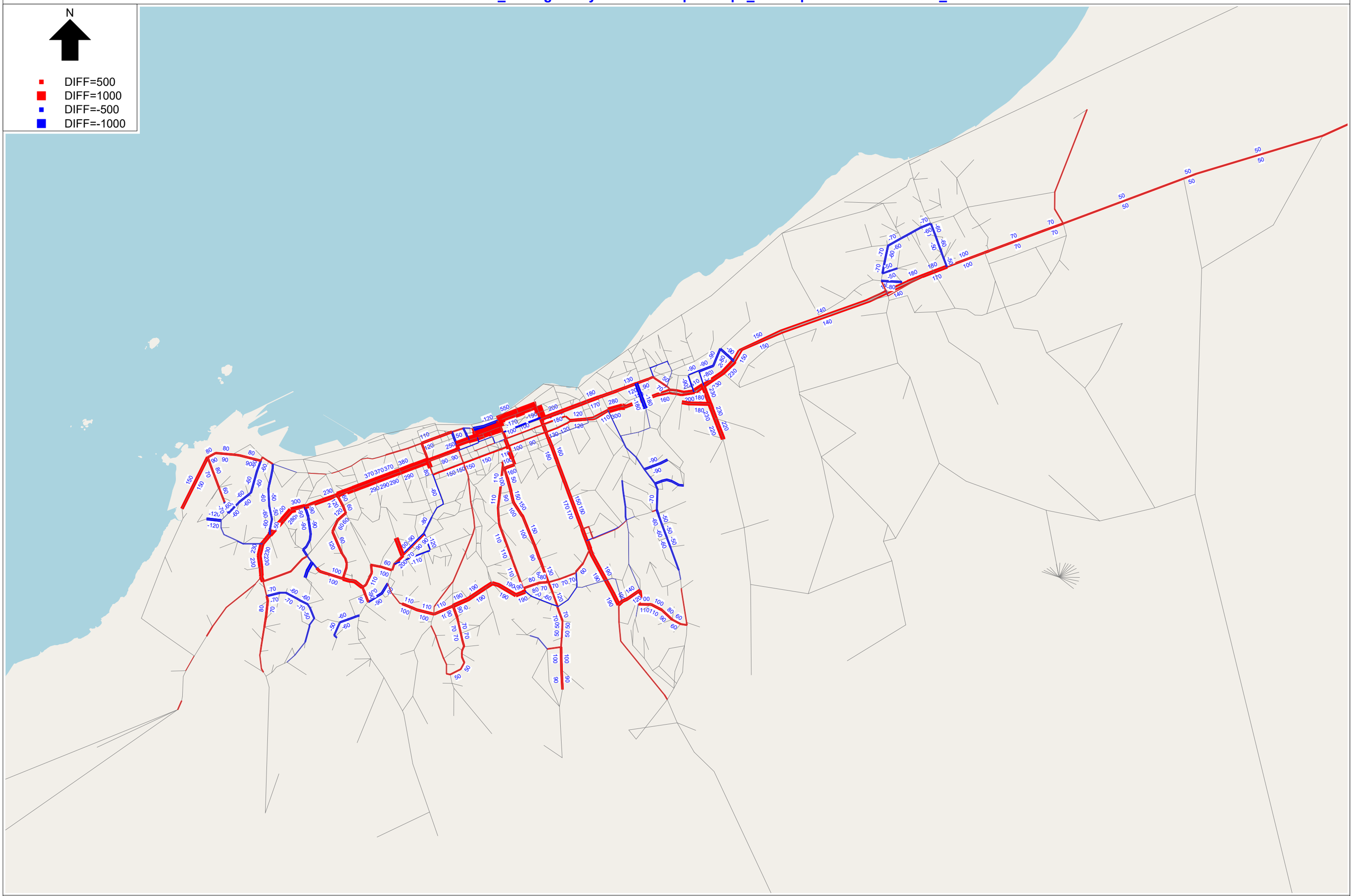
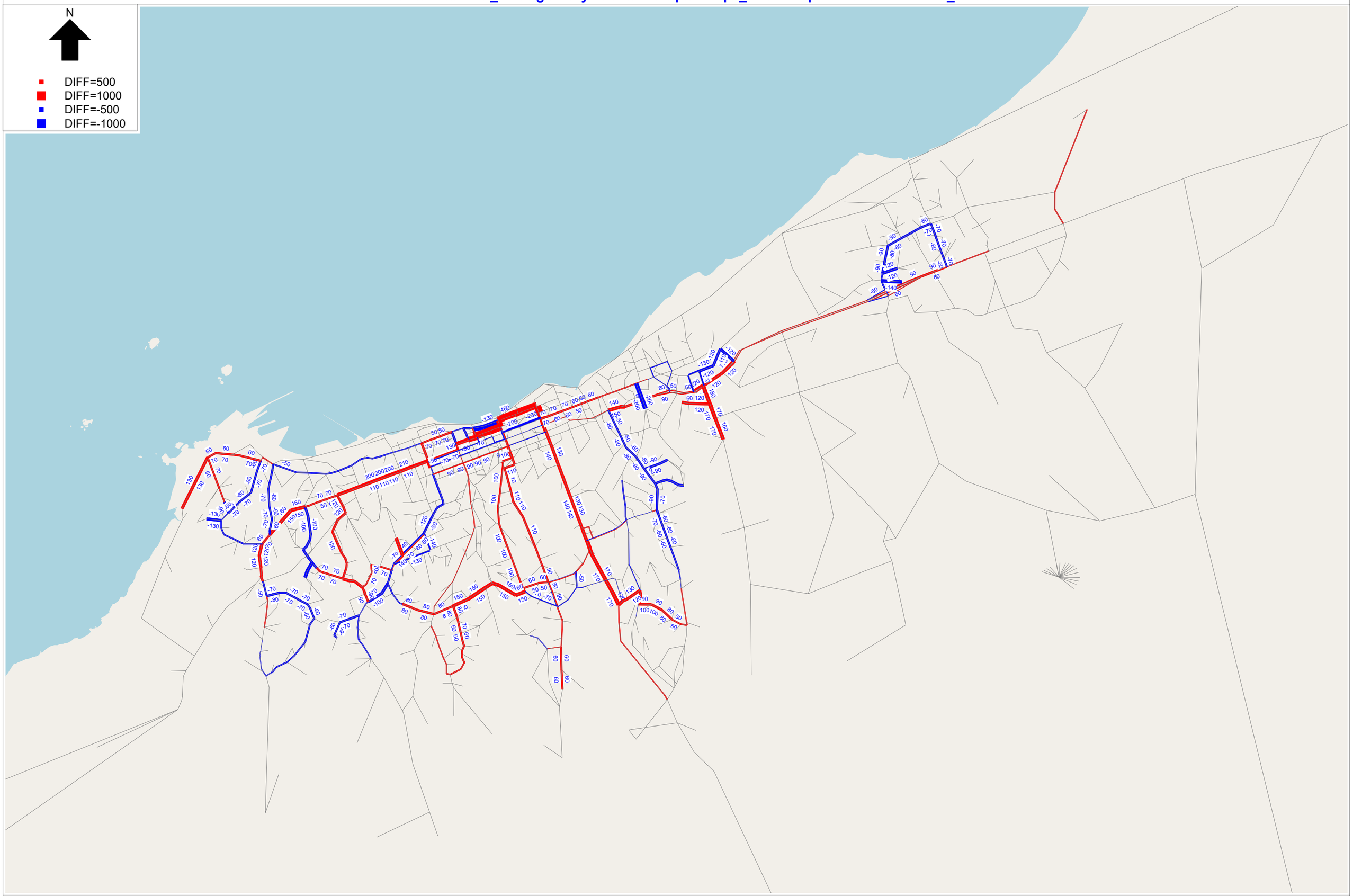
Flow Difference Plot_Average Daily Public Transport Trips_Gold Option vs Do Minimum_Y2035



C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2035\Third_Gold\BvsF_PT_ADT.NET

Flow Difference Plot_Average Daily Public Transport Trips_Bronze Option vs Do Minimum_Y2053



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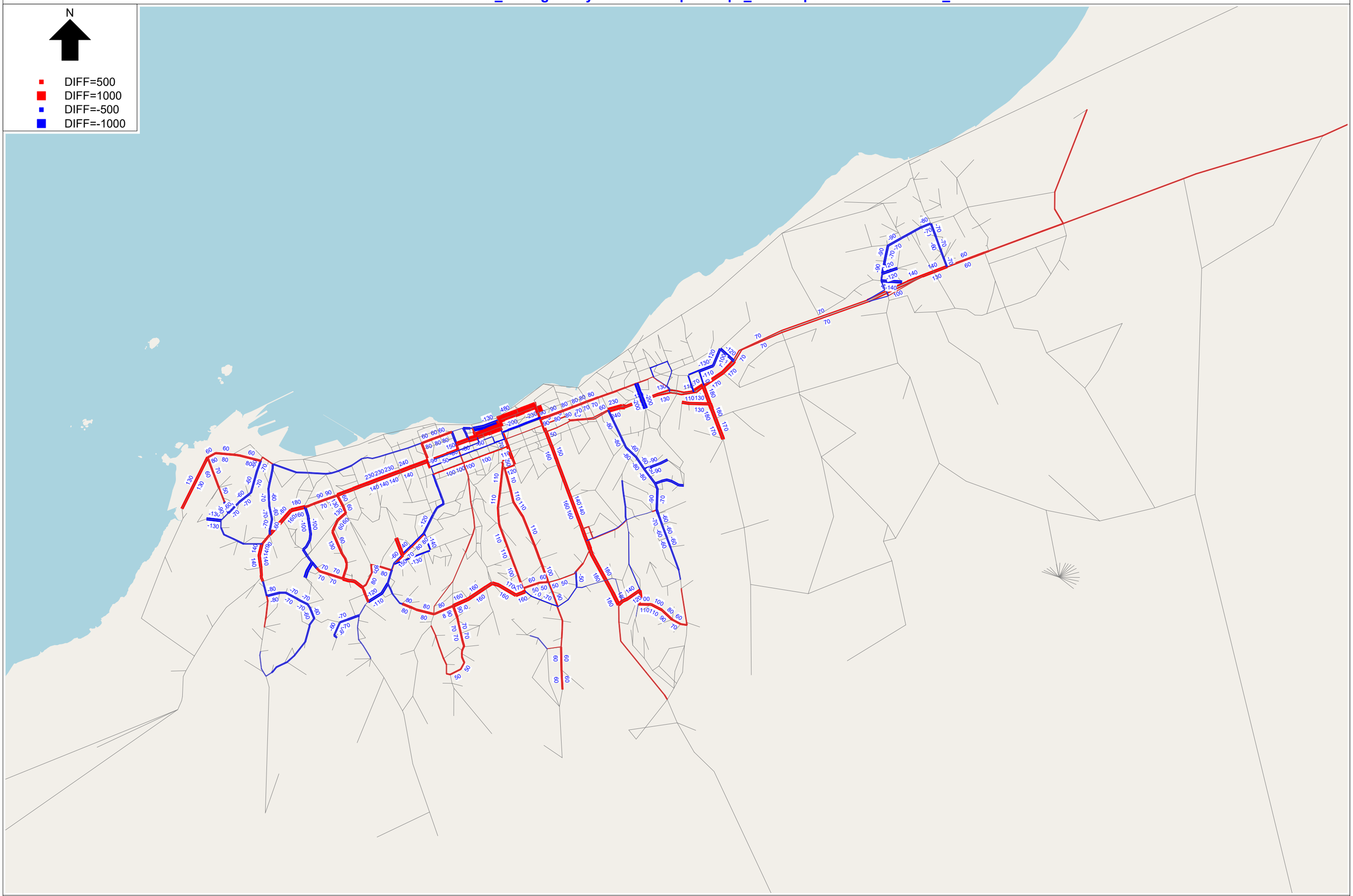
Flow Difference Plot_Average Daily Public Transport Trips_Silver Option vs Do Minimum_Y2053



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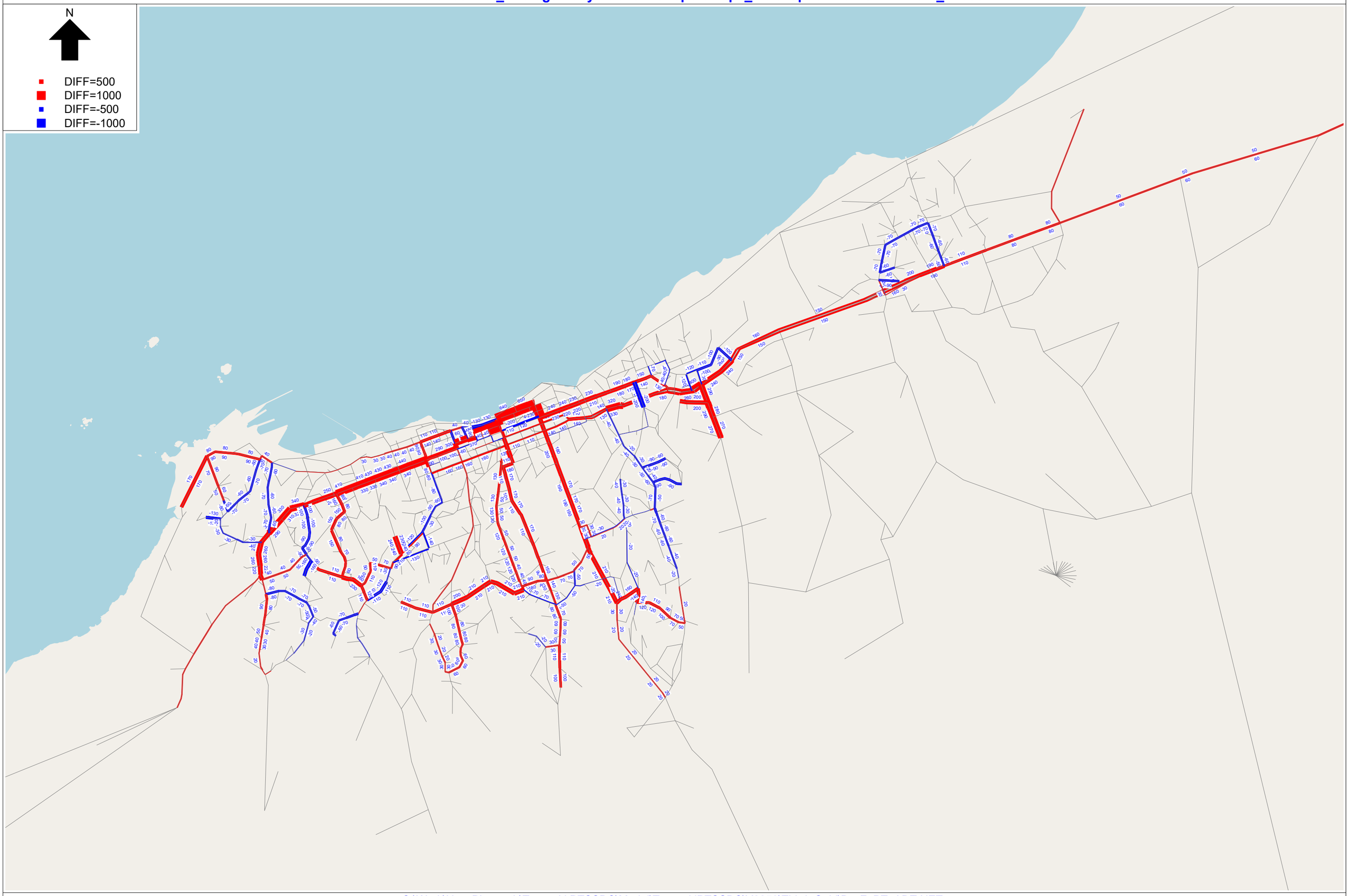
Flow Difference Plot_Average Daily Public Transport Trips_Gold Option vs Do Minimum_Y2053



C:\Work\New Plymouth\Taranaki PTSSBC\Model\TaranakiPTSSBC\Y2053\Third_Gold\BvsF_PT_ADT.NET

H

Appendix H – Economic Sheets

ASSUMPTIONS SHEET

Project: Taranaki PT SSBC

Component: Jul-24

Time Period

Time Zero:	**2024**
Base Date:	**2023**
Discount rate	**4%**
Analysis year	**40**

Options

Code	Name	Description
DM	**DM**	**Do minimum**
Opt_Bronze	**Third Option_Bronze Freq**	**PT Services for Third Option with Bronze Frequency with PT Off in 2018, PT On in 2035 and 2053**
Opt_Silver	**Third Option_Silver Freq**	**PT Services for Third Option with Silver Frequency**
Opt_Gold	**Third Option_Gold Freq**	**PT Services for Third Option with Gold Frequency**

Unit Cost Values

Table: RUCRATES

Modelled Period **NATIONAL EQUITY RESOURCE VALUES OF TIME, $2002/hour**		**AM**	**IP**	**PM**	**Off peak**	**Weekend**	**All Period**	Notes
Urban Arterial								
Travel Time Costs, $/hr	100%	35.52	37.78	35.35	35.62	38.32	38.24	
Congestion Time Costs, $/hr	100%	24.79	25.12	24.43	23.79	27	26.17	
Rural Strategic								
Travel Time Costs, $/hr	0%	50.7	50.7	50.7	50.7	50.9	49.43	
Congestion Time Costs, $/hr	0%	32.33	32.33	32.33	32.33	34.99	32.24	
Composite								
Travel Time Costs, $/hr		35.52	37.78	35.35	35.62	38.32	38.24	
Congestion Time Costs, $/hr		24.79	25.12	24.43	23.79	27.00	26.17	
					National Equity Value		**41.30**	**$2,022**
							28.26	**$2,022**

NATIONAL EQUITY RESOURCE VALUES OF TIME, $2021/hour					
	Class		**AM**	**IP**	**PM**
C1	**Car/LCV**	**R_C1**	$33.50	$35.88	$33.52
C2	**MCV/HCV**	**R_C2**	$73.90	$73.86	$70.13

NATIONAL EQUITY RESOURCE VALUES OF CRV, $2021/hour					
	Class		**AM**	**IP**	**PM**
C1	**Car/LCV**	**R_C1**	$24.50	$24.86	$24.12
C2	**MCV/HCV**	**R_C2**	$30.34	$30.23	$30.34
			$2018		

Traffic Reliability	% of Travel Time Benefit	**5.0%**	AM/IP/PM
PT Reliability	% of Total Benefit	**50%**	AM/IP/PM

Update Factors, to base date:		2023	2018 to 2022			2023
Travel Time Costs	2021 base	**1.08**	**1.14**	Walking and C	2021 base	**1.08**
Vehicle Operating Costs	2015 base VOC	**1.35**		Emission Red	2021 base	**1.14**
Accident Costs	2021 base Ax	**1.14**				

Annualisation

Table: ANNUAL

Modelled Period	**AM**	**IP**	**PM**		**Weekend**		Notes
Daily/annual periods:	**(1-hr models)**						
Periods per weekday peak	**2.5**	**8.63**	**2.5**		**13.4**		
Weekdays per year	**245**	**245**	**245**		**120**	**1**	
Periods per weekday peak PT	**490**	**1840.3**	**551.3**		0.17		
Adjustments							
VOC					1		Factors so weekday interpeak results
TT Cost:					1.014		can be used for off peak and weekends
CRV Costs					1.075		
Annual Factors:							
VOC	612.5	3722.4	612.5				
TTC	612.5	3745.3	612.5				
CRV	612.5	3842.7	612.5				

SUMMARY OF PERIOD MODEL RESULTS

Method	Matrix	Year					6	7	8	9	10																
RUN DATA							Distance Travelled	Travel Time	Congested CRV			**UNIT RATES**		**PERIOD TRAVEL COSTS, $**			Corrected	**ANNUAL FACTORS**			**ANNUAL TRAVEL COSTS, $Millions**						
						User Clas	Veh-Km	Veh-hours	Veh-hours		VOC, $			Travel Time	CRV	VOC	Reliability				VKT	VHT	Travel Time, $M	CRV, $M	VOC, $M	Variability	
Option Name	Method	Option	Compare to	Year	Period		Mat	Mat	Mat		Mat	TTC, $/hr	CRV, $/hr	Mat	Mat	Mat	100%	TTC	CRV	VOC	millions	millions				$M	TOTAL, $M
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	AM	C1	0	0	0		0	33.50	24.50	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	AM	C1	0	0	0		0	38.53	28.17	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	IP	C1	0	0	0		0	35.88	24.86	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	IP	C1	0	0	0		0	41.26	28.59	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	PM	C1	0	0	0		0	33.52	24.12	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	PM	C1	0	0	0		0	38.55	27.74	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	AM	C1	162.22	11.46	-7.09		44.78	33.50	24.50	384	-174	45	0	612.5	612.5	612.5	0.10	0.01	0.24	-0.11	0.03	0.00	0.16
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	AM	C2	-8.92	0.09	-0.75		-1.73	73.90	30.34	7	-23	-2	0	612.5	612.5	612.5	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	AM	C1	-347.38	-9.73	-1.83		-81.23	38.53	28.17	-375	-52	-81	0	612.5	612.5	612.5	-0.21	-0.01	-0.23	-0.03	-0.05	0.00	-0.31
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	AM	C2	-1.4	-0.03	-0.01		-0.33	73.90	30.34	-2	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	IP	C1	524.05	7.88	0.05		115.52	35.88	24.86	283	1	116	0	3745	3843	3722	1.95	0.03	1.06	0.00	0.43	0.00	1.49
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	IP	C2	20.19	0.02	-0.15		4.21	73.86	30.23	1	-5	4	0	3745	3843	3722	0.08	0.00	0.01	-0.02	0.02	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	IP	C1	-294.48	-8.17	-1.85		-69.34	41.26	28.59	-337	-53	-69	0	3745	3843	3722	-1.10	-0.03	-1.26	-0.20	-0.26	0.00	-1.72
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	IP	C2	-2.3	-0.05	-0.02		-0.55	73.86	30.23	-4	-1	-1	0	3745	3843	3722	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.02
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	PM	C1	194.4	12.47	10.67		53.32	33.52	24.12	418	257	53	0	612.5	612.5	612.5	0.12	0.01	0.26	0.16	0.03	0.00	0.45
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	PM	C2	3.17	0.12	0.44		1.35	70.13	30.34	8	13	1	0	612.5	612.5	612.5	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	PM	C1	-279.29	-8.37	-2.26		-66.82	38.55	27.74	-323	-63	-67	0	612.5	612.5	612.5	-0.17	-0.01	-0.20	-0.04	-0.04	0.00	-0.28
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	PM	C2	-1.37	-0.03	-0.02		-0.34	70.13	30.34	-2	-1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	AM	C1	580.82	9.66	6.8		117.01	33.50	24.50	324	167	117	0	612.5	612.5	612.5	0.36	0.01	0.20	0.10	0.07	0.00	0.37
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	AM	C2	18.87	-0.15	0.65		3.15	73.90	30.34	-11	20	3	0	612.5	612.5	612.5	0.01	0.00	-0.01	0.01	0.00	0.00	0.01
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	AM	C1	-346.17	-10.27	-2.23		-81.07	38.53	28.17	-396	-63	-81	0	612.5	612.5	612.5	-0.21	-0.01	-0.24	-0.04	-0.05	0.00	-0.33
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	AM	C2	1.38	0.04	0.02		0.34	73.90	30.34	3	1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	IP	C1	263.76	8.56	-9.33		87.29	35.88	24.86	307	-232	87	0	3745	3843	3722	0.98	0.03	1.15	-0.89	0.32	0.00	0.58
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	IP	C2	-3.09	-0.03	-0.92		1.51	73.86	30.23	-2	-28	2	0	3745	3843	3722	-0.01	0.00	-0.01	-0.11	0.01	0.00	-0.11
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	IP	C1	-268.28	-7.88	-1.91		-63.45	41.26	28.59	-325	-55	-63	0	3745	3843	3722	-1.00	-0.03	-1.22	-0.21	-0.24	0.00	-1.66
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	IP	C2	1.23	0.03	0.01		0.3	73.86	30.23	2	0	0	0	3745	3843	3722	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	PM	C1	-127.16	12.9	15.71		-42.31	33.52	24.12	432	379	-42	0	612.5	612.5	612.5	-0.08	0.01	0.26	0.23	-0.03	0.00	0.47
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	PM	C2	-21.33	0.42	0.73		-6.08	70.13	30.34	29	22	-6	0	612.5	612.5	612.5	-0.01	0.00	0.02	0.01	0.00	0.00	0.03
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	PM	C1	-253.28	-8.34	-2.68		-60.99	38.55	27.74	-321	-74	-61	0	612.5	612.5	612.5	-0.16	-0.01	-0.20	-0.05	-0.04	0.00	-0.28
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	PM	C2	0.87	0.04	0.02		0.23	70.13	30.34	3	1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	AM	C1	0	0	0		0	33.50	24.50	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	AM	C1	0	0	0		0	38.53	28.17	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	IP	C1	0	0	0		0	35.88	24.86	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	IP	C1	0	0	0		0	41.26	28.59	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	PM	C1	0	0	0		0	33.52	24.12	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	PM	C1	0	0	0		0	38.55	27.74	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2035	AM	C1	47.11	17.22	1.41		24.33	33.50	24.50	577	35	24	0	612.5	612.5	612.5	0.03	0.01	0.35	0.02	0.01	0.00	0.39
Third Option_Silver Freq	R	Opt_Silver	DM	2035	AM	C2	-36.33	0.19	-0.29		-8.2	73.90	30.34	14	-9	-8	0	612.5	612.5	612.5	-0.02	0.00	0.01	-0.01	-0.01	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2035	AM	C1	-533.25	-13.84	-3.1		-125.37	38.53	28.17	-533	-87	-125	0	612.5	612.5	612.5	-0.33	-0.01	-0.33	-0.05	-0.08	0.00	-0.46
Third Option_Silver Freq	U	Opt_Silver	DM	2035	AM	C2	-0.55	-0.01	0		-0.13	73.90	30.34	-1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2035	IP	C1	482.22	11.54	4.52		105.54	35.88	24.86	414	112	106	0	3745	3843	3722	1.79	0.04	1.55	0.43	0.39	0.00	2.38
Third Option_Silver Freq	R	Opt_Silver	DM	2035	IP	C2	2.42	0.09	0.24		0.06	73.86	30.23	7	7	0	0	3745	3843	3722	0.01	0.00	0.02	0.03	0.00	0.00	0.05
Third Option_Silver Freq	U	Opt_Silver	DM	2035	IP	C1	-406.51	-10.6	-2.52		-95.84	41.26	28.59	-437	-72	-96	0	3745	3843	3722	-1.51	-0.04	-1.64	-0.28	-0.36	0.00	-2.27
Third Option_Silver Freq	U	Opt_Silver	DM	2035	IP	C2	-1.21	-0.03	-0.01		-0.29	73.86	30.23	-2	0	0	0	3745	3843	3722	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01
Third Option_Silver Freq	R	Opt_Silver	DM	2035	PM	C1	84.9	19.13	12.07		43.44	33.52	24.12	641	291	43	0	612.5	612.5	612.5	0.05	0.01	0.39	0.18	0.03	0.00	0.60
Third Option_Silver Freq	R	Opt_Silver	DM	2035	PM	C2	-5.46	0.24	0.09		-0.33	70.13	30.34	17	3	0	0	612.5	612.5	612.5	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Silver Freq	U	Opt_Silver	DM	2035	PM	C1	-411.83	-11.55	-3.4		-99.03	38.55	27.74	-445	-94	-99	0	612.5	612.5	612.5	-0.25	-0.01	-0.27	-0.06	-0.06	0.00	-0.39
Third Option_Silver Freq	U	Opt_Silver	DM	2035	PM	C2	-0.75	-0.02	-0.01		-0.18	70.13	30.34	-1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2053	AM	C1	663.43	15.88	18.29		159.94	33.50	24.50	532	448	160	0	612.5	612.5	612.5	0.41	0.01	0.33	0.27	0.10	0.00	0.70
Third Option_Silver Freq	R	Opt_Silver	DM	2053	AM	C2	14.3	-0.06	1.33		3.93	73.90	30.34	-4	40	4	0	612.5	612.5	612.5	0.01	0.00	0.00	0.02	0.00	0.00	0.02
Third Option_Silver Freq	U	Opt_Silver	DM	2053	AM	C1	-567.39	-15.56	-4.04		-134.04	38.53	28.17	-599	-114	-134	0	612.5	612.5	612.5	-0.35	-0.01	-0.37	-0.07	-0.08	0.00	-0.52
Third Option_Silver Freq	U	Opt_Silver	DM	2053	AM	C2	0.73	0.03	0.01		0.19	73.90	30.34	2	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2053	IP	C1	319.05	13.67	-0.23		83.98	35.88	24.86	490	-6	84	0	3745	3843	3722	1.19	0.05	1.84	-0.02	0.31	0.00	2.13
Third Option_Silver Freq	R	Opt_Silver	DM	2053	IP	C2	-11.43	0.04	-0.64		-2.26	73.86	30.23	3	-19	-2	0	3745	3843	3722	-0.04	0.00	0.01	-0.07	-0.01	0.00	-0.07
Third Option_Silver Freq	U	Opt_Silver	DM	2053	IP	C1	-416.64	-11.38	-2.97		-99.02	41.26	28.59	-470	-85	-99	0	3745	3843	3722	-1.55	-0.04	-1.76	-0.33	-0.37	0.00	-2.45
Third Option_Silver Freq	U	Opt_Silver	DM	2053	IP	C2	1.27	0.03	0.01		0.32	73.86	30.23	2	0	0	0	3745	3843	3722	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Silver Freq	R	Opt_Silver	DM	2053	PM	C1	131.07	24.5	30.01		28.42	33.52	24.12	821	724	28	0	612.5	612.5	612.5	0.08	0.02	0.50	0.44	0.02	0.00	0.96
Third Option_Silver Freq	R	Opt_Silver	DM	2053	PM	C2	-15.54	0.78	1.5		-3.83	70.13	30.34	55	46	-4	0	612.5	612.5	612.5	-0.01	0.00	0.03	0.03	0.00	0.00	0.06
Third Option_Silver Freq	U	Opt_Silver	DM	2053	PM	C1	-422.18	-12.94	-4.61		-102.8	38.55	27.74	-499	-128	-103	0	612.5	612.5	612.5	-0.26	-0.01	-0.31	-0.08	-0.06	0.00	-0.45
Third Option_Silver Freq	U	Opt_Silver	DM	2053	PM	C2	0.84	0.04	0.03		0.23	70.13	30.34	3	1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	AM	C1	0	0	0		0	33.50	24.50	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	AM	C1	0	0	0		0	38.53	28.17	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	IP	C1	0	0	0		0	35.88	24.86	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	IP	C1	0	0	0		0	41.26	28.59	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	PM	C1	0	0	0		0	33.52	24.12	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	PM	C1	0	0	0		0	38.55	27.74	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2035	AM	C1	842.98	32.33	2.69		217.69	33.50	24.50	1083	66	218	0	612.5	612.5	612.5	0.52	0.02	0.66	0.04	0.13	0.00	0.84
Third Option_Gold Freq	R	Opt_Gold	DM	2035	AM	C2	-16.6	0.28	-0.38		-2.73	73.90	30.34	21	-12	-3	0	612.5	612.5	612.5	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2035	AM	C1	-1055.08	-26.71	-6.12		-248.61	38.53	28.17	-1029	-172	-249	0	612.5	612.5	612.5	-0.65	-0.02	-0.63	-0.11	-0.15	0.00	-0.89
Third Option_Gold Freq	U	Opt_Gold	DM	2035	AM	C2	1.01	0.02	0.01		0.25	73.90	30.34	1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2035	IP	C1	872.3	23.49	7.41		203.12	35.88	24.86	843	184	203	0	3745	3843	3722	3.25	0.09	3.16	0.71	0.76	0.00	4.62
Third Option_Gold Freq	R	Opt_Gold	DM	2035	IP	C2	0.39	0.17	0.06		-0.16	73.86	30.23	13	2	0	0	3745	3843	3722	0.00	0.00	0.05	0.01	0.00	0.00	0.05
Third Option_Gold Freq	U	Opt_Gold	DM	2035	IP	C1	-795.9	-20.32	-4.69		-187.56	41.26	28.59	-838	-134	-188	0	3745	3843	3722	-2.96	-0.08	-3.14	-0.52	-0.70	0.00	-4.35
Third Option_Gold Freq	U	Opt_Gold	DM	2035	IP	C2	0.58	0.01	0		0.14	73.86	30.23	1	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2035	PM	C1	455.54	40.71	20.25		150.2	33.52	24.12	1365	488	150	0	612.5	612.5	612.5	0.28	0.02	0.84	0.30	0.09	0.00	1.23
Third Option_Gold Freq	R	Opt_Gold	DM	2035	PM	C2	-14.26	0.59	0.18		-1.98	70.13	30.34	41	5	-2	0	612.5	612.5	612.5	-0.01	0.00	0.03	0.00	0.00	0.00	0.03
Third Option_Gold Freq	U	Opt_Gold	DM	2035	PM	C1	-875.93	-23.97	-6.9		-211.26	38.55	27.74	-924	-191	-211	0	612.5	612.5	612.5	-0.54	-0.01	-0.57	-0.12	-0.13	0.00	-0.81
Third Option_Gold Freq	U	Opt_Gold	DM	2035	PM	C2	0.51	0.02	0.01		0.13	70.13	30.34	1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2053	AM	C1	1078.36	35.27	29.18		281.43	33.50	24.50	1182	715	281	0	612.5	612.5	612.5	0.66	0.02	0.72	0.44	0.17	0.00	1.33
Third Option_Gold Freq	R	Opt_Gold	DM	2053	AM	C2	1.34	0.19	1.6		2.28	73.90	30.34	14	49	2	0	612.5	612.5	612.5	0.00	0.00	0.01	0.03	0.00	0.00	0.04
Third Option_Gold Freq	U	Opt_Gold	DM	2053	AM	C1	-1050.68	-28.54	-7.62		-248.78	38.53	28.17	-1100	-215	-249	0	612.5	612.5	612.5	-0.64	-0.02	-0.67	-0.13	-0.15	0.00	-0.96
Third Option_Gold Freq	U	Opt_Gold	DM	2053	AM	C2	9.43	0.22	0.09		2.3	73.90	30.34	16	3	2	0	612.5	612.5	612.5	0.01	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Gold Freq	R	Opt_Gold	DM	2053	IP	C1	586.71	24.88	2.4		186.33	35.88	24.86	893	60	186	0	3745	3843	3722	2.18	0.09	3.34	0.23	0.69	0.00	4.27
Third Option_Gold Freq	R	Opt_Gold	DM	2053	IP	C2	-13.22	-0.12	-0.94		-0.22	73.86	30.23	-9	-28	0	0	3745	3843	3722	-0.05	0.00	-0.03	-0.11	0.00	0.00	-0.14
Third Option_Gold Freq	U	Opt_Gold	DM	2053	IP	C1	-762.68	-20.58	-5.26		-181.05	41.26	28.59	-849	-150	-181	0	3745	3843	3722	-2.84	-0.08	-3.18	-0.58	-0.67	0.00	-4.43
Third Option_Gold Freq	U	Opt_Gold	DM	2053	IP	C2	9.12	0.21	0.09		2.23	73.86	30.23	16	3	2	0	3745	3843	3722	0.03	0.00	0.06	0.01	0.01	0.00	0.08
Third Option_Gold Freq	R	Opt_Gold	DM	2053	PM	C1	630.06	66.12	56.75		222.65	33.52	24.12	2216	1369	223	0	612.5	612.5	612.5	0.39	0.04	1.36	0.84	0.14	0.00	2.33
Third Option_Gold Freq	R	Opt_Gold	DM	2053	PM	C2	-24.26	2.14	2.73		-3.28	70.13	30.34	150	83	-3	0	612.5	612.5	612.5	-0.01	0.00	0.09	0.05	0.00	0.00	0.14
Third Option_Gold Freq	U	Opt_Gold	DM	2053	PM	C1	-834.12	-25.92	-9.7		-204.46	38.55	27.74	-999	-269	-204	0	612.5	612.5	612.5	-0.51	-0.02	-0.61	-0.16	-0.13	0.00	-0.90
Third Option_Gold Freq	U	Opt_Gold	DM	2053	PM	C2	6.43	0.23	0.14		1.67	70.13	30.34	16	4	2	0	612.5	612.5	612.5	0.00	0.00	0.01	0.00	0.00	0.00	0.01

PT Benefits

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Model results

				Benefits (pax-hours)				VoT, $/hr				Annual Benefit					
Year	Base	Option	Period	HBW	Others	HBE	School	HBW	Others	HBE	Annual Factor	HBW	Others	HBE	TOTAL	Reliability	Total
2018	DM	Opt_Bronze	AM	2.0	10.5	47.9	-1.8	$19.53	$18.91	$18.91	490	$19,522	$97,663	$426,695	$543,879	$271,940	$4.212
			IP	1.4	28.5	22.6	-0.6	$19.53	$18.91	$18.91	1840	$49,239	$991,788	$765,938	$1,806,965	$903,482	
			PM	7.0	24.9	11.7	0.0	$19.53	$18.91	$18.91	551	$75,792	$259,353	$122,275	$457,420	$228,710	
2035	DM	Opt_Bronze	AM	0.2	7.9	31.5	-1.5	$19.53	$18.91	$18.91	490	$2,297	$73,015	$278,255	$353,567	$176,783	$3.312
			IP	1.0	24.1	18.4	-0.5	$19.53	$18.91	$18.91	1840	$34,862	$838,670	$622,216	$1,495,748	$747,874	
			PM	4.9	20.4	9.0	0.0	$19.53	$18.91	$18.91	551	$52,861	$212,131	$93,609	$358,601	$179,300	
2053	DM	Opt_Bronze	AM	0.0	8.3	34.6	-1.4	$19.53	$18.91	$18.91	490	-$96	$77,000	$307,535	$384,439	$192,220	$3.746
			IP	1.2	27.4	21.5	-0.5	$19.53	$18.91	$18.91	1840	$41,691	$953,508	$729,399	$1,724,598	$862,299	
			PM	5.6	21.8	9.7	0.0	$19.53	$18.91	$18.91	551	$60,289	$226,725	$101,323	$388,337	$194,168	
2018	DM	Opt_Silver	AM	6.6	15.1	66.7	-2.4	$19.53	$18.91	$18.91	490	$63,543	$139,637	$595,890	$799,070	$399,535	$5.360
			IP	2.3	33.3	26.5	-0.8	$19.53	$18.91	$18.91	1840	$81,944	$1,157,086	$894,697	$2,133,727	$1,066,863	
			PM	12.4	33.3	15.3	0.0	$19.53	$18.91	$18.91	551	$133,928	$347,541	$159,177	$640,645	$320,323	
2035	DM	Opt_Silver	AM	5.2	13.4	53.3	-2.1	$19.53	$18.91	$18.91	490	$49,954	$124,163	$474,692	$648,809	$324,404	$4.631
			IP	1.9	29.6	22.9	-0.7	$19.53	$18.91	$18.91	1840	$68,646	$1,030,763	$772,202	$1,871,612	$935,806	
			PM	10.5	30.5	13.1	0.0	$19.53	$18.91	$18.91	551	$112,934	$317,415	$136,348	$566,697	$283,349	
2053	DM	Opt_Silver	AM	5.3	14.7	58.4	-2.0	$19.53	$18.91	$18.91	490	$51,102	$136,209	$522,319	$709,630	$354,815	$5.256
			IP	2.2	34.3	26.4	-0.7	$19.53	$18.91	$18.91	1840	$78,710	$1,192,233	$893,305	$2,164,248	$1,082,124	
			PM	11.7	33.9	14.4	0.0	$19.53	$18.91	$18.91	551	$126,069	$353,691	$150,212	$629,972	$314,986	
2018	DM	Opt_Gold	AM	19.2	29.8	105.9	-3.9	$19.53	$18.91	$18.91	490	$183,738	$276,031	$944,751	$1,404,521	$702,260	$9.898
			IP	6.3	66.9	42.1	-1.2	$19.53	$18.91	$18.91	1840	$227,144	$2,328,787	$1,423,650	$3,979,581	$1,989,791	
			PM	28.1	64.0	23.5	0.0	$19.53	$18.91	$18.91	551	$302,092	$667,458	$245,176	$1,214,725	$607,362	
2035	DM	Opt_Gold	AM	18.5	30.3	97.5	-3.8	$19.53	$18.91	$18.91	490	$176,561	$280,757	$868,771	$1,326,089	$663,044	$9.728
			IP	6.2	68.0	40.5	-1.2	$19.53	$18.91	$18.91	1840	$221,034	$2,366,370	$1,367,623	$3,955,028	$1,977,514	
			PM	26.8	65.5	22.4	0.0	$19.53	$18.91	$18.91	551	$288,096	$682,885	$233,501	$1,204,482	$602,241	
2053	DM	Opt_Gold	AM	20.0	34.3	107.9	-3.6	$19.53	$18.91	$18.91	490	$191,394	$317,635	$966,155	$1,475,184	$737,592	$11.176
			IP	7.1	79.6	46.5	-1.2	$19.53	$18.91	$18.91	1840	$253,381	$2,769,349	$1,576,768	$4,599,498	$2,299,749	
			PM	30.4	75.6	25.0	0.0	$19.53	$18.91	$18.91	551	$327,068	$788,273	$260,603	$1,375,945	$687,973	

c) Average Annual Vehicle Emission

Conversion Factor g/day to Kg/day: 0.001

TTSM Notation	Vehicle Emission Factor	Units	2018_Base	2035_DM	2053_DM	2018_Opt_Bronze	2018_Opt_Silver	2018_Opt_Gold	2035_Opt_Bronze	2035_Opt_Silver	2035_Opt_Gold	2053_Opt_Bronze	2053_Opt_Silver	2053_Opt_Gold
AADE_CO	Carbon monoxide (CO)	Kg/day	2,335	518	151	2,335	2,335	2,335	517	516	515	151	150	150
AADE_CO2-e	Carbon dioxide (CO2) equivalent	Kg/day	294,511	289,188	140,460	294,511	294,511	294,511	288,483	288,212	287,234	140,270	140,147	139,935
AADE_VOC	Volatile organic compounds (VOC)	Kg/day	161	13	5	161	161	161	13	13	13	5	5	5
AADE_NOX	Nitrogen oxides (NOx)	Kg/day	797	458	128	797	797	797	457	456	455	128	128	128
AADE_NO2	Nitrogen dioxide (NO2)	Kg/day	138	106	28	138	138	138	106	106	106	28	27	27
AADE_PM2.5E	PM2.5 E	Kg/day	38	10	2	38	38	38	10	10	10	2	2	2
AADE_PM10BT	PM10.0 BT	Kg/day	26	32	36	26	26	26	32	32	31	36	36	36
AADE_FC	Fuel Consumption	l/day	118,506	115,897	54,810	118,506	118,506	118,506	115,610	115,499	115,100	54,733	54,683	54,596

Project Benefits - Discounting

Scenario: Opt_Bronze
Compared to: DM
Method: VTM
Time Zero: 2024

	Equity Factor
TT	1.000
CRV	1.000
Reliability	1.000
VOC	1.000

	Scenario	Compared to	VTM Terms		
TRAVEL TIME	Opt_Bronze	DM	1		
Year	**RC**	**UC**		**Benefits**	**Adjusted**
2018	0.00	0.00		0.00	0.00
2035	1.69	-1.84		-0.15	-0.15
2053	1.75	-1.78		-0.03	-0.03

CRV

Year				
2018	0.00	0.00	0.00	0.00
2035	0.04	-0.30	-0.26	-0.26
2053	-0.69	-0.32	-1.00	-1.00

Reliability

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	-0.01	-0.01
2053	0.00	0.00	0.00	0.00

VOC

Year				
2018	0.00	0.00	0.00	0.00
2035	0.68	-0.47	0.21	0.21
2053	0.51	-0.43	0.07	0.07

PT

Year				
2018	4.55	0.00	4.55	4.55
2035	3.58	0.00	3.58	3.58
2053	4.05	0.00	4.05	4.05

Crash Saving (excluding intersection and crossing points)

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.00	0.00
2053	0.00	0.00	0.00	0.00

Cycle

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.00	0.00
2053	0.00	0.00	0.00	0.00

Emission

Year				
2018	0.00	0.00	0.00	0.00
2035	0.05	0.00	0.05	0.05
2053	0.02	0.00	0.02	0.02

	Population		
	3rd option bronz	balanced	Through
2018	41344	41712	36683
2035	50300	50582	43684
2053	54529	54802	46294

30 year cap? No

Start Construction 1
Construction Period 2
Benefits Start in year: 3 Benefit Streams, $/year

	Model	SPPWF	FY	Analysis Year	Include	Travel Time	CRV	Reliability	VOC	PT	Crash		Cycle	Emission	Other	Total (included yea	NPV
	2018	1.0000	2018/2019	-5.00	0	0.00	0.00	0.00	0.00	4.55	0.00		0.00	0.00	0.00	0.00	0.00
	2019	1.0000	2019/2020	-4.00	0	-0.01	-0.01	0.00	0.01	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2020	1.0000	2020/2021	-3.00	0	-0.02	-0.03	0.00	0.02	4.44	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2021	1.0000	2021/2022	-2.00	0	-0.03	-0.04	0.00	0.03	4.39	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2022	1.0000	2022/2023	-1.00	0	-0.03	-0.06	0.00	0.05	4.33	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2023	**1.0000**	2023/2024	0.00	**0**	-0.04	-0.07	0.00	0.06	4.28	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2024	0.9615	2024/2025	1.00	0	-0.05	-0.09	0.00	0.07	4.23	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	2025	0.9246	2025/2026	2.00	0.5	-0.06	-0.10	0.00	0.08	4.17	0.00	0.00	0.00	0.02	0.00	2.05	1.90
	2026	0.8890	**2026/2027**	3.00	1	-0.07	-0.12	0.00	0.09	4.12	0.00	0.00	0.00	0.02	0.00	4.04	3.59
	2027	0.8548	2027/2028	4.00	1	-0.08	-0.13	0.00	0.10	4.06	0.00	0.00	0.00	0.02	0.00	3.98	3.40
	2028	**0.8219**	2028/2029	5.00	**1**	-0.08	-0.15	0.00	0.12	4.01	0.00	0.00	0.00	0.03	0.00	3.92	3.22
	2029	0.7903	2029/2030	6.00	1	-0.09	-0.16	0.00	0.13	3.96	0.00	0.00	0.00	0.03	0.00	3.85	3.05
	2030	0.7599	2030/2031	7.00	1	-0.10	-0.18	-0.01	0.14	3.90	0.00	0.00	0.00	0.03	0.00	3.79	2.88
	2031	0.7307	**2031/2032**	8.00	1	-0.11	-0.19	-0.01	0.15	3.85	0.00	0.00	0.00	0.03	0.00	3.73	2.72
	2032	**0.7026**	2032/2033	9.00	**1**	-0.12	-0.20	-0.01	0.16	3.79	0.00	0.00	0.00	0.04	0.00	3.66	2.57
	2033	0.6756	2033/2034	10.00	1	-0.13	-0.22	-0.01	0.17	3.74	0.00	0.00	0.00	0.04	0.00	3.60	2.43
	2034	0.6496	2034/2035	11.00	1	-0.14	-0.23	-0.01	0.19	3.68	0.00	0.00	0.00	0.04	0.00	3.54	2.30
	2035	0.6246	**2035/2036**	12.00	1	**-0.15**	**-0.26**	**-0.01**	**0.21**	**3.58**	**0.00**		**0.00**	**0.05**	0.00	3.41	2.13
Taper	2036	0.6006	2036/2037	13.00	1	-0.15	-0.30	-0.01	0.20	3.60	0.00	0.00	0.00	0.05	0.00	3.39	2.04
1	2037	0.5775	2037/2038	14.00	1	-0.14	-0.35	-0.01	0.19	3.63	0.00	0.00	0.00	0.04	0.00	3.38	1.95
1	2038	0.5553	2038/2039	15.00	1	-0.13	-0.39	-0.01	0.19	3.65	0.00	0.00	0.00	0.04	0.00	3.36	1.86
1	2039	0.5339	2039/2040	16.00	1	-0.13	-0.43	-0.01	0.18	3.68	0.00	0.00	0.00	0.04	0.00	3.34	1.78
1	2040	0.5134	2040/2041	17.00	1	-0.12	-0.47	-0.01	0.17	3.71	0.00	0.00	0.00	0.04	0.00	3.32	1.71
1	2041	0.4936	2041/2042	18.00	1	-0.11	-0.51	-0.01	0.16	3.73	0.00	0.00	0.00	0.04	0.00	3.31	1.63
1	2042	0.4746	2042/2043	19.00	1	-0.11	-0.55	-0.01	0.15	3.76	0.00	0.00	0.00	0.04	0.00	3.29	1.56
1	2043	0.4564	2043/2044	20.00	1	-0.10	-0.59	0.00	0.15	3.79	0.00	0.00	0.00	0.04	0.00	3.27	1.49
1	2044	0.4388	2044/2045	21.00	1	-0.09	-0.63	0.00	0.14	3.81	0.00	0.00	0.00	0.03	0.00	3.26	1.43
1	2045	0.4220	2045/2046	22.00	1	-0.09	-0.67	0.00	0.13	3.84	0.00	0.00	0.00	0.03	0.00	3.24	1.37
1	2046	0.4057	2046/2047	23.00	1	-0.08	-0.72	0.00	0.12	3.86	0.00	0.00	0.00	0.03	0.00	3.22	1.31
1	2047	0.3901	2047/2048	24.00	1	-0.07	-0.76	0.00	0.12	3.89	0.00	0.00	0.00	0.03	0.00	3.20	1.25
1	2048	0.3751	2048/2049	25.00	1	-0.06	-0.80	0.00	0.11	3.92	0.00	0.00	0.00	0.03	0.00	3.19	1.20
1	2049	0.3607	2049/2050	26.00	1	-0.06	-0.84	0.00	0.10	3.94	0.00	0.00	0.00	0.03	0.00	3.17	1.14
1	2050	**0.3468**	2050/2051	27.00	1	-0.05	-0.88	0.00	0.09	3.97	0.00	0.00	0.00	0.03	0.00	3.15	1.09
1	2051	0.3335	2051/2052	28.00	1	-0.04	-0.92	0.00	0.09	3.99	0.00	0.00	0.00	0.02	0.00	3.14	1.05
1	2052	0.3207	2052/2053	29.00	1	-0.04	-0.96	0.00	0.08	4.02	0.00	0.00	0.00	0.02	0.00	3.12	1.00
1	2053	0.3083	**2053/2054**	30.00	1	**-0.03**	**-1.00**	**0.00**	**0.07**	**4.05**	**0.00**		**0.00**	**0.02**	0.00	3.10	0.96
1	2054	0.2965	2054/2055	31.00	1	-0.02	-1.05	0.00	0.06	4.07	0.00	0.00	0.00	0.02	0.00	3.08	0.91
1	2055	0.2851	2055/2056	32.00	1	-0.02	-1.09	0.00	0.06	4.10	0.00	0.00	0.00	0.02	0.00	3.07	0.87
1	2056	0.2741	2056/2057	33.00	1	-0.01	-1.13	0.00	0.05	4.12	0.00	0.00	0.00	0.02	0.00	3.05	0.84
1	2057	0.2636	2057/2058	34.00	1	0.00	-1.17	0.00	0.04	4.15	0.00	0.00	0.00	0.01	0.00	3.03	0.80
1	2058	0.2534	2058/2059	35.00	1	0.00	-1.21	0.00	0.03	4.18	0.00	0.00	0.00	0.01	0.00	3.01	0.76
1	2059	0.2437	2059/2060	36.00	1	0.01	-1.25	0.00	0.03	4.20	0.00	0.00	0.00	0.01	0.00	3.00	0.73
1	2060	0.2343	2060/2061	37.00	1	0.02	-1.29	0.00	0.02	4.23	0.00	0.00	0.00	0.01	0.00	2.98	0.70
1	2061	0.2253	2061/2062	38.00	1	0.02	-1.33	0.00	0.01	4.25	0.00	0.00	0.00	0.01	0.00	2.96	0.67
1	2062	0.2166	2062/2063	39.00	1	0.03	-1.38	0.00	0.00	4.28	0.00	0.00	0.00	0.01	0.00	2.95	0.64
1	2063	0.2083	2063/2064	40.00	1	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	2.93	0.61
0	2064	0.2003	2064/2065	41.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2065	0.1926	2065/2066	42.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2066	0.1852	2066/2067	43.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2067	0.1780	2067/2068	44.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2068	0.1712	2068/2069	45.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2069	0.1646	2069/2070	46.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2070	0.1583	2070/2071	47.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2071	0.1522	2071/2072	48.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2072	0.1463	2072/2073	49.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2073	0.1407	2073/2074	50.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2074	0.1353	2074/2075	51.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2075	0.1301	2075/2076	52.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2076	0.1251	2076/2077	53.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2077	0.1203	2077/2078	54.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2078	0.1157	2078/2079	55.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2079	0.1112	2079/2080	56.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2080	0.1069	2080/2081	57.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2081	0.1028	2081/2082	58.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2082	0.0989	2082/2083	59.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2083	0.0951	2083/2084	60.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2084	0.0914	2084/2085	61.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2085	0.0879	2085/2086	62.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2086	0.0845	2086/2087	63.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0	2087	0.0813	2087/2088	64.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00
			2088/2089														
			2089/2090														
			2090/2091														

	Travel Time	CRV	Reliability	VOC	PT	Crash	Crash 2	Cycle	Emission	Other	Total (included yea	NPV
Sum over 38.5 included years	-2.63	-25.98	-0.13	4.24	151.50	0.00	0.00	0.00	1.08	0.00	128.07	63.54
NPV Sum	-1.55	-9.27	-0.08	2.32	71.55	0.00	0.00	0.00	0.56	0.00	63.54	

First Full Year	3
First Full Year Benefits	0.00
Discounted	0.00
Discounted Costs	66.2
FYRR	0.0%

Project Benefits - Discounting

Scenario: Opt_Silver
Compared to: DM
Method: VTM
Time Zero: 2024

	Equity Factor
TT	1.000
CRV	1.000
Reliability	1.000
VOC	1.000

	Scenario	Compared to	VTM Terms		
TRAVEL TIME	Opt_Silver	DM	1		
Year	**RC**	**UC**		**Benefits**	**Adjusted**
2018	0.00	0.00		0.00	0.00
2035	2.53	-2.43		0.10	0.10
2053	2.92	-2.61		0.31	0.31

CRV

Year				
2018	0.00	0.00	0.00	0.00
2035	0.71	-0.42	0.29	0.29
2053	0.73	-0.51	0.22	0.22

Reliability

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.01	0.01
2053	0.00	0.00	0.00	0.00

VOC

Year				
2018	0.00	0.00	0.00	0.00
2035	0.58	-0.67	-0.09	-0.09
2053	0.57	-0.69	-0.12	-0.12

PT

Year				
2018	5.79	0.00	5.79	5.79
2035	5.00	0.00	5.00	5.00
2053	5.68	0.00	5.68	5.68

Crash Saving (excluding intersection and crossing points)

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.00	0.00
2053	0.00	0.00	0.00	0.00

Cycle

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.00	0.00
2053	0.00	0.00	0.00	0.00

Emission

Year				
2018	0.00	0.00	0.00	0.00
2035	0.07	0.00	0.07	0.07
2053	0.03	0.00	0.03	0.03

Start Construction 1
Construction Period 2
Benefits Start in year: 3 Benefit Streams, $/year

	Model	SPPWF	FY	Analysis Year	Include	Travel Time	CRV	Reliability	VOC	PT	Crash	Crash 2	Cycle	Emission	Other	Total (included yea	NPV
																0.00	0.00
	2018	1.0000	2018/2019	-5	0	0.00	0.00	0.00	0.00	5.79	0.00		0.00	0.00	0.00	0.00	0.00
	2019	1.0000	2019/2020	-4	0	0.01	0.02	0.00	0.00	5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2020	1.0000	2020/2021	-3	0	0.01	0.03	0.00	-0.01	5.70	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2021	1.0000	2021/2022	-2	0	0.02	0.05	0.00	-0.01	5.66	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2022	1.0000	2022/2023	-1	0	0.02	0.06	0.00	-0.02	5.61	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2023	**1.0000**	2023/2024	**0**	**0**	0.03	0.08	0.00	-0.02	5.57	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	2024	0.9615	2024/2025	1	0	0.03	0.10	0.00	-0.03	5.53	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	2025	0.9246	2025/2026	2	0.5	0.04	0.11	0.00	-0.03	5.48	0.00	0.00	0.00	0.03	0.00	2.81	2.60
	2026	0.8890	2026/2027	3	1	0.04	0.13	0.00	-0.04	5.44	0.00	0.00	0.00	0.03	0.00	5.60	4.98
	2027	0.8548	2027/2028	4	1	0.05	0.14	0.00	-0.04	5.40	0.00	0.00	0.00	0.03	0.00	5.58	4.77
	2028	**0.8219**	2028/2029	**5**	**1**	0.06	0.16	0.00	-0.05	5.35	0.00	0.00	0.00	0.04	0.00	5.56	4.57
	2029	0.7903	2029/2030	6	1	0.06	0.18	0.00	-0.05	5.31	0.00	0.00	0.00	0.04	0.00	5.53	4.37
	2030	0.7599	2030/2031	7	1	0.07	0.19	0.00	-0.06	5.26	0.00	0.00	0.00	0.04	0.00	5.51	4.19
	2031	0.7307	2031/2032	8	1	0.07	0.21	0.00	-0.06	5.22	0.00	0.00	0.00	0.05	0.00	5.49	4.01
	2032	**0.7026**	2032/2033	**9**	**1**	0.08	0.22	0.00	-0.07	5.18	0.00	0.00	0.00	0.05	0.00	5.46	3.84
	2033	0.6756	2033/2034	10	1	0.08	0.24	0.00	-0.07	5.13	0.00	0.00	0.00	0.06	0.00	5.44	3.68
	2034	0.6496	2034/2035	11	1	0.09	0.26	0.00	-0.08	5.09	0.00	0.00	0.00	0.06	0.00	5.42	3.52
	2035	0.6246	2035/2036	12	1	**0.10**	**0.29**	**0.01**	**-0.09**	**5.00**	**0.00**		**0.00**	**0.07**	0.00	5.37	3.36
Taper	2036	0.6006	2036/2037	13	1	0.11	0.28	0.00	-0.09	5.04	0.00	0.00	0.00	0.06	0.00	5.41	3.25
1	2037	0.5775	2037/2038	14	1	0.12	0.28	0.00	-0.09	5.08	0.00	0.00	0.00	0.06	0.00	5.45	3.15
1	2038	0.5553	2038/2039	15	1	0.14	0.28	0.00	-0.10	5.11	0.00	0.00	0.00	0.06	0.00	5.50	3.05
1	2039	0.5339	2039/2040	16	1	0.15	0.27	0.00	-0.10	5.15	0.00	0.00	0.00	0.06	0.00	5.54	2.96
1	2040	0.5134	2040/2041	17	1	0.16	0.27	0.00	-0.10	5.19	0.00	0.00	0.00	0.06	0.00	5.58	2.86
1	2041	0.4936	2041/2042	18	1	0.17	0.26	0.00	-0.10	5.23	0.00	0.00	0.00	0.06	0.00	5.62	2.77
1	2042	0.4746	2042/2043	19	1	0.18	0.26	0.00	-0.10	5.26	0.00	0.00	0.00	0.05	0.00	5.66	2.69
1	2043	0.4564	2043/2044	20	1	0.19	0.26	0.00	-0.11	5.30	0.00	0.00	0.00	0.05	0.00	5.70	2.60
1	2044	0.4388	2044/2045	21	1	0.21	0.25	0.00	-0.11	5.34	0.00	0.00	0.00	0.05	0.00	5.74	2.52
1	2045	0.4220	2045/2046	22	1	0.22	0.25	0.00	-0.11	5.38	0.00	0.00	0.00	0.05	0.00	5.78	2.44
1	2046	0.4057	2046/2047	23	1	0.23	0.24	0.00	-0.11	5.41	0.00	0.00	0.00	0.05	0.00	5.83	2.36
1	2047	0.3901	2047/2048	24	1	0.24	0.24	0.00	-0.11	5.45	0.00	0.00	0.00	0.05	0.00	5.87	2.29
1	2048	0.3751	2048/2049	25	1	0.25	0.24	0.00	-0.12	5.49	0.00	0.00	0.00	0.04	0.00	5.91	2.22
1	2049	0.3607	2049/2050	26	1	0.26	0.23	0.00	-0.12	5.53	0.00	0.00	0.00	0.04	0.00	5.95	2.15
1	2050	**0.3468**	2050/2051	**27**	**1**	0.28	0.23	0.00	-0.12	5.56	0.00	0.00	0.00	0.04	0.00	5.99	2.08
1	2051	0.3335	2051/2052	28	1	0.29	0.23	0.00	-0.12	5.60	0.00	0.00	0.00	0.04	0.00	6.03	2.01
1	2052	0.3207	2052/2053	29	1	0.30	0.22	0.00	-0.12	5.64	0.00	0.00	0.00	0.04	0.00	6.07	1.95
1	2053	0.3083	2053/2054	30	1	**0.31**	**0.22**	**0.00**	**-0.12**	**5.68**	**0.00**		**0.00**	**0.03**	0.00	6.11	1.89
1	2054	0.2965	2054/2055	31	1	0.32	0.21	0.00	-0.13	5.71	0.00	0.00	0.00	0.03	0.00	6.16	1.82
1	2055	0.2851	2055/2056	32	1	0.33	0.21	0.00	-0.13	5.75	0.00	0.00	0.00	0.03	0.00	6.20	1.77
1	2056	0.2741	2056/2057	33	1	0.35	0.21	0.00	-0.13	5.79	0.00	0.00	0.00	0.03	0.00	6.24	1.71
1	2057	0.2636	2057/2058	34	1	0.36	0.20	0.00	-0.13	5.83	0.00	0.00	0.00	0.03	0.00	6.28	1.66
1	2058	0.2534	2058/2059	35	1	0.37	0.20	0.00	-0.13	5.86	0.00	0.00	0.00	0.03	0.00	6.32	1.60
1	2059	0.2437	2059/2060	36	1	0.38	0.19	0.00	-0.14	5.90	0.00	0.00	0.00	0.02	0.00	6.36	1.55
1	2060	0.2343	2060/2061	37	1	0.39	0.19	0.00	-0.14	5.94	0.00	0.00	0.00	0.02	0.00	6.40	1.50
1	2061	0.2253	2061/2062	38	1	0.40	0.19	0.00	-0.14	5.98	0.00	0.00	0.00	0.02	0.00	6.44	1.45
1	2062	0.2166	2062/2063	39	1	0.42	0.18	0.00	-0.14	6.01	0.00	0.00	0.00	0.02	0.00	6.49	1.40
1	2063	0.2083	2063/2064	40	1	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	6.53	1.36
0	2064	0.2003	2064/2065	41	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2065	0.1926	2065/2066	42	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2066	0.1852	2066/2067	43	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2067	0.1780	2067/2068	44	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2068	0.1712	2068/2069	45	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2069	0.1646	2069/2070	46	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2070	0.1583	2070/2071	47	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2071	0.1522	2071/2072	48	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2072	0.1463	2072/2073	49	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2073	0.1407	2073/2074	50	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2074	0.1353	2074/2075	51	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2075	0.1301	2075/2076	52	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2076	0.1251	2076/2077	53	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2077	0.1203	2077/2078	54	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2078	0.1157	2078/2079	55	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2079	0.1112	2079/2080	56	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2080	0.1069	2080/2081	57	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2081	0.1028	2081/2082	58	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2082	0.0989	2082/2083	59	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2083	0.0951	2083/2084	60	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2084	0.0914	2084/2085	61	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2085	0.0879	2085/2086	62	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2086	0.0845	2086/2087	63	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2087	0.0813	2087/2088	64	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00

	Travel Time	CRV	Reliability	VOC	PT	Crash	Crash 2	Cycle	Emission	Other	Total (included yea	NPV
Sum over 38.5 included years	8.29	8.54	0.06	-3.95	210.38	0.00	0.00	0.00	1.62	0.00	224.94	104.94
NPV Sum	3.04	4.03	0.04	-1.65	98.65	0.00	0.00	0.00	0.82	0.00	104.94	

First Full Year	3
First Full Year Benefits	0.00
Discounted	0.00
Discounted Costs	77.2
FYRR	0.0%

Project Benefits - Discounting

Scenario: Opt_Gold
Compared to: DM
Method: VTM
Time Zero: 2024

	Equity Factor
TT	1.000
CRV	1.000
Reliability	1.000
VOC	1.000

	Scenario	Compared to	VTM Terms		
TRAVEL TIME	Opt_Gold	DM	1		
Year	**RC**	**UC**		**Benefits**	**Adjusted**
2018	0.00	0.00		0.00	0.00
2035	5.12	-4.68		0.44	0.44
2053	5.93	-4.74		1.19	1.19

CRV

Year				
2018	0.00	0.00	0.00	0.00
2035	1.13	-0.80	0.34	0.34
2053	1.59	-0.93	0.67	0.67

Reliability

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.02	0.02
2053	0.00	0.00	0.00	0.00

VOC

Year				
2018	0.00	0.00	0.00	0.00
2035	1.32	-1.32	0.00	0.00
2053	1.35	-1.27	0.08	0.08

PT

Year				
2018	10.69	0.00	10.69	10.69
2035	10.51	0.00	10.51	10.51
2053	12.07	0.00	12.07	12.07

Crash Saving (excluding intersection and crossing points)

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.00	0.00
2053	0.00	0.00	0.00	0.00

Cycle

Year				
2018	0.00	0.00	0.00	0.00
2035	0.00	0.00	0.00	0.00
2053	0.00	0.00	0.00	0.00

Emission

Year				
2018	0.00	0.00	0.00	0.00
2035	0.13	0.00	0.13	0.13
2053	0.06	0.00	0.06	0.06

Start Construction 1
Construction Period 2
Benefits Start in year: 3 Benefit Streams, $/year

	Model	SPPWF	FY	Analysis Year	Include	Travel Time	CRV	Reliability	VOC	PT	Crash		Cycle	Emission	Other	Total (included yea	NPV
			2020/2021		0											0.00	0.00
	2018	1.0000	2018/2019	-5	0	0.00	0.00	0.00	0.00	10.69	0.00		0.00	0.00	0.00	0.00	0.00
	2019	1.0000	2019/2020	-4	0	0.02	0.02	0.00	0.00	10.68	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2020	1.0000	2020/2021	-3	0	0.05	0.04	0.00	0.00	10.67	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	2021	1.0000	2021/2022	-2	0	0.07	0.06	0.00	0.00	10.66	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	2022	1.0000	2022/2023	-1	0	0.10	0.08	0.00	0.00	10.65	0.00	0.00	0.00	0.03	0.00	0.00	0.00
	2023	**1.0000**	2023/2024	**0**	**0**	0.12	0.09	0.01	0.00	10.64	0.00	0.00	0.00	0.04	0.00	0.00	0.00
	2024	0.9615	2024/2025	1	0	0.15	0.11	0.01	0.00	10.63	0.00	0.00	0.00	0.04	0.00	0.00	0.00
	2025	0.9246	2025/2026	2	0.5	0.17	0.13	0.01	0.00	10.62	0.00	0.00	0.00	0.05	0.00	5.49	5.08
	2026	0.8890	2026/2027	3	1	0.20	0.15	0.01	0.00	10.61	0.00	0.00	0.00	0.06	0.00	11.02	9.80
	2027	0.8548	2027/2028	4	1	0.22	0.17	0.01	0.00	10.60	0.00	0.00	0.00	0.07	0.00	11.06	9.46
	2028	**0.8219**	2028/2029	**5**	**1**	0.25	0.19	0.01	0.00	10.59	0.00	0.00	0.00	0.07	0.00	11.11	9.13
	2029	0.7903	2029/2030	6	1	0.27	0.21	0.01	0.00	10.58	0.00	0.00	0.00	0.08	0.00	11.15	8.81
	2030	0.7599	2030/2031	7	1	0.29	0.23	0.01	0.00	10.57	0.00	0.00	0.00	0.09	0.00	11.19	8.50
	2031	0.7307	2031/2032	8	1	0.32	0.24	0.02	0.00	10.56	0.00	0.00	0.00	0.10	0.00	11.23	8.21
	2032	**0.7026**	2032/2033	**9**	**1**	0.34	0.26	0.02	0.00	10.55	0.00	0.00	0.00	0.10	0.00	11.27	7.92
	2033	0.6756	2033/2034	10	1	0.37	0.28	0.02	0.00	10.54	0.00	0.00	0.00	0.11	0.00	11.31	7.64
	2034	0.6496	2034/2035	11	1	0.39	0.30	0.02	0.00	10.53	0.00	0.00	0.00	0.12	0.00	11.36	7.38
	2035	0.6246	2035/2036	12	1	**0.44**	**0.34**	**0.02**	**0.00**	**10.51**	**0.00**		**0.00**	**0.13**	0.00	11.44	7.15
Taper	2036	0.6006	2036/2037	13	1	0.48	0.36	0.02	0.00	10.59	0.00	0.00	0.00	0.13	0.00	11.59	6.96
1	2037	0.5775	2037/2038	14	1	0.53	0.37	0.02	0.01	10.68	0.00	0.00	0.00	0.12	0.00	11.73	6.77
1	2038	0.5553	2038/2039	15	1	0.57	0.39	0.02	0.01	10.77	0.00	0.00	0.00	0.12	0.00	11.88	6.60
1	2039	0.5339	2039/2040	16	1	0.61	0.41	0.02	0.02	10.85	0.00	0.00	0.00	0.12	0.00	12.02	6.42
1	2040	0.5134	2040/2041	17	1	0.65	0.43	0.02	0.02	10.94	0.00	0.00	0.00	0.11	0.00	12.17	6.25
1	2041	0.4936	2041/2042	18	1	0.69	0.45	0.01	0.03	11.03	0.00	0.00	0.00	0.11	0.00	12.32	6.08
1	2042	0.4746	2042/2043	19	1	0.73	0.47	0.01	0.03	11.11	0.00	0.00	0.00	0.10	0.00	12.46	5.91
1	2043	0.4564	2043/2044	20	1	0.78	0.48	0.01	0.04	11.20	0.00	0.00	0.00	0.10	0.00	12.61	5.75
1	2044	0.4388	2044/2045	21	1	0.82	0.50	0.01	0.04	11.29	0.00	0.00	0.00	0.10	0.00	12.75	5.60
1	2045	0.4220	2045/2046	22	1	0.86	0.52	0.01	0.04	11.38	0.00	0.00	0.00	0.09	0.00	12.90	5.44
1	2046	0.4057	2046/2047	23	1	0.90	0.54	0.01	0.05	11.46	0.00	0.00	0.00	0.09	0.00	13.05	5.29
1	2047	0.3901	2047/2048	24	1	0.94	0.56	0.01	0.05	11.55	0.00	0.00	0.00	0.08	0.00	13.19	5.15
1	2048	0.3751	2048/2049	25	1	0.98	0.58	0.01	0.06	11.64	0.00	0.00	0.00	0.08	0.00	13.34	5.00
1	2049	0.3607	2049/2050	26	1	1.03	0.59	0.00	0.06	11.72	0.00	0.00	0.00	0.07	0.00	13.48	4.86
1	2050	**0.3468**	2050/2051	**27**	**1**	1.07	0.61	0.00	0.07	11.81	0.00	0.00	0.00	0.07	0.00	13.63	4.73
1	2051	0.3335	2051/2052	28	1	1.11	0.63	0.00	0.07	11.90	0.00	0.00	0.00	0.07	0.00	13.78	4.59
1	2052	0.3207	2052/2053	29	1	1.15	0.65	0.00	0.08	11.98	0.00	0.00	0.00	0.06	0.00	13.92	4.46
1	2053	0.3083	2053/2054	30	1	**1.19**	**0.67**	**0.00**	**0.08**	**12.07**	**0.00**		**0.00**	**0.06**	0.00	14.07	4.34
1	2054	0.2965	2054/2055	31	1	1.23	0.69	0.00	0.09	12.16	0.00	0.00	0.00	0.05	0.00	14.21	4.21
1	2055	0.2851	2055/2056	32	1	1.28	0.70	0.00	0.09	12.24	0.00	0.00	0.00	0.05	0.00	14.36	4.09
1	2056	0.2741	2056/2057	33	1	1.32	0.72	0.00	0.09	12.33	0.00	0.00	0.00	0.05	0.00	14.51	3.98
1	2057	0.2636	2057/2058	34	1	1.36	0.74	0.00	0.10	12.42	0.00	0.00	0.00	0.04	0.00	14.65	3.86
1	2058	0.2534	2058/2059	35	1	1.40	0.76	-0.01	0.10	12.50	0.00	0.00	0.00	0.04	0.00	14.80	3.75
1	2059	0.2437	2059/2060	36	1	1.44	0.78	-0.01	0.11	12.59	0.00	0.00	0.00	0.03	0.00	14.94	3.64
1	2060	0.2343	2060/2061	37	1	1.48	0.79	-0.01	0.11	12.68	0.00	0.00	0.00	0.03	0.00	15.09	3.54
1	2061	0.2253	2061/2062	38	1	1.53	0.81	-0.01	0.12	12.76	0.00	0.00	0.00	0.02	0.00	15.24	3.43
1	2062	0.2166	2062/2063	39	1	1.57	0.83	-0.01	0.12	12.85	0.00	0.00	0.00	0.02	0.00	15.38	3.33
1	2063	0.2083	2063/2064	40	1	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	15.53	3.23
0	2064	0.2003	2064/2065	41	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2065	0.1926	2065/2066	42	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2066	0.1852	2066/2067	43	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2067	0.1780	2067/2068	44	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2068	0.1712	2068/2069	45	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2069	0.1646	2069/2070	46	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2070	0.1583	2070/2071	47	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2071	0.1522	2071/2072	48	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2072	0.1463	2072/2073	49	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2073	0.1407	2073/2074	50	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2074	0.1353	2074/2075	51	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2075	0.1301	2075/2076	52	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2076	0.1251	2076/2077	53	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2077	0.1203	2077/2078	54	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2078	0.1157	2078/2079	55	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2079	0.1112	2079/2080	56	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2080	0.1069	2080/2081	57	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2081	0.1028	2081/2082	58	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2082	0.0989	2082/2083	59	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2083	0.0951	2083/2084	60	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2084	0.0914	2084/2085	61	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2085	0.0879	2085/2086	62	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2086	0.0845	2086/2087	63	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
0	2087	0.0813	2087/2088	64	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00

	Travel Time	CRV	Reliability	VOC	PT	Crash	Crash 2	Cycle	Emission	Other	Total (included yea	NPV
Sum over 38.5 included years	32.48	19.31	0.28	1.81	440.38	0.00	0.00	0.00	2.99	0.00	497.24	226.35
NPV Sum	12.14	7.58	0.19	0.55	204.33	0.00	0.00	0.00	1.56	0.00	226.35	

First Full Year	3
First Full Year Benefits	0.00
Discounted	0.0
Discounted Costs	77.2
FYRR	0.0%

ASSUMPTIONS SHEET

Project: Taranaki PT SSBC *(DM Cost Included)*

Component: Jul-24

Time Period

Time Zero:	**2024**
Base Date:	**2023**
Discount rate	**4%**
Analysis year	**40**

Options

Code	Name	Description
DM	**DM**	**Do minimum**
Opt_Bronze	**Third Option_Bronze Freq**	**PT Services for Third Option with Bronze Frequency with PT Off in 2018, PT On in 2035 and 2053**
Opt_Silver	**Third Option_Silver Freq**	**PT Services for Third Option with Silver Frequency**
Opt_Gold	**Third Option_Gold Freq**	**PT Services for Third Option with Gold Frequency**

Unit Cost Values

Table: RUCRATES

Modelled Period **NATIONAL EQUITY RESOURCE VALUES OF TIME, $2002/hour**		**AM**	**IP**	**PM**	**Off peak**	**Weekend**	**All Period**	Notes
Urban Arterial								
Travel Time Costs, $/hr	100%	35.52	37.78	35.35	35.62	38.32	38.24	
Congestion Time Costs, $/hr	100%	24.79	25.12	24.43	23.79	27	26.17	
Rural Strategic								
Travel Time Costs, $/hr	0%	50.7	50.7	50.7	50.7	50.9	49.43	
Congestion Time Costs, $/hr	0%	32.33	32.33	32.33	32.33	34.99	32.24	
Composite								
Travel Time Costs, $/hr		35.52	37.78	35.35	35.62	38.32	38.24	
Congestion Time Costs, $/hr		24.79	25.12	24.43	23.79	27.00	26.17	
					National Equity Value		**41.30**	**$2,022**
							28.26	**$2,022**

NATIONAL EQUITY RESOURCE VALUES OF TIME, $2021/hour					
	Class		**AM**	**IP**	**PM**
C1	**Car/LCV**	**R_C1**	$33.50	$35.88	$33.52
C2	**MCV/HCV**	**R_C2**	$73.90	$73.86	$70.13

NATIONAL EQUITY RESOURCE VALUES OF CRV, $2021/hour					
	Class		**AM**	**IP**	**PM**
C1	**Car/LCV**	**R_C1**	$24.50	$24.86	$24.12
C2	**MCV/HCV**	**R_C2**	$30.34	$30.23	$30.34
			$2018		

Traffic Reliability	% of Travel Time Benefit	**5.0%** AM/IP/PM
PT Reliability	% of Total Benefit	**50%** AM/IP/PM

Update Factors, to base date:		2023	2018 to 2022		2023
Travel Time Costs	2021 base	**1.08**	**1.14**	Walking and C 2021 base	**1.08**
Vehicle Operating Costs	2015 base VOC	**1.35**		Emission Red 2021 base	**1.14**
Accident Costs	2021 base Ax	**1.14**			

Annualisation

Table: ANNUAL

Modelled Period	**AM**	**IP**	**PM**		**Weekend**		Notes
Daily/annual periods:	**(1-hr models)**						
Periods per weekday peak	**2.5**	**8.63**	**2.5**		**13.4**		
Weekdays per year	**245**	**245**	**245**		**120**	**1**	
Periods per weekday peak PT	**490**	**1840.3**	**551.3**		0.17		
Adjustments							
VOC					1		Factors so weekday interpeak results
TT Cost:					1.014		can be used for off peak and weekends
CRV Costs					1.075		
Annual Factors:							
VOC	612.5	3722.4	612.5				
TTC	612.5	3745.3	612.5				
CRV	612.5	3842.7	612.5				

SUMMARY OF PERIOD MODEL RESULTS

Method Matrix Year

							6	7	8	9	10																
RUN DATA							Distance Travelled	Travel Time	Congested CRV			**UNIT RATES**		**PERIOD TRAVEL COSTS, $**			Corrected	**ANNUAL FACTORS**			**ANNUAL TRAVEL COSTS, $Millions**						
						User Clas	Veh-Km	Veh-hours	Veh-hours		VOC, $			Travel Time	CRV	VOC	Reliability				VKT	VHT	Travel Time, $N	CRV, $M	VOC, $M	Variability	
Option Name	Method	Option	Compare to	Year	Period		Mat	Mat	Mat		Mat	TTC, $/hr	CRV, $/hr	Mat	Mat	Mat	100%	TTC	CRV	VOC	millions	millions				$M	TOTAL, $M
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	AM	C1	0	0	0		0	33.50	24.50	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	AM	C1	0	0	0		0	38.53	28.17	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	IP	C1	0	0	0		0	35.88	24.86	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	IP	C1	0	0	0		0	41.26	28.59	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	PM	C1	0	0	0		0	33.52	24.12	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	PM	C1	0	0	0		0	38.55	27.74	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	AM	C1	162.22	11.46	-7.09		44.78	33.50	24.50	384	-174	45	0	612.5	612.5	612.5	0.10	0.01	0.24	-0.11	0.03	0.00	0.16
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	AM	C2	-8.92	0.09	-0.75		-1.73	73.90	30.34	7	-23	-2	0	612.5	612.5	612.5	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	AM	C1	-347.38	-9.73	-1.83		-81.23	38.53	28.17	-375	-52	-81	0	612.5	612.5	612.5	-0.21	-0.01	-0.23	-0.03	-0.05	0.00	-0.31
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	AM	C2	-1.4	-0.03	-0.01		-0.33	73.90	30.34	-2	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	IP	C1	524.05	7.88	0.05		115.52	35.88	24.86	283	1	116	0	3745	3843	3722	1.95	0.03	1.06	0.00	0.43	0.00	1.49
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	IP	C2	20.19	0.02	-0.15		4.21	73.86	30.23	1	-5	4	0	3745	3843	3722	0.08	0.00	0.01	-0.02	0.02	0.00	0.00
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	IP	C1	-294.48	-8.17	-1.85		-69.34	41.26	28.59	-337	-53	-69	0	3745	3843	3722	-1.10	-0.03	-1.26	-0.20	-0.26	0.00	-1.72
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	IP	C2	-2.3	-0.05	-0.02		-0.55	73.86	30.23	-4	-1	-1	0	3745	3843	3722	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.02
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	PM	C1	194.4	12.47	10.67		53.32	33.52	24.12	418	257	53	0	612.5	612.5	612.5	0.12	0.01	0.26	0.16	0.03	0.00	0.45
Third Option_Bronze Freq	R	Opt_Bronze	DM	2035	PM	C2	3.17	0.12	0.44		1.35	70.13	30.34	8	13	1	0	612.5	612.5	612.5	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	PM	C1	-279.29	-8.37	-2.26		-66.82	38.55	27.74	-323	-63	-67	0	612.5	612.5	612.5	-0.17	-0.01	-0.20	-0.04	-0.04	0.00	-0.28
Third Option_Bronze Freq	U	Opt_Bronze	DM	2035	PM	C2	-1.37	-0.03	-0.02		-0.34	70.13	30.34	-2	-1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	AM	C1	580.82	9.66	6.8		117.01	33.50	24.50	324	167	117	0	612.5	612.5	612.5	0.36	0.01	0.20	0.10	0.07	0.00	0.37
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	AM	C2	18.87	-0.15	0.65		3.15	73.90	30.34	-11	20	3	0	612.5	612.5	612.5	0.01	0.00	-0.01	0.01	0.00	0.00	0.01
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	AM	C1	-346.17	-10.27	-2.23		-81.07	38.53	28.17	-396	-63	-81	0	612.5	612.5	612.5	-0.21	-0.01	-0.24	-0.04	-0.05	0.00	-0.33
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	AM	C2	1.38	0.04	0.02		0.34	73.90	30.34	3	1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	IP	C1	263.76	8.56	-9.33		87.29	35.88	24.86	307	-232	87	0	3745	3843	3722	0.98	0.03	1.15	-0.89	0.32	0.00	0.58
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	IP	C2	-3.09	-0.03	-0.92		1.51	73.86	30.23	-2	-28	2	0	3745	3843	3722	-0.01	0.00	-0.01	-0.11	0.01	0.00	-0.11
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	IP	C1	-268.28	-7.88	-1.91		-63.45	41.26	28.59	-325	-55	-63	0	3745	3843	3722	-1.00	-0.03	-1.22	-0.21	-0.24	0.00	-1.66
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	IP	C2	1.23	0.03	0.01		0.3	73.86	30.23	2	0	0	0	3745	3843	3722	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	PM	C1	-127.16	12.9	15.71		-42.31	33.52	24.12	432	379	-42	0	612.5	612.5	612.5	-0.08	0.01	0.26	0.23	-0.03	0.00	0.47
Third Option_Bronze Freq	R	Opt_Bronze	DM	2053	PM	C2	-21.33	0.42	0.73		-6.08	70.13	30.34	29	22	-6	0	612.5	612.5	612.5	-0.01	0.00	0.02	0.01	0.00	0.00	0.03
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	PM	C1	-253.28	-8.34	-2.68		-60.99	38.55	27.74	-321	-74	-61	0	612.5	612.5	612.5	-0.16	-0.01	-0.20	-0.05	-0.04	0.00	-0.28
Third Option_Bronze Freq	U	Opt_Bronze	DM	2053	PM	C2	0.87	0.04	0.02		0.23	70.13	30.34	3	1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	AM	C1	0	0	0		0	33.50	24.50	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	AM	C1	0	0	0		0	38.53	28.17	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	IP	C1	0	0	0		0	35.88	24.86	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	IP	C1	0	0	0		0	41.26	28.59	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	PM	C1	0	0	0		0	33.52	24.12	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	PM	C1	0	0	0		0	38.55	27.74	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2035	AM	C1	47.11	17.22	1.41		24.33	33.50	24.50	577	35	24	0	612.5	612.5	612.5	0.03	0.01	0.35	0.02	0.01	0.00	0.39
Third Option_Silver Freq	R	Opt_Silver	DM	2035	AM	C2	-36.33	0.19	-0.29		-8.2	73.90	30.34	14	-9	-8	0	612.5	612.5	612.5	-0.02	0.00	0.01	-0.01	-0.01	0.00	0.00
Third Option_Silver Freq	U	Opt_Silver	DM	2035	AM	C1	-533.25	-13.84	-3.1		-125.37	38.53	28.17	-533	-87	-125	0	612.5	612.5	612.5	-0.33	-0.01	-0.33	-0.05	-0.08	0.00	-0.46
Third Option_Silver Freq	U	Opt_Silver	DM	2035	AM	C2	-0.55	-0.01	0		-0.13	73.90	30.34	-1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2035	IP	C1	482.22	11.54	4.52		105.54	35.88	24.86	414	112	106	0	3745	3843	3722	1.79	0.04	1.55	0.43	0.39	0.00	2.38
Third Option_Silver Freq	R	Opt_Silver	DM	2035	IP	C2	2.42	0.09	0.24		0.06	73.86	30.23	7	7	0	0	3745	3843	3722	0.01	0.00	0.02	0.03	0.00	0.00	0.05
Third Option_Silver Freq	U	Opt_Silver	DM	2035	IP	C1	-406.51	-10.6	-2.52		-95.84	41.26	28.59	-437	-72	-96	0	3745	3843	3722	-1.51	-0.04	-1.64	-0.28	-0.36	0.00	-2.27
Third Option_Silver Freq	U	Opt_Silver	DM	2035	IP	C2	-1.21	-0.03	-0.01		-0.29	73.86	30.23	-2	0	0	0	3745	3843	3722	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01
Third Option_Silver Freq	R	Opt_Silver	DM	2035	PM	C1	84.9	19.13	12.07		43.44	33.52	24.12	641	291	43	0	612.5	612.5	612.5	0.05	0.01	0.39	0.18	0.03	0.00	0.60
Third Option_Silver Freq	R	Opt_Silver	DM	2035	PM	C2	-5.46	0.24	0.09		-0.33	70.13	30.34	17	3	0	0	612.5	612.5	612.5	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Silver Freq	U	Opt_Silver	DM	2035	PM	C1	-411.83	-11.55	-3.4		-99.03	38.55	27.74	-445	-94	-99	0	612.5	612.5	612.5	-0.25	-0.01	-0.27	-0.06	-0.06	0.00	-0.39
Third Option_Silver Freq	U	Opt_Silver	DM	2035	PM	C2	-0.75	-0.02	-0.01		-0.18	70.13	30.34	-1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2053	AM	C1	663.43	15.88	18.29		159.94	33.50	24.50	532	448	160	0	612.5	612.5	612.5	0.41	0.01	0.33	0.27	0.10	0.00	0.70
Third Option_Silver Freq	R	Opt_Silver	DM	2053	AM	C2	14.3	-0.06	1.33		3.93	73.90	30.34	-4	40	4	0	612.5	612.5	612.5	0.01	0.00	0.00	0.02	0.00	0.00	0.02
Third Option_Silver Freq	U	Opt_Silver	DM	2053	AM	C1	-567.39	-15.56	-4.04		-134.04	38.53	28.17	-599	-114	-134	0	612.5	612.5	612.5	-0.35	-0.01	-0.37	-0.07	-0.08	0.00	-0.52
Third Option_Silver Freq	U	Opt_Silver	DM	2053	AM	C2	0.73	0.03	0.01		0.19	73.90	30.34	2	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Silver Freq	R	Opt_Silver	DM	2053	IP	C1	319.05	13.67	-0.23		83.98	35.88	24.86	490	-6	84	0	3745	3843	3722	1.19	0.05	1.84	-0.02	0.31	0.00	2.13
Third Option_Silver Freq	R	Opt_Silver	DM	2053	IP	C2	-11.43	0.04	-0.64		-2.26	73.86	30.23	3	-19	-2	0	3745	3843	3722	-0.04	0.00	0.01	-0.07	-0.01	0.00	-0.07
Third Option_Silver Freq	U	Opt_Silver	DM	2053	IP	C1	-416.64	-11.38	-2.97		-99.02	41.26	28.59	-470	-85	-99	0	3745	3843	3722	-1.55	-0.04	-1.76	-0.33	-0.37	0.00	-2.45
Third Option_Silver Freq	U	Opt_Silver	DM	2053	IP	C2	1.27	0.03	0.01		0.32	73.86	30.23	2	0	0	0	3745	3843	3722	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Silver Freq	R	Opt_Silver	DM	2053	PM	C1	131.07	24.5	30.01		28.42	33.52	24.12	821	724	28	0	612.5	612.5	612.5	0.08	0.02	0.50	0.44	0.02	0.00	0.96
Third Option_Silver Freq	R	Opt_Silver	DM	2053	PM	C2	-15.54	0.78	1.5		-3.83	70.13	30.34	55	46	-4	0	612.5	612.5	612.5	-0.01	0.00	0.03	0.03	0.00	0.00	0.06
Third Option_Silver Freq	U	Opt_Silver	DM	2053	PM	C1	-422.18	-12.94	-4.61		-102.8	38.55	27.74	-499	-128	-103	0	612.5	612.5	612.5	-0.26	-0.01	-0.31	-0.08	-0.06	0.00	-0.45
Third Option_Silver Freq	U	Opt_Silver	DM	2053	PM	C2	0.84	0.04	0.03		0.23	70.13	30.34	3	1	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	AM	C1	0	0	0		0	33.50	24.50	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	AM	C1	0	0	0		0	38.53	28.17	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	AM	C2	0	0	0		0	73.90	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	IP	C1	0	0	0		0	35.88	24.86	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	IP	C1	0	0	0		0	41.26	28.59	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	IP	C2	0	0	0		0	73.86	30.23	0	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	PM	C1	0	0	0		0	33.52	24.12	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	PM	C1	0	0	0		0	38.55	27.74	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2018	PM	C2	0	0	0		0	70.13	30.34	0	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2035	AM	C1	842.98	32.33	2.69		217.69	33.50	24.50	1083	66	218	0	612.5	612.5	612.5	0.52	0.02	0.66	0.04	0.13	0.00	0.84
Third Option_Gold Freq	R	Opt_Gold	DM	2035	AM	C2	-16.6	0.28	-0.38		-2.73	73.90	30.34	21	-12	-3	0	612.5	612.5	612.5	-0.01	0.00	0.01	-0.01	0.00	0.00	0.00
Third Option_Gold Freq	U	Opt_Gold	DM	2035	AM	C1	-1055.08	-26.71	-6.12		-248.61	38.53	28.17	-1029	-172	-249	0	612.5	612.5	612.5	-0.65	-0.02	-0.63	-0.11	-0.15	0.00	-0.89
Third Option_Gold Freq	U	Opt_Gold	DM	2035	AM	C2	1.01	0.02	0.01		0.25	73.90	30.34	1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2035	IP	C1	872.3	23.49	7.41		203.12	35.88	24.86	843	184	203	0	3745	3843	3722	3.25	0.09	3.16	0.71	0.76	0.00	4.62
Third Option_Gold Freq	R	Opt_Gold	DM	2035	IP	C2	0.39	0.17	0.06		-0.16	73.86	30.23	13	2	0	0	3745	3843	3722	0.00	0.00	0.05	0.01	0.00	0.00	0.05
Third Option_Gold Freq	U	Opt_Gold	DM	2035	IP	C1	-795.9	-20.32	-4.69		-187.56	41.26	28.59	-838	-134	-188	0	3745	3843	3722	-2.96	-0.08	-3.14	-0.52	-0.70	0.00	-4.35
Third Option_Gold Freq	U	Opt_Gold	DM	2035	IP	C2	0.58	0.01	0		0.14	73.86	30.23	1	0	0	0	3745	3843	3722	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2035	PM	C1	455.54	40.71	20.25		150.2	33.52	24.12	1365	488	150	0	612.5	612.5	612.5	0.28	0.02	0.84	0.30	0.09	0.00	1.23
Third Option_Gold Freq	R	Opt_Gold	DM	2035	PM	C2	-14.26	0.59	0.18		-1.98	70.13	30.34	41	5	-2	0	612.5	612.5	612.5	-0.01	0.00	0.03	0.00	0.00	0.00	0.03
Third Option_Gold Freq	U	Opt_Gold	DM	2035	PM	C1	-875.93	-23.97	-6.9		-211.26	38.55	27.74	-924	-191	-211	0	612.5	612.5	612.5	-0.54	-0.01	-0.57	-0.12	-0.13	0.00	-0.81
Third Option_Gold Freq	U	Opt_Gold	DM	2035	PM	C2	0.51	0.02	0.01		0.13	70.13	30.34	1	0	0	0	612.5	612.5	612.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Third Option_Gold Freq	R	Opt_Gold	DM	2053	AM	C1	1078.36	35.27	29.18		281.43	33.50	24.50	1182	715	281	0	612.5	612.5	612.5	0.66	0.02	0.72	0.44	0.17	0.00	1.33
Third Option_Gold Freq	R	Opt_Gold	DM	2053	AM	C2	1.34	0.19	1.6		2.28	73.90	30.34	14	49	2	0	612.5	612.5	612.5	0.00	0.00	0.01	0.03	0.00	0.00	0.04
Third Option_Gold Freq	U	Opt_Gold	DM	2053	AM	C1	-1050.68	-28.54	-7.62		-248.78	38.53	28.17	-1100	-215	-249	0	612.5	612.5	612.5	-0.64	-0.02	-0.67	-0.13	-0.15	0.00	-0.96
Third Option_Gold Freq	U	Opt_Gold	DM	2053	AM	C2	9.43	0.22	0.09		2.3	73.90	30.34	16	3	2	0	612.5	612.5	612.5	0.01	0.00	0.01	0.00	0.00	0.00	0.01
Third Option_Gold Freq	R	Opt_Gold	DM	2053	IP	C1	586.71	24.88	2.4		186.33	35.88	24.86	893	60	186	0	3745	3843	3722	2.18	0.09	3.34	0.23	0.69	0.00	4.27
Third Option_Gold Freq	R	Opt_Gold	DM	2053	IP	C2	-13.22	-0.12	-0.94		-0.22	73.86	30.23	-9	-28	0	0	3745	3843	3722	-0.05	0.00	-0.03	-0.11	0.00	0.00	-0.14
Third Option_Gold Freq	U	Opt_Gold	DM	2053	IP	C1	-762.68	-20.58	-5.26		-181.05	41.26	28.59	-849	-150	-181	0	3745	3843	3722	-2.84	-0.08	-3.18	-0.58	-0.67	0.00	-4.43
Third Option_Gold Freq	U	Opt_Gold	DM	2053	IP	C2	9.12	0.21	0.09		2.23	73.86	30.23	16	3	2	0	3745	3843	3722	0.03	0.00	0.06	0.01	0.01	0.00	0.08
Third Option_Gold Freq	R	Opt_Gold	DM	2053	PM	C1	630.06	66.12	56.75		222.65	33.52	24.12	2216	1369	223	0	612.5	612.5	612.5	0.39	0.04	1.36	0.84	0.14	0.00	2.33
Third Option_Gold Freq	R	Opt_Gold	DM	2053	PM	C2	-24.26	2.14	2.73		-3.28	70.13	30.34	150	83	-3	0	612.5	612.5	612.5	-0.01	0.00	0.09	0.05	0.00	0.00	0.14
Third Option_Gold Freq	U	Opt_Gold	DM	2053	PM	C1	-834.12	-25.92	-9.7		-204.46	38.55	27.74	-999	-269	-204	0	612.5	612.5	612.5	-0.51	-0.02	-0.61	-0.16	-0.13	0.00	-0.90
Third Option_Gold Freq	U	Opt_Gold	DM	2053	PM	C2	6.43	0.23	0.14		1.67	70.13	30.34	16	4	2	0	612.5	612.5	612.5	0.00	0.00	0.01	0.00	0.00	0.00	0.01

PT Benefits

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Model results

				Benefits (pax-hours)				VoT, $/hr				Annual Benefit					
Year	Base	Option	Period	HBW	Others	HBE	School	HBW	Others	HBE	Annual Factor	HBW	Others	HBE	TOTAL	Reliability	Total
2018	DM	Opt_Bronze	AM	2.0	10.5	47.9	-1.8	$19.53	$18.91	$18.91	490	$19,522	$97,663	$426,695	$543,879	$271,940	$4.212
			IP	1.4	28.5	22.6	-0.6	$19.53	$18.91	$18.91	1840	$49,239	$991,788	$765,938	$1,806,965	$903,482	
			PM	7.0	24.9	11.7	0.0	$19.53	$18.91	$18.91	551	$75,792	$259,353	$122,275	$457,420	$228,710	
2035	DM	Opt_Bronze	AM	0.2	7.9	31.5	-1.5	$19.53	$18.91	$18.91	490	$2,297	$73,015	$278,255	$353,567	$176,783	$3.312
			IP	1.0	24.1	18.4	-0.5	$19.53	$18.91	$18.91	1840	$34,862	$838,670	$622,216	$1,495,748	$747,874	
			PM	4.9	20.4	9.0	0.0	$19.53	$18.91	$18.91	551	$52,861	$212,131	$93,609	$358,601	$179,300	
2053	DM	Opt_Bronze	AM	0.0	8.3	34.6	-1.4	$19.53	$18.91	$18.91	490	-$96	$77,000	$307,535	$384,439	$192,220	$3.746
			IP	1.2	27.4	21.5	-0.5	$19.53	$18.91	$18.91	1840	$41,691	$953,508	$729,399	$1,724,598	$862,299	
			PM	5.6	21.8	9.7	0.0	$19.53	$18.91	$18.91	551	$60,289	$226,725	$101,323	$388,337	$194,168	
2018	DM	Opt_Silver	AM	6.6	15.1	66.7	-2.4	$19.53	$18.91	$18.91	490	$63,543	$139,637	$595,890	$799,070	$399,535	$5.360
			IP	2.3	33.3	26.5	-0.8	$19.53	$18.91	$18.91	1840	$81,944	$1,157,086	$894,697	$2,133,727	$1,066,863	
			PM	12.4	33.3	15.3	0.0	$19.53	$18.91	$18.91	551	$133,928	$347,541	$159,177	$640,645	$320,323	
2035	DM	Opt_Silver	AM	5.2	13.4	53.3	-2.1	$19.53	$18.91	$18.91	490	$49,954	$124,163	$474,692	$648,809	$324,404	$4.631
			IP	1.9	29.6	22.9	-0.7	$19.53	$18.91	$18.91	1840	$68,646	$1,030,763	$772,202	$1,871,612	$935,806	
			PM	10.5	30.5	13.1	0.0	$19.53	$18.91	$18.91	551	$112,934	$317,415	$136,348	$566,697	$283,349	
2053	DM	Opt_Silver	AM	5.3	14.7	58.4	-2.0	$19.53	$18.91	$18.91	490	$51,102	$136,209	$522,319	$709,630	$354,815	$5.256
			IP	2.2	34.3	26.4	-0.7	$19.53	$18.91	$18.91	1840	$78,710	$1,192,233	$893,305	$2,164,248	$1,082,124	
			PM	11.7	33.9	14.4	0.0	$19.53	$18.91	$18.91	551	$126,069	$353,691	$150,212	$629,972	$314,986	
2018	DM	Opt_Gold	AM	19.2	29.8	105.9	-3.9	$19.53	$18.91	$18.91	490	$183,738	$276,031	$944,751	$1,404,521	$702,260	$9.898
			IP	6.3	66.9	42.1	-1.2	$19.53	$18.91	$18.91	1840	$227,144	$2,328,787	$1,423,650	$3,979,581	$1,989,791	
			PM	28.1	64.0	23.5	0.0	$19.53	$18.91	$18.91	551	$302,092	$667,458	$245,176	$1,214,725	$607,362	
2035	DM	Opt_Gold	AM	18.5	30.3	97.5	-3.8	$19.53	$18.91	$18.91	490	$176,561	$280,757	$868,771	$1,326,089	$663,044	$9.728
			IP	6.2	68.0	40.5	-1.2	$19.53	$18.91	$18.91	1840	$221,034	$2,366,370	$1,367,623	$3,955,028	$1,977,514	
			PM	26.8	65.5	22.4	0.0	$19.53	$18.91	$18.91	551	$288,096	$682,885	$233,501	$1,204,482	$602,241	
2053	DM	Opt_Gold	AM	20.0	34.3	107.9	-3.6	$19.53	$18.91	$18.91	490	$191,394	$317,635	$966,155	$1,475,184	$737,592	$11.176
			IP	7.1	79.6	46.5	-1.2	$19.53	$18.91	$18.91	1840	$253,381	$2,769,349	$1,576,768	$4,599,498	$2,299,749	
			PM	30.4	75.6	25.0	0.0	$19.53	$18.91	$18.91	551	$327,068	$788,273	$260,603	$1,375,945	$687,973	

c) Average Annual Vehicle Emission

Conversion Factor g/day to Kg/day 0.001

TTSM Notation	Vehicle Emission Factor	Units	2018_Base	2035_DM	2053_DM	2018_Opt_Bronze	2018_Opt_Silver	2018_Opt_Gold	2035_Opt_Bronze	2035_Opt_Silver	2035_Opt_Gold	2053_Opt_Bronze	2053_Opt_Silver	2053_Opt_Gold
AADE_CO	Carbon monoxide (CO)	Kg/day	2,335	518	151	2,335	2,335	2,335	517	516	515	151	150	150
AADE_CO2-e	Carbon dioxide (CO2) equivalent	Kg/day	294,511	289,188	140,460	294,511	294,511	294,511	288,483	288,212	287,234	140,270	140,147	139,935
AADE_VOC	Volatile organic compounds (VOC)	Kg/day	161	13	5	161	161	161	13	13	13	5	5	5
AADE_NOX	Nitrogen oxides (NOx)	Kg/day	797	458	128	797	797	797	457	456	455	128	128	128
AADE_NO2	Nitrogen dioxide (NO2)	Kg/day	138	106	28	138	138	138	106	106	106	28	27	27
AADE_PM2.5E	PM2.5 E	Kg/day	38	10	2	38	38	38	10	10	10	2	2	2
AADE_PM10BT	PM10.0 BT	Kg/day	26	32	36	26	26	26	32	32	31	36	36	36
AADE_FC	Fuel Consumption	l/day	118,506	115,897	54,810	118,506	118,506	118,506	115,610	115,499	115,100	54,733	54,683	54,596

Project Benefits - Discounting

Scenario: Opt_Bronze
Compared to: DM
Method: VTM
Time Zero: 2024

	Equity Factor
TT	1.000
CRV	1.000
Reliability	1.000
VOC	1.000

	Scenario	Compared to		VTM Terms				
TRAVEL TIME	Opt_Bronze	DM		1				
Year	**RC**	**UC**					**Benefits**	**Adjusted**
2018	0.00	0.00					0.00	0.00
2035	1.69	-1.84					-0.15	-0.15
2053	1.75	-1.78					-0.03	-0.03
CRV								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.04	-0.30					-0.26	-0.26
2053	-0.69	-0.32					-1.00	-1.00
Reliability								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					-0.01	-0.01
2053	0.00	0.00					0.00	0.00
VOC								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.68	-0.47					0.21	0.21
2053	0.51	-0.43					0.07	0.07
PT								
Year								
2018	4.55	0.00					4.55	4.55
2035	3.58	0.00					3.58	3.58
2053	4.05	0.00					4.05	4.05
Crash Saving (excluding intersection and crossing points)								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.00	0.00
2053	0.00	0.00					0.00	0.00
Cycle								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.00	0.00
2053	0.00	0.00					0.00	0.00
Emission								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.05	0.00					0.05	0.05
2053	0.02	0.00					0.02	0.02

Population

	3rd option bronz	balanced	Through
2018	41344	41712	36683
2035	50300	50582	43684
2053	54529	54802	46294

30 year cap? No

Start Construction 1
Construction Period 2
Benefits Start in year: 3 Benefit Streams, $/year

Model	SPPWF	FY	Analysis Year	Include	Travel Time	CRV	Reliability	VOC	PT	Crash		Cycle	Emission	Other	Total (included yea	NPV	
2018	1.0000	2018/2019	-5.00	0	0.00	0.00	0.00	0.00	4.55	0.00		0.00	0.00	0.00	0.00	0.00	
2019	1.0000	2019/2020	-4.00	0	-0.01	-0.01	0.00	0.01	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2020	1.0000	2020/2021	-3.00	0	-0.02	-0.03	0.00	0.02	4.44	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
2021	1.0000	2021/2022	-2.00	0	-0.03	-0.04	0.00	0.03	4.39	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
2022	1.0000	2022/2023	-1.00	0	-0.03	-0.06	0.00	0.05	4.33	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
2023	**1.0000**	2023/2024	0.00	**0**	-0.04	-0.07	0.00	0.06	4.28	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
2024	0.9615	2024/2025	1.00	0	-0.05	-0.09	0.00	0.07	4.23	0.00	0.00	0.00	0.02	0.00	0.00	0.00	
2025	0.9246	2025/2026	2.00	0.5	-0.06	-0.10	0.00	0.08	4.17	0.00	0.00	0.00	0.02	0.00	2.05	1.90	
2026	0.8890	**2026/2027**	3.00	1	-0.07	-0.12	0.00	0.09	4.12	0.00	0.00	0.00	0.02	0.00	4.04	3.59	
2027	0.8548	2027/2028	4.00	1	-0.08	-0.13	0.00	0.10	4.06	0.00	0.00	0.00	0.02	0.00	3.98	3.40	
2028	**0.8219**	2028/2029	5.00	**1**	-0.08	-0.15	0.00	0.12	4.01	0.00	0.00	0.00	0.03	0.00	3.92	3.22	
2029	0.7903	2029/2030	6.00	1	-0.09	-0.16	0.00	0.13	3.96	0.00	0.00	0.00	0.03	0.00	3.85	3.05	
2030	0.7599	2030/2031	7.00	1	-0.10	-0.18	-0.01	0.14	3.90	0.00	0.00	0.00	0.03	0.00	3.79	2.88	
2031	0.7307	**2031/2032**	8.00	1	-0.11	-0.19	-0.01	0.15	3.85	0.00	0.00	0.00	0.03	0.00	3.73	2.72	
2032	**0.7026**	2032/2033	9.00	**1**	-0.12	-0.20	-0.01	0.16	3.79	0.00	0.00	0.00	0.04	0.00	3.66	2.57	
2033	0.6756	2033/2034	10.00	1	-0.13	-0.22	-0.01	0.17	3.74	0.00	0.00	0.00	0.04	0.00	3.60	2.43	
2034	0.6496	2034/2035	11.00	1	-0.14	-0.23	-0.01	0.19	3.68	0.00	0.00	0.00	0.04	0.00	3.54	2.30	
2035	0.6246	**2035/2036**	12.00	1	-0.15	-0.26	-0.01	0.21	3.58	0.00		0.00	0.05	0.00	3.41	2.13	
2036	0.6006	2036/2037	13.00	1	-0.15	-0.30	-0.01	0.20	3.60	0.00	0.00	0.00	0.05	0.00	3.39	2.04	Taper
2037	0.5775	2037/2038	14.00	1	-0.14	-0.35	-0.01	0.19	3.63	0.00	0.00	0.00	0.04	0.00	3.38	1.95	1
2038	0.5553	2038/2039	15.00	1	-0.13	-0.39	-0.01	0.19	3.65	0.00	0.00	0.00	0.04	0.00	3.36	1.86	1
2039	0.5339	2039/2040	16.00	1	-0.13	-0.43	-0.01	0.18	3.68	0.00	0.00	0.00	0.04	0.00	3.34	1.78	1
2040	0.5134	2040/2041	17.00	1	-0.12	-0.47	-0.01	0.17	3.71	0.00	0.00	0.00	0.04	0.00	3.32	1.71	1
2041	0.4936	2041/2042	18.00	1	-0.11	-0.51	-0.01	0.16	3.73	0.00	0.00	0.00	0.04	0.00	3.31	1.63	1
2042	0.4746	2042/2043	19.00	1	-0.11	-0.55	-0.01	0.15	3.76	0.00	0.00	0.00	0.04	0.00	3.29	1.56	1
2043	0.4564	2043/2044	20.00	1	-0.10	-0.59	0.00	0.15	3.79	0.00	0.00	0.00	0.04	0.00	3.27	1.49	1
2044	0.4388	2044/2045	21.00	1	-0.09	-0.63	0.00	0.14	3.81	0.00	0.00	0.00	0.03	0.00	3.26	1.43	1
2045	0.4220	2045/2046	22.00	1	-0.09	-0.67	0.00	0.13	3.84	0.00	0.00	0.00	0.03	0.00	3.24	1.37	1
2046	0.4057	2046/2047	23.00	1	-0.08	-0.72	0.00	0.12	3.86	0.00	0.00	0.00	0.03	0.00	3.22	1.31	1
2047	0.3901	2047/2048	24.00	1	-0.07	-0.76	0.00	0.12	3.89	0.00	0.00	0.00	0.03	0.00	3.20	1.25	1
2048	0.3751	2048/2049	25.00	1	-0.06	-0.80	0.00	0.11	3.92	0.00	0.00	0.00	0.03	0.00	3.19	1.20	1
2049	0.3607	2049/2050	26.00	1	-0.06	-0.84	0.00	0.10	3.94	0.00	0.00	0.00	0.03	0.00	3.17	1.14	1
2050	**0.3468**	2050/2051	27.00	1	-0.05	-0.88	0.00	0.09	3.97	0.00	0.00	0.00	0.03	0.00	3.15	1.09	1
2051	0.3335	2051/2052	28.00	1	-0.04	-0.92	0.00	0.09	3.99	0.00	0.00	0.00	0.02	0.00	3.14	1.05	1
2052	0.3207	2052/2053	29.00	1	-0.04	-0.96	0.00	0.08	4.02	0.00	0.00	0.00	0.02	0.00	3.12	1.00	1
2053	0.3083	**2053/2054**	30.00	1	-0.03	-1.00	0.00	0.07	4.05	0.00		0.00	0.02	0.00	3.10	0.96	1
2054	0.2965	2054/2055	31.00	1	-0.02	-1.05	0.00	0.06	4.07	0.00	0.00	0.00	0.02	0.00	3.08	0.91	1
2055	0.2851	2055/2056	32.00	1	-0.02	-1.09	0.00	0.06	4.10	0.00	0.00	0.00	0.02	0.00	3.07	0.87	1
2056	0.2741	2056/2057	33.00	1	-0.01	-1.13	0.00	0.05	4.12	0.00	0.00	0.00	0.02	0.00	3.05	0.84	1
2057	0.2636	2057/2058	34.00	1	0.00	-1.17	0.00	0.04	4.15	0.00	0.00	0.00	0.01	0.00	3.03	0.80	1
2058	0.2534	2058/2059	35.00	1	0.00	-1.21	0.00	0.03	4.18	0.00	0.00	0.00	0.01	0.00	3.01	0.76	1
2059	0.2437	2059/2060	36.00	1	0.01	-1.25	0.00	0.03	4.20	0.00	0.00	0.00	0.01	0.00	3.00	0.73	1
2060	0.2343	2060/2061	37.00	1	0.02	-1.29	0.00	0.02	4.23	0.00	0.00	0.00	0.01	0.00	2.98	0.70	1
2061	0.2253	2061/2062	38.00	1	0.02	-1.33	0.00	0.01	4.25	0.00	0.00	0.00	0.01	0.00	2.96	0.67	1
2062	0.2166	2062/2063	39.00	1	0.03	-1.38	0.00	0.00	4.28	0.00	0.00	0.00	0.01	0.00	2.95	0.64	1
2063	0.2083	2063/2064	40.00	1	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	2.93	0.61	1
2064	0.2003	2064/2065	41.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2065	0.1926	2065/2066	42.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2066	0.1852	2066/2067	43.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2067	0.1780	2067/2068	44.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2068	0.1712	2068/2069	45.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2069	0.1646	2069/2070	46.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2070	0.1583	2070/2071	47.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2071	0.1522	2071/2072	48.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2072	0.1463	2072/2073	49.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2073	0.1407	2073/2074	50.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2074	0.1353	2074/2075	51.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2075	0.1301	2075/2076	52.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2076	0.1251	2076/2077	53.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2077	0.1203	2077/2078	54.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2078	0.1157	2078/2079	55.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2079	0.1112	2079/2080	56.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2080	0.1069	2080/2081	57.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2081	0.1028	2081/2082	58.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2082	0.0989	2082/2083	59.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2083	0.0951	2083/2084	60.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2084	0.0914	2084/2085	61.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2085	0.0879	2085/2086	62.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2086	0.0845	2086/2087	63.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
2087	0.0813	2087/2088	64.00	0	0.04	-1.42	0.00	0.00	4.31	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0
		2088/2089															
		2089/2090			**Travel Time**	**CRV**	**Reliability**	**VOC**	**PT**	**Crash**	**Crash 2**	**Cycle**	**Emission**	**Other**	**Total (included yea**	**NPV**	
		2090/2091	**Sum over 38.5 included years**		-2.63	-25.98	-0.13	4.24	151.50	0.00	0.00	0.00	1.08	0.00	128.07	63.54	
			NPV Sum		-1.55	-9.27	-0.08	2.32	71.55	0.00	0.00	0.00	0.56	0.00	63.54		

First Full Year	3
First Full Year Benefits	0.00
Discounted	0.00
Discounted Costs	66.2
FYRR	0.0%

Project Benefits - Discounting

Scenario: Opt_Silver
Compared to: DM
Method: VTM
Time Zero: 2024

	Equity Factor
TT	1.000
CRV	1.000
Reliability	1.000
VOC	1.000

	Scenario	Compared to		VTM Terms				
TRAVEL TIME	Opt_Silver	DM		1				
Year	**RC**	**UC**					**Benefits**	**Adjusted**
2018	0.00	0.00					0.00	0.00
2035	2.53	-2.43					0.10	0.10
2053	2.92	-2.61					0.31	0.31
CRV								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.71	-0.42					0.29	0.29
2053	0.73	-0.51					0.22	0.22
Reliability								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.01	0.01
2053	0.00	0.00					0.00	0.00
VOC								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.58	-0.67					-0.09	-0.09
2053	0.57	-0.69					-0.12	-0.12
PT								
Year								
2018	5.79	0.00					5.79	5.79
2035	5.00	0.00					5.00	5.00
2053	5.68	0.00					5.68	5.68
Crash Saving (excluding intersection and crossing points)								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.00	0.00
2053	0.00	0.00					0.00	0.00
Cycle								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.00	0.00
2053	0.00	0.00					0.00	0.00
Emission								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.07	0.00					0.07	0.07
2053	0.03	0.00					0.03	0.03

Start Construction 1
Construction Period 2
Benefits Start in year: 3 Benefit Streams, $/year

Model	SPPWF	FY	Analysis Year	Include	Travel Time	CRV	Reliability	VOC	PT	Crash	Crash 2	Cycle	Emission	Other	Total (included yea	NPV	
															0.00	0.00	
2018	1.0000	2018/2019	-5	0	0.00	0.00	0.00	0.00	5.79	0.00		0.00	0.00	0.00	0.00	0.00	
2019	1.0000	2019/2020	-4	0	0.01	0.02	0.00	0.00	5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2020	1.0000	2020/2021	-3	0	0.01	0.03	0.00	-0.01	5.70	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
2021	1.0000	2021/2022	-2	0	0.02	0.05	0.00	-0.01	5.66	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
2022	1.0000	2022/2023	-1	0	0.02	0.06	0.00	-0.02	5.61	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
2023	**1.0000**	2023/2024	**0**	**0**	0.03	0.08	0.00	-0.02	5.57	0.00	0.00	0.00	0.02	0.00	0.00	0.00	
2024	0.9615	2024/2025	1	0	0.03	0.10	0.00	-0.03	5.53	0.00	0.00	0.00	0.02	0.00	0.00	0.00	
2025	0.9246	2025/2026	2	0.5	0.04	0.11	0.00	-0.03	5.48	0.00	0.00	0.00	0.03	0.00	2.81	2.60	
2026	0.8890	2026/2027	3	1	0.04	0.13	0.00	-0.04	5.44	0.00	0.00	0.00	0.03	0.00	5.60	4.98	
2027	0.8548	2027/2028	4	1	0.05	0.14	0.00	-0.04	5.40	0.00	0.00	0.00	0.03	0.00	5.58	4.77	
2028	**0.8219**	2028/2029	**5**	**1**	0.06	0.16	0.00	-0.05	5.35	0.00	0.00	0.00	0.04	0.00	5.56	4.57	
2029	0.7903	2029/2030	6	1	0.06	0.18	0.00	-0.05	5.31	0.00	0.00	0.00	0.04	0.00	5.53	4.37	
2030	0.7599	2030/2031	7	1	0.07	0.19	0.00	-0.06	5.26	0.00	0.00	0.00	0.04	0.00	5.51	4.19	
2031	0.7307	2031/2032	8	1	0.07	0.21	0.00	-0.06	5.22	0.00	0.00	0.00	0.05	0.00	5.49	4.01	
2032	**0.7026**	2032/2033	**9**	**1**	0.08	0.22	0.00	-0.07	5.18	0.00	0.00	0.00	0.05	0.00	5.46	3.84	
2033	0.6756	2033/2034	10	1	0.08	0.24	0.00	-0.07	5.13	0.00	0.00	0.00	0.06	0.00	5.44	3.68	
2034	0.6496	2034/2035	11	1	0.09	0.26	0.00	-0.08	5.09	0.00	0.00	0.00	0.06	0.00	5.42	3.52	
2035	0.6246	2035/2036	12	1	0.10	0.29	0.01	-0.09	5.00	0.00		0.00	0.07	0.00	5.37	3.36	
2036	0.6006	2036/2037	13	1	0.11	0.28	0.00	-0.09	5.04	0.00	0.00	0.00	0.06	0.00	5.41	3.25	Taper
2037	0.5775	2037/2038	14	1	0.12	0.28	0.00	-0.09	5.08	0.00	0.00	0.00	0.06	0.00	5.45	3.15	1
2038	0.5553	2038/2039	15	1	0.14	0.28	0.00	-0.10	5.11	0.00	0.00	0.00	0.06	0.00	5.50	3.05	1
2039	0.5339	2039/2040	16	1	0.15	0.27	0.00	-0.10	5.15	0.00	0.00	0.00	0.06	0.00	5.54	2.96	1
2040	0.5134	2040/2041	17	1	0.16	0.27	0.00	-0.10	5.19	0.00	0.00	0.00	0.06	0.00	5.58	2.86	1
2041	0.4936	2041/2042	18	1	0.17	0.26	0.00	-0.10	5.23	0.00	0.00	0.00	0.06	0.00	5.62	2.77	1
2042	0.4746	2042/2043	19	1	0.18	0.26	0.00	-0.10	5.26	0.00	0.00	0.00	0.05	0.00	5.66	2.69	1
2043	0.4564	2043/2044	20	1	0.19	0.26	0.00	-0.11	5.30	0.00	0.00	0.00	0.05	0.00	5.70	2.60	1
2044	0.4388	2044/2045	21	1	0.21	0.25	0.00	-0.11	5.34	0.00	0.00	0.00	0.05	0.00	5.74	2.52	1
2045	0.4220	2045/2046	22	1	0.22	0.25	0.00	-0.11	5.38	0.00	0.00	0.00	0.05	0.00	5.78	2.44	1
2046	0.4057	2046/2047	23	1	0.23	0.24	0.00	-0.11	5.41	0.00	0.00	0.00	0.05	0.00	5.83	2.36	1
2047	0.3901	2047/2048	24	1	0.24	0.24	0.00	-0.11	5.45	0.00	0.00	0.00	0.05	0.00	5.87	2.29	1
2048	0.3751	2048/2049	25	1	0.25	0.24	0.00	-0.12	5.49	0.00	0.00	0.00	0.04	0.00	5.91	2.22	1
2049	0.3607	2049/2050	26	1	0.26	0.23	0.00	-0.12	5.53	0.00	0.00	0.00	0.04	0.00	5.95	2.15	1
2050	**0.3468**	2050/2051	**27**	**1**	0.28	0.23	0.00	-0.12	5.56	0.00	0.00	0.00	0.04	0.00	5.99	2.08	1
2051	0.3335	2051/2052	28	1	0.29	0.23	0.00	-0.12	5.60	0.00	0.00	0.00	0.04	0.00	6.03	2.01	1
2052	0.3207	2052/2053	29	1	0.30	0.22	0.00	-0.12	5.64	0.00	0.00	0.00	0.04	0.00	6.07	1.95	1
2053	0.3083	2053/2054	30	1	0.31	0.22	0.00	-0.12	5.68	0.00		0.00	0.03	0.00	6.11	1.89	1
2054	0.2965	2054/2055	31	1	0.32	0.21	0.00	-0.13	5.71	0.00	0.00	0.00	0.03	0.00	6.16	1.82	1
2055	0.2851	2055/2056	32	1	0.33	0.21	0.00	-0.13	5.75	0.00	0.00	0.00	0.03	0.00	6.20	1.77	1
2056	0.2741	2056/2057	33	1	0.35	0.21	0.00	-0.13	5.79	0.00	0.00	0.00	0.03	0.00	6.24	1.71	1
2057	0.2636	2057/2058	34	1	0.36	0.20	0.00	-0.13	5.83	0.00	0.00	0.00	0.03	0.00	6.28	1.66	1
2058	0.2534	2058/2059	35	1	0.37	0.20	0.00	-0.13	5.86	0.00	0.00	0.00	0.03	0.00	6.32	1.60	1
2059	0.2437	2059/2060	36	1	0.38	0.19	0.00	-0.14	5.90	0.00	0.00	0.00	0.02	0.00	6.36	1.55	1
2060	0.2343	2060/2061	37	1	0.39	0.19	0.00	-0.14	5.94	0.00	0.00	0.00	0.02	0.00	6.40	1.50	1
2061	0.2253	2061/2062	38	1	0.40	0.19	0.00	-0.14	5.98	0.00	0.00	0.00	0.02	0.00	6.44	1.45	1
2062	0.2166	2062/2063	39	1	0.42	0.18	0.00	-0.14	6.01	0.00	0.00	0.00	0.02	0.00	6.49	1.40	1
2063	0.2083	2063/2064	40	1	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	6.53	1.36	1
2064	0.2003	2064/2065	41	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2065	0.1926	2065/2066	42	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2066	0.1852	2066/2067	43	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2067	0.1780	2067/2068	44	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2068	0.1712	2068/2069	45	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2069	0.1646	2069/2070	46	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2070	0.1583	2070/2071	47	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2071	0.1522	2071/2072	48	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2072	0.1463	2072/2073	49	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2073	0.1407	2073/2074	50	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2074	0.1353	2074/2075	51	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2075	0.1301	2075/2076	52	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2076	0.1251	2076/2077	53	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2077	0.1203	2077/2078	54	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2078	0.1157	2078/2079	55	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2079	0.1112	2079/2080	56	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2080	0.1069	2080/2081	57	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2081	0.1028	2081/2082	58	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2082	0.0989	2082/2083	59	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2083	0.0951	2083/2084	60	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2084	0.0914	2084/2085	61	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2085	0.0879	2085/2086	62	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2086	0.0845	2086/2087	63	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
2087	0.0813	2087/2088	64	0	0.43	0.18	0.00	-0.14	6.05	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0
					Travel Time	**CRV**	**Reliability**	**VOC**	**PT**	**Crash**	**Crash 2**	**Cycle**	**Emission**	**Other**	**Total (included yea**	**NPV**	
			Sum over 38.5 included years		8.29	8.54	0.06	-3.95	210.38	0.00	0.00	0.00	1.62	0.00	224.94	104.94	
			NPV Sum		3.04	4.03	0.04	-1.65	98.65	0.00	0.00	0.00	0.82	0.00	104.94		

First Full Year	3
First Full Year Benefits	0.00
Discounted	0.00
Discounted Costs	77.2
FYRR	0.0%

Project Benefits - Discounting

Scenario: Opt_Gold
Compared to: DM
Method: VTM
Time Zero: 2024

	Equity Factor
TT	1.000
CRV	1.000
Reliability	1.000
VOC	1.000

	Scenario	Compared to		VTM Terms				
TRAVEL TIME	Opt_Gold	DM		1				
Year	**RC**	**UC**					**Benefits**	**Adjusted**
2018	0.00	0.00					0.00	0.00
2035	5.12	-4.68					0.44	0.44
2053	5.93	-4.74					1.19	1.19
CRV								
Year								
2018	0.00	0.00					0.00	0.00
2035	1.13	-0.80					0.34	0.34
2053	1.59	-0.93					0.67	0.67
Reliability								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.02	0.02
2053	0.00	0.00					0.00	0.00
VOC								
Year								
2018	0.00	0.00					0.00	0.00
2035	1.32	-1.32					0.00	0.00
2053	1.35	-1.27					0.08	0.08
PT								
Year								
2018	10.69	0.00					10.69	10.69
2035	10.51	0.00					10.51	10.51
2053	12.07	0.00					12.07	12.07
Crash Saving (excluding intersection and crossing points)								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.00	0.00
2053	0.00	0.00					0.00	0.00
Cycle								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.00	0.00					0.00	0.00
2053	0.00	0.00					0.00	0.00
Emission								
Year								
2018	0.00	0.00					0.00	0.00
2035	0.13	0.00					0.13	0.13
2053	0.06	0.00					0.06	0.06

Start Construction 1
Construction Period 2
Benefits Start in year: 3 Benefit Streams, $/year

Model	SPPWF	FY	Analysis Year	Include	Travel Time	CRV	Reliability	VOC	PT	Crash		Cycle	Emission	Other	Total (included yea	NPV
		2020/2021		0											0.00	0.00
2018	1.0000	2018/2019	-5	0	0.00	0.00	0.00	0.00	10.69	0.00		0.00	0.00	0.00	0.00	0.00
2019	1.0000	2019/2020	-4	0	0.02	0.02	0.00	0.00	10.68	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2020	1.0000	2020/2021	-3	0	0.05	0.04	0.00	0.00	10.67	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2021	1.0000	2021/2022	-2	0	0.07	0.06	0.00	0.00	10.66	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2022	1.0000	2022/2023	-1	0	0.10	0.08	0.00	0.00	10.65	0.00	0.00	0.00	0.03	0.00	0.00	0.00
2023	**1.0000**	2023/2024	**0**	**0**	0.12	0.09	0.01	0.00	10.64	0.00	0.00	0.00	0.04	0.00	0.00	0.00
2024	0.9615	2024/2025	1	0	0.15	0.11	0.01	0.00	10.63	0.00	0.00	0.00	0.04	0.00	0.00	0.00
2025	0.9246	2025/2026	2	0.5	0.17	0.13	0.01	0.00	10.62	0.00	0.00	0.00	0.05	0.00	5.49	5.08
2026	0.8890	2026/2027	3	1	0.20	0.15	0.01	0.00	10.61	0.00	0.00	0.00	0.06	0.00	11.02	9.80
2027	0.8548	2027/2028	4	1	0.22	0.17	0.01	0.00	10.60	0.00	0.00	0.00	0.07	0.00	11.06	9.46
2028	**0.8219**	2028/2029	**5**	**1**	0.25	0.19	0.01	0.00	10.59	0.00	0.00	0.00	0.07	0.00	11.11	9.13
2029	0.7903	2029/2030	6	1	0.27	0.21	0.01	0.00	10.58	0.00	0.00	0.00	0.08	0.00	11.15	8.81
2030	0.7599	2030/2031	7	1	0.29	0.23	0.01	0.00	10.57	0.00	0.00	0.00	0.09	0.00	11.19	8.50
2031	0.7307	2031/2032	8	1	0.32	0.24	0.02	0.00	10.56	0.00	0.00	0.00	0.10	0.00	11.23	8.21
2032	**0.7026**	2032/2033	**9**	**1**	0.34	0.26	0.02	0.00	10.55	0.00	0.00	0.00	0.10	0.00	11.27	7.92
2033	0.6756	2033/2034	10	1	0.37	0.28	0.02	0.00	10.54	0.00	0.00	0.00	0.11	0.00	11.31	7.64
2034	0.6496	2034/2035	11	1	0.39	0.30	0.02	0.00	10.53	0.00	0.00	0.00	0.12	0.00	11.36	7.38
2035	0.6246	2035/2036	12	1	0.44	0.34	0.02	0.00	10.51	0.00		0.00	0.13	0.00	11.44	7.15
2036	0.6006	2036/2037	13	1	0.48	0.36	0.02	0.00	10.59	0.00	0.00	0.00	0.13	0.00	11.59	6.96
2037	0.5775	2037/2038	14	1	0.53	0.37	0.02	0.01	10.68	0.00	0.00	0.00	0.12	0.00	11.73	6.77
2038	0.5553	2038/2039	15	1	0.57	0.39	0.02	0.01	10.77	0.00	0.00	0.00	0.12	0.00	11.88	6.60
2039	0.5339	2039/2040	16	1	0.61	0.41	0.02	0.02	10.85	0.00	0.00	0.00	0.12	0.00	12.02	6.42
2040	0.5134	2040/2041	17	1	0.65	0.43	0.02	0.02	10.94	0.00	0.00	0.00	0.11	0.00	12.17	6.25
2041	0.4936	2041/2042	18	1	0.69	0.45	0.01	0.03	11.03	0.00	0.00	0.00	0.11	0.00	12.32	6.08
2042	0.4746	2042/2043	19	1	0.73	0.47	0.01	0.03	11.11	0.00	0.00	0.00	0.10	0.00	12.46	5.91
2043	0.4564	2043/2044	20	1	0.78	0.48	0.01	0.04	11.20	0.00	0.00	0.00	0.10	0.00	12.61	5.75
2044	0.4388	2044/2045	21	1	0.82	0.50	0.01	0.04	11.29	0.00	0.00	0.00	0.10	0.00	12.75	5.60
2045	0.4220	2045/2046	22	1	0.86	0.52	0.01	0.04	11.38	0.00	0.00	0.00	0.09	0.00	12.90	5.44
2046	0.4057	2046/2047	23	1	0.90	0.54	0.01	0.05	11.46	0.00	0.00	0.00	0.09	0.00	13.05	5.29
2047	0.3901	2047/2048	24	1	0.94	0.56	0.01	0.05	11.55	0.00	0.00	0.00	0.08	0.00	13.19	5.15
2048	0.3751	2048/2049	25	1	0.98	0.58	0.01	0.06	11.64	0.00	0.00	0.00	0.08	0.00	13.34	5.00
2049	0.3607	2049/2050	26	1	1.03	0.59	0.00	0.06	11.72	0.00	0.00	0.00	0.07	0.00	13.48	4.86
2050	**0.3468**	2050/2051	**27**	**1**	1.07	0.61	0.00	0.07	11.81	0.00	0.00	0.00	0.07	0.00	13.63	4.73
2051	0.3335	2051/2052	28	1	1.11	0.63	0.00	0.07	11.90	0.00	0.00	0.00	0.07	0.00	13.78	4.59
2052	0.3207	2052/2053	29	1	1.15	0.65	0.00	0.08	11.98	0.00	0.00	0.00	0.06	0.00	13.92	4.46
2053	0.3083	2053/2054	30	1	1.19	0.67	0.00	0.08	12.07	0.00		0.00	0.06	0.00	14.07	4.34
2054	0.2965	2054/2055	31	1	1.23	0.69	0.00	0.09	12.16	0.00	0.00	0.00	0.05	0.00	14.21	4.21
2055	0.2851	2055/2056	32	1	1.28	0.70	0.00	0.09	12.24	0.00	0.00	0.00	0.05	0.00	14.36	4.09
2056	0.2741	2056/2057	33	1	1.32	0.72	0.00	0.09	12.33	0.00	0.00	0.00	0.05	0.00	14.51	3.98
2057	0.2636	2057/2058	34	1	1.36	0.74	0.00	0.10	12.42	0.00	0.00	0.00	0.04	0.00	14.65	3.86
2058	0.2534	2058/2059	35	1	1.40	0.76	-0.01	0.10	12.50	0.00	0.00	0.00	0.04	0.00	14.80	3.75
2059	0.2437	2059/2060	36	1	1.44	0.78	-0.01	0.11	12.59	0.00	0.00	0.00	0.03	0.00	14.94	3.64
2060	0.2343	2060/2061	37	1	1.48	0.79	-0.01	0.11	12.68	0.00	0.00	0.00	0.03	0.00	15.09	3.54
2061	0.2253	2061/2062	38	1	1.53	0.81	-0.01	0.12	12.76	0.00	0.00	0.00	0.02	0.00	15.24	3.43
2062	0.2166	2062/2063	39	1	1.57	0.83	-0.01	0.12	12.85	0.00	0.00	0.00	0.02	0.00	15.38	3.33
2063	0.2083	2063/2064	40	1	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	15.53	3.23
2064	0.2003	2064/2065	41	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2065	0.1926	2065/2066	42	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2066	0.1852	2066/2067	43	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2067	0.1780	2067/2068	44	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2068	0.1712	2068/2069	45	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2069	0.1646	2069/2070	46	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2070	0.1583	2070/2071	47	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2071	0.1522	2071/2072	48	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2072	0.1463	2072/2073	49	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2073	0.1407	2073/2074	50	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2074	0.1353	2074/2075	51	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2075	0.1301	2075/2076	52	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2076	0.1251	2076/2077	53	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2077	0.1203	2077/2078	54	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2078	0.1157	2078/2079	55	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2079	0.1112	2079/2080	56	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2080	0.1069	2080/2081	57	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2081	0.1028	2081/2082	58	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2082	0.0989	2082/2083	59	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2083	0.0951	2083/2084	60	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2084	0.0914	2084/2085	61	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2085	0.0879	2085/2086	62	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2086	0.0845	2086/2087	63	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2087	0.0813	2087/2088	64	0	1.61	0.85	-0.01	0.13	12.94	0.00	0.00	0.00	0.02	0.00	0.00	0.00
					Travel Time	**CRV**	**Reliability**	**VOC**	**PT**	**Crash**	**Crash 2**	**Cycle**	**Emission**	**Other**	**Total (included yea**	**NPV**
			Sum over 38.5 included years		32.48	19.31	0.28	1.81	440.38	0.00	0.00	0.00	2.99	0.00	497.24	226.35
			NPV Sum		12.14	7.58	0.19	0.55	204.33	0.00	0.00	0.00	1.56	0.00	226.35	

First Full Year	3
First Full Year Benefits	0.00
Discounted	0.0
Discounted Costs	77.2
FYRR	0.0%

Benefit Cost Anlaysis

Worksheet 3 VTM

Project: **Taranaki PT SSBC (DM Cost Included)**
Component: **Jul-24**
Discount Rate: **4%**
Analysis Period: **40**

	Project Options Code Compared Against	DM	Opt_Bronze DM	Opt_Silver DM	Opt_Gold DM
	VTM Code		Opt_BronzeDM	Opt_SilverDM	Opt_GoldDM
	BENEFITS (NPV):				
1a	Travel Time Benefit		-1.6	3.0	12.1
1b	Congestion Benefit		-9.3	4.0	7.6
1c	Trip Reliability Benefit		-0.1	0.0	0.2
2	Vehicle Operating Cost Benefit		2.3	-1.6	0.5
3	Public Transport Benefit		71.6	98.7	204.3
4	Crash Saving Benefit		0.0	0.0	0.0
5	Cycle Benefit		0.0	0.0	0.0
6	Emission Benefit		0.6	0.8	1.6
7					
8	**PV Total Net Benefits**		**63.5**	**104.9**	**226.4**
9	**Assumed WEBs %**				
10	**Agglomeration Benefits**		0.0	0.0	0.0
11	**PV Benefits inclu Agglomeration**		**63.5**	**104.9**	**226.4**
	COSTS (NPV):				
12	Pre Implementation	0.0	0.0	0.0	0.0
13	Land	0.0	0.0	0.0	0.0
14	Construction	0.0	1.9	1.9	1.9
15	PT Operating Cost	64.3	0.0	11.0	68.0
16	Annual and Periodic Maintenance	0.0	0.0	0.0	0.0
18	**PV of Total Net Costs**	64.3	1.9	12.9	69.9
19	**National BCR excluding Agglomeration = (8)/(18)**		**33.7**	**8.1**	**3.2**