
State Highway 2: Ngauranga to Te Marua (as part of a multi-modal corridor)

NZ Transport Agency

August 2016

VERSION 1.0

Programme Business Case



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TE AWA KAIRANGI

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SUPPORTING DOCUMENTS

The supporting documents for the programme business case include:

- SH2 Ngauranga to Te Marua Strategic Case, 2015, NZTA
- SH2 Hutt Corridor Strategic Study, 2010, NZTA
- The Regional Land Transport Plan (RLTP) including Hutt Corridor Strategy, 2015, Greater Wellington Regional Council (GWRC)
- Other project investigations

GLOSSARY OF TERMS

TERM	DEFINITION
BCR	Benefit Cost Ratio
BRT	Bus Rapid Transport
DBC	Detailed Business Case
DSi	Death and Serious Injury
EEM	Economic Evaluation Manual
FAR	Funding Assistance Rate
GWRC	Greater Wellington Regional Council
HCC	Hutt City Council
HCV	Heavy Commercial Vehicle
HILP	High Impact Low Probability Event
IAF	Investment Assessment Framework
IBC	Indicative Business Case
ILM	Investment Logic Mapping
ITS	Intelligent Transport Systems
KPI	Key Performance Indicator
LIHP	Low Impact High Probability Event
LTP	Long Term Plan
LoS	Level of Service
MCA	Multi Criteria Analysis
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
NZTA	NZ Transport Agency

ONRC	One Network Road Classification
PBC	Programme Business Case
PIKB	Planning and Investment Knowledge Base
PPP	Public Private Partnership
PT	Public Transport
RLTP	Regional Land Transport Plan
RMA	Resource Management Act
SATURN	Traffic Model - Simulation and Assignment of Traffic to Urban Road Networks
SH(#)	State Highway (number)
SMART (objectives)	Specific, measurable, assignable, realistic and time-related
TDM	Travel Demand Management
TREIS	Traffic Road Event Information System - Transport Agency incident database that records reported events that disrupt highway traffic
UHCC	Upper Hutt City Council
VAC	Value Assurance Committee
VPD	Vehicles per day
WCC	Wellington City Council

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EXECUTIVE SUMMARY

CONTEXT

The Wellington Region is the third largest in New Zealand, accounting for 11% of the population and 12% of the workforce. It is also the second largest economy and contains the centre of Government and large social services and business services sectors.

The two largest centres within the Wellington Region are Wellington City and the Hutt Valley. Accordingly, the transport corridor between these two centres is vital to the economy of the Wellington Region.

This programme business case considers the section of SH2 between Ngauranga and Te Marua. The corridor carries over 115,000 multi-modal commuters and 4,000 heavy vehicles per day as well as significant volumes of rail freight connecting to CentrePort, one of New Zealand's largest ports. SH2 is also a vital corridor in the national network, linking Wellington and Auckland along the east coast of the North Island.

PROBLEMS AND BENEFITS

The stakeholder panel identified and agreed the following key problems:

- **Problem one:** "Poor configuration and operational environment of SH2 and associated local network results in poor multi-modal network performance." (50%)
- **Problem two:** "High traffic volumes and insufficient network capacity results in peak delay and unreliable journey times that adversely affect regional productivity." (30%)
- **Problem three:** "Constrained topography, the geology and lack of alternative routes results in poor network resilience." (20%)

The evidence supporting the problem is:

- There have been almost 1,000 crashes on this section of SH2 in the last 5 years, which resulted in 59 deaths and serious injuries.
- The majority of the route is classified as having a Medium-High or High Collective Risk.
- Rail journeys are typically on time, but the trains and park and ride facilities are approaching or over capacity.
- Trips on SH2 that take 25 minutes in the off peak period take between 35 and 65 minutes in the morning peak period.
- Minor events (e.g. rear-end non-injury crashes) have large, network wide, impacts.
- The corridor is at risk of flooding, landslides, tsunami, climate change impacts, earthquakes and liquefaction. In the last five years the highway and rail lines have been closed on multiple occasions, including a storm in June 2013 which washed out the rail line for over a week. These events have a massive impact on commuters as there is no simple alternative route.

The investment objectives for this corridor were agreed and discussed with the investment partners and key stakeholders. They are:

- Improve travel time reliability on SH2 between Ngauranga and Te Marua;
- Improve public transport in the Hutt valley;
- Improve the safety of the transport corridor by reducing the number of deaths and serious injuries;
- Improve the quality of infrastructure by increasing the KiwiRAP Star Rating;
- Increase availability along the transport corridor by reducing the number of journeys impacted by natural closures and delays.

OPTIONS AND PROGRAMMES

A total of 110 options were suggested by stakeholders and investment partners during a facilitated workshop session. These were consolidated and compiled into programmes by the project team. After analysis and discussion with stakeholders and investors, the “Multi-Modal Medium” programme was agreed as the recommended programme, as it:

- Provides a balanced solution across all investment objectives;
- Is likely to meet customer expectations in regards to improvements across all modes; and
- Provides an appropriate response to the problems without including some larger infrastructure projects which are high risk, high cost and unlikely to be necessary.

RECOMMENDED PROGRAMME

The recommended programme incorporates wide-ranging measures to improve the performance of the transport corridor including:

- Increasing capacity on rail;
- Increasing capacity on road;
- Reducing demand for peak hour travel;
- Improving road safety; and
- Improving resilience of the network.

The recommended programme is estimated to cost between \$1.4 billion and \$2.1 billion. It includes investment for rail, road, bike, bus and foot, as well as considering access, land use and travel demand management.

The overall outcomes of the recommended programme are:

- Travel time reliability on the state highway will improve by around 30%; i.e. the once-a-month worst trip that currently takes 65 minutes will now take 40 minutes.
- There will be regular 10 minute peak services on the Hutt Valley Rail Line compared to irregular 20 minutes services currently. There will also be a 6 minute journey time reduction.
- Deaths and serious injuries on the state highway will reduce from 59 every 5 years to around 30.
- The state highway will have a minimum KiwiRAP 4 star rating.
- The number of closures over a five year period are expected to reduce from 7 to 2 along with a reduction in the number of journeys impacted by future events.

A visual summary of the recommended programme is contained in Appendix A.

PART A – THE STRATEGIC CASE

1 INTRODUCTION

1.1 STRATEGIC CASE

State Highway 2 is a vital transport route that runs from Wellington to south of Auckland. Within the Wellington Region, it is the principal commuter and freight route linking Wellington, the Hutt Valley and the Wairarapa.

The New Zealand Transport Agency developed a Strategic Case for SH2 (as part of a multi-modal corridor) from Ngauranga to Te Marua in July 2015 to determine the problems along this corridor and to identify the potential benefits of investment. As part of the strategic case, a facilitated investment logic mapping workshop (ILM) was held with key stakeholders to gain a better understanding of the current issues and opportunities along the corridor. The stakeholder panel identified and agreed on three key problems, which are presented in Table 1-1 below.

Table 1-1: Strategic Case Conclusions

Problems Identified in the ILM	Key Findings in the Strategic Case	Conclusions
Problem one: Poor configuration and operational environment of SH2 and associated local network results in poor multi-modal network performance.	There are many areas of concern including curves, road cross section and intersection form. Overall, this results in delays, unreliable journeys and a high crash rate.	There is a need to reduce the 250 injury crashes that are occurring every five years.
Problem two: High traffic volumes and insufficient network capacity results in peak delay and unreliable journey times that adversely affect regional productivity.	Sections coming under the most pressure include Petone to Ngauranga, Upper Hutt to Silverstream and many intersections. This results in congestion and travel time variability of up to half an hour in peak periods.	The very large travel time variability impacts on getting people to work and goods to their destination on time.
Problem three: Constrained topography, the geology and lack of alternative routes results in poor network resilience.	This section of SH2 has been affected by crashes, landslides, flooding and storm events. The most critical section is between Ngauranga and Petone.	Doing nothing could result in an inability to respond to storm events such as in 2013 and 2015, and also to many more man-made events which have the potential to have significant economic impact.

1.2 SCOPE AND PURPOSE

This Programme Business Case (PBC) is being progressed to confirm the problems, benefits and opportunities identified in the Strategic Case, identify a range of options and alternatives that help address the problems, develop potential programmes of activities and compare these programmes against agreed investment objectives and key performance attributes. This will help investors to make a decision on a recommended programme for this multi-modal transport corridor over the short, medium and long term.

The PBC relates to the entire transport network along this corridor; not just one mode. In particular, road and rail need to continue to operating efficiently and effectively together as a system, as any issue with one impacts on the operation of both.

2 PARTNERS AND KEY STAKEHOLDERS

The partners and key stakeholders involved in informing this Programme Business Case have excellent knowledge of the corridor and surrounding network. They have also had involvement in previous studies, the Strategic Case phase and throughout this Programme Business Case. Developing and implementing the right programme of improvements along this corridor would not be possible without the full involvement of the investment partners and stakeholders outlined in the sections below. They have been involved through individual discussions and the workshops, which act as hold points through the PBC process, as shown in Figure 2-1 below.

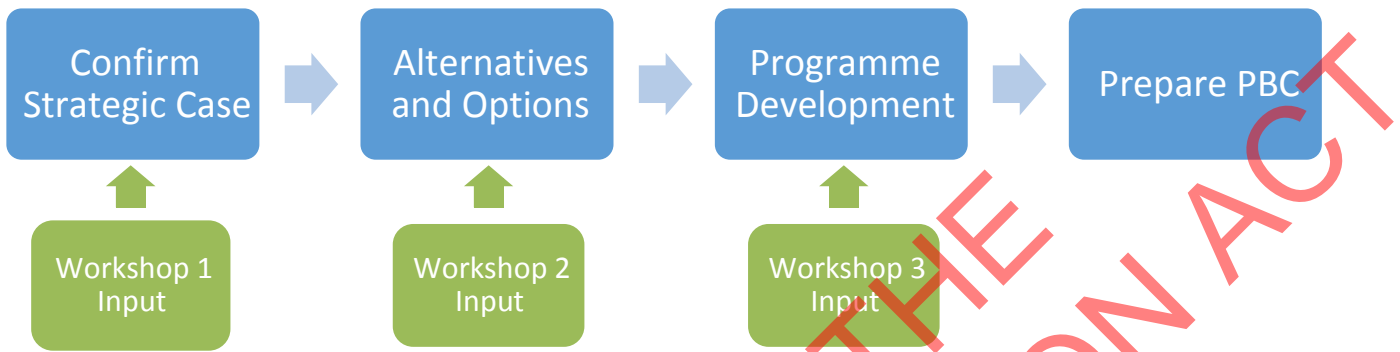


Figure 2-1: PBC Process and Stakeholder Workshops

2.1 INVESTMENT PARTNERS

The investment partners involved in the PBC process are outlined in Table 2-1 below. Through the PBC process, these parties have understood that this is a multi-agency study which may require investment from them as partners. As the transport network is one system, so these investment partners need to be, otherwise the achievement of the investment outcomes may not be realised.

Table 2-1: Investment Partners

Investment Partner	Focus areas
NZ Transport Agency	<p>The Agency’s primary purpose is to provide transport solutions for a thriving New Zealand.</p> <p>They achieve this by investing in land transport activities, regulating access and use of the land transport system, and maintaining, operating, planning for and improving the state highways.</p> <p>Investment in the state highway network is essential to solving the problems identified and to fully realise the benefits of investing.</p>
Wellington City Council	<p>The Wellington City Council is responsible for fully managing the local road, walking and cycling network that forms, with the state highway, the land transport network connecting Wellington City to Porirua and the Hutt Valley.</p> <p>Investment by the Council could improve the local network to help realise the benefits for solving Problems 1, 2 and 3 as identified in the strategic case.</p>
Hutt City Council	<p>The Hutt City Council is responsible for fully managing the local road, walking and cycling network that forms, with the state highway, the land transport network connecting Petone to Stokes Valley.</p> <p>Investment by the Council could improve the local network to help realise the benefits for solving Problems 1, 2 and 3 as identified in the strategic case.</p>

Investment Partner	Focus areas
Upper Hutt City Council	<p>The Upper Hutt City Council is responsible for fully managing the local road, walking and cycling network that forms, with the state highway, the land transport network connecting Stokes Valley to Te Marua.</p> <p>Investment by the Council could improve the local network to fully realise the benefits for solving Problems 1 and 3 as identified in the strategic case.</p>
Greater Wellington Regional Council	<p>Greater Wellington Regional Council (GWRC) is responsible for public transport and transport planning in the region.</p> <p>Investment by GWRC could improve the integration of modes, active modes (walking and cycling), and public transport services (e.g. bus and rail). Investment could fully realise the benefits for solving Problems 1 and 2 as identified in the strategic case.</p>
KiwiRail	<p>KiwiRail is responsible for nationwide rail infrastructure.</p> <p>Investment by KiwiRail could improve the rail infrastructure and services in addition to improving modal integration.</p>

2.2 KEY STAKEHOLDERS

In addition to the investment partners presented above, there are a number of key stakeholders who have interests in the SH2 corridor and the outcomes of the PBC. The key stakeholders who have been specifically consulted throughout this study, and their focus areas, are outlined in Table 2-2 below.

Table 2-2: Partners and Key Stakeholders

Stakeholders	Focus areas
Road Transport Association	Represents the interests of road transport operators, primarily road freight.
Automobile Association	Road safety.
Wellington Lifelines Group	<p>Understanding hazards, risk reduction measures.</p> <p>Developing best practice approaches to risk reduction, readiness, response and recovery for lifelines.</p>
Hutt Cycle Network	<p>Better cycling environment - including improved safety for cyclists, creation of a good cycling environment and integrated cycle planning.</p> <p>Promotion of cycling, resulting in increased numbers of cyclists.</p>
CentrePort	Transport logistics - intermodal hub linking road, rail, domestic and international shipping services.
NZ Police	Enforcement and road safety of all road users.

There are a wide range of other stakeholders who will be taking an interest in this corridor and will need to be specifically considered during public consultation. A Consultation Strategy for the corridor will need to be prepared before future phases are implemented (see Part C).

2.3 INTERFACES

There are a number of other activities currently proceeding, or due to proceed, with which co-ordination is needed to ensure the SH2 outcomes are successfully achieved. Some of these key activities are as follows:

- **Ngauranga to Airport (N2A)** is a partnership between Wellington City Council, Greater Wellington Regional Council, the New Zealand Transport Agency and other local agencies to jointly identify, plan and deliver significant and integrated improvements across the Wellington transport system in the corridor between the Wellington Urban Motorway and Wellington International Airport.
- **Wellington Resilience Programme Business Case**, which is due to start in 2016 and will consider high risk areas, including parts of this SH2 corridor.
- **Wellington Port Access Programme Business Case**, which is running concurrent with this PBC to consider access to and from CentrePort
- **Masterton to Te Marua Programme Business Case**, which is also running concurrent with this PBC and considered investment in the transport network north of this study area.
- **Petone to Grenada Link Road**, which is currently under investigation and could result in different traffic patterns on SH2, depending on the layout of the Petone Interchange.

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3 PROGRAMME CONTEXT

This chapter outlines the geographic, environmental, social, economic and transport context to the Programme Business Case, presented in a series of maps.

The Ngauranga to Te Marua corridor has the function of connecting Wellington to the Hutt Valley and Wairarapa. Within the Wellington region it is the only commuter and freight route between these centres.

The scope of this PBC considers the SH2 corridor from the Ngauranga Interchange (SH2 RP: 962/16.7) to Te Marua (SH2 RP: 931/13.4) a distance of approximately 33 km, highlighted in Figure 3-1 below.



Figure 3-1: Regional Context

The geographic and environmental context is:

- Between Ngauranga and Petone, SH2 and the Hutt Valley Railway Line occupy a narrow strip of flat land between a steep escarpment and the Wellington Harbour. Between Petone and Te Marua, the highway route is located on the western side of the Hutt Valley, directly below steep hills and adjacent to the Hutt River. The corridor is bound on the north-western side by parkland, including the Belmont Regional Park and the Battle Hill Farm Forest Park.
- The Hutt River runs alongside the highway through Upper Hutt and crosses the highway to the south of the Moonshine Road intersection. To the south of Upper Hutt, the river follows the rail line before re-joining the highway at the northern extent of Lower Hutt, before diverting to the Wellington Harbour with the river mouth located east of Petone. The Wellington Fault runs roughly parallel to SH2 and the Hutt River through the study area.



Figure 3-2: Social Context

The social context is:

- The SH2 corridor provides an important access function for communities (with strong commuter populations) traveling to and from Porirua, Wellington City and the Hutt Valley, and a wider access and freight function for the lower North Island and beyond. It also operates as a key link connecting the different areas of the Hutt Valley
- The local populations through the Hutt Valley and Wairarapa are expected to increase only modestly over the next 30 years. The Statistics NZ medium projection is for a combined increase of 10,000 people over 30 years, a growth rate of +0.4% p.a¹. In comparison, the national medium term growth projection is approximately double at 0.8% p.a.
- Unemployment across the Hutt Valley is similar to the national average of 7% based on 2013 Census data.
- There are a large number of schools throughout the study area. The largest schools are Hutt Valley High in Lower Hutt and Upper Hutt College, both with rolls of over 1,600 and 1,000 students respectively. In addition, the Wellington Institute of Technology (WelTec) is based in Petone and has a roll of over 8,500 students (equivalent to over 4,000 equivalent full time students). In addition, there are many students in the Hutt Valley who travel to schools or tertiary institutions in Wellington.
- The main hospital for the Hutt Valley DHB is the Hutt Valley Hospital which is located within Lower Hutt; however some services are only provided by the Wellington Regional Hospital in Wellington City.

¹ There is a possibility that population growth could be higher than this. BERL (2012 Upper Hutt Analysis p2) judge a high growth future is likely for Upper Hutt (i.e. +0.8% p.a.) and the Upper Hutt and Hutt Councils are actively monitoring and planning to ensure section supply does not impose a constraint on population growth.

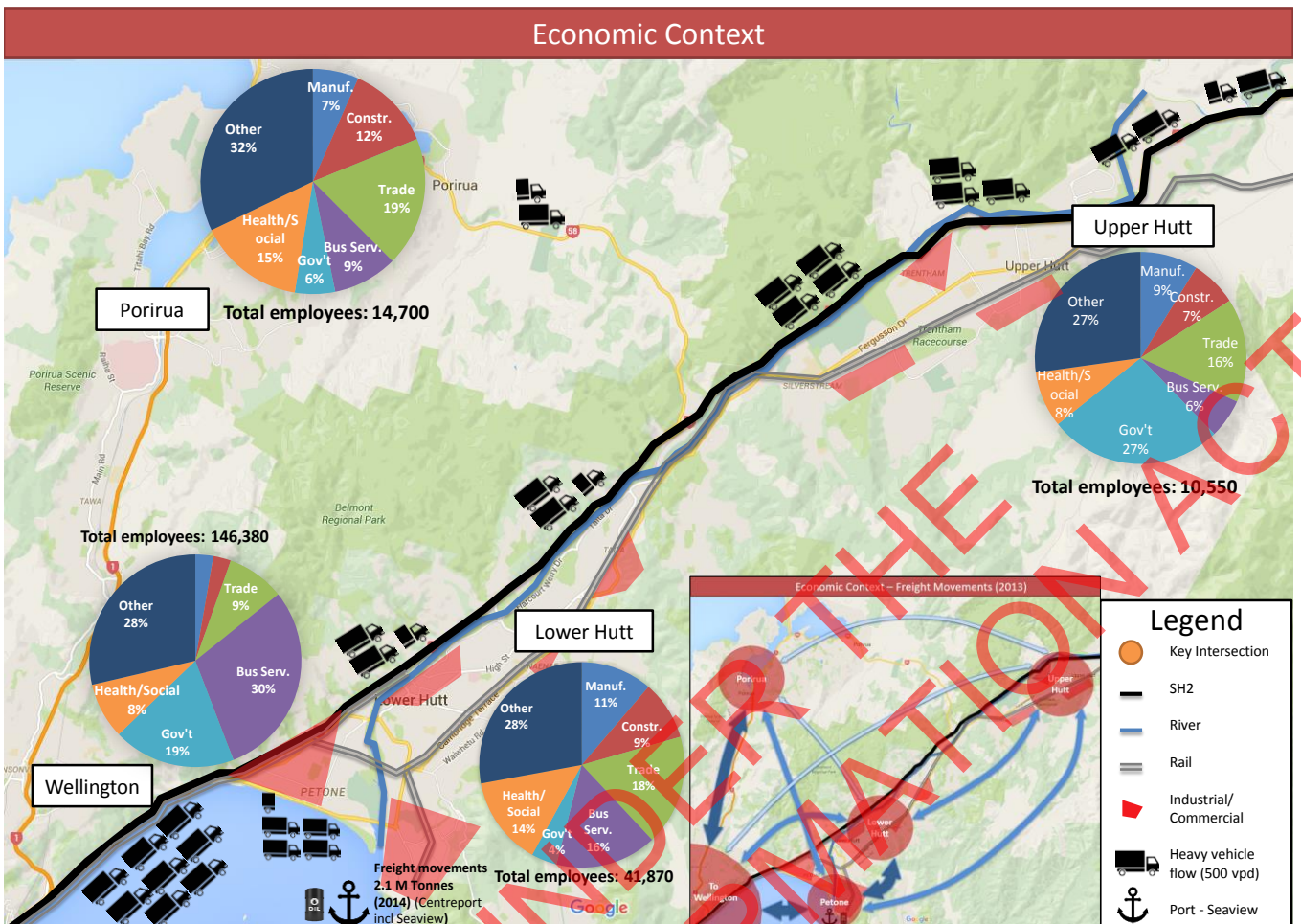


Figure 3-3: Economic Context

The economic context is:

- The Wellington Region has the second-largest economy in New Zealand and contributes 13.2% of New Zealand's GDP and has 10.9% of New Zealand's population².
- The two largest economic centres within the Wellington Region are Wellington City and the Hutt Valley. Accordingly there are many commuter, shopping, entertainment and economic trips between the two.
- The highest volume of journeys are made by commuters. Some features of this commuting are:
 - Approximately half of commuting trips are made by train.
 - Most commuters are managers, professionals and administrative workers travelling to Wellington CBD.
 - Around 80% of trips occurring in the peak periods are commuter trips (GW 2015 RLTP WP2).
 - Over 70% of Wellington inflow is from the Hutt Valley/Wairarapa direction (GW 2015 RLTP).
- The 2014 National Freight Demand Study estimated that a total freight load of 17 million tonnes was shifted into, from and around the Wellington region (including the Wairarapa) by road in 2012, with an additional 1 million tonnes by rail. The study forecast estimates this figure will rise to 30 million tonnes by 2042.
- The key heavy vehicle movements, as presented in Figure 3-3 above (refer to the inset map), include trips in both directions between:
 - Wellington and Seaview/Petone;
 - Seaview/Petone and Lower Hutt; and
 - Porirua/Tawa and Wellington.

² Ministry of Business, Innovation and Employment, Regional Economic Activity Report, 2015

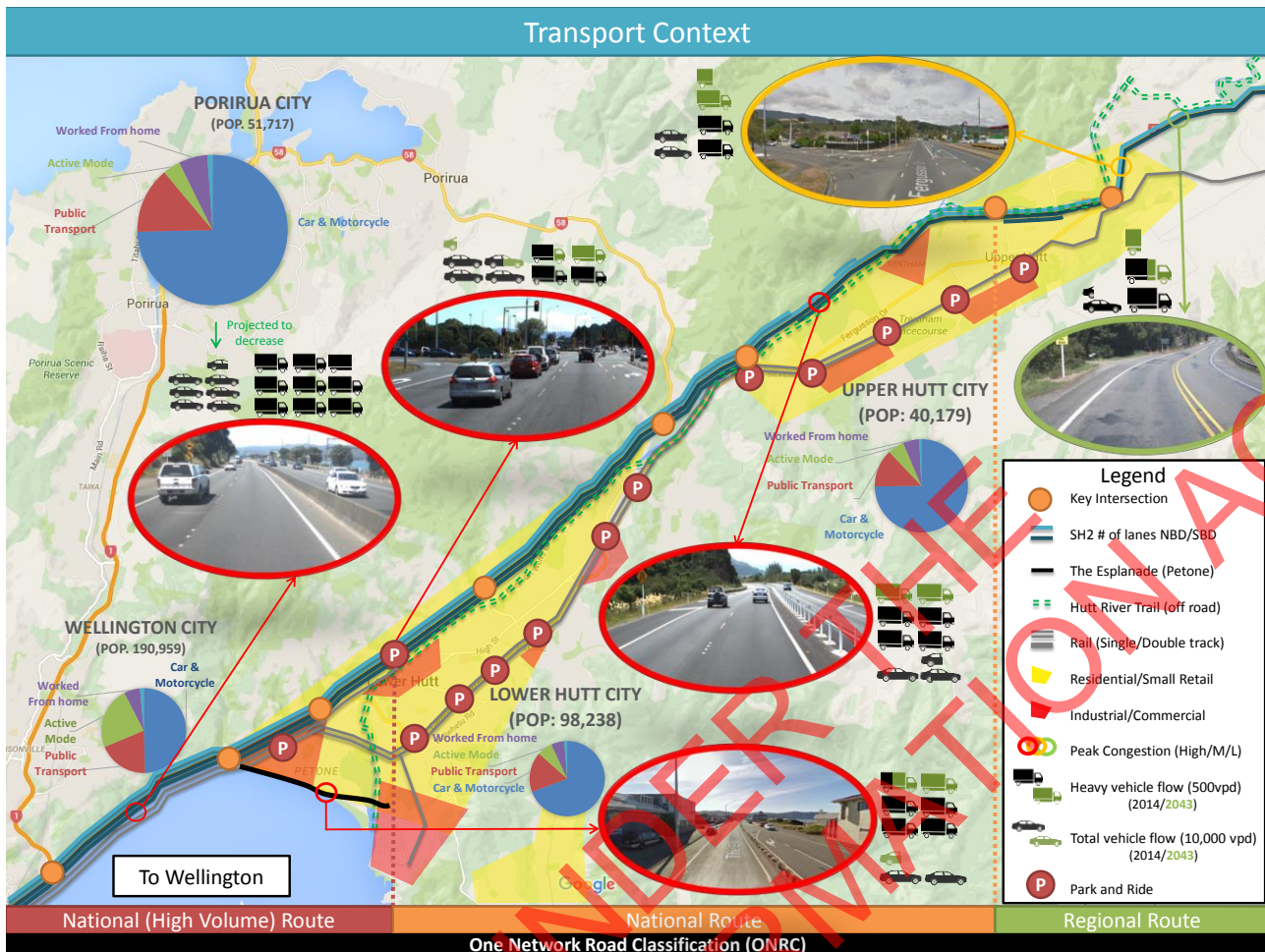


Figure 3-4: Transport Context

The transport context is:

SH2

- SH2 is a National (High Volume) Route from Ngauranga to Melling; a National Route from Melling to Gibbons Street; and a Regional Route from Gibbons Street to Te Marua. Traffic volumes on the corridor are approximately 70,000 vpd between Ngauranga and Petone, 35,000 vpd past Lower Hutt, 25,000 vpd past Upper Hutt and 12,000 vpd north of Upper Hutt. These volumes result in significant congestion in peak periods.
- In terms of form, the highway is a four lane median divided highway from Ngauranga to Upper Hutt; a 2 lane highway with passing lanes past Upper Hutt; a 2 lane urban highway through Maoribank; then a 2 lane rural highway to Te Marua. There are a number of signalised and non-signalised intersections along the corridor which are out of context, particularly on the four lane sections.

Rail

- Three commuter rail lines run through the Hutt Valley: Wellington to Melling, Wellington to Hutt Valley and Wellington to Wairarapa (which is an extension of the Hutt Valley line); together, these services carry half of the 12 million rail passenger boardings in the Wellington Region per annum.
- Annual patronage from 2014 to 2015 showed growth of over 5% for both the Hutt Valley and Wairarapa lines, compared to 3% for the Kapiti line.
- The rail services have very good on-time performance; however, the demand for park and ride facilities exceeds their capacity.
- Rail freight trains operate through the Hutt Valley between Wellington/CentrePort, Masterton and Napier; however, the route is secondary to the National Main Trunk Line (NMTL). Rail freight through the Hutt Valley typically occurs overnight.

Walking and Cycling

- There is a large network of walking and cycling routes through the Hutt Valley, including the off-road Hutt River Trail and on SH2. However, a number of sections of the state highway network do not have adequate shoulder width to safely provide for cyclists.

Local Roads

- The local road network is focussed around Lower Hutt and Upper Hutt cities. There are several key local road intersections with State Highway 2 along the corridor. Congestion problems are particularly evident at Petone, where State Highway 2 connects with The Esplanade and Hutt Road.
- Parts of the local road network are at or near capacity in peak periods. In addition, due to geographical constraints, SH2 often operates as part of the local road network for trips within the Hutt Valley, especially between Lower Hutt and Upper Hutt where only one other route is available.

Bus

- There is a very good bus service network within the Hutt Valley which has a number of core services for trips within the valley and, in particular, connecting with the railway spine. Public transport trips into Wellington are services primarily by train, however there are a few bus services which do use SH2.
- Key public transport network hubs include Petone, Melling, Waterloo, Taita and Upper Hutt.

Ferry

- Harbour ferries run between Days Bay (Eastbourne/Lower Hutt) and Wellington seven days a week.

Alternate Routes

- The key alternative routes to SH2 include SH58, SH1 and the local road network spine that runs through Petone and Fergusson Drive North.
- The only alternative route for the high volume section of SH2 between Ngauranga and Petone is via SH1 and SH58, which can add an additional 30km of travel between Wellington and Lower Hutt.

Key Planned Projects

A number of projects, both in construction and in various stages of development, have the potential to significantly impact future journeys along the Ngauranga to Te Marua transport corridor. These are detailed in the uncertainty log in Section 4.3, with larger influences outlined below:

- The Transmission Gully project, currently under construction and due for completion in 2020, will have an effect on SH2 by potentially adding more traffic from the north via SH58.
- 2/58 grade separation, currently under construction along this corridor.
- The Petone to Grenada Link Road, currently under investigation, could result in traffic being taken off SH2 especially between Ngauranga and Petone but an increase in traffic north of Petone.
- Improvements to the Wellington passenger rail network, currently in development and due for completion in 2020, focusing on improved capacity, frequency and reliability of services. These are being considered as part of this PBC.

4 STRATEGIC ASSESSMENTS – OUTLINING THE NEED FOR INVESTMENT

This section discusses the problems that have been identified by the stakeholders and the outcomes that could be achieved by investing in this corridor.

4.1 DEFINING THE PROBLEM

A facilitated investment logic mapping workshop was held on 13 April 2015, as part of the Strategic Case, with key stakeholders to gain a better understanding of current issues and needs. The stakeholder panel identified and agreed the following key problems:

- **Problem one:** “Poor configuration and operational environment of SH2 and associated local network results in poor multi-modal network performance” (50%)
- **Problem two:** “High traffic volumes and insufficient network capacity results in peak delay and unreliable journey times that adversely affect regional productivity” (30%)
- **Problem three:** “Constrained topography, the geology and lack of alternative routes results in poor network resilience” (20%)

The Investment Logic Map is attached as Appendix B.

As part of this PBC, a check-in workshop was held on 15 February 2016 to ensure that the problem statements presented in the Strategic Case were still relevant and current. The stakeholders were presented additional evidence that had been collected since the completion of the strategic case and subsequently reaffirmed the problems and benefits.

Customer insight surveys³ were undertaken to gauge how people using the transport network from the Wairarapa to Wellington perceive the service and to provide insights into both their points of pain and satisfaction. A number of the key insights were found to relate directly to the problem statements, these are further outlined in the sections below.

4.1.1 Problem 1: Poor configuration and operational environment of SH2 and associated local network results in poor multi-modal network performance

Cause	Effect and Consequence
<ul style="list-style-type: none"> • The existing road and rail infrastructure is operating at or near capacity; especially during peak hours. 	<ul style="list-style-type: none"> • Peak delays are common and journey times are unreliable (Refer Problem 2 below for further detail).
<ul style="list-style-type: none"> • The standard and form of state highway infrastructure is poor and out of context in sections (e.g. traffic signals, sections below KiwiRAP 3 stars) is exacerbated by high traffic volumes; especially at conflict points. 	<ul style="list-style-type: none"> • Poor road safety performance with almost 1,000 crashes, including 59 deaths or serious injuries (DSI) occurring in the five year period from 2010 to 2014.
<ul style="list-style-type: none"> • Existing pedestrian and cycle facilities are of a poor standard and discontinuous. 	<ul style="list-style-type: none"> • People are less willing to uptake active transport modes increasing demand on the State Highway resulting in delays and unreliable journeys.
<ul style="list-style-type: none"> • Demand for facilities such as park and ride is outstripping supply. 	<ul style="list-style-type: none"> • Public transport is unable to relieve pressure on the State Highway resulting in delays and unreliable journeys.

³ ThinkPlace and NZTA, Customer Insights Informing Programme Business Cases, May 2016.

The multi-modal performance of this corridor can be measured in many ways. For this business case, the following elements have been considered:

- Rail performance including park and ride capacity;
- Pedestrian and cycle journeys;
- Delays and unreliable journeys on SH2 (covered under Problem 2); and
- Safety of SH2.

Rail Journeys

An alternative to travelling on the highway is travel by rail. The train service is currently meeting its on-time performance measures. However, as both the train service and the highway are running at or near capacity in peak hours, if an incident occurs on one mode, modal transfers result in significant effects on the operation of both modes.

The current system is not operating in an optimal manner. Patronage peaks in a 15 minute window in the morning peak period when 30% of all passengers arrive at Wellington Railway Station. During the busiest hour, 46% of all morning peak boardings on the Hutt Valley Line occur at Waterloo station.

In addition, passengers wanting to use park and ride experience problems at some of the stations in the Hutt Valley. A recent research report⁴ noted that the demand for park and ride facilities, at the Petone and Waterloo stations in particular, significantly exceeds the current supply. The report noted that this will have an impact on the number of rail journeys, with these potential rail users currently using the state highway network, placing additional demand on SH2, particularly in peak periods⁵.

Pedestrian and Cycle Journeys

The poor pedestrian and cycling environment along and across this corridor is having a severance effect and preventing communities connecting. It is also suppressing the demand for walking and cycling. The Regional Land Transport Plan (RLTP) recognises that the sites along this corridor which have this effect include:

- SH2 between Petone and Ngauranga;
- SH2 in the vicinity of SH58;
- SH2 at Cornish Street, Petone; and
- SH2 at Dowse Interchange.

In addition, it is recognised that poor perceptions of safety are limiting the uptake of cycling and mean that the benefits of cycling for the community are not being fully realised. This may place additional demand on the state highway.

Safety

Arguably, the biggest effect of the poor configuration of the current state highway is on the safety of road users. In the five year period from 2010 to 2014, almost 1,000 crashes occurred on this section of Stage Highway 2. Of these, over 200 resulted in minor injury and 59 resulted in deaths or serious injuries (DSI). The distribution of the injury crashes is shown in Figure 4-1 below.

⁴ NZTA, research report 562 TAR13/01, December 2014.

⁵ Since the report was published in late 2014, the Transport Agency and Hutt City Council have provided additional parking at Petone station to accommodate current and future demand for park and ride.

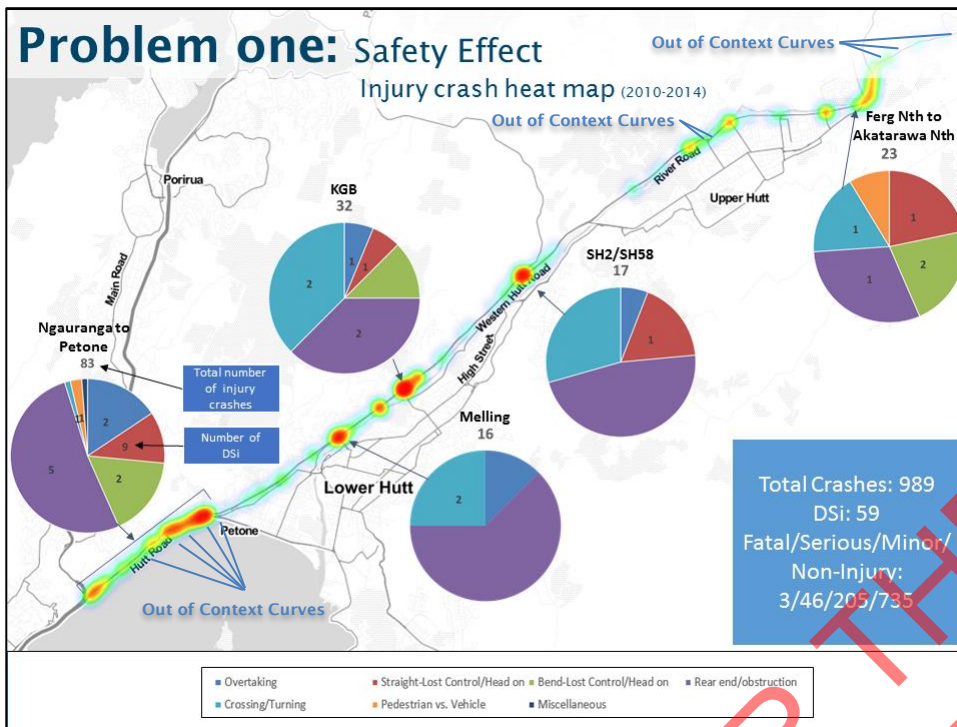


Figure 4-1: Crash Heat Map (Injury Crashes 2010-2014)

The above heat map shows the location of injury crashes, with the hotter colours reflecting higher numbers of crashes. It also shows the approximate location of the out of context curves.

The above figure shows that the crashes are spread all along the corridor, but the Petone to Ngauranga section is over represented in all crash severities, even though it is a relatively short length. This is likely a reflection of the higher traffic volumes, the five out of context curves along this stretch and the queuing experienced at the Petone and Ngauranga interchanges.

Approximately half of all crashes occurred at or near intersections. In particular, there are very high numbers of injury crashes at Petone, Melling, Kennedy Good and SH58. These intersections, plus Whakatiki Street, are also the location of high numbers of deaths and serious injuries. Again, these high crash rates reflect the location of intersections with safety deficiencies.

The majority of the route is classified as Medium-High or High Collective Risk according to the criteria in the High Risk Rural Roads Guide, which again reflects that fact that there are a very high number of crashes occurring on this route on a national level.

The KiwiRAP data (presented in Table 4-1 below) shows the typical Star ratings compared to the provisional ONRC customer levels of service outcomes.

Table 4-1: Comparison of existing and desired KiwiRAP Star Rating

Section	ONRC Classification	ONRC KiwiRAP Target	Current KiwiRAP Rating
Ngauranga to Melling	National (High Volume)	4 Star	3-4 Star
Melling to Gibbons Street (Upper Hutt)	National	3-4 Star	3-4 Star (with some 2 Star sections)
Gibbons Street North	Regional	3 Star +	2-3 Star

Customer Insights

Table 4-2 below highlights clear alignment between Problem 1 and the key insights of the research, reflecting that customers realise there is both a safety and route form issue along the corridor. They also recognise and value recent improvements.

“[if there were] less traffic lights between Belmont and Melling. It means that I would probably use that section of the motorway more frequently.”

(Source: Customer Insights SH2 PBCs)

Table 4-2: Problem 1 customer insights alignment

Problem 1	Customer Insight Alignment	Comments
Poor configuration and operational environment of SH2, and associated local network, results in poor multi-modal network performance	People are willing to use indirect/longer routes because of perceived comfort, safety and efficiency gain (key insight 1)	Commuters understand the safety risk (highlighted by poor driving behaviour) along the corridor as well as the poor intersection form, adjusting their journeys accordingly.
	The positive impacts of recent infrastructure improvements have been recognised and appreciated by road users (key insight 4)	Customers appreciate the investment on the corridor, in both road and rail, and are looking forward to the completion of the Haywards interchange and the SMART motorway, recognising the long term benefits over the short term effects (e.g. road works).
	There is an increasingly positive perception of the train service (key insight 5)	

Potential Benefits of Investment

If the route was upgraded to be a typical 4 Star state highway⁶, there is the potential to save approximately 120 of the 250 injury crashes that are currently occurring over a five year period. This will result in significant savings in terms of social cost, as well as economic saving in fewer closures and delays on the state highway network.

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⁶ Provisional ONRC customer levels of service suggest targets of 4 Star between Ngauranga and Melling, 3-4 Star between Melling and Gibbons Street, Upper Hutt, and 3 Star minimum north of Gibbons Street.

4.1.2 Problem 2: High traffic volumes and insufficient network capacity results in peak delay and unreliable journey times that adversely affect regional productivity

Cause	Effect and Consequence
<ul style="list-style-type: none"> High traffic volumes and insufficient network capacity during peak periods 	<ul style="list-style-type: none"> Peak delays are common and journey times can vary by up to 40 minutes. Minor events (e.g. rear-end non-injury crashes) have large, network wide, impacts.

Traffic volumes on this section of SH2 have been steadily increasing over the past 20 years. Current daily traffic volumes on the highway range from 5,000 vpd at Te Marua to around 69,000 vpd on the Petone to Ngauranga section.

Based on their growth strategies and Statistics NZ projections, Hutt City is expecting to grow by about 11% over the next 20 years, and Upper Hutt is expecting to grow by around 1%. Identified areas of growth include: Petone, Seaview, Wainuiomata, Stokes Valley, Wallaceville, Totara Park, Kelson and Maymorn⁷. Wellington, at the other end of the journey, is expected to grow even more with 16% growth in the 20 year period.

There will also be increasing state highway traffic, in line with a growing national economy. This includes a projected 65% increase in freight tonnage, from about 17 million tonnes to 30 million tonnes by 2042⁸.

These factors will all place additional demand on SH2, in particular during the morning and afternoon peaks.

The SH2 Hutt Corridor Strategic Study⁹ and SATURN¹⁰ transport modelling for future years shows that significant lengths of this highway are, or will be, operating at or above their theoretical capacity. The worst performing sections are shown in the Figure 4-2 below.



Figure 4-2: Sections and intersections at or approaching capacity in 2036.

⁷ Refer to the uncertainty log contained in Section 4.3 for further development information.

⁸ Ministry of Transport, National Freight Demand Study, freight movements with origins and destinations in the Wellington Region, March 2014.

⁹ NZ Transport Agency, SH2 Hutt Corridor Strategic Study, 2010.

¹⁰ SATURN is a network transportation model that has been developed by the NZ Transport Agency to model the traffic effects of a number of different transportation projects north of Wellington.

Overall, this results in 11km of the route and nine of the major intersections being at, or approaching, capacity by 2036 and therefore having a very poor, and deteriorating, Level of Service. This will impact on the ability of people to travel to work and for goods to get to market.

In addition to these sections, the performance of the remainder of the corridor, including some key local roads (e.g. the Esplanade in Petone), also continues to worsen as traffic volumes increase.

A summary of both the speeds and travel time variability in the critical morning peak period is presented in Figure 4-3 below. For vehicles travelling the entire route, the average speed is 45km/h with an average travel time of 45 minutes. However, speeds along sections of SH2, specifically south of Kennedy Good Bridge, are in the order of 30-40km/h or less and suffer from significant travel time variability.

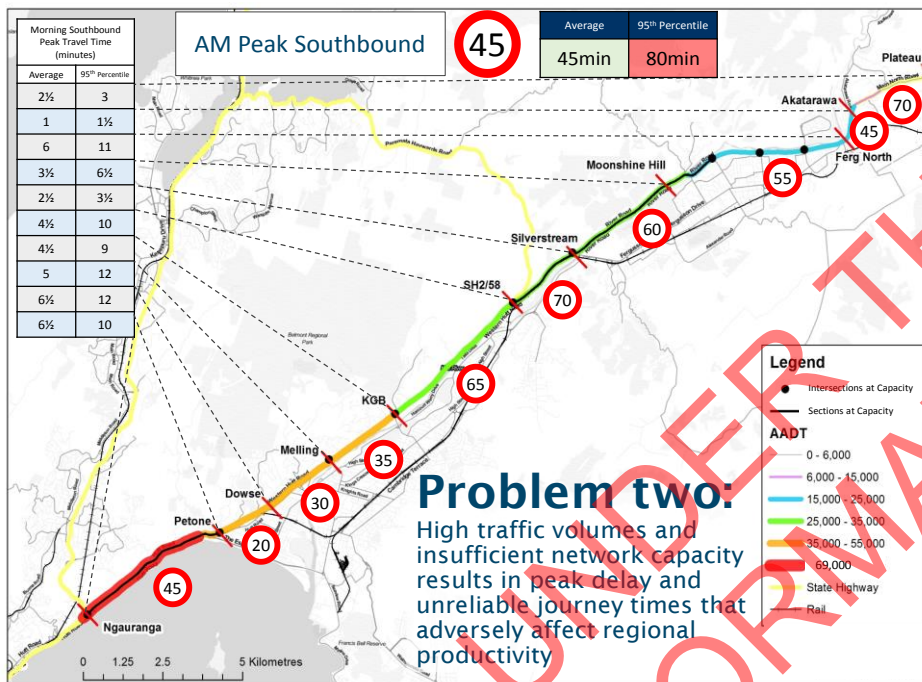


Figure 4-3: Morning Peak Travel Speeds and Variability

In addition to travel time impacts, there are also real travel time reliability issues. TomTom data from every weekday in 2015 was assessed to determine the average travel times in peak periods compared to off peak periods, and also the variability in travel times in those time periods. Figure 4-4 below gives a snapshot of that information.

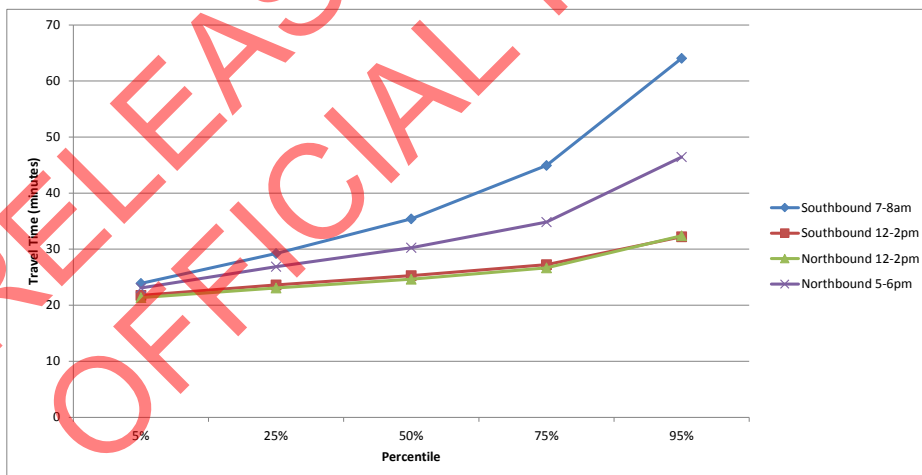


Figure 4-4: Travel time variability SH2 Te Marua to Ngauranga - 2015 Weekdays

Figure 4-4 shows that a trip in the morning peak period from Te Marua to Ngauranga can take anywhere between 25 and 65 minutes. That is a variability range of 40 minutes for a trip that on average takes 25 minutes in the off peak period.

This large difference in travel time and travel time variability means that commuters will often not be getting to work on time, leading to a reduction in productivity time; or they will leave their origin too early, losing personal time. This economic value is difficult to determine, but it is much greater than lost labour time, as labour time results in a much greater economic impact than pure wages.

With travel time variability, goods will be delayed getting to and from the port and airport, leading to impacts on economic productivity. In some cases, the delays mean that businesses will need additional vehicles and drivers to insure against travel time variability.

Customer Insights

Table 4-3 below highlights clear alignment between problem 2 and the key insights of the research.

Key Insight 3

There is a ‘zone of friction’ of existing infrastructure that causes stress and frustration for drivers on SH2

“When I am driving it is pretty good once I get past Petone but, man, getting on to the motorway and dealing with the stop start and dealing with the merge lanes – that’s the worse part of my drive. You see people getting fed up and doing really dumb things to try and get ahead.” (Source: Customer Insights SH2 PBCs)

Table 4-3: Problem 2 customer insights alignment

Problem 2	Customer Insight Alignment	Comments
High traffic volumes and insufficient network capacity results in peak delay and unreliable journey times that adversely affect regional productivity.	People are willing to use indirect/longer routes because of perceived comfort, safety and efficiency gain (key insight 1)	Customers noted that they frequently use alternate routes for sections of their drive during peak times just to keep moving, but even these routes are now congested. Train commuters noted that they were willing to drive away from their ultimate destination so they could get a seat on the train.
	Drivers have experienced a noticeable increase in SH2 congestion since 2015, and had a range of views about what might contribute to this (key insight 2)	Analysis of TomTom data between 2014 and 2016 supports the survey findings, showing that congestion and travel time in the morning peak period have increased.
	There is a ‘zone of friction’ of existing infrastructure that causes stress and frustration for drivers on SH2 (key insight 7)	Customers understand where the bottlenecks are and are clear about the negative impact this has, both in terms of their journey time and their overall well-being.
	Travel choices are influenced by the values people live and operate by, as well as their individual circumstances and constraints (key insight 8)	The increasing congestion is causing people to consider alternatives to their routine, from adjusting their journey time (peak spread) to taking the train instead (mode shift).

Potential Benefits of Investment

By investing in the network, peak travel times will decrease and journey time reliability problems will reduce benefiting commuters, freight companies and the overall economic productivity of the region.

4.1.3 Problem 3: Constrained topography, the geology and lack of alternative routes results in poor network resilience

Cause	Effect and Consequence
<ul style="list-style-type: none"> Proximity of the transport corridor to forces of nature and natural hazards, with limited or no alternatives. 	<ul style="list-style-type: none"> Incidents occurring in the corridor often affect multiple modes and overwhelming demand on remaining modes often leads to significant delays, impacting regional productivity.

The Wellington Regional Transport Plan has identified that the section of SH2 from Ngauranga to Lower Hutt is susceptible to both High Impact Low Probability events (HILP i.e. large earthquake or tsunami) and Low Impact High Probability events (LIHP i.e. flooding and small landslips).

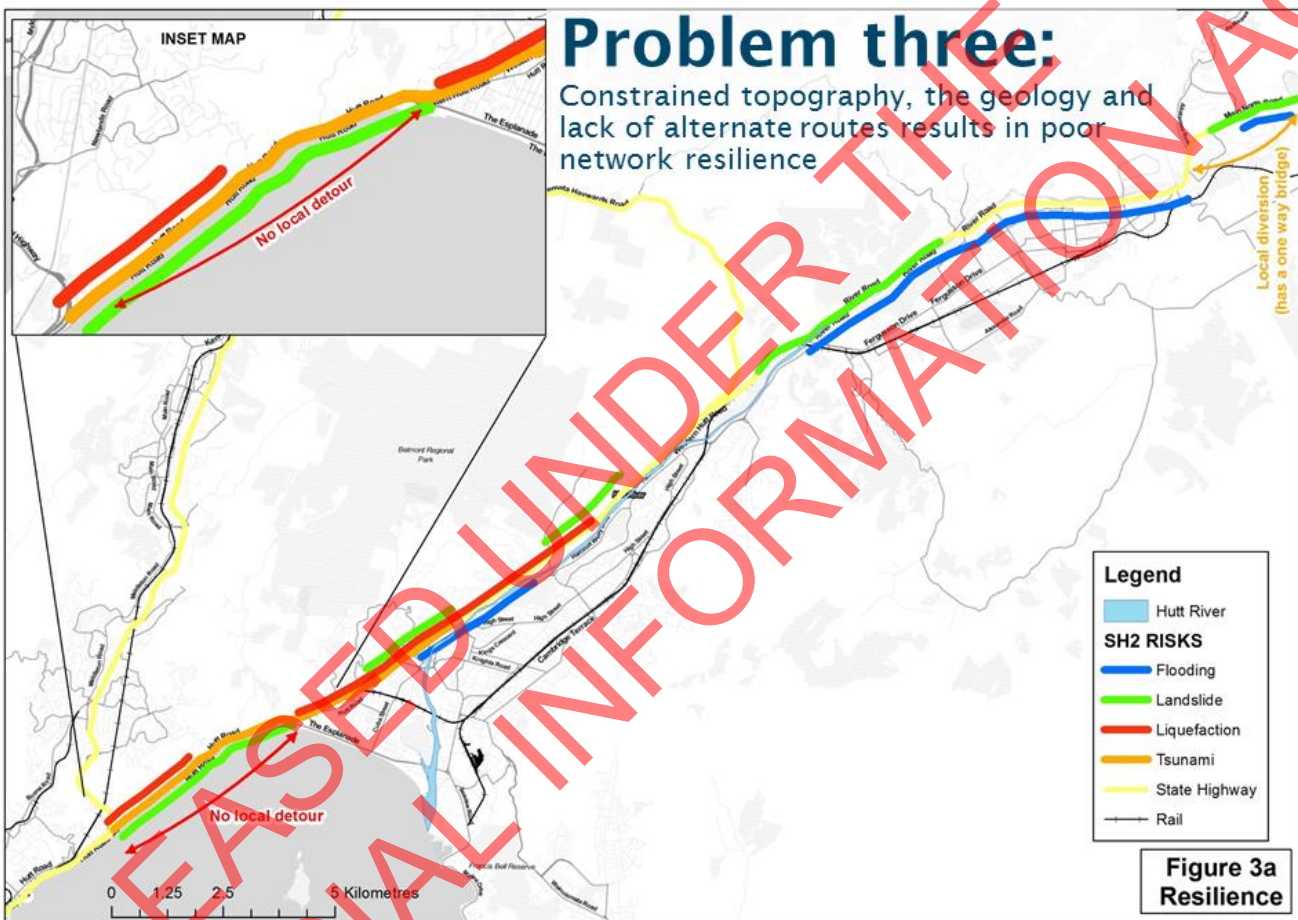


Figure 4-5: Problem Three - Location of Natural Risks

Heavy rainfall events were the most common cause of closure on the network over the last five years, with the highway being particularly susceptible to surface flooding north of Melling and south of Dowse¹¹.

Large storm events can also impact the section from Ngauranga to Petone in terms of wave action, as it runs adjacent to the harbour. This section is vital because it carries both road and rail infrastructure in close proximity. Any events impact on all modes and, therefore, the ability for travel between Wellington and the Hutt Valley.

¹¹ TRIES data from NZ Transport Agency, 2011-2015

As the corridor runs parallel to the Hutt River, the highway is susceptible to flooding due to high river levels, especially in areas where the flood corridor is constrained (i.e. Moonshine and Melling Bridges). Greater Wellington have identified a number of locations where the current flood protection infrastructure is less than desirable and flooding at these locations could impact on the state highway¹².

The topography of the corridor makes it susceptible to landslides. Key areas include Petone to Ngauranga, and in the vicinity of the Melling Interchange¹³.

The above resilience issues are compounded by the lack of alternative routes for parts of the network. For example, the only alternative route between Ngauranga and Petone is via SH1 and SH58, which can add an additional 30km of travel between Wellington and Lower Hutt; this is an additional half hour of travel time in off peak periods and significantly longer in peak periods. SH58 is a two-way, two lane route which is not designed to carry large volumes of traffic.

The resilience issues also have a major impact on the operational efficiency of the corridor. The Wellington Traffic Operations Centre had advised that SH2 between Ngauranga and Te Marua has been closed a total of seven times between 2011 and 2015, due to natural events (all due to flooding). In addition to the flooding closures, there were also three closures due to snow on the Rimutaka Hill, which impacted greatly on those commuters from the Wairarapa.

The seven natural event road closures on SH2 between Ngauranga and Te Marua were all due to surface flooding from high rainfall events. These closures had an average duration of over 7 hours. Four of these events occurred during peak hour traffic. Four of these closures occurred just north of the Melling intersection. The other three flooding events occurred around the Dowse area.



Figure 4-6: Photo of flooding of SH2 at Petone, May 2015 (Photo David Morrison via Stuff.co.nz)

While slips have not resulted in closure of the highway over the last five years, they have caused 28 'caution' events during this time. Other natural event cautions on this stretch of SH2 include rock falls, fallen trees, ice, strong winds and drop outs.

In addition to the actual closures as recorded in TREIS there is also the ongoing possibility of both low impact high probability events and high impact low probability events due to the causes identified above.

Closures have a significant impact on the economy. An example is the storm event of June 2013 in Wellington that washed out rail lines between Petone and Ngauranga, resulting in a significant increase in congestion and delays on

¹² Greater Wellington Hutt River Flood Plain Management Plan <http://www.gw.govt.nz/huttriver/>.

¹³ Brabharan, Hancox, Perrin and Dellow, 1994, Earthquake-induced slope failure hazard study, Wellington Region.

the adjacent state highway network for over a week. The Ministry of Transport estimated that the economic impact of the event was between \$12 and \$43 million, including a \$5.3 million cost to government agencies¹⁴.

Another example of the impact of a closure occurred in 2012. A crash involving a petrol tanker on SH2 prior to the morning peak period closed the rail lines until 8am and the highway until 9:15am. This resulted in the following:

- Delays on the state highway continued until at least 11am.
- Congestion was experienced on SH58 and SH1 due to diverted traffic.
- Hundreds of people were stranded at railway stations in the Hutt Valley.
- Additional ferry sailings were put on but could not cater to the additional demand.
- Buses on at least four routes were cancelled.

In May 2015, flooding closed SH2 through Petone for most of a day (see Figure 4-6). The flooding also caused cancellation of all commuter train services in the Hutt Valley. Traffic was diverted via SH1 and SH58, but many of these trips took over 5 hours, due to the heavy congestion and the inability of the alternative route to handle the diverted traffic.

Customer Insights

Table 4-4 below highlights clear alignment between Problem 3 and the key insights of the research, reflecting that customers are aware that even small events have large impacts on busy transport network and customers

“There is more and more traffic, which means that smaller and smaller things have a greater and greater impact on the traffic”

(Source: Customer Insights SH2 PBCs)

Table 4-4: Problem 3 customer insights alignment

Problem 3	Customer Insight Alignment	Comments
Constrained topography, the geology and lack of alternate routes results in poor network resilience.	People are willing to use indirect/longer routes because of perceived comfort, safety and efficiency gain (key insight 1).	Customers are aware of the fragility of the network and understand that even small events have the potential for a large impact on their journey.
	People want to be informed – it makes them feel like they can make choices about how to spend their time (key insight 6).	Some customers use information from multiple sources, from smartphone apps to variable messages signs, to stay aware of events on the transport network and will adjust their travel accordingly.
	Drivers have experienced a noticeable increase in SH2 congestion since 2015, and had a range of views about what might contribute to this (key insight 2).	The increasing congestion is causing people to consider alternatives to their routine, from adjusting their journey time (peak spread) to taking the train instead (mode shift).

Potential Benefits of Investment

Storm events such as 2013 and 2015 are likely to be more frequent in the future due to climate change, which could result in an inability to travel between Wellington and the Hutt Valley when such natural events occur. By investing in the network, better alternate routes will enable fewer journeys to be impacted for a shorter period of time. Infrastructure improvements can also reduce the number of events that effect road users.

¹⁴ Regional Land Transport Plan 2015 <http://www.gw.govt.nz/assets/Transport/Regional-transport/RLTP-2015/Other-Action-AreasNetwork-Resilience.pdf>.

4.2 BENEFITS AND INVESTMENT OBJECTIVES

From the problem statements, the stakeholder panel identified and agreed the following potential benefits for addressing the problems:

- **Benefit one:** Efficient reliable journeys that support economic productivity and growth (60%)
- **Benefit two:** Safer Journeys for all users (20%)
- **Benefit three:** Reduce social and economic impact of HILP and LPHI events (20%)

From the problems and benefits, investment objectives were developed and agreed with the stakeholders. The investment objectives have a baseline, but no specific target or year yet, for two reasons:

- Having specific targets can dictate or predetermine solutions.
- If targets were set here and they changed later in the PBC process, stakeholders are likely to question the process and/or outcomes.

Drafts of the investment objectives were discussed with the key stakeholders at the start of Workshop Two in March 2016 and were adopted with only minor changes. These objectives are presented in Figure 4-7 below.

SH2 Ngauranga to Te Marua (as part of a multi-modal corridor)
Programme Business Case

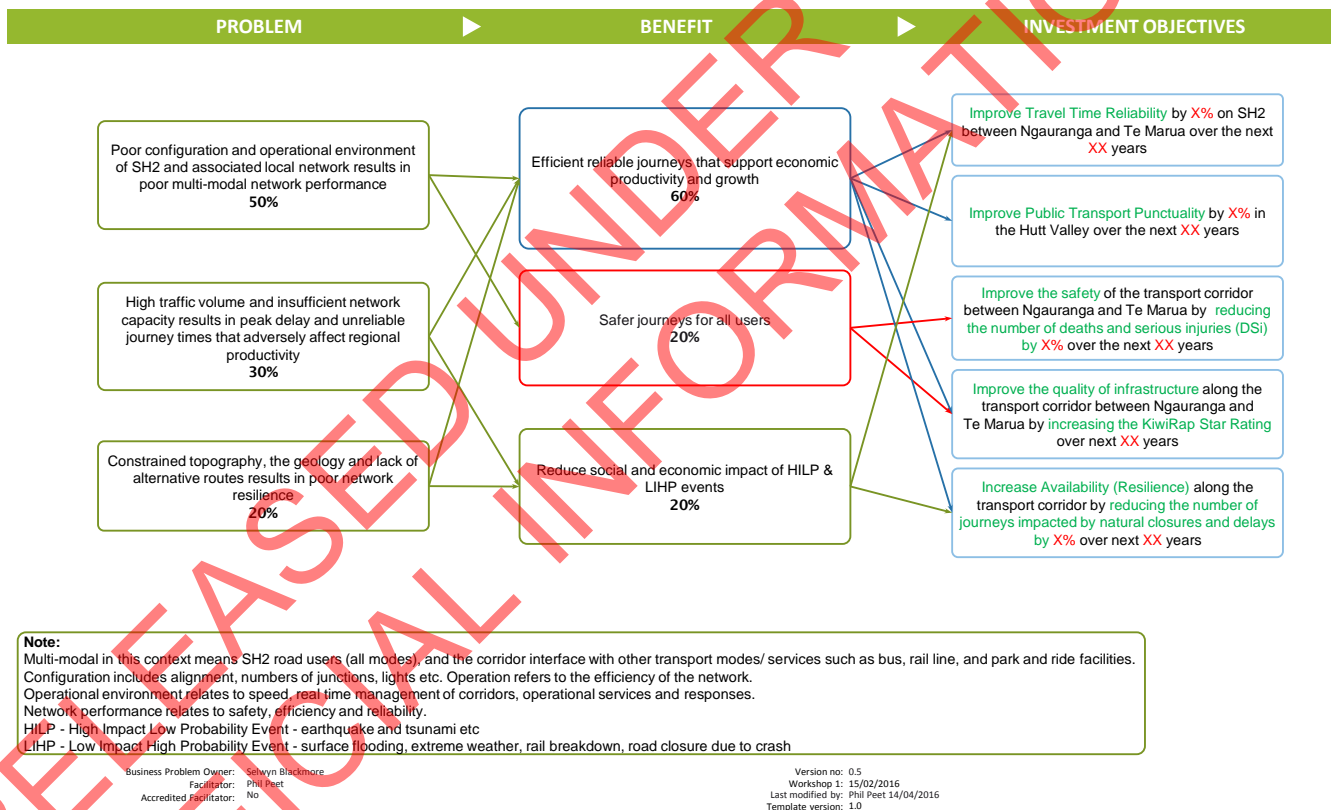


Figure 4-7: Smart Investment Objectives (Draft)

In addition to the above investment objectives there are a range of other measures which will be used to evaluate programmes and monitor outcomes. An example of this is travel time. The full benefit map, showing all proposed measures, is attached in Appendix C.

In addition, whilst public transport punctuality was accepted as an investment objective as it is currently monitored, the options and programmes were assessed against their ability to improve the public transport network as a whole. This is because punctuality is not a measure of the overall performance of public transport.

4.3 UNCERTAINTY LOG

A number of issues, constraints and key uncertainties which may impact the programme of works are summarised in the uncertainty log in Appendix D.

The key uncertainties for the programme include:

- Factors affecting transport demand:
 - Future residential growth in Upper Hutt and Wellington City.
 - Commercial and industrial development in Hutt City.
 - Effectiveness of Travel Demand Management measures.
- Factors affecting supply and cost of transport:
 - The Petone to Grenada Link Road.
 - Ngauranga to Airport project (including public transport along the Golden Mile).
 - Rail Scenarios (including park and ride).

All the uncertainties were considered by the project team during the development and assessment of options and programmes.

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PART B – DEVELOPING THE PROGRAMME

The previous sections show that there are real and immediate problems to be addressed along this corridor. Part B of this report maps the path from identifying a broad range of options in response to these problems (Section 5) through to considering a range of programmes (combinations of options – Section 6) to identifying a recommended programme (Section 7).

5 OPTIONS

5.1 HOW OPTIONS WERE GENERATED

A second facilitated workshop with the stakeholders was held on 16 March 2016. The purpose of this workshop was to:

1. Provide an update on Problem and Benefit Statements and Investment Objectives that were developed in Workshop One¹⁵;
2. Identify potential options to address the Problem Statements and achieve the Benefit Statements and Investment Objectives;
3. Identify the Investment Objectives to which each of the options contribute;
4. Identify risks and dependencies for each of the options identified; and
5. Outline the next steps in the project.

The attendees then split into three groups, based on each of the three Problem Statements. Context information, from the Context Report, was presented through a series of maps and displayed for stakeholders to refer back to at any stage during the workshop. The groups rotated around the three stations to identify any potential options they could think of to address the three problems with support from project team members.

The groups were encouraged to consider a wide range of solutions on the supply, demand and productivity spectrum including land use, infrastructure, management, information and pricing.

The outcome of the workshop was three sets of sheets (one set for each problem statement) generated by the workshop participants, identifying:

- Options;
- The extent to which each of the options are likely to contribute towards the investment objectives; and
- The risks and dependencies of each option.

A total of 110 options were identified, ranging from the highly aspirational (i.e. decentralisation of economic activity to the suburbs), through to less ambitious ideas (i.e. increased speed enforcement). To capture the widest scope of possibilities, the philosophy of “no wrong answers” was adopted; therefore, no matter how unlikely, no option was discarded at this early phase.

The options were organised into the following 11 broad categories:

Table 5-1: Broad categories of options

Option Category	Example options
Physical works to road	Road widening or interchanges
Improvements to rail	Rail Scenarios as per the Wellington Regional Rail Plan

¹⁵ Workshop One reviewed the Strategic Case, presented the supporting evidence, and with the stakeholders generated a draft set of investment objectives that have been progressively developed with Stakeholder input since that time.

Option Category	Example options
Cycling and walking	New cycle lanes or off road facilities
Public transport	Improved park and ride
Adjacent / related land uses	District Plan changes
Freight management	Port Access Study
Traffic management	Managed motorway
Trip management	Communicating multi-modal transport status
Speed management	Speed limit review
Behaviour	Increased driver education and active mode promotion programmes
Resilience	Improved flood protection

5.2 OPTION ASSESSMENT

Option assessment is undertaken to remove clearly infeasible options and to assess the remaining options against the investment objectives and other key criteria.

An initial review was undertaken to identify any options that were fatally flawed, or that would not assist in achieving the Investment Objectives; no options were discounted at this stage. However, the list was reviewed by the project team and consolidated where there were obvious duplications or where one option could be described as a sub-set of a wider option¹⁶. This process reduced the list of options to 75.

Feasibility level analysis of the option long list was then undertaken by the project team with a mix of skills (safety, design, planning, RMA) with a focus on identifying which options would be worth investigating in later business case phases.

Table 5-2 provides a summary of the option assessment, presenting the performance of each option against the five investment objectives and the MCA criteria, as outlined below.

- **Performance against each of the five investment objectives:**
 - Improve travel time reliability
 - Improve public transport (not just punctuality)
 - Improve safety
 - Improve quality of infrastructure
 - Improve resilience
- **Implementability and risk:**
 - Feasibility
 - Affordability
 - Public/stakeholder acceptability
 - Implementability risks
- **Other criteria including:**
 - Safety
 - Economy
 - Environmental
 - Social
 - Cultural

¹⁶ This also involved combining all behaviour change and travel demand management initiatives into groups of initiatives that would provide increasing levels of intervention. The individual activities would need to be investigated at later stages.

Table 5-2: Option Assessment Summary

Category	Option		Option Number	INVESTMENT OBJECTIVES (High, Medium, Low, None)					MCA (1 Major benefit, 4 Neutral, 7 Major Cost/Impact)					Implementability Risks (Low to Very High)	Cost (\$M)
				Improve travel time reliability	Improve public transport punctuality	Improve safety	Improve quality of infrastructure (KiwiRAP)	Improve resilience	Safety	Economy	Environment	Social	Cultural		
Physical works to Road	Physical works to Road		100												
	Grade Separated I/C	Melling Grade Separated Interchange	101a	HIGH	LOW	HIGH	HIGH	HIGH	1	1	6	4	4	H	\$70-150
		Kennedy Good Grade Separated Interchange	101b	HIGH	LOW	HIGH	HIGH	MEDIUM	1	2	6	5	4	H	\$70-130
		Silverstream Grade Separated Interchange	101c	HIGH	LOW	MEDIUM	HIGH	HIGH	2	2	7	5	4	M	\$20-30
	Consistent Intersections	Remove at grade right turns south of Upper Hutt	102a	MEDIUM	LOW	MEDIUM	MEDIUM	NONE	2	3	4	5	4	M	\$1-2
		Improve at grade intersections in rural areas through and north of Upper Hutt	102b	MEDIUM	LOW	HIGH	MEDIUM	NONE	1	3	5	3	4	M	\$4-8
		Improve major intersections at-grade	102c	LOW	LOW	LOW	LOW	NONE	3	3	5	4	4	M	\$12-25
		Improve intersections through urban areas	102d	LOW	LOW	MEDIUM	MEDIUM	NONE	2	4	5	5	4	L	\$0.5-2
	Improving and Optimising Access onto SH2	Remove all access in rural areas	103a	LOW	NONE	HIGH	MEDIUM	NONE	1	5	4	6	4	H	\$5-20
		Ensure no more access in urban areas	103b	LOW	LOW	MEDIUM	LOW	NONE	3	4	4	5	4	M	\$0.1-0.2
	Reduce number of dangerous access points/side roads	Rationalise access from SH2 to the Hutt River	104a	LOW	NONE	MEDIUM	MEDIUM	NONE	2	4	4	6	4	L	\$0.5-2
	Crash Barriers or removal of hazards	Crash Barriers or removal of hazards	105a	LOW	NONE	MEDIUM	MEDIUM	NONE	2	4	5	5	4	M	\$6-10
		Crash Barriers or removal of hazards	105b	LOW	NONE	HIGH	HIGH	NONE	1	4	5	5	4	H	\$30-50
	Geometry and alignment improvements along corridor	Realignment of out of context curves	106a	LOW	NONE	MEDIUM	MEDIUM	NONE	2	3	6	5	4	H	\$50-80
		Realignment to 100km/h design speed	106b	LOW	NONE	MEDIUM	MEDIUM	NONE	2	3	6	5	4	H	\$100-160
		Realignment to 110km/h design speed	106c	LOW	NONE	HIGH	HIGH	NONE	1	3	6	5	4	VH	-
	Separate PT and cyclists from traffic, HOV lanes, different modes or traffic directions	Make one lane HOV in peak periods	108a	LOW	LOW	LOW	LOW	NONE	4	4	6	3	4	H	\$1-5
	More lanes	Six laning Ngauranga to Petone	109a	HIGH	LOW	MEDIUM	LOW	MEDIUM	3	1	7	3	5	VH	\$255-425
		Six laning Petone to Dowse	109b	HIGH	NONE	LOW	LOW	MEDIUM	3	1	7	3	4	VH	\$250-375
		Six laning Dowse to Melling	109c	HIGH	NONE	LOW	LOW	MEDIUM	3	1	7	3	4	H	\$80-135
Six laning Melling to KGB		109d	HIGH	NONE	LOW	LOW	MEDIUM	3	1	6	3	4	H	\$100-160	
Six laning KGB to SH2/58		109e	HIGH	NONE	LOW	LOW	MEDIUM	3	1	6	4	4	H	\$150-250	

Category	Option		Option Number	INVESTMENT OBJECTIVES <i>(High, Medium, Low, None)</i>					MCA <i>(1 Major benefit, 4 Neutral, 7 Major Cost/Impact)</i>					Implementability Risks <i>(Low to Very High)</i>	Cost <i>(\$M)</i>
				Improve travel time reliability	Improve public transport punctuality	Improve safety	Improve quality of infrastructure (KiwirAP)	Improve resilience	Safety	Economy	Environment	Social	Cultural		
Physical Works to Rail	Six laning SH2/58 to Silverstream		109f	MEDIUM	NONE	LOW	LOW	MEDIUM	3	1	6	4	4	H	\$40-70
		Four laning Silverstream to Moonshine	109g	HIGH	NONE	MEDIUM	LOW	MEDIUM	3	1	6	3	4	H	\$40-85
	Upgrade Parallel Routes on local roads	Upgrade Hutt Road - Petone to Dowse	110a	LOW	MEDIUM	LOW	LOW	NONE	3	3	4	4	4	L	\$1-5
		Upgrade Fergusson Drive - Silverstream to Fergusson Drive North	110e	LOW	MEDIUM	LOW	LOW	NONE	3	3	4	4	4	L	\$1-5
	Improved East West Connections	Capacity improvement along the Esplanade	111a	LOW	LOW	LOW	LOW	LOW	3	2	5	5	4	M	\$20-90
	Wider shoulders	Shoulder widening to 1.5m	112a	LOW	NONE	MEDIUM	MEDIUM	LOW	2	4	5	5	4	M	\$70-105
		Shoulder widening to 2.5m	112b	LOW	NONE	MEDIUM	MEDIUM	MEDIUM	2	4	5	5	4	H	\$180-270
	Upper Hutt Bypass	Upper Hutt Bypass or upgrade existing SH2	113a	MEDIUM	LOW	HIGH	HIGH	HIGH	1	1	7	5	6	H	\$225-260
	Melling Bridge	Melling Bridge	117a	NONE	LOW	LOW	LOW	HIGH	3	4	6	1	5	M	\$20-35
	Improve Hutt Valley East West Connections	Improve Hutt Valley East West Connections	118a	LOW	LOW	LOW	LOW	MEDIUM	3	1	6	2	4	H	\$70-90
	Petone to Grenada	Petone to Grenada	119a	HIGH	LOW	MEDIUM	MEDIUM	HIGH	2	1	7	6	5	H	\$300-350
Physical Works to Rail	Physical Works to Rail		200												
	Extend Melling Line	Extend to City Centre	201a	LOW	LOW	NONE	NONE	LOW	4	2	6	3	4	H	\$30-50
		Extend to Hutt Valley Line	201b	MEDIUM	MEDIUM	LOW	NONE	MEDIUM	3	2	7	3	4	VH	\$300-500
	Rail Scenarios ¹⁷	Rail Scenario 1 (RS1)	207a	MEDIUM	HIGH	LOW	NONE	MEDIUM	3	2	2	2	4	M	\$120-140
		Rail Scenario 2 (RS2)	207b	LOW	MEDIUM	NONE	NONE	LOW	3	3	3	3	4	L	\$115-135
		Rail Scenario A (RSA)	207c	MEDIUM	HIGH	LOW	NONE	MEDIUM	3	2	6	5	4	H	\$195-230
		Rail Scenario B (RSB)	207d	LOW	MEDIUM	NONE	NONE	LOW	3	2	3	3	4	M	\$270-325
Cycling and Walking	Cycling and Walking		300												
	Removing conflicts between modes	Ngauranga to Melling Cycleway	301a	LOW	NONE	HIGH	MEDIUM	HIGH	1	3	6	2	4	H	\$45-60
	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - Ngauranga to Petone	302a	LOW	NONE	MEDIUM	MEDIUM	LOW	2	3	3	3	4	M	\$45-60
		On road cycle lane - Petone to Melling	302b	LOW	NONE	LOW	MEDIUM	LOW	2	3	6	3	4	M	\$10-50
		On road cycle lane - Melling to KGB	302c	LOW	NONE	LOW	MEDIUM	LOW	2	3	5	3	4	M	\$6-30

¹⁷ The rail scenarios, presented in the Wellington Regional Rail Plan 2010-2035 can be summarised as:
 Rail Scenario 1 (RS1): targets capacity, reliability and frequency improvements. Key improvements include fleet expansion, double tracking Trentham to Upper Hutt, station upgrades and park and ride upgrades. The outcomes of RS1 include regular 15min services and improved seat capacity during the peak period.
 Rail Scenario 2 (RS2): building on from RS1, RS2 focuses on capacity and frequency through fleet expansion and does not require further network upgrades. Key outcomes include 10min peak hour services on the Hutt Valley Line.
 Rail Scenario A (RSA): focuses on journey time improvements through track upgrades and curve easing. RSA can be implemented after RS1 or RS2. Key outcomes include a 6min reduction in journey time from Upper Hutt to Wellington.
 Rail Scenario B (RSB): focusing on reach, with network extensions and shuttle services beyond Upper Hutt. RSB can be founded on either RS1 or RS2 (or totally independent).
 As the rail scenarios are regional costs, costs were apportioned to the Hutt Valley (and Wairarapa) services based on the regional patronage of approximately 50%.

Category	Option		Option Number	INVESTMENT OBJECTIVES (High, Medium, Low, None)					MCA (1 Major benefit, 4 Neutral, 7 Major Cost/Impact)					Implementability Risks (Low to Very High)	Cost (\$M)
				Improve travel time reliability	Improve public transport punctuality	Improve safety	Improve quality of infrastructure (KiwirAP)	Improve resilience	Safety	Economy	Environment	Social	Cultural		
Public Transport	On road cycle lane - KGB to Silverstream	On road cycle lane - KGB to Silverstream	302d	LOW	NONE	LOW	MEDIUM	LOW	2	3	6	3	4	M	\$8-40
		On road cycle lane - Silverstream to Fergusson Drive North	302e	LOW	NONE	LOW	MEDIUM	LOW	2	3	6	3	4	M	\$10-50
		On road cycle lane - Fergusson Drive North to Norana Road	302f	LOW	NONE	LOW	MEDIUM	LOW	2	3	5	5	4	M	\$3-15
		On road cycle lane - Norana Road to Plateau Road	302g	LOW	NONE	LOW	MEDIUM	LOW	2	3	5	4	4	M	\$4.6-23
	Cycle racks on front of buses	Cycle racks on front of buses ¹⁸	304a	LOW	NONE	NONE	NONE	NONE	4	4	4	4	4	L	\$0.2-0.3
	High Quality off road cycle lanes	Hutt River Trail Extension and Connections	306a	LOW	NONE	LOW	LOW	NONE	3	3	5	1	4	M	\$10-15
	Cyclist bypasses at Petone and Dowse	Cyclist bypasses at Petone and Dowse	308a	LOW	NONE	MEDIUM	LOW	LOW	2	4	4	3	4	M	\$2-4
	Improved walking and cycling integration with PT	Improved walking and cycling links to and infrastructure at key rail stations (e.g. East/West links).	309a	LOW	LOW	LOW	LOW	NONE	3	3	3	3	4	H	\$4-10
	Improved walking and cycling integration with PT	New link between lower Hutt CBD and Melling station	309b	LOW	LOW	LOW	LOW	NONE	3	3	6	1	5	L	\$10-20
Public Transport	Public Transport		400												
	Increase park and ride	Increase park and ride	401a	MEDIUM	LOW	LOW	NONE	NONE	4	2	4	3	4	M	\$1-10
	Dedicated bus lanes	Bus lanes SH2 Ngauranga to Petone	402a	LOW	MEDIUM	NONE	LOW	HIGH	3	3	7	3	5	VH	\$200-340
	Dedicated bus lanes	Bus lanes on local roads - Petone to Lower Hutt CBD	402b	LOW	MEDIUM	NONE	LOW	NONE	4	3	3	3	4	M	\$5-10
	Increase capacity and frequency of buses, reduce fares	Increase capacity and frequency of buses	403a	LOW	MEDIUM	NONE	NONE	LOW	4	3	3	2	4	L	\$10-20
	Better fares and ticketing	Regional fares and ticketing improvements ¹⁹	406a	LOW	MEDIUM	NONE	NONE	NONE	4	3	3	3	4	L	\$2-3
Adjacent/Related Land Uses	Adjacent/Related Land Uses		500												
	Manage land uses better	Ensure development near town centres and PT corridors	501a	LOW	LOW	NONE	NONE	LOW	3	2	5	4	4	H	\$0.3-0.5
	Manage accesses better for new development	Ensure safe and efficient access to new developments	502a	LOW	LOW	LOW	LOW	NONE	3	4	4	5	4	L	\$0.1-0.2
Freight Management	Freight Management		600												
	Port Access Study ²⁰		601												

¹⁸ A regional initiative, with total costs up to \$0.4M.

¹⁹ A regional initiative, with a cost range of \$3-5M.

²⁰ Being developed by the Accessing Wellington's Port Area PBC.

Category	Option		Option Number	INVESTMENT OBJECTIVES (High, Medium, Low, None)					MCA (1 Major benefit, 4 Neutral, 7 Major Cost/Impact)					Implementability Risks (Low to Very High)	Cost (\$M)	
				Improve travel time reliability	Improve public transport punctuality	Improve safety	Improve quality of infrastructure (KiwirAP)	Improve resilience	Safety	Economy	Environment	Social	Cultural			
Traffic Management	Traffic Management		700													
	Intelligent Transport Systems	Expansion of ITS throughout corridor	701a	LOW	LOW	LOW	LOW	MEDIUM	3	3	5	4	4	L	\$10-30	
		Extension of managed motorway from Petone to Melling	702b	MEDIUM	NONE	LOW	LOW	MEDIUM	3	2	5	4	4	M	\$25-35	
			Extension of managed motorway from Melling to SH58	702c	MEDIUM	NONE	LOW	LOW	MEDIUM	3	2	5	4	4	M	\$25-35
			Extension of managed motorway from SH58 to Silverstream	702d	MEDIUM	NONE	LOW	LOW	MEDIUM	3	2	5	4	4	M	\$15-20
	Ramp Metering	Ramp metering at Ngauranga	703a	LOW	NONE	LOW	NONE	NONE	4	3	4	5	4	L	\$0.15-0.3	
		Ramp metering at Petone	703b	LOW	NONE	LOW	NONE	NONE	4	3	4	5	4	L	\$0.15-0.3	
Ramp metering at other interchanges		703c	LOW	NONE	LOW	NONE	NONE	4	3	4	5	4	L	\$0.5-1.5		
Trip Management	Trip Management		800													
	Communicating multi-modal transport status	Communicating multi-modal transport status	801a	MEDIUM	MEDIUM	LOW	NONE	MEDIUM	3	3	5	3	4	L	\$5-10	
Speed	Speed		900													
	Speed Limits Review	Speed limits consistent with road environment	901a	LOW	NONE	MEDIUM	NONE	NONE	2	4	4	2	4	M	\$0.3-0.4	
		Speed Enforcement	Improve speed enforcement	902a	LOW	NONE	LOW	NONE	NONE	3	4	4	2	4	L	\$0.5-1
	Speed enforcement at high risk intersections		902b	LOW	NONE	MEDIUM	NONE	NONE	2	4	4	2	4	L	\$0.5-1	
Behaviour	Behaviour		1000													
	Retain existing level of behaviour change programmes		1000a	NONE	NONE	NONE	NONE	NONE	3	4	3	3	4			
	Increase behaviour change programmes ²¹		1000b	LOW	NONE	LOW	NONE	NONE	3	3	3	3	4	L	\$2-5	
	Large step change in behaviour change including ²²		1000c	HIGH	LOW	LOW	NONE	NONE	2	2	3	4	4	VH	\$5-75	
Resilience	Resilience		1100													
	Improve flood protection on SH2 at Te Marua		1104a	NONE	NONE	NONE	NONE	MEDIUM	3	4	6	6	6	M	\$2-5	
	Improved drainage at high risk areas i.e. Melling, Petone and Silverstream		1105a	LOW	LOW	NONE	NONE	HIGH	3	3	5	5	5	M	\$0.8-1.2	
	Identifying and remedying LIHP events and locations		1112a	NONE	NONE	NONE	NONE	HIGH						L	\$0.1-0.2	

²¹ A regional initiative which includes a more intensive roll out of the current campaigns including; information provision (promotion of active modes, public transport, road safety), skills training and events. The total regional cost is likely to be in the order of \$5-10M.

²² A regional initiative which includes a large step change in behaviour change including parking changes, parking restriction, congestion tax etc. The total regional cost is likely to be in the order of 10-150M, depending on the initiatives progressed.

6 PROGRAMME OPTIONS

6.1 PROGRAMME GENERATION

It is unlikely that any option will be progressed on its own (and many are dependent on other options) and a programme of options will be needed to address the current problems. Programmes were developed through both a ‘top down’ and ‘bottom up’ approach, with each approach including consideration of how investment in certain areas would address the problems and achieve the investment objectives.

The programmes are shown in Table 6-1 below. Top down (or thematic) programmes included the ‘Roading Do Maximum’ and ‘Public Transport / Travel Demand Management 1’ programmes, where a selection of options were chosen (from a pool of 75 options) based on their fit and contribution to the overall programme theme. In contrast, the ‘bottom up’ approach considered which options, across the range of option categories, would collectively address the problems and achieve the investment objectives. Three bottom up ‘Multi-Modal’ programmes were developed; Low, Medium and High, which reflected increasing investment, benefit and risk.

It is noted that there are almost limitless programme combinations; therefore, the programme themes outlined in Table 6-1 below were circulated to stakeholders as part of a PBC progress update, for comment prior to the Programme Assessment Workshop (Workshop 3).

No substantive comments were received by the stakeholders, so the project team populated the programmes for assessment prior to the workshop, noting that the programmes were able to be changed by stakeholders at the workshop. Appendix E contains the list of options that are included in each programmes.

Table 6-1: Programmes Considered

Prog.	Programme Title	Scope
1	DO MINIMUM	<ul style="list-style-type: none"> Continued maintenance programme Continued operations Committed projects (e.g. SH2/SH58 Interchange)
2	BASE (+ Do Minimum)	<ul style="list-style-type: none"> Includes projects where a large amount of investigation and planning has already been undertaken. Includes the Do Minimum programme. Example projects include: Petone to Grenada Link Road, Melling interchange, Ngauranga to Melling cycleway, Rail Scenario 1 (capacity, frequency and reliability improvements) and Integrated Ticketing.
3	ROADING DO MAXIMUM	<ul style="list-style-type: none"> This programme centres on large scale, corridor wide, roading based works. Example projects aimed at capacity and safety include: 6 laning SH2 from Ngauranga to SH2/SH58, 4 laning SH2 from Silverstream to Moonshine, interchanges, Upper Hutt bypass and the Cross Valley link.
4	MAXIMISE EXISTING ASSETS / OPTIMISATION (+ Base)	<ul style="list-style-type: none"> This programme consists of options which aim to maximise the efficiency of existing assets (ideally within the existing corridor footprints), deferring the need for large scale infrastructure works. Includes Base programme. Example projects include: Managed motorway, intersection upgrades, The Esplanade capacity upgrade, Rail Scenario 2 (capacity and frequency), 1.5m shoulder widening and a speed limits review.

5	PUBLIC TRANSPORT / TRAVEL DEMAND MANAGEMENT 1 <i>(+ Base)</i>	<ul style="list-style-type: none"> This programme consists of options which aim to promote improved Public Transport mode share by improving existing infrastructure and services in conjunction with travel demand management measures. Includes Base programme. Example projects include: Rail Scenario 2, Rail Scenario A (journey time), increasing park and ride, improved connections to rail stations, land use changes, vehicle management systems, corridor ITS improvements, bus priority lanes, increased funding for existing driver behaviour programmes and improved walking and cycling facilities.
6	PUBLIC TRANSPORT / TRAVEL DEMAND MANAGEMENT 2 <i>(+ PT/TDM 1 - EXCEPT P2G)</i>	<ul style="list-style-type: none"> This programme consists of options which aim to provide a significant step change in Public Transport mode share by investing in new and improved infrastructure and services in conjunction with a series of travel demand management changes. Includes PT/TDM 1 programme and excludes the Porirua to Grenada project. Example additional projects include Melling line extension to Hutt City, Rail Scenarios A & B (reach), rail realignment, additional park and ride facilities, congestion tax, increased parking changes, cyclist bypasses of Dowse and Petone, and on-road cycle lanes.
7	SAFE SYSTEM <i>(+ Base)</i>	<ul style="list-style-type: none"> This programme consists of a number of options combined to create a safe system approach along the SH2 corridor. Includes Base programme. Example additional projects include 1.5m shoulder widening, speed limits review, realign out of context curves, intersection improvements, moderate and severe hazard removal, driver behaviour programmes and access rationalisation.
8	MULTI-MODAL LOW <i>(+ Base)</i>	<ul style="list-style-type: none"> A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. Includes Base programme. Example additional projects include: Kennedy Good Bridge interchange, The Esplanade capacity, realign out of context curves, 1.5m shoulder widening, increase park & ride facilities and a speed limit review.
9	MULTI-MODAL MEDIUM <i>(+ Multi-modal Low)</i>	<ul style="list-style-type: none"> A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. This programme builds on the Multi-Modal Low programme, including medium and some large scale options. Example additional projects include: Silverstream interchange, Cross Valley Link, Rail Scenario 2, cycle bypasses of interchanges, improved walking and cycling connections to rail stations, multi-storey park & ride facilities and a managed motorway.
10	MULTI-MODAL HIGH <i>(+ Multi-modal Medium)</i>	<ul style="list-style-type: none"> A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. This programme builds on the Multi-Modal Medium programme, including further medium to large scale options. Example additional projects include: 6 laning SH2 Petone to Ngauranga, access rationalisation, further grade separated interchanges, Rail Scenarios A & B and additional park and ride facilities (including some multi-storey facilities).

6.2 PROGRAMME EVALUATION PROCESS

The 10 programmes were assessed against a number of criteria consistent with the Options Assessment:

- Performance against each of the five investment objectives;
- Implementability Risks;
- MCA (Safety, Economy, Social, Environmental and Cultural);
- Indicative Cost;
- IAF (Strategic Fit, Effectiveness, Efficiency); and
- Risks and Dependencies.

The programme level assessment was carried out for a number of the above criteria based on both an 'engineering judgement' and 'sum-of-the-parts' approach. The 'engineering judgement' approach consisted of each programme being assessed holistically by the project team in a workshop setting, while the 'sum-of-the-parts' assessment approach was based on the aggregate, range or weighted performance of each of the constituent options against the various criteria. The Do Minimum was used as the baseline for the programme assessment i.e. a neutral score for the majority of the criteria.

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6.3 OUTCOME OF PROGRAMMES ASSESSMENT

6.3.1 Programme Assessment Summary

The 10 programmes were defined and assessed using the criteria from Section 6.2 above. Single page sheets for each programme outlining its composition and evaluation are contained in Appendix F.

			Programme										
			1	2	3	4	5	6	7	8	9	10	
Investment Objectives	Objective	Weighting	Do-minimum	Base (+ Do-minimum)	Roading Do-Maximum	Maximise existing assets (+ Base) / Optimisation	Public Transport / Travel Demand Management 1 (+ Base)	PT / Travel Demand Management 2 (+ PT/TDM 1 except P2G)	Safe System (+ Base)	Multi-Modal - Low (+ Base)	Multi-Modal - Medium (+ Multi-Modal - Low)	Multi-Modal - High (+ Multi-Modal - Medium)	
	Improve Travel time Reliability	45%	Neutral	Minor Benefit	Major Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Major Benefit	
	Improve Public Transport	15%	Neutral	Minor Benefit	Moderate Disbenefit	Moderate Benefit	Major Benefit	Major Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Major Benefit	
	Improve Safety	15%	Neutral	Minor Benefit	Major Benefit	Major Benefit	Minor Benefit	Moderate Benefit	Major Benefit	Major Benefit	Major Benefit	Major Benefit	
	Improve Quality of Infrastructure (KiwirAP)	10%	Neutral	Minor Benefit	Major Benefit	Major Benefit	Minor Benefit	Minor Benefit	Major Benefit	Major Benefit	Major Benefit	Major Benefit	
	Improve Resilience	15%	Neutral	Moderate Benefit	Major Benefit	Moderate Benefit	Moderate Benefit	Moderate Benefit	Moderate Benefit	Moderate Benefit	Moderate Benefit	Major Benefit	
	Weighted Overall Score			4.0	2.9	1.8	2.2	2.6	2.0	2.4	2.4	1.8	1.0
	Weighted Overall Score Band			Neutral	Minor Benefit	Moderate Benefit	Moderate Benefit	Minor Benefit	Moderate Benefit	Moderate Benefit	Moderate Benefit	Moderate Benefit	Major Benefit
Implementability Risks			Low	Low	Very High	Medium	Medium	Very High	High	Medium	High	Very High	

Figure 6-1: Programme Assessment Summary²³

The Weighted Overall Score was determined based on the investment objective weighting, which in turn was developed from the problem and benefit weightings agreed by the stakeholder panel (refer Section 4.2 above). The overall programme assessment summary and the individual programme sheets were circulated to stakeholders as pre-reading prior to the Programme Assessment Workshop: the outcomes of this workshop are discussed in the sections below.

²³ The disbenefit to Public Transport associated with the Rooding Do-Maximum was applied due to an assumption that patronage on the rail network would decrease due to mode shift, leading to a decrease in funding which results in a deterioration in level of service. Lower 'Weighted Overall Score' reflects better achievement of the investment objectives.

6.3.2 Programme Shortlist #1

A workshop of stakeholders was held on Monday 30 May 2016. The purpose of this workshop was primarily to agree on a shortlist of programmes.

Ten programmes were presented, with detail of each programme available up on the wall. Each programme was discussed in terms of its approach, the component options which make up the programme, and outcome from the assessment.

The attendees then participated in a facilitated discussion, with particular consideration of the questions:

“Which programmes do not contribute to the investment objectives?”
“Which programmes do not need to be considered further?”

The discussion led to an agreement by the workshop participants that Programmes 1, 2, 3, 5 and 7 would not be considered further. There were various reasons for these options being discounted by the workshop participants including:

- **Programmes 1 (Do Minimum), 2 (Base) and 5 (Public Transport / Travel Demand Management 1)** were discounted based on their poor overall performance against the investment objectives.
- **Programme 7 (Safe System)** was discounted on the basis that:
 - A specific safe systems programme was not needed, but that the safe system philosophy would be embedded into any shortlisted programme; and
 - There were no options in the Safe System programme that weren't already included (in some form) in the other remaining programmes.
- **Programme 3 (Roading Do-Maximum)** was discounted based on the very high implementability risks as well as being the only programme to achieve a dis-benefit under an investment objective. It was also considered to be an overinvestment in roading infrastructure when a multi-modal solution is needed.

It was collectively agreed by the workshop participants that Programmes 4, 6, 8, 9 and 10 would remain for consideration in the next stage of the workshop.

6.3.3 Programme Shortlist #2

Another facilitated discussion was undertaken a second programme shortlisting, guided by the question:

“Which programmes should be carried forward for serious consideration?”

This discussion resulted in the five programmes being reduced to a single recommended programme. Through the discussion, the workshop participants agreed on Programme 9 being preferred, with some amendments to the options within that programme brought in from other programmes. The main reasons for the updated Programme 9 being the programme identified for further investigation were:

- It provided a balanced solution across all investment objectives.
- It is likely to meet customer expectations in regards to improvements across all modes.
- It provided an appropriate response to the problems without including some larger infrastructure projects which are high risk, high cost and unlikely to be necessary (e.g. Upper Hutt Bypass and Rail Scenario B).
- Agreed by investment partners.

Programmes 4, 6, 8, and 10 were not favoured for a number of reasons including:

- **Programme 4 (Maximise Existing Assets/Optimisation)** was not recommended based on overall performance against the investment objectives and only a 'minor' benefit to the key investment objective of improving travel time reliability. However, the general consensus of the stakeholders was that Programme 4 should form the base or first phase of the Programme 9, as it may unlock some early benefits at a relatively low cost and implementability risk.

- **Programme 6 (Public Transport/Travel Demand Management 2)** was not preferred based on overall investment objective performance and very high implementability risks due to some TDM measures (e.g. congestion charging). However, key options including major park and ride, staged TDM measures and investment in rail were noted as worthy of consideration in Programme 9.
- **Programme 8 (Multi-Modal Low)** was also not preferred based on investment objective performance (particularly a 'minor' benefit to the key investment objective of improving travel time reliability). In addition, this programme was identified as not being adequate/enduring in the longer term, noting also that all the options of this programme were contained in Programme 9.
- **Programme 10** was not preferred, as despite the major benefits in terms of all the investment objectives, this was considered to be outweighed by the very high implementability risks and costs relative to the other programmes. It was identified that Programme 9 could be phased into Programme 10 in the longer term if required under a future scenario. Programme 10 was also identified as having a low return on some investments and may not be needed to adequately address the problems.

Subsequently, a more detailed assessment of these five programmes was undertaken in regards to the investment objectives; this reinforced that the updated Programme 9 was preferred. The full results of this assessment is contained in Appendix G.

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7 RECOMMENDED PROGRAMME

7.1 PROGRAMME OVERVIEW

The recommended programme was developed with investment partners and stakeholders, after detailed consideration of the problems and consideration of a wide range of multi-modal options and alternatives to address supply, demand and productivity.

The recommended programme incorporates wide-ranging measures to improve the performance of the transport corridor including:

- Improving capacity on rail;
- Improving capacity on road;
- Reducing demand for peak hour travel;
- Improving road safety; and
- Improving resilience of the network.

The recommended programme is estimated to cost between \$1.4 and \$2.1b and includes investment for rail, road, bike, bus and foot, as well as considering access, land use and travel demand management.

The key projects included in the recommended programme are presented in the table below.

- **Core** activities that are expected from the programme: these reflect the essential elements that must be successfully delivered.
- **Desirable** requirements to be met: these are the requirements that would add value and bring about additional benefits but are not essential to successful delivery.
- **Optional** requirements: those things that might be delivered if sufficient budget were available.

Table 7-1: Programme Overview

Activity	Status
Physical Works to Road	
Melling Grade Separated Interchange	Core
Kennedy Good Grade Separated Interchange	Core
Silverstream Grade Separated Interchange	Core
Remove at grade right turns south of Upper Hutt	Core
Improve at grade intersections in rural areas through and north of Upper Hutt	Core
Improve intersections through urban areas on SH2	Core
Rationalise all access in rural 80-100km/h areas	Core
Ensure no more access in the urban 70km/h area	Core
Crash Barriers or removal of hazards on SH2 - Moderate and Severe	Core
Realignment of out of context curves	Core
Four laning Silverstream to Upper Hutt	Core
Shoulder widening to 1.5m	Core
Improve Hutt Valley East West Connections	Core
Petone to Grenada	Core
Ngauranga off-ramp extension	Core
Rationalise access on River Road to the Hutt River	Desirable
Upgrade Hutt Road - Eastern Arterial	Desirable
Upgrade Fergusson Drive - Silverstream to Fergusson Drive North	Desirable
Physical Works to Rail	
Additional network infrastructure and renewals to deliver RS1 (e.g. overhead power-supply upgrades)	Core
Rail Scenario 1 (Network upgrades, capacity, frequency and reliability improvements)	Core

Activity	Status
Rail Scenario A (Network upgrades for journey time improvements)	Core
Rail Scenario 2 (Further capacity, frequency and reliability improvements)	Core
Cycling and Walking	
Ngauranga to Melling Cycleway	Core
Improved walking and cycling links and infrastructure between communities and public transport hubs (e.g. access to Totara Park).	Core
New walking and cycling link between Lower Hutt CBD and Melling station	Core
Cycle racks on front of buses	Desirable
Hutt River Trail Extension and Connections	Desirable
Public Transport	
Increase park and ride	Core
Multi Storey park and ride	Core
Increase capacity and frequency of buses in the Hutt Valley	Core
Regional fares and ticketing improvements	Core
Adjacent/Related Land Uses	
Ensure development near town centres and PT corridors	Core
Ensure safe and efficient access to new developments	Core
Traffic Management	
Extension of managed motorway from Petone to Melling	Core
Extension of managed motorway from Melling to SH58	Core
Extension of managed motorway from SH58 to Silverstream	Core
Ramp metering at Ngauranga	Core
Ramp metering at Petone	Core
Ramp metering at other interchanges	Core
Trip Management	
Communicating multi-modal transport status	Core
Speed	
Speed limits consistent with road environment	Core
Improve speed enforcement	Desirable
Speed enforcement at high risk intersections	Desirable
Behaviour	
Increase current behaviour change programmes	Desirable
Large step change in behaviour change	Core
Resilience	
Improve flood protection on SH2 at Te Marua	Core
Identifying and remedying LIHP events and locations	Core
Resilience Programme Business Case	Core

7.1.1 Programme implementation strategy and trigger points

As presented earlier, the highway is currently operating very poorly in regards to safety and efficiency; there are significant issues with the walking and cycling network, and the capacity and lack of park and ride facilities is impacting on the potential use of the rail network. Accordingly, investment needs to occur now.

All of the proposed improvements would contribute towards the achievement of the objectives, but all cannot be implemented at once; staged delivery is necessary.

The implementation strategy presented in Table 7-2 below is based on a few principles:

- The transport network along this corridor relies on road and rail operating efficiently and effectively together as a system. Any issue with one impacts on the operation of both. Accordingly, the key aspect of implementation is to ensure that this balance is retained. Improvements to rail (RS1) should be undertaken first as these can largely be constructed without affecting the capacity of the overall network. These rail improvements will increase the overall capacity thereby minimising the potential disruption when the highway improvements are undertaken (which will affect capacity of SH2, but commuters can switch to rail using the newly available network capacity).
- Staged improvements on the rail network are in line with Greater Wellington's current thinking; RS1 (predominantly capacity), then RSA (predominantly journey time), then RS2 (predominantly capacity).
- Staged improvements on the highway network in regard to capacity are roughly following a south to north strategy in line with reducing traffic volumes. Therefore Petone to Grenada Link Road and the Melling interchange should be progressed first.
- Staged improvements on the highway network in regard to safety are programmed on the basis of both safety risk (the higher the risk, the earlier the implementation) and Implementability (acknowledging some projects will be difficult to progress).
- Some of the 'hard' Travel Demand Management measures will take time to progress and therefore should come on stream later in the programme, after the initial capacity improvements to road and rail. Implementing TDM measures later in the programme period will help ensure that the capacity gains made by infrastructure improvements can be retained for the long term.
- It is noted that no traffic modelling to inform the implementation strategy has been undertaken during this programme business case, due to time constraints.

Table 7-2: Programme Implementation

Timeframe	Road	Public Transport and Active Modes	Other
Short (1-3 years)	Melling Grade Separated Interchange	Rail Scenario 1 (Network upgrades, capacity, frequency and reliability improvements)	Extension of managed motorway from Petone to Melling
	Ensure no more access in the urban 70km/h area	Additional network infrastructure and renewals to deliver RS1 (e.g. overhead power-supply upgrades)	Ramp metering at interchanges
	Crash Barriers or removal of hazards on SH2 - Moderate and Severe	Increase park and ride	Speed limits consistent with road environment
	Petone to Grenada	Cycle racks on front of buses	Improve speed enforcement
	Ngauranga Off ramp extension	Improved walking and cycling links and infrastructure between communities and public transport hubs (e.g. access to Totara Park).	Increase current behaviour change programmes
		Ngauranga to Melling Cycleway	Improve flood protection on SH2 at Te Marua
			Wellington Resilience PBC and Identifying and remedying LIHP events and locations
Medium (4-10 years)	Kennedy Good Grade Separated Interchange	Rail Scenario A (Network upgrades for journey time improvements)	Ensure development near town centres and PT corridors
	Remove at grade right turns south of Upper Hutt	Increase capacity and frequency of buses in the Hutt Valley	Ensure safe and efficient access to new developments
	Improve at grade intersections in rural areas through and north of Upper Hutt	Hutt River Trail Extension and Connections	Extension of managed motorway from Melling to SH58
	Improve intersections through urban areas on SH2		Communicating multi-modal transport status
	Rationalise access on River Road to the Hutt River		
	Realignment of out of context curves		
	Four laning Silverstream to Upper Hutt		
	Upgrade Hutt Road - Eastern Arterial		
Shoulder widening to 1.5m			
Upgrade Fergusson Drive - Silverstream to Fergusson Drive North			
Long (11-20 years)	Silverstream Grade Separated Interchange	Rail Scenario 2 (Further capacity, frequency and reliability improvements)	Extension of managed motorway from SH58 to Silverstream
	Rationalise all access in rural 80-100km/h areas	Multi Storey park and ride	Large step change in behaviour change
	Improve Hutt Valley East West Connections	Regional fares and ticketing improvements	
		New walking and cycling link between Lower Hutt CBD and Melling station	

7.2 RECOMMENDED PROGRAMME – ASSESSMENT

As presented in Section 6.3, Programme 9 is recommended after consideration of the key benefits, dis-benefits, risks and alignment to the investment objectives when compared to the other programmes.

This section provides an outline of the programme outcomes, key risks and value for money, as well as the indicative assessment profile.

7.2.1 Programme outcomes

The outcomes from implementing the recommended programme over the next 10-20 years have been estimated and are presented in Table 7-3 below.

Table 7-3: Recommended Programme Outcomes

Investment Objectives	Indicative Outcome Measure	Likelihood of achieving outcomes
Improve Travel Time Reliability by 30% on SH2 between Ngauranga and Te Marua over the next 20 years.	<ul style="list-style-type: none"> Travel time reliability on the state highway will improve by around 30%; i.e. the once-a-month worst trip that currently takes 65 minutes will now only take 40 minutes. Approximately 7-12 minutes will be saved off the 40 minute average travel time on the state highway in the peak hour. 	MEDIUM/HIGH ²⁴
Improve Public Transport in the Hutt Valley over the next 20 years.	<ul style="list-style-type: none"> There will be regular 10 minute peak services on the Hutt Valley Rail Line compared to irregular 20 minutes services currently. There will be a 6 minute journey time reduction on the Hutt Valley Rail Line. Inbound peak capacity on the entire rail network will increase from approximately 14,000 to 22,000 seated passengers. More frequent bus services, with improved rail integration, in the Hutt Valley. 	HIGH
Improve the safety of the transport corridor between Ngauranga and Te Marua by reducing the number of deaths and serious injuries (DSI) by 50% over the next 20 years.	<ul style="list-style-type: none"> Deaths and serious injuries on the state highway will reduce from 59 every 5 years to around 30. 	HIGH
Improve the quality of infrastructure along the transport corridor between Ngauranga and Te Marua by increasing the KiwiRAP Star Rating over next 20 years.	<ul style="list-style-type: none"> A minimum KiwiRAP 4 star rating on the state highway. 	HIGH
Increase Availability (Resilience) along the transport corridor by reducing the number of journeys impacted by natural closures and delays by 70% over next 20 years.	<ul style="list-style-type: none"> The number of closures over a five year period are expected to reduce from 7 to 2 along with a reduction in the number of journeys impacted by future events. 	MEDIUM

²⁴ There is high confidence in achieving the travel time savings, but a medium for travel time reliability due to the difficulty in predicting this. Whilst the measures show there will be a large improvement, the programme will not completely remove delays and variability during peak hours, specifically south of KGB. Some level of congestion is considered appropriate for this urban, multi-modal commuter network.

Other key outcomes from implementation of the recommended programme include:

- Improved safety and social benefits for vulnerable road users from the provision of improved walking and cycling facilities, and connections between modes, along the corridor. These improvements will also result in opportunities for significant growth in active mode use.
- Addressing a number of points reflected in the customer insights survey (e.g. significant investment to address the ‘zone of friction’).
- A corridor look and feel which is consistent with the ONRC vision for a National High Volume highway from Wellington to Upper Hutt (Fergusson Drive North). North of Upper Hutt the corridor look and feel would continue to reflect a Regional highway.

Further detail on how key projects within the programme contribute to meeting the desired outcomes are outlined in Table 5-2 above.

Overall, the programme will deliver on all the investment objectives; resulting safer and more efficient journeys to and from Wellington’s CBD and Port for multi-modal commuters and freight.

7.2.2 Programme risk

This section considers the risks and dependencies associated with the programme. The key risks are shown in the table below.

Table 7-4: Key Risks

Trigger	Certainty	Impact	Comments
Petone to Grenada Link Road	More than likely	Very high	The Petone to Grenada Link Road (P2G) will reduce demand on some sections of SH2. This will be even more important once Transmission Gully is operational and more vehicles use SH58. If P2G is delayed or is unable to be progressed then other solutions will be required to mitigate the effects of high traffic volumes.
Ngauranga to Airport (N2A)	More than likely	High	The principal interdependency for this corridor is the Ngauranga to Airport project (N2A). This is a cross-agency initiative to jointly identify, plan and deliver significant and integrated improvements across the Wellington transport system, including public transport along the golden mile. The improvements on the SH2 corridor need to be consistent with the improvements proposed for N2A to ensure a coherent strategy for improvement and consistent journey experience to and from Wellington.
Rail scenario funding	Reasonably foreseeable	High	Staged improvements on the Rail network are currently in line with Greater Wellington’s current thinking; RS1 (predominantly capacity), then RSA (predominantly journey time), then RS2 (predominantly capacity). This programme includes expedited delivery of RS1, to take the pressure off the state highway before road improvements, which may be difficult to achieve.
Land use development	Reasonably foreseeable	Medium	If very large subdivisions in Upper Hutt or Lincolnshire Farm are developed and have significant uptake, this will impact on traffic volumes and the timing of projects within the programme.

In addition there are a wide number of other risks which are outlined under key areas such as:

Dependencies and Technical Risks:

- Depending on the form of the Petone to Grenada Link Road, the Petone Interchange and the improvements to the East-West links across the Hutt Valley, there still may be inadequate capacity on SH2 between Dowse and Petone. Capacity improvements along this stretch may be required at a future date, but it is recommended that this be re-considered after the short term improvement projects have been implemented and the Ngauranga to Airport programme has been agreed.
- Other dependencies that would need to be considered further in the subsequent business case phases are outlined in the uncertainty log contained in Appendix D.

Operational:

- If investment towards public transport is progressed first, there may not be enough capacity in the system to allow capacity reductions during construction of state highway upgrades and increased congestion will occur.
- Rationalisation of the accesses onto SH2 may result in significant route lengthening for some users, expensive mitigation works or dissatisfaction.

Financial:

- Programme unable to be progressed as intended as funding needs to come from multiple funding sources (NLTP, Crown and rates) with different constraints. E.g. Interdependencies between KiwiRail (assets), TransDev (rail services operation), GWRC (Public transport planning) and NZTA (Planning, funding).
- Inaccurate cost estimate due to level of available data at this feasibility stage, including utility information and assumptions in regards to topography and land value/use.
- Overall cost of programme uncertain due to unknown scope of some options at this preliminary stage i.e. intersection form, scope of east-west connection, etc.

Stakeholder/Public:

- Limited consultation with the public has occurred to date.
- Changes to access may have negative impacts on the public.
- Potential to affect sites of cultural, heritage or environmental significance.
- Traffic delays during construction.

Environmental and Social Responsibility:

- Environmental effects during construction, particularly on the Hutt River and harbour.
- Difficulties in obtaining resource consents and/or alteration to designation, particularly on the Hutt River and harbour.

Safety:

- Staggered safety improvements (short and medium term) may not provide a reduction in the number of deaths and serious injuries in the short term when compared with the long term solution.

Economy:

- Indicative BCRs are inaccurate due to the high level investigation of costs and benefits.
- The efficiency of the recommended programme is not well defined, as no traffic modelling has been undertaken on the programme as a whole.

A number of these risks can be mitigated or minimised through further information gathering i.e. traffic modelling or through more detailed investigations at subsequent business case stages.

7.2.3 Value for money

The recommended programme achieves a BCR in the range of 0.9 to 2.0. This is based on a sum of the activities within the programme.

The economic analysis carried out is indicative only and has been used as a basis for comparison of separate

projects using consistent base data. No formal evaluation, discounting or contingent assessment has been applied due to the uncertainty in terms of individual project form. Evaluation has been determined from a simple rationale of high level total benefit divided by the rough order cost of implementation.

7.2.4 Sensitivity analysis

The risks which have the largest impact on the BCR of the programme are:

- The timing of the Petone to Grenada Link Road; if this is delayed or is unable to be progressed then other solutions are required to mitigate the effects of high traffic volumes on the southern part of this corridor.
- Significant changes in land use; if very large subdivisions in Upper Hutt or Lincolnshire Farm are developed and have significant uptake, this will impact on traffic volumes and hence the performance of the programme.

No sensitivity testing has been undertaken in relation to variations in costs and benefits, as these are inherent in the cost and BCR estimates for each programme’s elements and are therefore already reflected in the programme BCR range.

7.2.5 Assessment profile

An assessment profile of HHL has been determined for the programme, using the Transport Agency’s Investment Assessment Framework as detailed below:

Strategic fit of the problem, issue or opportunity that is being addressed:	H
<p>The strategic fit of the problem is high as it involves:</p> <ul style="list-style-type: none"> • Journeys for employment, economic opportunities, tourism and freight, particularly into Wellington City. • A significant gap in the customer level of service for journey time reliability; the morning peak period trip from Te Marua to Ngauranga can take anywhere between 25 and 65 minutes²⁵. That is a variability range of 40 minutes for a trip that on average takes 25 minutes in the off peak period. • A high crash risk, as the majority of the route is classified as Medium-High or High Collective Risk, according to the criteria in the High Risk Rural Roads Guide. 	
Effectiveness of the proposed solution:	H
<p>The effectiveness is considered high due to the following criteria:</p> <ul style="list-style-type: none"> • Outcomes Focussed: The solutions on this corridor would result in a tangible change in addressing the journey time reliability and safety problems identified. • Integrated: The programme is consistent with the RLTP and supports the One Network classification system. It also supports current and future land use planning in the Hutt Valley, and includes multiple modes of transport. The programme is also supported by all investment partners. • Correctly Scoped: Most elements are part of the RLTP. Different levels of investment have been considered throughout the PBC process so there is confidence that this programme is of an appropriate scale. • Affordable: The programme is considered affordable, but each individual element will need to be considered in more detail at subsequent business case stages. The implementation can be staged to match investment priorities. • Timely: The programme will deliver enduring benefits by ensuring appropriate speeds for the road type, function and use. Benefits can be realised immediately. • Confidence: Ongoing risk management and further sensitivity testing will be an integral part of future phases. 	
Benefit and cost appraisal:	L
<p>The BCR range for this programme has been assessed as being in the range of 1-3. The key risks to the BCR are presented in Sections 7.2.2 and 7.2.4 above.</p>	

²⁵ Similar variances are present in the 8am-9am period.

7.3 PROGRAMME FINANCIAL CASE

This section highlights the affordability of the programme, and what elements are to be funded by the partnering organisations.

7.3.1 Indicative cost

The total cost of the programme is estimated to range from \$1.4b to 2.1b. Figure 7-1 below outlines the investment outlay by type of intervention with the cost of each activity listed in Appendix H.

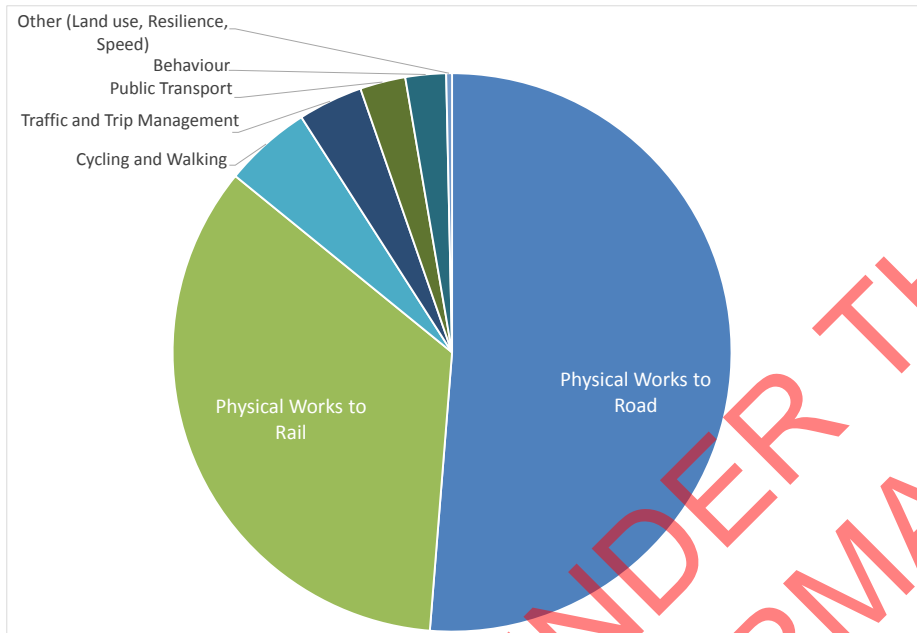


Figure 7-1: Investment split by option category

The programme includes a number of regional activities that affect the entire region (not specific to the Hutt Valley corridor) i.e. Rail Scenario 1 (regional track upgrades, new cars, station upgrades, park and ride and network improvements) and Travel Demand Management (regional ticketing, behaviour change initiatives). For the purposes of this PBC, the relevant costs from the regional activities were apportioned to the Hutt Valley where practicable²⁶.

There are no development costs identified.

7.3.2 Funding arrangements

The recommended programme will require funding from a variety of sources:

- The state highway aspects of the programme will primarily be funded through the NLTF by including activities in future NLTPs.
- Local authority and GWRC activities will be part funded through Council rates contribution with some activities part funded through the NLTF FAR.
- Enforcement and emergency management activities undertaken by the Police are funded by the NLTF.
- In terms of the rail scenarios, much of the costs of these is associated with renewals and maintenance which is Crown funded.
- Greater Wellington have indicated that it can be hard to obtain funding for travel demand management

²⁶ For example, the rail scenario costs included in the programme were based on identification of capital works specific to the Hutt Valley/Wairarapa lines and the operational costs based on the services on these lines being approximately 50% of the Wellington region's patronage.

under the existing Investment Assessment Framework. As this programme includes significant TDM measures, some early funding discussions may be necessary.

There are some significant increases in operational activities for the Rail Scenarios and the Managed Motorway. Maintenance activities for highways and local roads are typically covered in Network Operating Contracts. Maintenance and operating costs for the Rail Scenarios are included in the cost estimates within the programme.

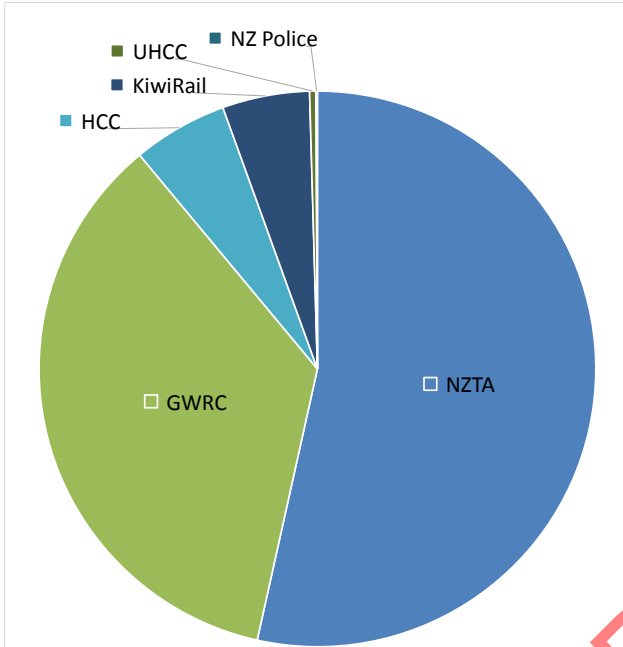


Figure 7-2: Investment split by lead organisation

The costs by lead organisation and timeframe is provided in Appendix H.

7.3.3 Affordability

The overall programme is considered affordable as it is programmed over a 20 year period, but each individual element will need to be considered in more detail at subsequent business case stages. The implementation can be staged to match investment priorities. All large projects within the recommended programme have been previously considered by the funding partners and are contained in other planning documents.

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PART C – DELIVERING AND MONITORING THE PROGRAMME

8 MANAGEMENT CASE

The following section provides further information to assist in the development and implementation of the different aspects of the recommended programme.

8.1 INVESTMENT TO BE PROGRESSED NOW

If the PBC is ultimately approved, the recommended next key steps will be the development of a number of different activities as shown below. The full implementation programme (including activities which are already underway) is shown in Appendix H.

Table 8-1: Indicative Delivery Programme – Short Term only

Next Step	Next Step Timing	Activity	Owner	Status	Implementation Timing
Study	Short	Ensure no more access in the urban 70km/h area	NZTA	Core	Short
		Ensure development near town centres and PT corridors	HCC/UHCC		Medium
		Ensure safe and efficient access to new developments	HCC/UHCC		Medium
Study	Short	Speed limits consistent with road environment	NZTA	Core	Short
Study	Short	Increase current behaviour change programmes	GWRC	Desirable	Short
		Large step change in behaviour change		Core	Long
PBC	Short	Identifying and remedying LIHP events and locations	NZTA	Core	Short
		Resilience Programme Business Case			Long
IBC/DBC	Short	Extension of managed motorway from Petone to Melling	NZTA	Core	Short
		Extension of managed motorway from Melling to SH58	NZTA		Medium
		Communicating multi-modal transport status	GWRC		Long
IBC/DBC	Short	Kennedy Good Grade Separated Interchange	NZTA	Core	Medium
IBC/DBC	Short	Improve Hutt Valley East West Connections	HCC	Core	Long
IBC/DBC	Short	Whakatiki St Intersection upgrade	NZTA	Core	Short
		Remove at grade right turns south of Upper Hutt			Medium
		Improve at grade intersections in rural areas through and north of Upper Hutt			
		Improve intersections through urban areas on SH2			
		Rationalise all access in rural 80-100km/h areas		Long	
Rationalise access on River Road to the Hutt River	Desirable	Medium			

Next Step	Next Step Timing	Activity	Owner	Status	Implementation Timing
IBC/DBC	Short	Improved walking and cycling links and infrastructure between communities and public transport hubs (e.g. access to Totara Park)	GWRC	Core	Medium
		New walking and cycling link between Lower Hutt CBD and Melling station	HCC		Long
IBC/DBC	Short	Increase park and ride	GWRC	Core	Short
		Multi Storey park and ride			Long
IBC/DBC	Short	Ramp metering at Ngauranga	NZTA	Core	Medium
		Ramp metering at Petone			
		Ramp metering at other interchanges			
DBC	Short	Ngauranga Off ramp extension	NZTA	Core	Short
DBC	Short	Crash Barriers or removal of hazards on SH2 - Moderate and Severe	NZTA	Core	Short
		Shoulder widening to 1.5m			Medium
Implement	Short	Cycle racks on front of buses	GWRC	Desirable	Short
Implement	Short	Improve speed enforcement	NZ Police	Desirable	Short
		Speed enforcement at high risk intersections			
Implement	Short	Improve flood protection on SH2 at Te Marua	NZTA/ UHCC	Core	Short

8.2 PROGRAMME GOVERNANCE AND REPORTING

Overarching programme governance lies with NZ Transport Agency as the principal funding organisation and asset owner, although as outlined in Section 7.3.2, the recommended programme will require funding from a number of investment partners and a variety of funding sources.

The governance structure will be developed during the set-up of the next stage of the business case. The diagram below shows an indicative arrangement of the organisation and interrelationship between different business cases and project teams.

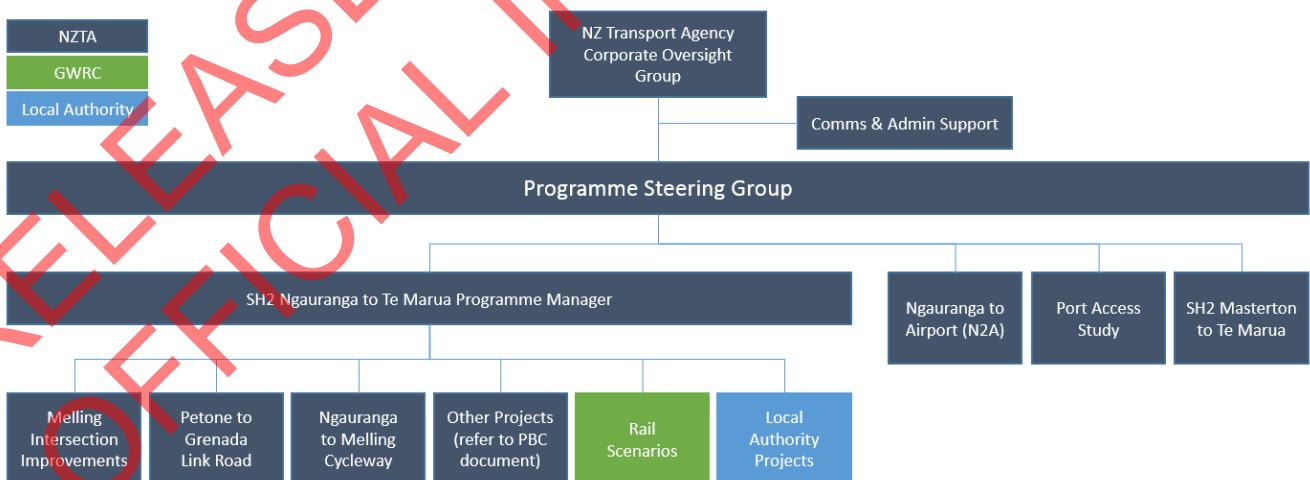


Figure 8-1: Proposed Governance Structure

Roles and responsibilities are summarised below, it is acknowledged that this may change as the business case progresses and more stakeholders are engaged as the level of detail of the programme is better developed.

Table 8-2: Roles and Responsibilities

Who	Role	Responsibility
NZ Transport Agency	Programme Lead	Manage the NZTA business cases, ensure co-ordination of all activities in the programme, work with partner organisations and stakeholders to ensure diverse needs are catered for at the appropriate time in the appropriate manner through providing a future proofed corridor that meets customer levels of service.
Greater Wellington Regional Council	Investment Partner	Develop and lead the Rail Scenario implementation programme, behaviour change, active mode and public transport improvements in collaboration with the Transport Agency and local authorities.
KiwiRail	Investment Partner	On-going maintenance, renewals and infrastructure upgrades required to deliver the Rail Scenarios.
Hutt City Council	Investment Partner	Co-funding of works and collaboration with other partner organisations on initiatives within the Hutt City.
Upper Hutt City Council	Investment Partner	Co-funding of works and collaboration with other partner organisations on initiatives within Upper Hutt City.
NZ Police	Emergency management and road policing	Assist in the development and implementation of enforcement and emergency management activities.

8.3 STAKEHOLDER ENGAGEMENT AND COMMUNICATIONS PLAN

It is recommended that an overarching stakeholder engagement and consultation plan is developed for the SH2 Corridor in the Wellington Region which would refined as the subsequent business case phases develop.

The key objectives of this are:

- To ensure a whole-of-corridor engagement approach is taken to ensure alignment between agencies and avoid stakeholder fatigue;
- To ensure that the focus of investment remains appropriate;
- To define and reinforce partner roles and responsibilities within the delivery of the programme;
- To keep stakeholders informed of development of the programme and seek agreement of the staging and scope of the investment;
- To actively engage with the local community to understand concerns and issues and explain how these are resolved through the proposed programme; and
- To inform the public of the benefits of the programme, its timing and the impacts of construction.

This stakeholder and engagement plan needs to include all parties which have been involved in the PBC to date.

8.4 PROGRAMME PERFORMANCE AND REVIEW

Monitoring of the network forms a critical element of determining the timing of implementation of activities, and once implemented, the effectiveness of the improvements against the investment objectives.

In terms of timing of implementation, consideration and monitoring of items in the uncertainty log and risk register will need to be undertaken. Key risks and uncertainties are outlined in Table 8-3 below. In addition to this, it is also recommended that traffic modelling is undertaken to confirm the assumed timing of activities in this PBC.

Table 8-3: Risk monitoring

Trigger	Comments
Petone to Grenada Link Road	If P2G is delayed or is unable to be progressed then other solutions will be required to mitigate the effects of high traffic volumes.
Ngauranga to Airport (N2A)	Once the N2A improvements are known, the timing and scope of activities along the SH2 corridor should be reviewed for consistency.
Rail scenario funding	This programme includes expedited delivery of RS1, to take the pressure off the state highway before road improvements, which may be difficult to achieve. If this is unable to be achieved, the timing of other activities may need to be reviewed.
Land use development	If very large subdivisions in Upper Hutt or Lincolnshire Farm are developed and have significant uptake, this will impact on traffic volumes and the timing of projects within the programme.

A monitoring programme will also need to be established to track the progress of the programme towards achieving the investment objectives. Monitoring of the programme will be managed by the Transport Agency, but could involve reporting through to the Regional Land Transport Committee. The key programme outcomes that need to be measured are outlined in the Table 8-4 below.

The monitoring programme should also consider how the SMART investment objectives will be reviewed after delivery of each activity in the programme. There may be no need to pursue parts of the programme if after review, a few of the activities have delivered the majority of the outcomes and benefits. This could also then result in a change in the trigger points for when further activities in the programme may be required.

Table 8-4: Performance measures and values

Investment Objective	Key Indicator	Targeted Outcomes
Improve Travel Time Reliability	95 th %tile travel time	<ul style="list-style-type: none"> Currently the once-a-month worst trip takes 65 minutes and the target is 40 minutes.
	Travel time	<ul style="list-style-type: none"> Currently the average travel time is 40 minutes and the target is 28-33 minutes.
Improve Public Transport	Various	<ul style="list-style-type: none"> 10 minute peak services on the Hutt Valley Rail Line. A 6 minute journey time reduction on the Hutt Valley Rail Line. More frequent bus services, with improved rail integration, in the Hutt Valley.
Improve safety	Deaths and Serious Injuries	<ul style="list-style-type: none"> Currently 59 DSIs occur within a 5 year period and the target is 30.

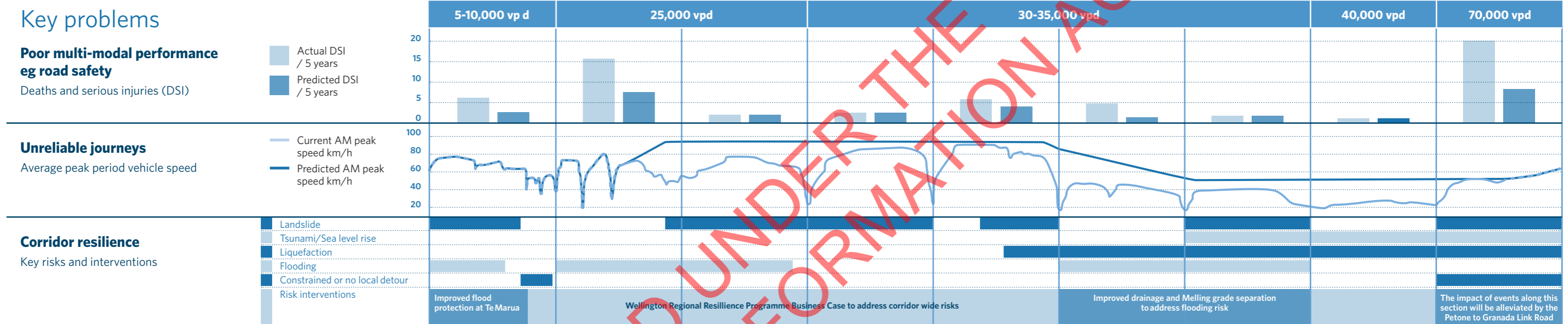
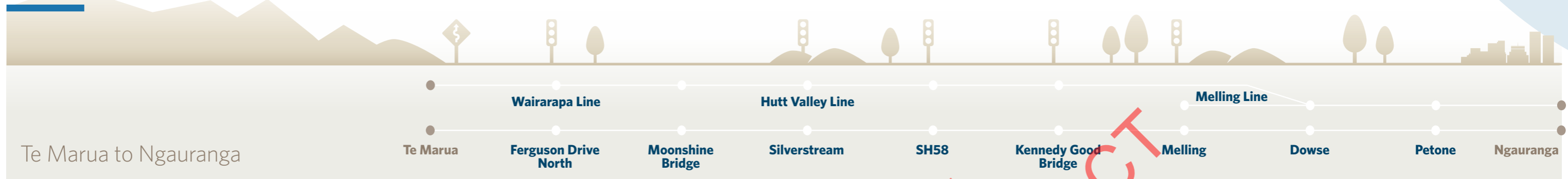
Investment Objective	Key Indicator	Targeted Outcomes
Improve the quality of infrastructure	KiwiRAP	<ul style="list-style-type: none"> The existing KiwiRAP rating varies between 3 and 4 Stars and the target is a minimum of 4 Star.
Increase Availability (Resilience)	Number and duration of closures	<ul style="list-style-type: none"> Currently 7 closures over a five year period and the target is 2.

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APPENDIX A – RECOMMENDED PROGRAMME VISUAL SUMMARY

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SH2 TE MARUA TO NGAURANGA RECOMMENDED PROGRAMME



Recommended programme The recommended programme includes investment for rail, road, bike, bus and foot as well as considering access, land use and travel demand management.

Outcomes	Theme	SH2 and local road safety improvements		Safety and capacity improvements (SH2 four laning)		SH2 safety and capacity improvements (grade separation of intersections)			Safety and walking and cycling improvements, Petone to Granada Link Road								
		Cost	BCR	Cost	BCR	Cost	BCR	Cost	BCR	Cost	BCR						
7-12 min average travel time saving on SH2 during peak periods, with a 30% improvement in reliability 60 fewer deaths and serious injuries over 10 years 10 min regular services, 6min journey time reduction and 60% increase in capacity during peak hours for rail services 5 fewer closures over 5 years Programme cost range \$1.4 - \$2.1b Programme investment profile H/H/1-3	Rail: improvements focusing on improved capacity, frequency and reliability (rail scenario 1 and 2) and journey time (rail scenario A). Bus and active modes: more frequent bus services, improved public transport and active mode integration and improved walking and cycling links. Improved travel demand management (eg regional ticketing, behaviour change initiatives), access rationalisation and integrated land use planning.																
	State Highway	Upper Hutt to Trentham double tracking Upper Hutt to Silverstream four laning Intersection improvements Intersection grade separation Intersection grade separation Melling to Ngauranga cycleway															
	Roading, walking and cycling, and other non-public transport initiatives	\$10-30m	<1	\$110-205m	<1	\$40-65m	1-3	\$50-90m	1-3	\$95-175m	1-3	\$120-235m	1-3	\$40-65m	1-3	\$420-515m	1-3
	Public transport and travel demand management							\$530-705m	1-3								

SH2 TE MARUA TO NGAURANGA CORRIDOR

PROGRAMME BUSINESS CASE

STRATEGIC CONTEXT

The Wellington Region is the third biggest in New Zealand, accounting for 11% of the population and 12% of the workforce. It is also the second-largest economy and contains the centre of Government and large social services and business services sectors.

The two largest centres within the Wellington Region are Wellington City and the Hutt Valley. Accordingly, the transport corridor between these two centres is vital to the economy of the Wellington Region.

The corridor carries over 115,000 multi-modal commuters and 4,000 heavy vehicles and significant volumes of rail freight connecting to CentrePort, one of New Zealand's largest ports.

SH2 is a vital corridor in the national network, linking Wellington and Auckland along the east coast of the North Island.

However, the current transport link between Te Marua and Ngauranga is congested, unsafe and lacks resilience. Trips on SH2 that take 25 minutes in the off peak period take between 35 and 65 minutes in the morning peak period. Rail journeys are typically on time, but the trains are approaching capacity. There have been almost 1,000 crashes on SH2 in the last 5 years, which resulted in 58 deaths and serious injuries.

The corridor is also at risk of flooding, landslides, tsunami, climate change impacts, earthquakes and liquefaction. In the last five years the highway and rail lines have been closed on multiple occasions, including a storm in June 2013 which washed out the rail line for over a week. These events have a massive impact on commuters as there is no simple, alternative route.

The strategy for this section of SH2 is to improve the performance of the transport corridor by:

- Improving capacity on rail
- Improving capacity on road
- Reducing demand for peak hour travel
- Improving road safety
- Improving resilience of the network



Programme multi-criteria assessment

	Programme 1	Programme 2	Programme 3	Programme 4	Programme 5	Programme 6	Programme 7	Programme 8	Programme 9	Programme 10
	Do-minimum	Base (+ do-minimum)	Roading do-maximum	Maximise existing assets (+ base) / optimisation	Public transport / travel demand management 1 (+ base)	Public transport / travel demand management 2 (+ PT/TDM 1)	Safe system (+ base)	Multi-modal - low (+ base)	Multi-modal - medium (+ multi-modal - low)	Multi-modal - high (+ multi-modal - medium)
Investment objectives										
Improve travel time reliability Reduction in 95th percentile travel time	Neutral	Minor benefit	Major benefit	15-25% Minor benefit	Minor benefit	20-40% Moderate benefit	Minor benefit	15-25% Minor benefit	30-45% Moderate benefit	40-55% Major benefit
Improve public transport punctuality	Neutral	Minor benefit	Moderate disbenefit	10min peak services, +60% peak capacity, Moderate benefit	Major benefit	10min peak services, +60% peak capacity, 6min journey reduction, extended network reach, Major benefit	Minor benefit	10min peak services, +60% peak capacity, Moderate benefit	10min peak services, +60% peak capacity, 6min journey reduction, Moderate benefit	10min peak services, +60% peak capacity, 6min journey reduction, extended network reach, Major benefit
Improve road safety DSI saved/5 years	Neutral	Minor benefit	Major benefit	<20 Major benefit	Minor benefit	<10 Moderate benefit	Major benefit	<20 Major benefit	25-30+ Major benefit	30+ Major benefit
Improve quality of infrastructure KiwiRAP star rating	Neutral	Minor benefit	Major benefit	4+ Moderate benefit	Minor benefit	3-4 Minor benefit	Major benefit	4+ Moderate benefit	4.5 Major benefit	4.5+ Major benefit
Improve resilience Number of closures	Neutral	Moderate benefit	Major benefit	2 Moderate benefit	Moderate benefit	2 Moderate benefit	Moderate benefit	2 Moderate benefit	2 Moderate benefit	1 Major benefit
Stakeholder ranking (Shortlisted programmes include further detailed outcomes)	-	-	-	Shortlisted	-	Shortlisted	-	Shortlisted	Recommended	Shortlisted
Implementability risks (feasibility, affordability, public/stakeholder)	Low	Low	Very high	Medium	Medium	Very high	High	Medium	High	Very high
MCA										
Safety	Neutral	Minor benefit	Major benefit	Major benefit	Minor benefit	Moderate benefit	Major benefit	Major benefit	Major benefit	Major benefit
Economy	Neutral	Minor benefit	Major benefit	Minor benefit	Minor benefit	Moderate benefit	Minor benefit	Minor benefit	Moderate benefit	Major benefit
Environmental	Neutral	Minor disbenefit	Major disbenefit	Neutral	Neutral	Moderate disbenefit	Neutral	Minor disbenefit	Minor disbenefit	Moderate disbenefit
Social	Neutral	Moderate benefit	Minor disbenefit	Minor disbenefit	Minor benefit	Minor benefit	Neutral	Minor benefit	Neutral	Minor benefit
Cultural	Neutral	Minor disbenefit	Moderate disbenefit	Minor disbenefit	Neutral	Neutral	Neutral	Minor disbenefit	Minor disbenefit	Moderate disbenefit
Economics										
Cost Range (\$m)	\$0	\$600 - \$800	\$1800 - \$2800	\$1100 - \$1600	\$1100 - \$1500	\$1400 - \$2000	\$900 - \$1400	\$1000 - \$1500	\$1400 - \$2100	\$2500 - \$3600
Benefit Cost Ratio (BCR)		1.3 - 2.5	0.6 - 1.7	1.1 - 2.2	1.0 - 1.9	1.0 - 1.9	1.1 - 2.3	1.0 - 2.2	0.9 - 2.0	0.7 - 1.6

Recommended programme

Stakeholders selected programme 9 as the recommended programme on the basis that:

- It provided a balanced solution across all investment objectives; delivering over 70% of the benefits for approximately half the cost of programme 10.
- It is likely to meet customer expectations in regards to improvements across all modes.
- It provides an appropriate response to the problems without including some larger infrastructure projects which are high risk, high cost and unlikely to be necessary.
- There was support and buy-in from the investment partners.

STAKEHOLDERS AND INVESTORS

Investment partners

- Greater Wellington Regional Council
- NZ Police
- KiwiRail
- Hutt City Council
- Wellington City Council
- Upper Hutt City Council

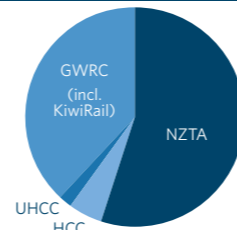
Stakeholders

- Automobile Association
- Wellington Lifelines Group
- Road Transport Association
- CentrePort
- Hutt Cycle Network

IMPLEMENTATION PARTNERS

We will partner with a range of organisations to deliver the recommended programme

- Greater Wellington Regional Council
- Regional Council
- NZ Police
- KiwiRail
- Upper Hutt City Council
- Hutt City Council
- Wellington City Council



RISKS AND UNCERTAINTIES

Trigger	Time	Certainty	Impact	Comments
Petone to Grenada Link Road	5 years	More than likely	Very high	Petone to Grenada Link Road (P2G) will reduce demand on some SH2 sections, even more important once Transmission Gully is operational and more vehicles use SH58. If P2G is delayed or is unable to progress, other solutions will be required to mitigate the effects of high traffic volumes.
Ngauranga to Airport (N2A)	10 years	More than likely	High	Principal interdependency is the Ngauranga to Airport project (N2A). A cross-agency initiative to identify, plan and deliver integrated improvements across Wellington's transport system. Improvements on SH2 corridor need to be consistent with those proposed for N2A to ensure a coherent improvement strategy and consistent journey experience to and from Wellington.
Rail scenario funding	3 years	Reasonably foreseeable	High	Staged improvements on the Rail network are in line with Greater Wellington's current thinking: RS1 (capacity), then RSA (speed), then RS2 (capacity). This programme includes expedited delivery of RS1, to take pressure off the state highway before road improvements.
Land use development	10-20 years	Reasonably foreseeable	Medium	If very large subdivisions in Upper Hutt or Lincolnshire Farm are developed and have significant uptake, this will impact on traffic volumes and timing of projects in the programme.

APPENDIX B – INVESTMENT LOGIC MAP

New Zealand Transport Agency (NZTA)



SH2 (as part of a multi-modal corridor) from Ngauranga Gorge Intersection to Te Marua

INVESTMENT LOGIC MAP Programme

PROBLEM

BENEFIT

A
Poor configuration and operational environment of SH2 and associated local network results in poor multi-modal network performance
50%

Efficient reliable journeys that support economic productivity and growth
60%

- Ease of movement
- Increased reliability
- Increased throughput
- Infrastructure quality

B
High traffic volume and insufficient network capacity results in peak delay and unreliable journey times that adversely affect regional productivity
30%

Safer journeys for all users
20%

- Increased infrastructure quality
- Improved customer experience

C
Constrained topography, the geology and lack of alternative routes results in poor network resilience
20%

Reduce social and economic impact of HILP & LIHP events
20%

KPI 1: Projected cost to recover network
KPI 2: Network reliability

Note:
Multi-modal in this context means SH2 road users (all modes), and the corridor interface with other transport modes/ services such as bus, rail line, and park and ride facilities
Configuration includes alignment, numbers of junctions, lights etc. Operation refers to the efficiency of the network.
Network performance relates to safety, efficiency and reliability.
Operational environment relates to speed, real time management of corridors, operational services and responses
HILP - High Impact Low Probability Event - earthquake and tsunami etc
LIHP - Low Impact High Probability Event - flood, extreme weather, climatic change, rail breakdown, road closure due to crash

Business Problem Owner: Selwyn Blackmore
Facilitator: Stephen Davies Howard
Accredited Facilitator: Yes

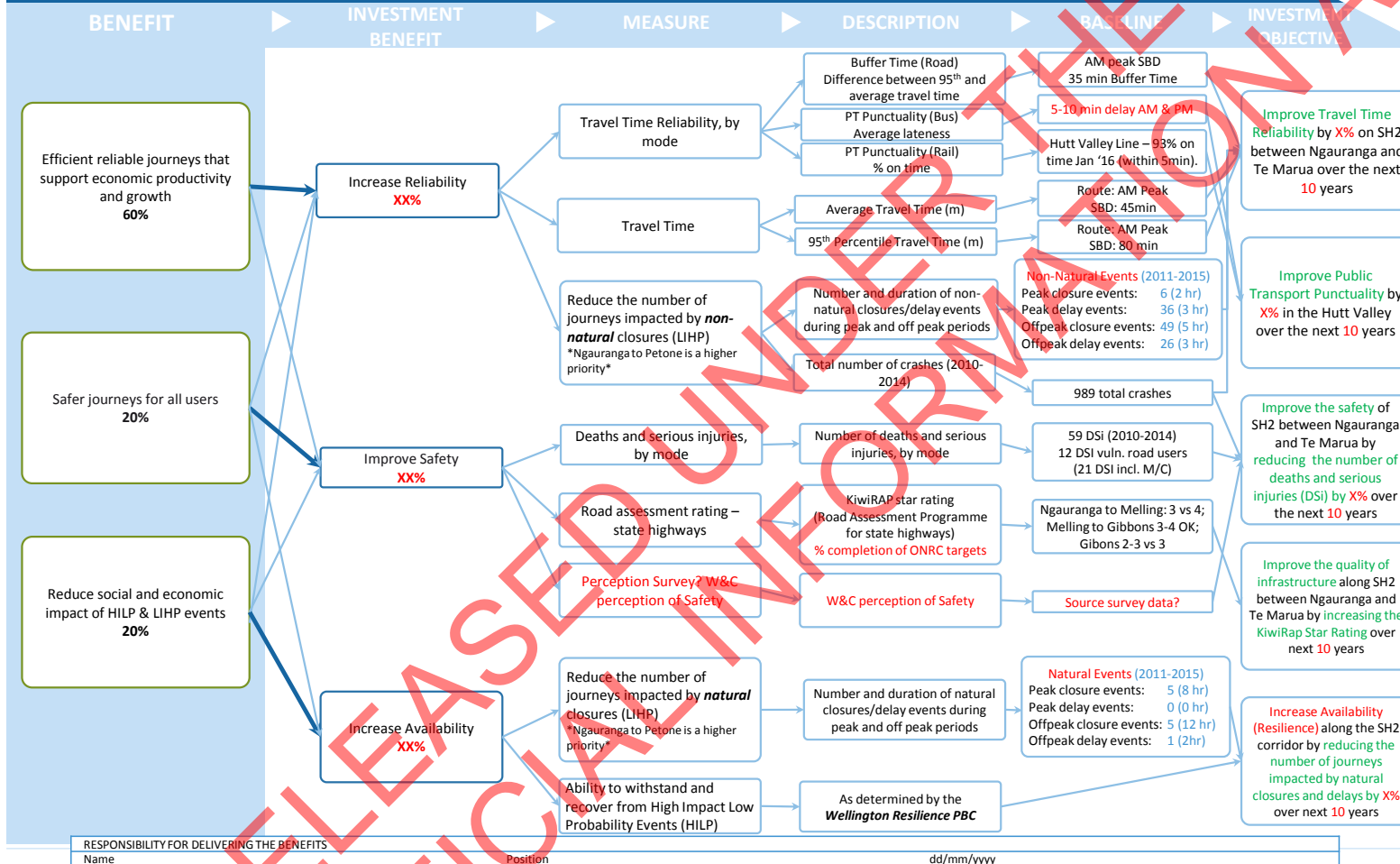
Version no: 0.5
Initial Workshop: 13/04/2015
Last modified by: Stephen Davies Howard 05/05/2015
Template version: 5.0

APPENDIX C – BENEFIT MAPS

SH2 Ngauranga to Te Marua (as part of a multi-modal corridor)

Programme Business Case

BENEFIT MAP



RESPONSIBILITY FOR DELIVERING THE BENEFITS

Name

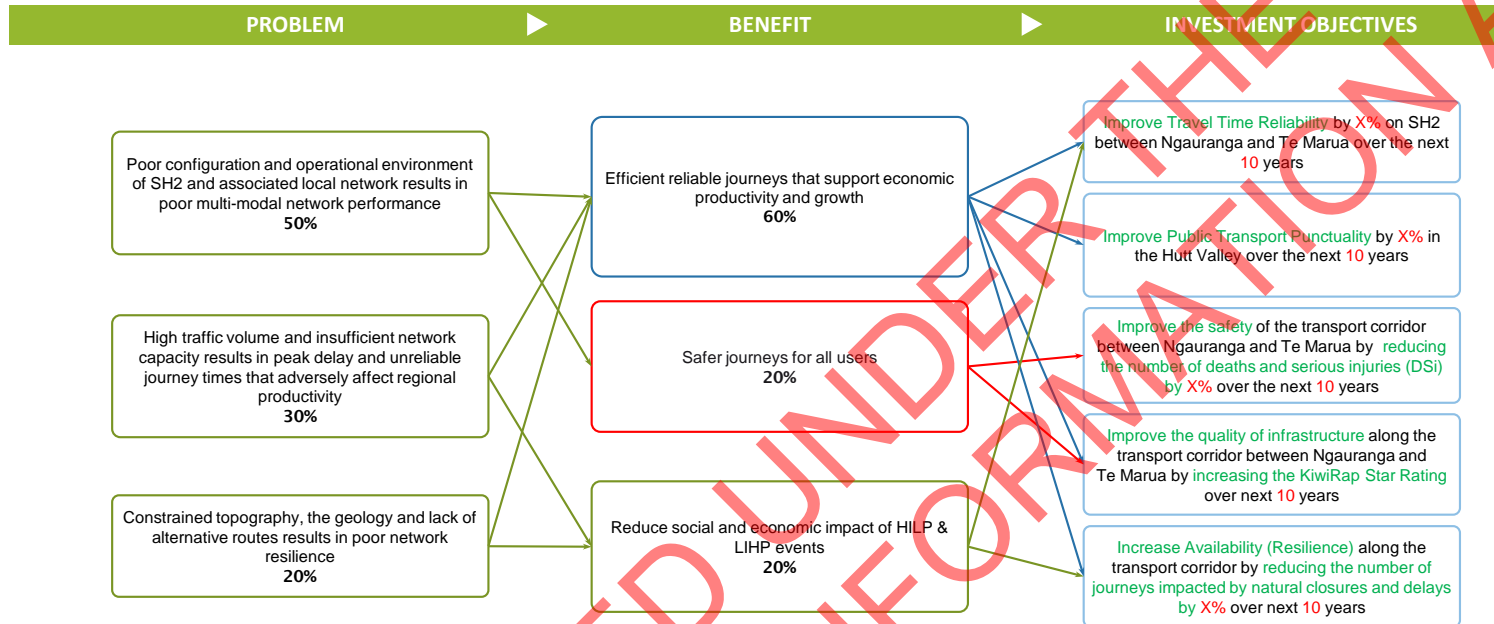
Position

dd/mm/yyyy

Business Problem Owner: Selwyn Blackmore
Facilitator:
Accredited Facilitator:

Version no: 0.5
Initial Workshop: 15/02/2016
Last modified by: Dhimantha Ranatunga
Template version: 1.0

SH2 Ngauranga to Te Marua (as part of a multi-modal corridor)
 Programme Business Case



Note:
 Multi-modal in this context means SH2 road users (all modes), and the corridor interface with other transport modes/ services such as bus, rail line, and park and ride facilities. Configuration includes alignment, numbers of junctions, lights etc. Operation refers to the efficiency of the network. Operational environment relates to speed, real time management of corridors, operational services and responses. Network performance relates to safety, efficiency and reliability.
 HILP - High Impact Low Probability Event - earthquake and tsunami etc
 LIHP - Low Impact High Probability Event - surface flooding, extreme weather, rail breakdown, road closure due to crash

Business Problem Owner: Selwyn Blackmore
 Facilitator: Phil Peet
 Accredited Facilitator: No

Version no: 0.5
 Workshop 1: 15/02/2016
 Last modified by: Phil Peet 14/04/2016
 Template version: 1.0

APPENDIX D – UNCERTAINTY LOG

Table D-1: Uncertainty log classifications

Probability	Status
Near certain: The outcome will happen or there is a high probability that it will happen	Policy or funding approval Tenders let Under construction
More than likely: The outcome is likely to happen but there is some uncertainty	Submission of planning consent application imminent Adopted plans
Reasonably foreseeable: The outcome may happen, but there is significant uncertainty	Adopted plans Draft plans Development conditional upon interventions going ahead
Hypothetical: There is considerable uncertainty whether the outcome will ever happen	A policy aspiration

Table D-2: SH2 Ngauranga to Te Marua Uncertainty Log

Factor	Time	Probability	Impact on programme	Comments
Factors affecting demand				
Upper Hutt – Housing General	Beyond 10 years	Reasonably foreseeable	High	<ul style="list-style-type: none"> Residential development resulting in 4,500 dwellings over the next 30 years (to cater for projected population growth of 8,100 people). Includes subdivisions named within the uncertainty log. Demand is expected to outstrip zoned land within the next 20 years.
Riverstone Terraces	Underway	Near certain	Medium	<ul style="list-style-type: none"> Residential development on greenfield site in Upper Hutt City. 250 dwellings still to be constructed.
Wallaceville	Underway	Near certain	High	<ul style="list-style-type: none"> Residential intensification within this Upper Hutt suburb. Up to 800 lots.
Upper Hutt CBD	Underway	Reasonably foreseeable	Medium	<ul style="list-style-type: none"> Residential intensification in Upper Hutt City. Currently scoping even further intensification.

Factor	Time	Probability	Impact on programme	Comments
Trentham	Underway	Reasonably foreseeable	Medium	<ul style="list-style-type: none"> Residential intensification in Upper Hutt City.
Kingsley Heights; Gillespie Road; Guildford Land; Maymorn	Beyond 10 years	Hypothetical	High	<ul style="list-style-type: none"> Numerous residential greenfield locations within the Upper Hutt City Council region. Scoping study stage.
Central Institute of Technology (CIT)	Underway	More than likely	Medium	<ul style="list-style-type: none"> Former campus site largely unused since 2001; new site owners in late 2015. 18.3ha total area, 28,000m² Mixed-use development potential Tenants beginning to occupy in 2016.
Petone West	Beyond 10 years	More than likely	Medium	<ul style="list-style-type: none"> Residential and commercial development. Apartments and offices. Plan Change 29 approved.
Vision Seaview Gracefield	Beyond 10 years	More than likely	Medium	<ul style="list-style-type: none"> Commercial and industrial development in the Hutt City Council.
Wainuiomata House	Beyond 10 years	Reasonably foreseeable	Low	<ul style="list-style-type: none"> Residential greenfield site for 1000 dwellings. Hutt City Council.
Wainuiomata College; Epuni; Kelson; Hutt City CBD fringes; Stokes Valley; Waterloo	Beyond 10 years	Reasonably foreseeable	Low	<ul style="list-style-type: none"> Numerous residential intensification within the Hutt City Council region. Scoping stages currently.
Wellington City Council - Housing General	Beyond 10 years	More than likely	High	<ul style="list-style-type: none"> 21,600 houses in 30 years, based on 8640 in the CBD (40%), 7560 in existing residential areas (35%) and 5400 in new residential areas (25%). Adopted from the Wellington City Growth Plan.
Porirua City Council -	Beyond 10 years	Reasonably foreseeable	Low	<ul style="list-style-type: none"> 200 new houses per year in the Porirua City Council.

Factor	Time	Probability	Impact on programme	Comments
Housing General				
Waingawa	Beyond 5 years	Reasonably foreseeable	Medium	<ul style="list-style-type: none"> 300 residential dwellings, 200 hectares of commercial and industrial development.
Chamberlain Road; Ngaumutawa Industrial Zone	Proposed	Reasonably foreseeable	Low	<ul style="list-style-type: none"> Residential and commercial intensification in Masterton District. 25 ha residential, 15 ha commercial.
Wairarapa Water Use Project	Scoping	Hypothetical	Medium	<ul style="list-style-type: none"> Rural Intensification. 30,000 hectares. Masterton District Council, Carterton District Council, South Wairarapa District Council.
Factors affecting supply				
Transmission Gully	2021	Near certain	Medium	<ul style="list-style-type: none"> PPP underway.
SH2/SH58 Interchange	2019	Near certain	High	<ul style="list-style-type: none"> D&C underway.
SH1/SH2 Petone to Grenada	2024	Reasonably foreseeable	High	<ul style="list-style-type: none"> The Petone to Grenada project would construct a new road between SH1 (Grenada) and SH2 (Petone) to improve road network resilience. Preferred route option has been selected. Project still at early investigation stages.
Resilience PBC	Beyond five years	Near certain	Medium	<ul style="list-style-type: none"> The Wellington Resilience Programme will identify an optimal mix of alternatives and options for the development of this PBC and those for Ngauranga to Airport and SH1 Ngauranga to SH58.
Wellington to Hutt Valley cycleway / walkway / resilience	2018	Near certain	Medium	<ul style="list-style-type: none"> Provision of a continuous high quality cycleway adjacent to SH2 between Ngauranga and Petone.

Factor	Time	Probability	Impact on programme	Comments
Rail Scenario 1 – Passenger Rail Improvements	2020	Near certain	Low	<ul style="list-style-type: none"> Under construction. Implementation of a nominal 15 minute morning peak period service with a modified service pattern rail infrastructure upgrades and twin tracking on the Hutt Line.
Rail Scenario 2	Beyond 10 years	Hypothetical	Medium	<ul style="list-style-type: none">
PT spine study outcomes	Beyond five years	More than likely	Low	<ul style="list-style-type: none"> The recommendation for the inner city Wellington spine is Bus Rapid Transit (BRT). Next stage is confirm corridor and exact configuration of the BRT facilities.
Park and ride facilities	2016	Near certain	Low	<ul style="list-style-type: none"> New park and ride facility provided at the SH2/58 interchange for the Manor Park station. However most park and ride facilities proposed are for other rail corridors.
Factors affecting cost				
Local integrated ticketing scheme	2014	Reasonably foreseeable	Low	<ul style="list-style-type: none"> Business case under preparation for funding of a scheme.
Rates	2016	More than likely	Low	<ul style="list-style-type: none"> Greater Wellington Regional Council approved a 9.8% annual rates increase under the 2015-25 LTP. This funding will generate \$10M and go towards keeping existing services running, fund the current capital investment programme and for new activities.
Changes in PT cost – fares	Annually	Reasonably foreseeable	Low	<ul style="list-style-type: none"> Although rail fare increases did not occur in 2014 and 2015, due to low oil prices and increased patronage, it is foreseeable that future fare increases would occur.
Fuel prices	2045	Hypothetical	Medium	<ul style="list-style-type: none"> Fluctuation in global fuel costs had an impact on travel demand in the 2008/9; a similar change in markets will reduce private travel and slow growth for a period of time.

Factor	Time	Probability	Impact on programme	Comments
				Similarly a sustained decline in cost could have the converse effect. There is no real way of accurately forecasting this.
Maintenance of roads	2025	Hypothetical	Medium	<ul style="list-style-type: none"> A long term reduction in LOS for road condition "sweating the asset" will result in reduced ride and surface quality with an increase in temporary speed restrictions and sections undergoing maintenance, this could impact on the efficiency of freight transport.

RELEASED UNDER THE OFFICIAL INFORMATION ACT

APPENDIX E - PROGRAMME OPTIONS

As presented at Workshop 3.

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

1				INVESTMENT OBJECTIVES (H,M,L,None)					MCA (1 Major benefit, 4 neutral, 7 Major)					Programme											
Option Number	Option Type	Option	Option Description	Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure for Safety (KiwIRAP)	Improve Resilience	Safety	Economy	Social (#2)	Cultural (#3)	Environment (#1)	Implementability Risks (VH,H,M,L)	1	2	3	4	5	6	7	8	9	10	
															Do-minimum Base (+ Do-minimum)	Roading Do-Maximum	Maximise existing assets (+ Base) / Optimisation	Public Transport / Travel Demand Management 1	PT / Travel Demand Management 2	Safe System (+ Base)	Multi-Modal - Low (+ Base)	Multi-Modal - Medium (+ Multi-Modal - Low)	Multi-Modal - High (+ Multi-Modal - Medium)		
Physical Works to Road																									
101a	Grade Separated Interchanges	Melling Grade Separated Interchange	Provision of a Grade Separated Interchange at Melling Link. Includes provision of new bridge over the Hutt River. Scope based on the Melling Gateway Programme Business Case (NZTA, 2015).	HIGH	LOW	HIGH	HIGH	HIGH	1	1	4		6	H	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
101b	Grade Separated Interchanges	Kennedy Good Grade Separated Interchange	Provision of a Grade Separated Interchange at Fairway Drive. Scope based on the Melling to Haywards Upgrades Investigation Scoping Report (Beca, 2010)	HIGH	LOW	HIGH	HIGH	MEDIUM	1	2	5		6	H	x	x	✓	✓	x	x	✓	✓	✓	✓	✓
101c	Grade Separated Interchanges	Silverstream Grade Separated Interchange	Provision of a Grade Separated Interchange at Fergusson Drive South. Scope based on the SH2 / Fergusson Drive Intersection, Silverstream Project Feasibility Report (MWH, 2009)	HIGH	LOW	MEDIUM	HIGH	HIGH	2	2	5		7	M	x	x	✓	x	x	x	✓	x	✓	✓	✓
102a	Consistent Intersections	Remove at grade right turns south of Upper Hutt	Intersection upgrades at Grounsell Cres, Owen St and Hebden Cres to remove right turns onto the state highway. This would likely involve installing median barrier and providing access at adjacent interchanges.	MEDIUM	LOW	MEDIUM	MEDIUM	NONE	2	3	5		4	M	x	x	✓	✓	x	x	✓	x	✓	✓	✓
102b	Consistent Intersections	Improve at grade intersections in rural areas through and north of Upper Hutt	Various upgrades to the nine at grade intersections in the rural areas between Moonshine Hill Road and Plateau Road. Intersection treatments would vary to treat specific local issues.	MEDIUM	LOW	HIGH	MEDIUM	NONE	1	3	3		5	M	x	x	x	✓	x	x	✓	✓	✓	x	✓
102c	Consistent Intersections	Improve major intersections at-grade on SH2	Improve major at grade intersections south of Upper Hutt, Melling, KGB and Silverstream. Melling upgrade option from SH2 at Melling - Intersection Improvements Business Case Report (GHD, Nov 2014).	LOW	LOW	LOW	LOW	NONE	3	3	4		5	M	x	x	x	x	x	x	x	x	x	x	x
		Just Silverstream		LOW	LOW	LOW	LOW	NONE	3	3	4	0	5	M											
102d	Consistent Intersections	Improve intersections through urban areas on SH2	Improve intersections through urban area (Maoribank Gr to Sunnyview Dr). This may involve physical works such as increase in lane width, right turn bays, separated turn movements (traffic islands), or more functional changes like traffic signals, signage/road marking. Minor works would fit within the road corridor, but there is potential that more extensive works would need additional land area.	LOW	LOW	MEDIUM	MEDIUM	NONE	2	4	5		5	L	x	x	✓	✓	x	x	✓	✓	✓	✓	✓
103a	Improving and Optimising Access onto SH2	Remove all access in rural 80km/h areas - Dependent on I/C & Bypass	Remove all access in rural areas south of Moonshine. This would require closing intersections and driveways and making traffic reroute via local road network or interchanges. This can only be done in conjunction with Grade Separated Interchanges. (North of Moonshine considered in Upper Hutt Bypass option).	LOW	NONE	HIGH	MEDIUM	NONE	1	5	6		4	H	x	x	✓	x	x	x	✓	✓	✓	✓	✓
103b	Improving and Optimising Access onto SH2	Ensure no more access in the urban 70km/h area	District Plan changes and other measures to ensure no additional access directly onto the highway through the urban north of Upper Hutt, except at intersections	LOW	LOW	MEDIUM	LOW	NONE	3	4	5		4	M	x	x	x	✓	x	x	✓	✓	✓	✓	x
104a	Reduce number of dangerous access points/side roads	Access on River Road to the Hutt River	Reduce and improve dangerous access points/side roads on River Road. There are currently 6 access points onto River Road.	LOW	NONE	MEDIUM	MEDIUM	NONE	2	4	6		4	L	x	x	x	✓	x	x	✓	✓	✓	✓	x
105a	Crash Barriers or removal of hazards	Crash Barriers or removal of hazards on SH2 - Severe only	Crash barriers or removal of hazards for all severe hazards along the corridor. This is likely to involve 8km of barriers.	LOW	NONE	MEDIUM	MEDIUM	NONE	2	4	5		5	M	x	x	x	✓	x	x	x	✓	✓	✓	x
105b	Crash Barriers or removal of hazards	Crash Barriers or removal of hazards on SH2 - Moderate and Severe	Crash barriers or removal of hazards for all severe and moderate hazards along the corridor. This is likely to result in a total of 38km of barrier.	LOW	NONE	HIGH	HIGH	NONE	1	4	5		5	H?	x	x	✓	x	x	x	✓	x	✓	✓	✓
106a	Geometry and alignment improvements along corridor	Realignment of out of context curves	Realignment of out of context curves. Number and location to be determined.	LOW	NONE	MEDIUM	MEDIUM	NONE	2	3	5		6	H?	x	x	x	✓	x	x	✓	✓	✓	✓	x
106b	Geometry and alignment improvements along corridor	Realignment to 100km/h design speed	Improved alignment and geometry along corridor to increase to 100km/h design speed. Number and location to be determined.	LOW	NONE	MEDIUM	MEDIUM	NONE	2	3	5		6	H?	x	x	✓	x	x	x	x	x	x	x	✓
106c	Geometry and alignment improvements along corridor	Realignment to 110km/h design speed	Improved alignment and geometry along corridor to increase to 110km/h design speed. Number and location to be determined.	LOW	NONE	HIGH	HIGH	NONE	1	3	5		6	H?	x	x	x	x	x	x	x	x	x	x	x
108a	Separate PT and cyclists from traffic, HOV lanes, different modes or traffic directions	Make one lane HOV in peak periods	Ngauranga to Petone only. Use existing carriageway width and create a high occupancy vehicle lane either using current shoulder or converting an existing lane to HOV only in peak periods.	LOW	LOW	LOW	LOW	NONE	4	4	3		6	H	x	x	x	x	x	✓	x	x	x	x	x
109a	More lanes	Six laning Ngauranga to Petone	Six laning Ngauranga to Petone. Assumes lane gain and drop at Ngauranga. New Petone interchange part of P2G. 8.5km	HIGH	LOW	MEDIUM	LOW	MEDIUM	3	1	3	5	7	VH	x	x	✓	x	x	x	x	x	x	x	✓
109b	More lanes	Six laning Petone to Dowse	Six laning Petone to Dowse. Requires alterations to overbridges and new Dowse interchange. 2.5km	HIGH	NONE	LOW	LOW	MEDIUM	3	1	3		7	VH	x	x	✓	x	x	x	x	x	x	x	✓
109c	More lanes	Six laning Dowse to Melling	Six laning Dowse to Melling. Allowance for increase cost for six laning provision through new interchange at Melling. 2.7km	HIGH	NONE	LOW	LOW	MEDIUM	3	1	3		7	H	x	x	✓	x	x	x	x	x	x	x	x
109d	More lanes	Six laning Melling to KGB	Six laning Melling to Kennedy Good Bridge. Allowance for increase cost for six laning provision through new interchange at KGB. 3.2km	HIGH	NONE	LOW	LOW	MEDIUM	3	1	3		6	H	x	x	✓	x	x	x	x	x	x	x	x
109e	More lanes	Six laning KGB to SH2/58	Six laning KGB to SH2/58. Requires changing new SH2/SH58 Interchange. 9.0km	HIGH	NONE	LOW	LOW	MEDIUM	3	1	4		6	H	x	x	✓	x	x	x	x	x	x	x	x
109f	More lanes	Six laning SH2/58 to Silverstream	Six laning SH2/58 to Silverstream. Assumes lane drop at Silverstream. 2.8km	MEDIUM	NONE	LOW	LOW	MEDIUM	3	1	4		6	H	x	x	x	x	x	x	x	x	x	x	x
109g	More lanes	Four laning Silverstream to Moonshine	Four laning Silverstream to Moonshine. 2.2km	HIGH	NONE	MEDIUM	LOW	MEDIUM	3	1	3		6	H	x	x	✓	x	x	x	x	x	x	✓	✓
110a	Upgrade Parallel Routes on local roads	Upgrade Hutt Road - Eastern Arterial	Upgrade Hutt Road - Petone to Dowse	LOW	MEDIUM	LOW	LOW	NONE	3	3	4		4	L	x	x	✓	✓	x	x	x	✓	✓	✓	✓
110e	Upgrade Parallel Routes on local roads	Upgrade Fergusson Drive - Silverstream to Fergusson Drive North	Upgrade Fergusson Drive - Silverstream to Fergusson Drive North	LOW	MEDIUM	LOW	LOW	NONE	3	3	4		4	L	x	x	✓	✓	x	x	x	✓	✓	✓	✓
111a	Improved East West Connections	Capacity improvement along the Esplanade	Upgrading The Esplanade, including new intersections as appropriate, from Hutt Park Roundabout (Seaview Road) to Petone. This includes widening to four lanes at the western end, but not a new bridge over the Hutt River.	LOW	LOW	LOW	LOW	LOW	3	2	5		5	M	x	x	x	✓	x	x	x	✓	x	x	x
112a	Wider shoulders	Shoulder widening to 1.5m	Increasing the sealed shoulder width to 1.5m consistently along SH2. Location and extent to be determined.	LOW	NONE	MEDIUM	MEDIUM	LOW	2	4	5		5	M	x	x	x	✓	✓	x	✓	✓	✓	✓	✓
112b	Wider shoulders	Shoulder widening to 2.5m	Increasing the sealed shoulder width to 2.5m consistently along SH2. Location and extent to be determined.	LOW	NONE	MEDIUM	MEDIUM	MEDIUM	2	4	5		5	H	x	x	x	x	x	x	x	x	x	x	x
113a	Upper Hutt Bypass	Upper Hutt Bypass or upgrade existing SH2 (Moonshine to Topaz)	Upper Hutt Bypass or upgrade existing SH2 As outlined in the SH2 - River Road Realignment Project Feasibility Report (2009) this would constitute a new four-lane route from Moonshine Road to Topaz Street \ Option 2	MEDIUM	LOW	HIGH	HIGH	HIGH	1	1	5	6	7	H	x	x	✓	x	x	x	x	x	x	x	✓
117a	Melling Bridge	Melling Bridge	Replacement and upgrading of Melling Bridge. From a transport perspective, Melling Bridge and the adjacent intersection with SH2 operates at capacity in peak periods. The bridge is narrow with only three traffic lanes, does not provide a safe, segregated path for cyclists and is a constraint on the floodway. From Melling Gateway Programme Business Case (NZTA, Nov 2015)	MEDIUM	LOW	LOW	LOW	HIGH	3	2	1	5	6	M	x	x	x	x	x	x	x	x	x	x	x
118a	Cross Valley Link	Cross Valley Link	Cross Valley Link (possibly between Whites Line East and Hutt Road). New link east-west across the Hutt Valley including a new bridge over the Hutt River. Scope from The Ngauranga Triangle Study (NZTA, Jan 2010).	LOW	LOW	LOW	LOW	MEDIUM	3	1	2		6	H	x	x	✓	x	x	x	x	x	✓	✓	✓
119a	Petone to Grenada	Petone to Grenada	Petone to Grenada The proposed new transport route will: * Provide a four-lane route between Petone and Tawa, plus crawler lanes on the Petone side * Run between Petone and Tawa via the Horokivi Crest (largely avoiding homes in the Hunters Hill area * Be constructed mostly in cut through Horokivi to reduce visibility from Horokivi and much of the Hutt Valley * Create four new interchanges, providing better access on and off State Highways 1 and 2 * Avoid impacting on the Belmont Regional Park and * Provides future highway capacity north of Tawa on SH1 within the existing highway footprint between Tawa and Transmission Gully when it is needed.	HIGH	LOW	MEDIUM	MEDIUM	HIGH	2	1	6	5	7	H	x	✓	✓	✓	✓	x	✓	✓	✓	✓	✓
Physical Works to Rail																									
201a	Extend Melling Line	Extend to Hutt City Centre	Extend Melling Link to Hutt City Centre. Includes a new link over the Hutt River and approximately 400m of new track.	LOW	LOW	NONE	NONE	LOW	4	2	3		6	H	x	x	x	x	✓	✓	x	x	x	✓	✓

1				INVESTMENT OBJECTIVES (H,M,L,None)					MCA (1 Major benefit, 4 neutral, 7 Major)					Programme											
Option Number	Option Type	Option	Option Description	Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure for Safety (KiwIRAP)	Improve Resilience	Safety	Economy	Social (#2)	Cultural (#3)	Environment (#1)	Implementability Risks (VH,H,M,L)	1	2	3	4	5	6	7	8	9	10	
															Do-minimum Base (+ Do-minimum)	Roading Do-Maximum	Maximise existing assets (+ Base) / Optimisation	Public Transport / Travel Demand Management 1	PT / Travel Demand Management 2	Safe System (+ Base)	Multi-Modal - Low (+ Base)	Multi-Modal - Medium (+ Multi-Modal - Low)	Multi-Modal - High (+ Multi-Modal - Medium)		
201b	Extend Melling Line	Extend to Hutt Valley Line	Extend to Hutt Valley Line. Includes a new link over the Hutt River and approximately 2,000m of new track. May need to involve some cut and cover tunnelling.	MEDIUM	MEDIUM	LOW	NONE	MEDIUM	3	2	3			VH	x	x	x	x	x	x	x	x	x	x	
207a	Rail Scenarios	Rail Scenario 1	Rail Scenario 1 (RS1) was designed to underpin the region's strategic requirements for rail based passenger and freight transportation. The primary focus of RS1 is the continued improvement of the following key operational characteristics, specifically during peak periods: Capacity · Reliability · Frequency. RS1, as developed in the 2009 RRP, provides for a significant increase in the number of new electric trains forming the GWRC rolling stock fleet. Consequently RS1 had increasing peak seat capacity and delivery of a regular and reliable service with at least four trains per hour to Wellington on all electrified lines during the two hour AM Peak time. By design, RS1 also had the effect of increasing freight capacity and speed.	MEDIUM	HIGH	LOW	NONE	MEDIUM	3	2	2			M	x	✓	x	✓	✓	✓	✓	✓	✓	✓	
207b	Rail Scenarios	Rail Scenario 2	Rail Scenario 2 (RS2) builds on the substantial reliability and capacity improvements delivered through the implementation of RS1. RS2 has been specifically developed to optimise the use of existing capacity on the Hutt Valley Line. Similar to RS1 the 'layered' timetable is representative of today's service pattern, however, the increase renders a 10 minute maximum wait time on the Hutt Valley Line and 15 minute maximum wait time on all other metro lines. Further investment in rolling stock is necessary to provide the required service level and capacity that closely matches the requirements of future strategic demand. Key components include: 10 minute peak frequency service level representing six trains per hour commencing service from each of: · Upper Hutt and Taita (HVL). 15 minute peak frequency service level representing four trains per hour commencing service from each of: · Waikanae and Pimmerton (PPL) · Johnsonville (JVL) · Melling (MEL). RS2 optimises spare capacity on the Hutt Valley Line as a direct result of fully developing RS1, consequently no additional infrastructure work is required.	LOW	MEDIUM	NONE	NONE	LOW	3	3	3			L	x	x	x	✓	✓	✓	x	✓	✓	✓	
207c	Rail Scenarios	Rail Scenario A	Rail Scenario A (RSA) is a service enhancement option, developed as such, that can be founded on either RS1 or RS2. It is anticipated that the implementation of RSA would be as a direct result of a 'trigger factor', most probably the inherent need for a more competitive passenger transport offering based on the successes of either RS1 or RS2 (as road de-congestion takes effect). This scenario would provide true 'express' services, from outer lying stations, on both the Waikanae to Wellington Line and the Hutt Valley Line, resulting in noticeable reductions in journey times. The reductions will be achieved through a combination of 'quick impact projects' and larger more significant enhancements. Key components include: 20 minute peak frequency service level representing three trains per hour commencing service from Upper Hutt (HVL). · Curve easement and speed improvements, along the Petone foreshore (this may also incorporate a corridor for other modes such as walking and cycling) · Track upgrades, slab track and higher speed 'turnouts and cross-overs', to increase average operational speeds · Overhead electrification 'system strengthening' · Safety Improvements at Level Crossings · Corridor security enhancements · Rationalisation of stations with 'very low patronage' · Additional improvements at selected stations.	MEDIUM	HIGH	LOW	NONE	MEDIUM	3	2	5				H	x	x	x	x	✓	✓	x	x	✓	✓
207d	Rail Scenarios	Rail Scenario B	Rail Scenario B (RSB) is a service enhancement option, similar to RSA in that it can be founded on either RS1 or RS2 scenarios but is considered to be independent. It is anticipated that the implementation of RSB would be as a direct result of a 'trigger factor', most probably the inherent need for a more competitive passenger transport offering based on the need to penetrate further into the region through service expansion beyond existing Tranz Metro Wellington (TMW) operational boundaries. It is considered that this scenario will be reactionary, with the necessity and ability for quick implementation. Key components of this option include: Nominal three trains per hour operating and integrating with peak period services providing 'shuttle' services operating between Masterton / Maymorn and Upper Hutt. Track and Signalling enhancements, to provide necessary operational flexibility · New and Upgraded Stations (origin, intermediate and interchange). This scenario does not encompass the extension of the electrification network.	LOW	MEDIUM	NONE	NONE	LOW	3	2	3				M	x	x	x	x	✓	x	x	x	✓	
301a	Removing conflicts between modes	Ngauranga to Melling Cycleway	Ngauranga to Melling cycleway. The path would be three metres wide with a metre-wide shoulder on each side, and would be built between the current railway line and the sea. The project will require substantial reclamation since the rail tracks are on the edge of the harbour.	LOW	NONE	HIGH	MEDIUM	HIGH	1	3	2			H	x	✓	x	✓	✓	✓	✓	✓	✓	✓	
302a	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - Ngauranga to Petone	On road cycle lane - Ngauranga to Petone. Minimum option is a consistent 2.5m shoulder including a marked cycle lane. Maximum option is 2.0m cycle lanes on each side separated from the traffic lanes by a barrier. Will likely involve carriageway widening into the hillside or existing cycleway.	LOW	NONE	MEDIUM	MEDIUM	LOW	2	3	3			M	x	x	x	x	x	x	x	x	x	x	
302b	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - Petone to Melling	On road cycle lane - Petone to Melling. Dimensions as per 302a.	LOW	NONE	LOW	MEDIUM	LOW	2	3	3			M	x	x	x	x	x	✓	x	x	x	x	
302c	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - Melling to KGB	On road cycle lane - Melling to Kennedy Good Bridge. Dimensions as per 302a.	LOW	NONE	LOW	MEDIUM	LOW	2	3	3			M	x	x	x	x	x	✓	x	x	x	x	
302d	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - KGB to Silverstream	On road cycle lane - Kennedy Good Bridge to Silverstream. Dimensions as per 302a.	LOW	NONE	LOW	MEDIUM	LOW	2	3	3			M	x	x	x	x	x	✓	x	x	x	x	
302e	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - Silverstream to Fergusson Drive North	On road cycle lane - Silverstream to Fergusson Drive North. Dimensions as per 302a.	LOW	NONE	LOW	MEDIUM	LOW	2	3	3			M	x	x	x	x	x	✓	x	x	x	x	
302f	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - Fergusson Drive North to Norana Road	On road cycle lane - Fergusson Drive North to Norana Road. Dimensions as per 302a.	LOW	NONE	LOW	MEDIUM	LOW	2	3	5			M	x	x	x	x	x	✓	x	x	x	x	
302g	Consistent cycle lanes (road shoulders through corridor)	On road cycle lane - Norana Road to Plateau Road	On road cycle lane - Norana Road to Plateau Road. Dimensions as per 302a.	LOW	NONE	LOW	MEDIUM	LOW	2	3	4			M	x	x	x	x	x	x	x	x	x	x	
304a	Cycle racks on front of buses	Cycle racks on front of buses	Roll out after the current test of putting cycle racks on the front of buses.	LOW	None	None	None	NONE	4	4	4			L	x	✓	x	✓	✓	✓	✓	✓	✓	✓	
306a	High Quality off road cycle lanes	Hutt River Trail Extension and Connections	East-West pedestrian and cycle links (local) Hutt River cycle trail, consistency & connections. The Hutt River Trail currently spans 29km and runs along the eastern bank of the Hutt River from Petone to Upper Hutt. The secondary trail follows the western side of the Hutt River from Hutt Estuary Bridge to Manor Park. This option would involve extending the secondary western bank trail to Te Marua as well as creating east-west connections to link the two trails as there are currently very few crossing points. Potential improvements could be: 1) Manor Park extension 2) Totara connection to Upper Hutt 3) trail connection north east to link into the Rimutaka Trail 4) connections to the Maymorn trail east of Te Marua	LOW	None	LOW	LOW	None	3	3	1	4	5	M	x	x	x	✓	✓	✓	✓	✓	✓	✓	
308a	Cyclist bypasses at Petone and Dowse	Cyclist bypasses at Petone and Dowse	Cycle bypasses at Petone and Dowse interchanges. Similar to that proposed at the SH2/58 interchange. This option comprises bypasses for north / south travelling cyclists which mean they can avoid the interchange.	LOW	NONE	MEDIUM	LOW	LOW	2	4	3			H	x	x	x	x	x	✓	✓	x	x	✓	
309a	Improved walking and cycling integration with PT	Improved walking and cycling links to and infrastructure at key rail stations (e.g. East/West links).	Improvements at and near railway and bus stations to encourage more people to walk or cycle to public transport. This could include improved walking and cycling paths, better crossing facilities and cycle racks at stations.	LOW	LOW	LOW	LOW	None	3	3	3			L	x	x	x	✓	✓	✓	✓	✓	✓		
309b	Improved walking and cycling integration with PT	New link between lower hutt CBD and Melling station	Installation of a new walking and cycling bridge and connections to facilitate movement between the Hutt CBD and Melling station.	LOW	LOW	LOW	LOW	None	3	3	1	5	6	M	x	x	x	x	x	x	x	✓	✓	x	

1				INVESTMENT OBJECTIVES (H,M,L,None)					MCA (1 Major benefit, 4 neutral, 7 Major)					Programme											
Option Number	Option Type	Option	Option Description	Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure for Safety (KiwirAP)	Improve Resilience	Safety	Economy	Social (#2)	Cultural (#3)	Environment (#1)	Implementability Risks (VH,H,M,L)	1	2	3	4	5	6	7	8	9	10	
															Do-minimum Base (+ Do-minimum)	Roading Do-Maximum	Maximise existing assets (+ Base) / Optimisation	Public Transport / Travel Demand Management 1	PT / Travel Demand Management 2	Safe System (+ Base)	Multi-Modal - Low (+ Base)	Multi-Modal - Medium (+ Multi-Modal - Low)	Multi-Modal - High (+ Multi-Modal - Medium)		
Public Transport																									
401a	Increase park and ride	Increase park and ride	Increase park and ride facilities at key stations. May include multi-storey carparks.	MEDIUM	LOW	LOW	None	NONE	4	2	3		4	M	x	✓	x	✓	✓	✓	✓	✓	✓	✓	✓
		Multi Storey Park and Ride		MEDIUM	LOW	LOW	None	NONE	4	2	3	0	4	M	x	x	x	x	x	✓	x	x	✓	✓	
402a	Dedicated bus lanes	Bus lanes SH2 Ngauranga to Petone	Bus Lanes on the seaward side of the railway lines between Ngauranga to Petone. This route would join into Hutt Road at the southern end and the Petone roundabout at the northern end. Would involve significant reclamation.	LOW	MEDIUM	NONE	LOW	HIGH	3	3	3	5	7	VH	x	x	x	x	x	x	x	x	x	x	x
402b	Dedicated bus lanes	Bus lanes on local roads - Petone to Lower Hutt CBD	Bus lanes on local roads – Petone to Lower Hutt CBD The assumed route is along the Esplanade, Cuba then Victoria. Assume The Esplanade doesn't need widening. Peak hour only, reallocate existing space, no widening needed.	LOW	MEDIUM	NONE	LOW	NONE	4	3	3		3	M	x	x	x	✓	✓	✓	x	x	x	✓	
403a	Increase capacity and frequency of buses, reduce fares	Increase capacity and frequency of buses in the Hutt Valley	Increase capacity and frequency of buses. Focused on local trips and feeder services to rail rather than services competing with rail.	LOW	MEDIUM	NONE	None	LOW	4	3	2		3	L	x	x	x	✓	✓	✓	x	x	✓	✓	
406a	Better fares and ticketing	Regional fares and ticketing improvements	Regional fares and ticketing improvements Integrated Ticketing. Simplified Fare Structure. New fare products.	LOW	MEDIUM	NONE	None	NONE	4	3	3		3	L	x	✓	x	✓	✓	✓	✓	✓	✓	✓	
Adjacent/Related Land Uses																									
501a	Manage land uses better	Changes to district plan to ensure development near town centres and PT corridors	Changes to district plan to ensure development near town centres and PT corridors rather than isolated greenfield. The main district plans relevant to this area are Upper Hutt City and Hutt City.	LOW	LOW	NONE	NONE	LOW	3	2	4		5	H	x	x	x	✓	✓	✓	x	x	✓	✓	
502a	Manage accesses better for new development	Changes to district plans to ensure safe and efficient access to new developments	Changes to district plans to ensure new developments do not have adverse effects on key arterials and state highways.	LOW	LOW	LOW	LOW	NONE	3	4	5		4	L	x	x	x	✓	x	✓	✓	✓	✓	✓	
Freight Management																									
		Port Access Study													x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Traffic Management																									
701a	Intelligent Transport Systems	Expansion of ITS throughout corridor	Expansion of intelligent transport systems throughout corridor. Will include new CCTV cameras, variable message signs and variable mandatory speed signs amongst other infrastructure.	LOW	LOW	LOW	LOW	MEDIUM	3	3	4		5	L	x	x	x	✓	✓	✓	✓	✓	x	x	
702a	Managed Motorway	Extension of managed motorway from Ngauranga to Petone		None	None	None	None	None																	
702b	Managed Motorway	Extension of managed motorway from Petone to Melling	Extension of managed motorway from Petone to Melling	MEDIUM	NONE	LOW	LOW	MEDIUM	3	2	4		5	M	x	x	✓	✓	x	x	x	x	✓	✓	
702c	Managed Motorway	Extension of managed motorway from Melling to SH58	Extension of managed motorway from Melling to SH58	MEDIUM	NONE	LOW	LOW	MEDIUM	3	2	4		5	M	x	x	✓	✓	x	x	x	x	✓	✓	
702d	Managed Motorway	Extension of managed motorway from SH58 to Silverstream	Extension of managed motorway from SH58 to Silverstream	MEDIUM	NONE	LOW	LOW	MEDIUM	3	2	4		5	M	x	x	✓	✓	x	x	x	x	✓	✓	
703a	Ramp Metering	Ramp metering at Ngauranga	Ramp metering at Ngauranga. Only northbound on ramp.	LOW	None	LOW	None	None	4	3	5		4	L	x	x	✓	✓	x	x	x	x	✓	✓	
703b	Ramp Metering	Ramp metering at Petone	Ramp metering at Petone. Southbound on ramp.	LOW	None	LOW	None	None	4	3	5		4	L	x	x	✓	✓	x	x	x	x	✓	✓	
703c	Ramp Metering	Ramp metering at other interchanges	Ramp metering at other interchanges (yet to be constructed)	LOW	NONE	LOW	None	None	4	3	5		4	L	x	x	✓	✓	x	x	x	x	✓	✓	
Trip Management																									
801a	Communicating multi modal transport status	Communicating multi modal transport status	Communicating Multi Modal Transport Status. Web, Text, Apps, and VMS to road users giving details of road travel times, public transport travel times, car park usage etc. Before and during travel.	MEDIUM	MEDIUM	LOW	None	MEDIUM	3	3	3		5	L	x	x	x	✓	✓	✓	x	✓	✓	✓	
802a	Driver education and training, media campaigns	Driver education and training, media campaigns		None	None	None	None	None					3	4											
Speed																									
901a	Speed Limits Review	Speed limits consistent with road environment	Review speed limits on SH2	LOW	NONE	MEDIUM	None	None	2	4	2		4	M	x	x	x	✓	✓	✓	✓	✓	✓	✓	
		Just Maoribank		LOW	NONE	MEDIUM	None	None	2	4	2	0	4	M	x	✓	x	x	x	x	x	x	x	x	
902a	Speed Enforcement	Improve speed enforcement	Improve speed enforcement via police presence or speed cameras.	LOW	NONE	LOW	None	None	3	4	2		4	L	x	x	✓	✓	✓	✓	✓	✓	✓	✓	
902b	Speed Enforcement	Speed enforcement at high risk intersections	Speed enforcement at high-risk intersections	LOW	NONE	MEDIUM	None	None	2	4	2		4	L	x	x	x	✓	✓	✓	✓	✓	✓	x	
Behaviour																									
1000a	Retain existing level of behaviour change programmes			NONE	None	NONE	None	None	3	4	3		3												
1000b	Increase behaviour change programmes		Increase behaviour change programmes. More intensive roll out of the current campaigns including: information provision (promotion of active modes, public transport, road safety), skills training and events.	LOW	NONE	LOW	None	None	3	3	3		3	L	x	x	x	✓	✓	✓	✓	✓	✓	✓	
1000c	Large step change in behaviour change		Large step change in behaviour change including parking changes, parking restriction, congestion tax etc.	HIGH	LOW	LOW	None	None	2	2	4		3	VH	x	x	x	x	x	✓	x	x	✓	✓	
Resilience																									
1104a	Improve flood protection on SH2 at Te Marua		Improved flood protection for the state highway at Te Marua. Likely to involve improved stopbanks at this location.	None	None	None	None	MEDIUM	3	4	6	6	6	M	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	
1105a	Improved drainage at high risk areas i.e. Melling, Petone and Silverstream		Improved drainage at high-risk areas i.e. Melling, Petone and Silverstream. Physical works to improve stormwater management could include carriageway improvements/surfacing improvements, increased capacity of the reticulated stormwater system, improved carriageway drainage.	LOW	LOW	None	None	HIGH	3	3	5	5	5	M	x	x	x	✓	x	x	x	✓	x	x	
1112a	Identifying and remedying LHP events and locations		Study to identifying LHP events and locations.	None	None	None	None	HIGH	4	3				L	x	✓	x	✓	✓	✓	✓	✓	✓	✓	

APPENDIX F – PROGRAMME EVALUATION

As presented at Workshop 3.

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

PROGRAMME 1: DO MINIMUM

Description

- Continued maintenance programme
- Continued operations
- Committed projects (e.g. SH2/SH58 Interchange)

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	L	0	

Key outcomes of the programme assessment:

- A default score of Neutral has been used for the Do-minimum programme against all of the Objectives and MCA criteria.
- The subsequent programmes are then assessed on whether they are an improvement or reduction based on the outcome of the Objectives and MCA analysis.
- This programme includes none of the options generated for assessment.
- This programme is unlikely to be accepted by the public and key stakeholders.

Programme Dependencies

- None

Programme Risks and Constraints

- Public unacceptability
- Safety deficiencies
- Flooding risk remains
- Level of Service decreases further



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State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

PROGRAMME 2: BASE (+ DO MINIMUM)

Description

- Includes projects where a large amount of investigation and planning has already been undertaken. Includes the Do-minimum programme.
- Example projects include; Petone to Grenada Link Road, Melling interchange, Ngauranga to Melling cycleway, Rail Scenario 1 and Integrated Ticketing.

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%							0.4-0.6	0.4-0.5	
Minor Benefit	Minor Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Minor Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Minor Disbenefit	Minor Disbenefit			

Key outcomes of the programme assessment:

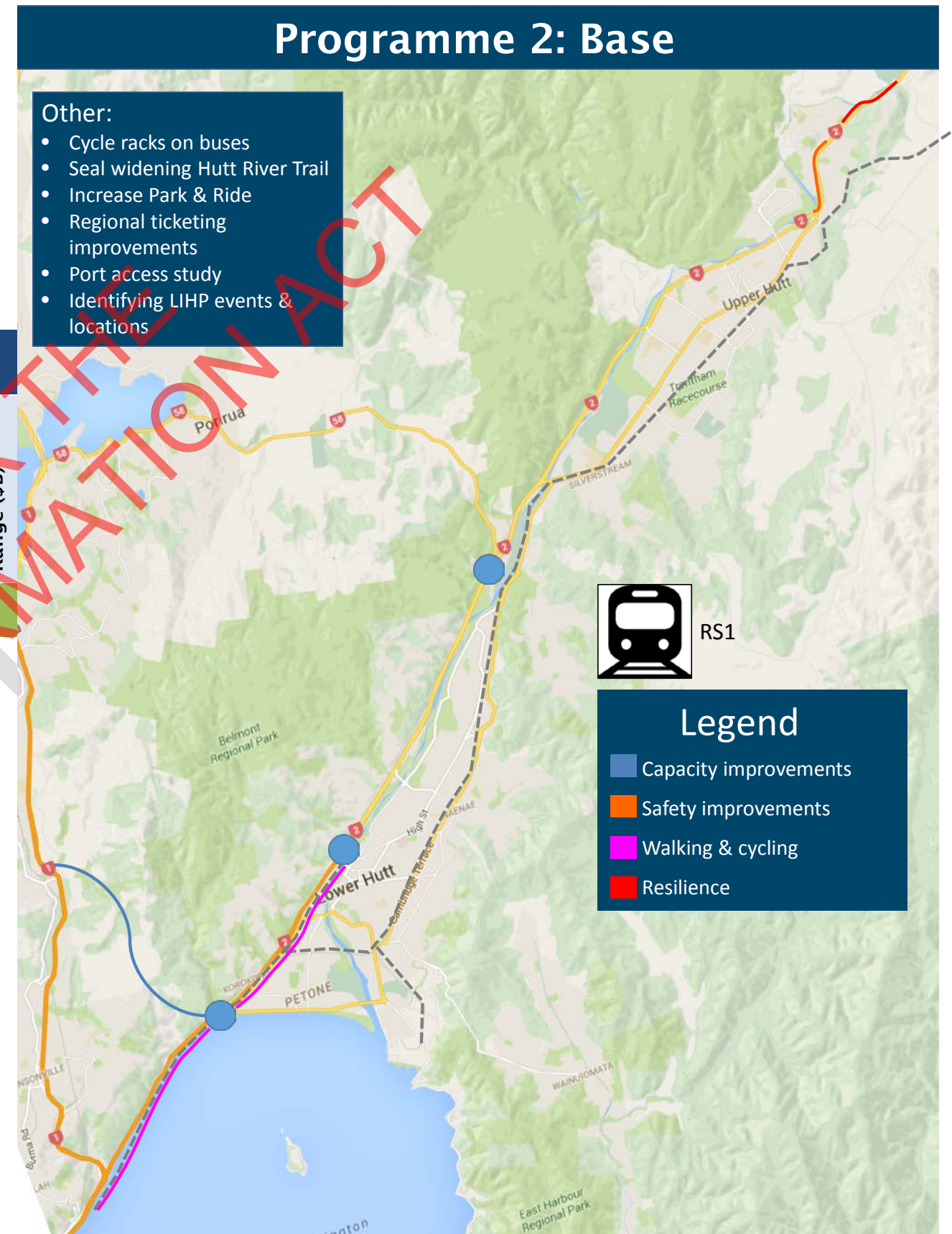
- Is the lowest performing programme after the Do-minimum programme in terms of performance against the investment objective and MCA criteria.
- Resilience improvements were assessed as the main benefits realised from this programme. These are derived via; the Ngauranga to Melling cycleway, the Melling interchange (including the Melling Bridge replacement) and SH2 Te Marua flood improvements.

Programme Dependencies

<ul style="list-style-type: none"> Ngauranga to Airport (N2A) 	<ul style="list-style-type: none"> Very low growth in the region
--	---

Programme Risks and Constraints

<ul style="list-style-type: none"> Consentability of coastal shared path 	<ul style="list-style-type: none"> Costs of key projects 	<ul style="list-style-type: none"> Future Level of service concerns
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State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

PROGRAMME 3: ROADING DO-MAXIMUM

Description

- This programme centres on large scale, corridor wide, roading based works.
- Example projects, aimed at capacity and safety include; 6 laning SH2 from Ngauranga to SH2/SH58, 4 laning SH2 from Silverstream to Moonshine, interchanges, Upper Hutt bypass and the Cross Valley link.

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%	Moderate Benefit	Major Benefit	Major Benefit	Minor Dis-benefit	Major Disbenefit	Moderate Disbenefit	VH	1.8-2.8	0

Key outcomes of the programme assessment:

- Highly focused on road infrastructure, including all major SH2 intersections converted to grade separated interchanges.
- Major benefits for road safety along SH2 and some major parallel local roads (Hutt Road and Fergusson Drive)
- Would help the economy by increasing travel time reliability and also reducing travel times.
- However the attractiveness of personal vehicle travel would have a huge detrimental impact to public transport throughout the Hutt Valley. Likely to take people off trains and buses and into their own vehicle.
- Major negative environmental impacts, including large scale earth works to allow for six-laning, Petone to Grenada and the Hutt River diversion for Upper Hutt bypass.

Programme Dependencies

- | | | |
|-------------------------------|------------------------|--------------------------|
| • Major capacity improvements | • Ngauranga to Airport | • SH2 South of Ngauranga |
| • | • | • |

Programme Risks and Constraints

- | | | |
|------------------------|--|--|
| • Cost of key projects | • Consentability of Upper Hutt Bypass | • Topographical constraints for six laning |
| • Property acquisition | • Modification at Dowse I/C for six laning | • Reduced PT patronage – reduced funding into PT systems |
| • Public Acceptability | • Environmental concerns | |

Programme 3: Roading – Do Maximum

Other:

- Remove all access in rural areas throughout corridor
- Remove or barrier severe & moderate hazards
- Managed motorway
- Ramp metering



State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

PROGRAMME 4: MAXIMISE EXISTING ASSETS (+ BASE) / OPTIMISATION

Description

- This programme consists of options which aim to maximise the efficiency of existing assets (ideally within the existing corridor footprints), deferring the need for large scale infrastructure works. Includes Base programme.
- Example projects include; Managed motorway, intersection upgrades, The Esplanade capacity upgrade, Rail Scenario 2, 1.5m shoulder widening and a speed limits review.

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%	Moderate Benefit	Major Benefit	Minor Benefit	Minor Disbenefit	Neutral	Minor Dis-benefit	0.7-1.2	0.7-0.8	
Minor Benefit	Moderate Benefit	Major Benefit	Major Benefit	Moderate Benefit	Moderate Benefit	Major Benefit	Minor Benefit	Minor Disbenefit	Neutral	Minor Dis-benefit	M		

Key outcomes of the programme assessment:

- Upgrades the SH2 intersections to interchanges, where capacity issues is the main concern.
- Environmental impacts are neutral overall, as the intention of most projects is to utilise the existing road corridor where possible.
- Encourages a mode shift from private vehicle travel to public transport, by increasing the current level of TDM, instigating Rail Scenario's 1 & 2, and adding more buses and bus lanes.

Programme Dependencies

• Ngauranga to Airport	•	•
•	•	•

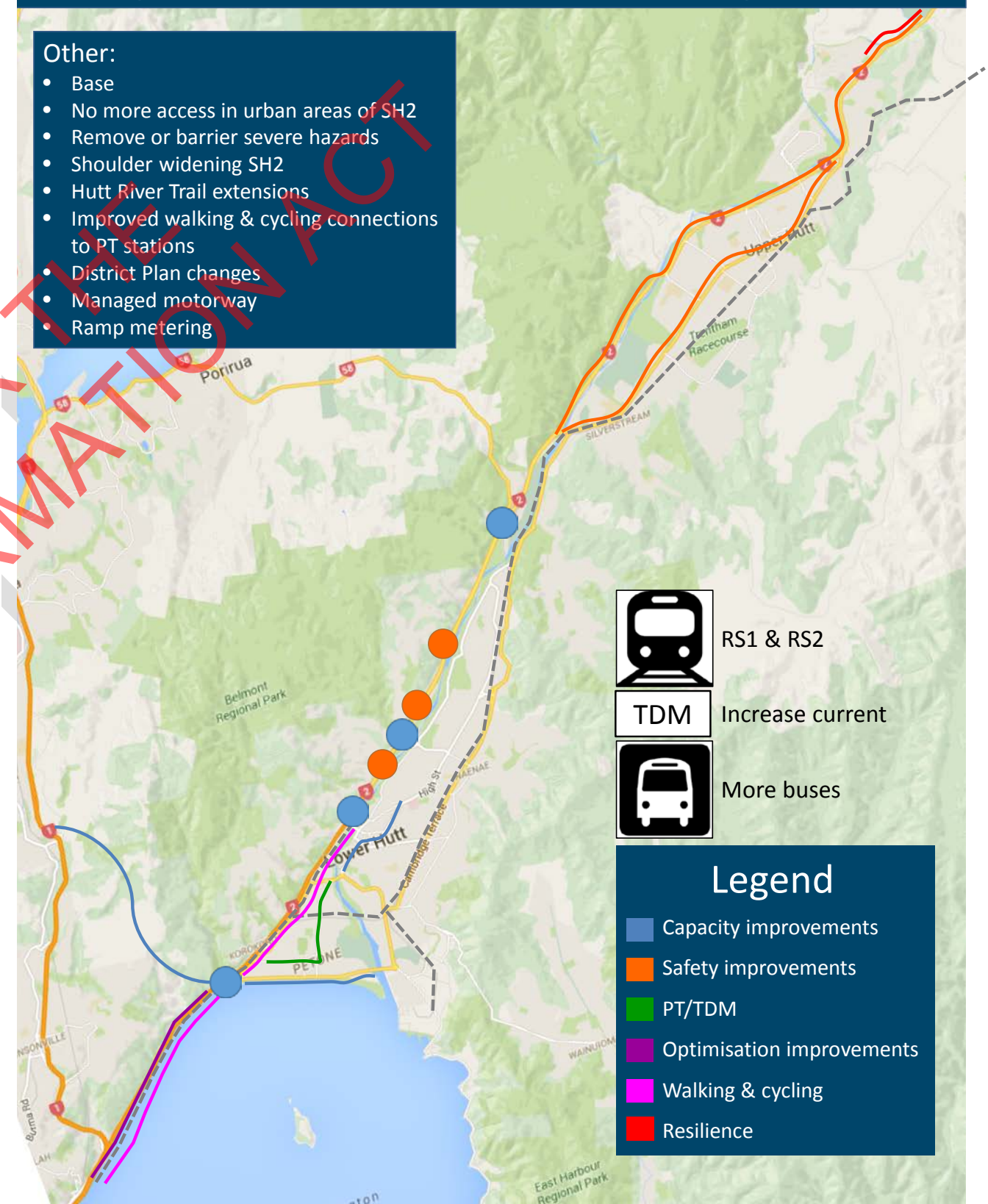
Programme Risks and Constraints

• Consenting of coastal shared path	• Property acquisition	• Effects on the Esplanade
•	•	•

Programme 4: Maximise Existing Assets

Other:

- Base
- No more access in urban areas of SH2
- Remove or barrier severe hazards
- Shoulder widening SH2
- Hutt River Trail extensions
- Improved walking & cycling connections to PT stations
- District Plan changes
- Managed motorway
- Ramp metering



State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

PROGRAMME 5: PUBLIC TRANSPORT / TRAVEL DEMAND MANAGEMENT 1 (+ BASE)

Description

- This programme consists of options which aim to promote improved Public Transport mode share by improving existing infrastructure and services in conjunction with travel demand management measures. Includes Base programme.
- Example projects include; Rail Scenario 2, Rail Scenario A, increasing park & ride, improved connections to rail stations, land use changes, vehicle management systems, corridor ITS improvements, bus priority lanes, increased funding for existing driver behaviour programmes and improved walking and cycling facilities.

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%									
Minor Benefit	Major Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Minor Benefit	Minor Benefit	Minor Benefit	Minor Benefit	Neutral	Neutral	M	0.6-0.8	1.1-1.3

Key outcomes of the programme assessment:

- Much stronger emphasis on public transport corridors between Petone and Lower Hutt city centres.
- Rail Scenarios 1, 2 & A are all implemented in parallel to upgrading walking and cycling connections to railway stations. Also proposes that the Melling rail line is extended into Lower Hutt CBD.

Programme Dependencies

<ul style="list-style-type: none"> Ngauranga to Airport 	<ul style="list-style-type: none"> More PT on Golden Mile
--	--

Programme Risks and Constraints

<ul style="list-style-type: none"> Bus lanes removing parking Property acquisition 	<ul style="list-style-type: none"> Lessened safety improvement Funding of key projects 	<ul style="list-style-type: none"> Consentability of shared path
--	--	---

Programme 5: Public Transport /TDM 1

- Other:
- Base
 - Shoulder widening SH2
 - Hutt River Trail extensions
 - Improved walking & cycling connections to PT stations
 - District Plan changes
 - ITS



RS1, RS2 & RSA
 TDM Increase current
 More buses

Legend
 Capacity improvements
 PT/TDM
 Walking & cycling
 Resilience

State Highway 2: Ngauranga to Te Marua Programme Business Case

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PROGRAMME 6: PUBLIC TRANSPORT / TRAVEL DEMAND MANAGEMENT 2 (+ PT/TDM 1 - EXCEPT P2G)

Description

- This programme consists of options which aim to provide a significant step change in Public Transport mode share by investing in new and improved infrastructure and services in conjunction with a series of travel demand management changes. Includes PT/TDM 1 programme and excludes the Porirua to Grenada project.
- E.g. Melling line extension to Hutt City, rail realignment, additional park and ride facilities, congestion tax, increased parking changes, cyclist bypasses of Dowse and Petone, and on-road cycle lanes.

Programme Assessment

Investment Objectives						MCA					Economic		
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural	Implementability Risks	Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%	Moderate Benefit	Moderate Benefit	Moderate Benefit	Minor Benefit	Moderate Dis-benefit	Neutral	V H	0.2-0.6	1.7-2.1

Key outcomes of the programme assessment:

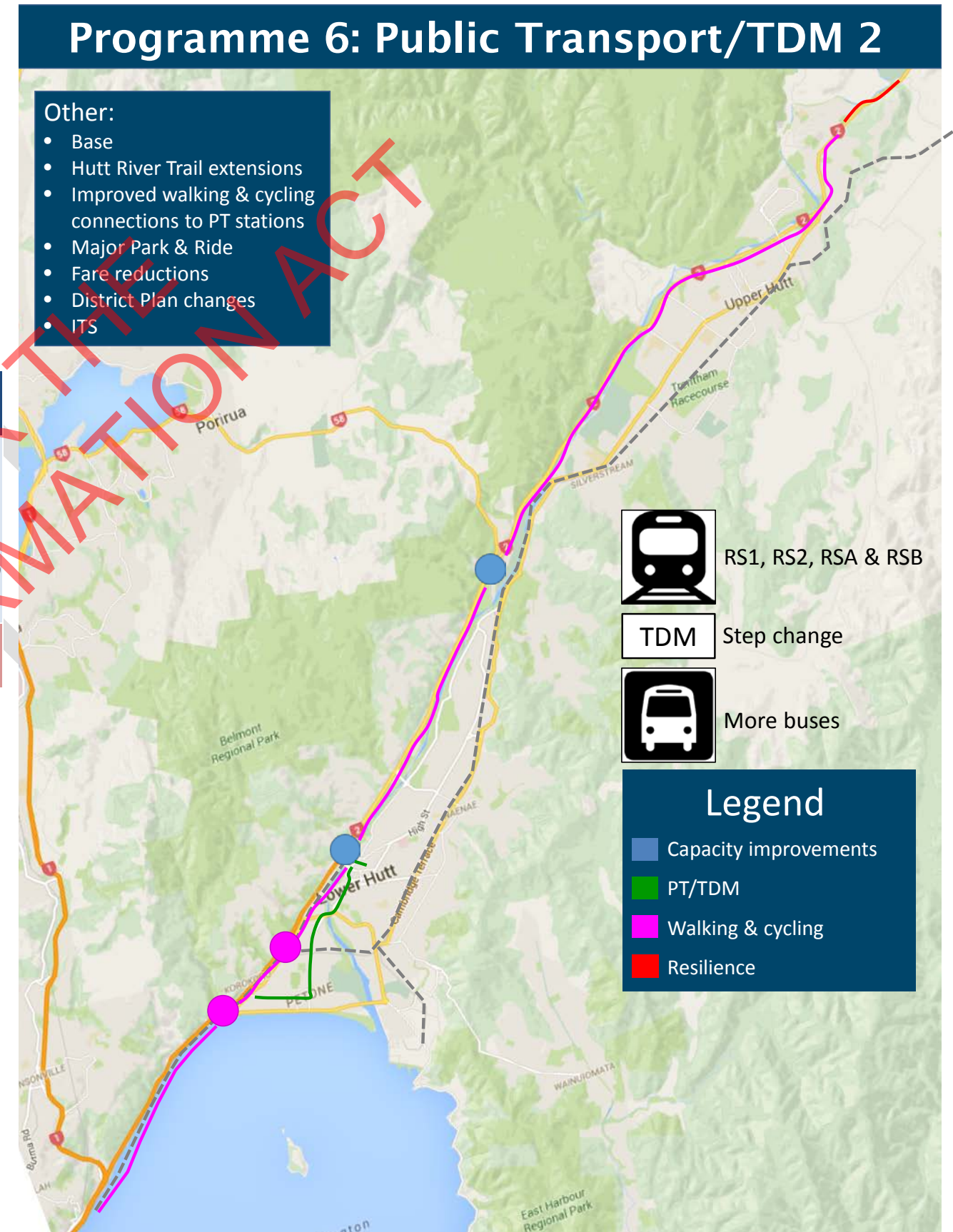
- A step change in the philosophy of travel provision in the corridor, heavily focused on public transport and walking & cycling improvements.
- By converting one of the existing Ngauranga to Petone lanes to HOV during peak hours, the attraction of personal travel via SH2 would be greatly diminished and is designed to get road users onto the public transport network, which will be greatly enhanced.
- This programme would surely get a lot of negative feedback from road users accustomed to travelling via their own private vehicle.

Programme Dependencies

• Ngauranga to Airport	• More PT on Golden Mile	• Public changing behaviour
•	•	•

Programme Risks and Constraints

• Public Acceptability of Extreme TDM	• Resistance to District Plan changes	• Property acquisition
• Political pressure to not do all TDM	•	•
•	•	•



State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

PROGRAMME 7: SAFE SYSTEM (+ BASE)

Description

- This programme consists of a number of options which combine to create a safe system approach along the SH2 corridor. Includes Base programme.
- E.g. 1.5m shoulder widening, speed limits review, realign out of context curves, intersection improvements, moderate and severe hazard removal, driver behaviour programmes and access rationalisation.

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%	Moderate Benefit	Major Benefit	Minor Benefit	Neutral	Neutral	Neutral	H	0.7-1.1	0.4-0.5

Key outcomes of the programme assessment:

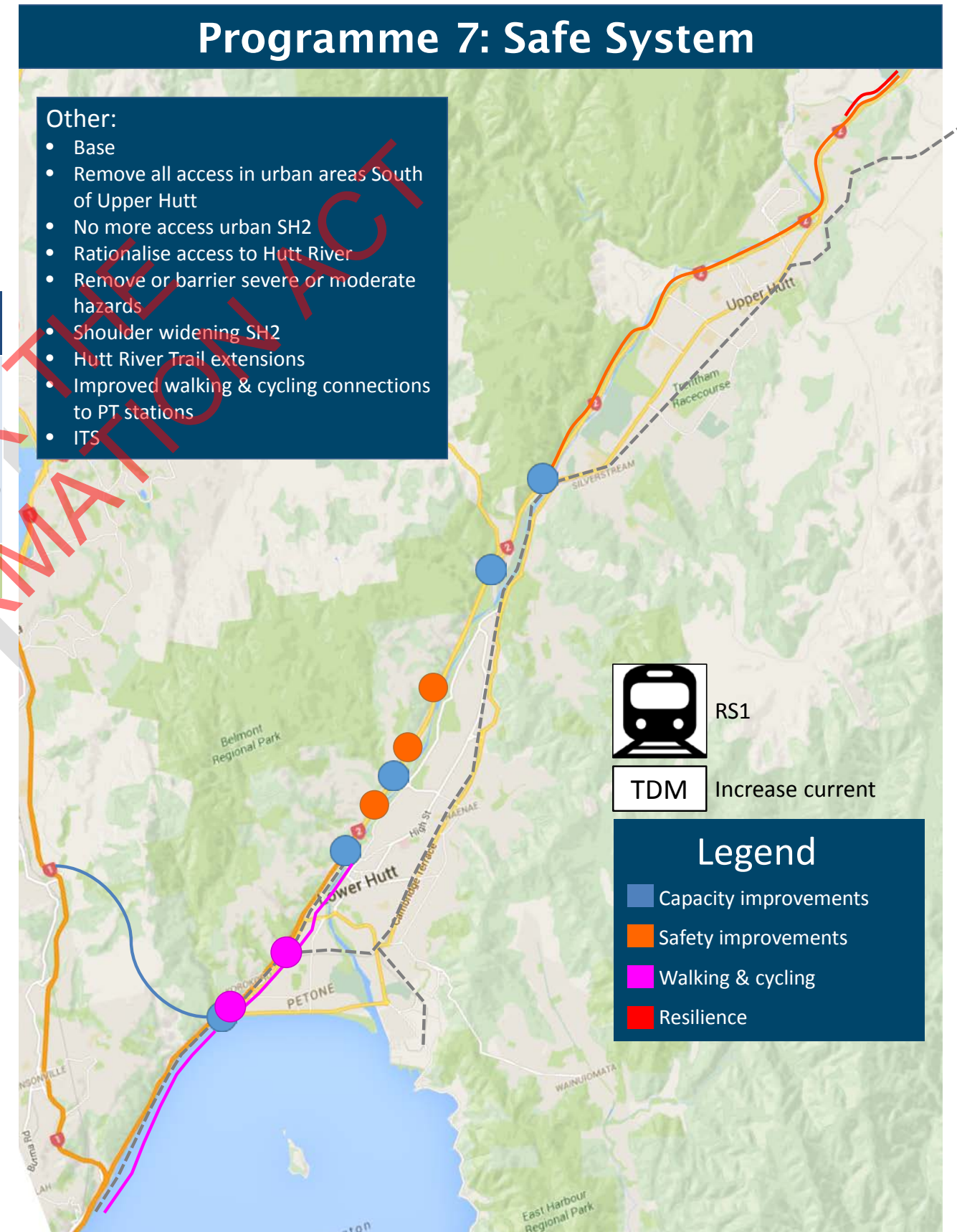
- The safety of the SH2 corridor would be greatly enhanced by this programme, as a lot of conflict points, hazards and other safe system improvements are implemented along SH2 in particular.
- Capacity improvements for SH2 via the grade separated interchanges.
- A lower range of improvements for walking and cycling, doesn't go to the extents of PT/TDM 1 & 2.
- Will raise the KiwiRAP rating of the corridor, particularly at the lowest rating segments, providing a major benefit for safety.

Programme Dependencies

Ngauranga to Airport	

Programme Risks and Constraints

Public Acceptability of SH2 access reduction	Consentability of coastal shared path	Little improvement outside SH2
No significant benefit for economy (i.e. travel time savings)		



State Highway 2: Ngauranga to Te Marua Programme Business Case

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PROGRAMME 8: MULTI-MODAL LOW (+ BASE)

Description

- A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. Includes Base programme.
- Example projects include; Kennedy Good Bridge interchange, The Esplanade capacity, realign out of context curves, 1.5m shoulder widening, increase park & ride facilities and a speed limit review.

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%									
Minor Benefit	Minor Benefit	Major Benefit	Major Benefit	Moderate Benefit	Moderate Benefit	Major Benefit	Minor Benefit	Minor Benefit	Minor Disbenefit	Minor Disbenefit	M	0.7-1.1	0.7-0.8

Key outcomes of the programme assessment:

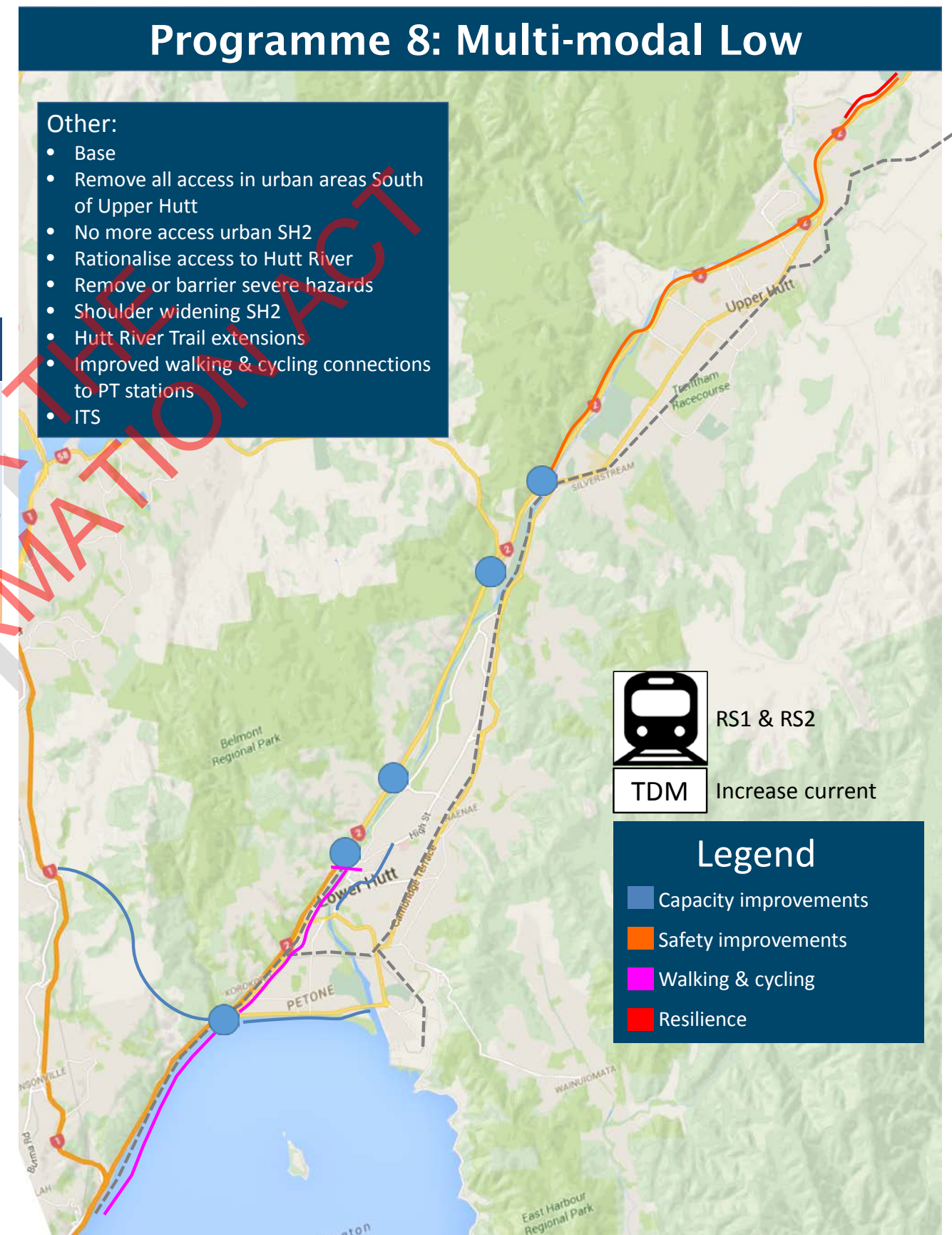
- The aim of the programme is to provide a balanced level of service improvement for all mode types, without undertaking some of the riskier and more contentious projects.
- Upgrades SH2 intersections to grade separated interchanges, where capacity concerns currently exist.
- Combines the SH2 improvements with an enhanced public transport network, which coupled with increased TDM, should encourage more users onto the rail service.
- Major enhancements for safety under this programme.
- The negative impacts to Environments and Cultural criterion are lower in this programme due to exclusion of the riskier and contentious projects.

Programme Dependencies

• Ngauranga to Airport	•	•
•	•	•

Programme Risks and Constraints

• No significant benefit for economy (i.e. travel time savings)	• Consentability of coastal shared path	•
•	•	•



State Highway 2: Ngauranga to Te Marua Programme Business Case

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PROGRAMME 9: MULTI-MODAL MEDIUM (+ M-ML)

Description

- A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. This programme builds on the Multi-Modal Low programme, including medium and some large scale options.
- Example projects include; Silverstream interchange, Cross Valley Link, Rail Scenario 2, cycle bypasses of interchanges, improved walking and cycling connections to rail stations, multi-storey park & ride facilities and a managed motorway.

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%									
Moderate Benefit	Moderate Benefit	Major Benefit	Major Benefit	Moderate Benefit	Moderate Benefit	Major Benefit	Moderate Benefit	Neutral	Minor Dis-benefit	Minor Dis-benefit	H	0.9-1.4	1.1-1.5

Key outcomes of the programme assessment:

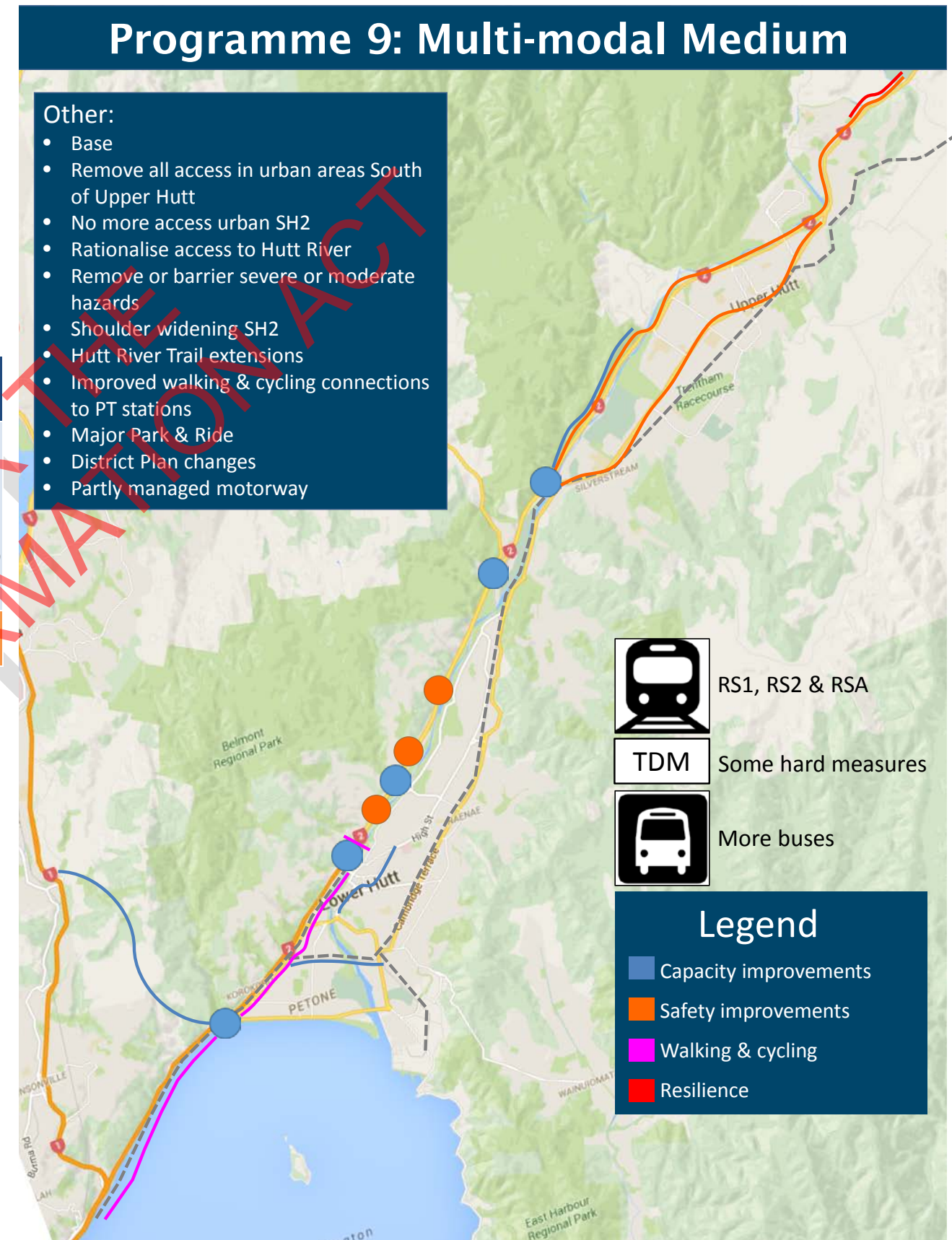
- Builds on the multi-modal low programme, but has increased benefits for travel time reliability and public transport punctuality.
- These benefits are realised by an increase from minor to moderate benefits for the economy.
- Provides additional safety benefits via crash barriers to protect against moderate hazards, as well as severe hazards.

Programme Dependencies

• Ngauranga to Airport	•
•	•

Programme Risks and Constraints

• Problem between Petone and Dowse due to CVL	• Buildability/ topographical constraints	• Higher implementability risks
• No significant benefit for economy	• Consentability of coastal shared path	• Public Acceptability of hard TDM
•	•	•



State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

PROGRAMME 10: MULTI-MODAL HIGH (+ M-MM)

Description

- A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. This programme builds on the Multi-Modal Medium programme, including further medium to large scale options.
- Example projects include; 6 laning SH2 Petone to Ngauranga, access rationalisation, further grade separated interchanges, Rail Scenarios' A & B and additional park & ride facilities (including some multi-storey facilities).

Programme Assessment

Investment Objectives						MCA					Implementability Risks	Economic	
Improve Travel time reliability	Improve Public transport Punctuality	Improve safety	Improve quality of infrastructure	Improve Resilience	Weighted Investment Objective	Safety	Economy	Social	Environmental	Cultural		Corridor Cost Range (\$B)	Regional Cost Range (\$B)
45%	15%	15%	10%	15%									
Major Benefit	Major Benefit	Major Benefit	Major Benefit	Major Benefit	Major Benefit	Major Benefit	Major Benefit	Minor Benefit	Moderate Disbenefit	Moderate Disbenefit	VH	1.7-2.6	1.7-2.1

Key outcomes of the programme assessment:

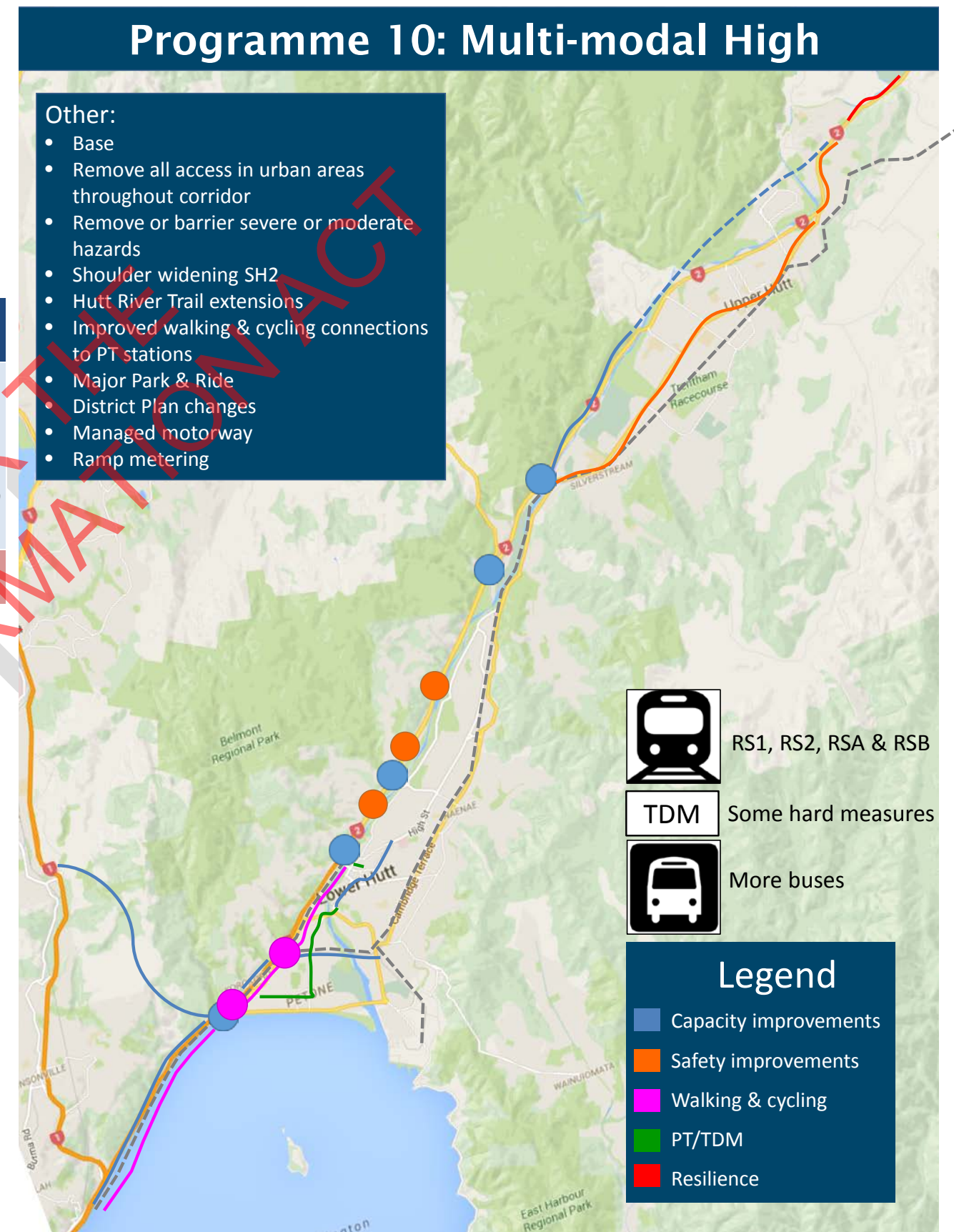
- This programme attempts to provide major improvements for all transport modes in parallel, future proofing the corridor against growth.
- Have increased benefits for travel time reliability, public transport punctuality and resilience.
- Offsetting the major benefits are increased dis-benefits for the environment and cultural criterion, particularly around the Upper Hutt bypass project and subsequent river realignment work.

Programme Dependencies

• Ngauranga to Airport	•
•	•

Programme Risks and Constraints

• Very high Implementability risks	• Buildability/ topographical constraints	• Consentability of numerous projects
• Property acquisition	• Public Acceptability of hard TDM	• Changes to District Plan
• Environmental concerns	• Cultural concerns due to river works	•
•	•	•



State Highway 2: Ngauranga to Te Marua Programme Business Case

DRAFT FOR DISCUSSION AND MODIFICATION AT WORKSHOP 3

Programme Theme	Broad Details
DO MINIMUM	<ul style="list-style-type: none"> Continued maintenance programme Continued operations Committed projects (e.g. SH2/SH58 Interchange)
BASE (+ Do Minimum)	<ul style="list-style-type: none"> Includes projects where a large amount of investigation and planning has already been undertaken. Includes the Do-minimum programme. Example projects include; Petone to Grenada Link Road, Melling interchange, Ngauranga to Melling cycleway, Rail Scenario 1 and Integrated Ticketing.
ROADING DO-MAXIMUM	<ul style="list-style-type: none"> This programme centres on large scale, corridor wide, roading based works. Example projects, aimed at capacity and safety include; 6 laning SH2 from Ngauranga to SH2/SH58, 4 laning SH2 from Silverstream to Moonshine, interchanges, Upper Hutt bypass and the Cross Valley link.
MAXIMISE EXISTING ASSETS / OPTIMISATION (+ Base)	<ul style="list-style-type: none"> This programme consists of options which aim to maximise the efficiency of existing assets (ideally within the existing corridor footprints), deferring the need for large scale infrastructure works. Includes Base programme. Example projects include; Managed motorway, intersection upgrades, The Esplanade capacity upgrade, Rail Scenario 2, 1.5m shoulder widening and a speed limits review.
PUBLIC TRANSPORT / TRAVEL DEMAND MANAGEMENT 1 (+ Base)	<ul style="list-style-type: none"> This programme consists of options which aim to promote improved Public Transport mode share by improving existing infrastructure and services in conjunction with travel demand management measures. Includes Base programme. Example projects include; Rail Scenario 2, Rail Scenario A, increasing park & ride, improved connections to rail stations, land use changes, vehicle management systems, corridor ITS improvements, bus priority lanes, increased funding for existing driver behaviour programmes and improved walking and cycling facilities.
PUBLIC TRANSPORT / TRAVEL DEMAND MANAGEMENT 2 (+ PT/TDM 1 – EXCEPT P2G)	<ul style="list-style-type: none"> This programme consists of options which aim to provide a significant step change in Public Transport mode share by investing in new and improved infrastructure and services in conjunction with a series of travel demand management changes. Includes PT/TDM 1 programme and excludes the Porirua to Grenada project. E.g. Melling line extension to Hutt City, rail realignment, additional park and ride facilities, congestion tax, increased parking changes, cyclist bypasses of Dowse and Petone, and on-road cycle lanes.
SAFE SYSTEM (+ Base)	<ul style="list-style-type: none"> This programme consists of a number of options which combine to create a safe system approach along the SH2 corridor. Includes Base programme. E.g. 1.5m shoulder widening, speed limits review, realign out of context curves, intersection improvements, moderate and severe hazard removal, driver behaviour programmes and access rationalisation.
MULTI-MODAL LOW (+ Base)	<ul style="list-style-type: none"> A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. Includes Base programme. Example projects include; Kennedy Good Bridge interchange, The Esplanade capacity, realign out of context curves, 1.5m shoulder widening, increase park & ride facilities and a speed limit review.
MULTI-MODAL MEDIUM (+ Multi-modal - Low)	<ul style="list-style-type: none"> A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. This programme builds on the Multi-Modal Low programme, including medium and some large scale options. Example projects include; Silverstream interchange, Cross Valley Link, Rail Scenario 2, cycle bypasses of interchanges, improved walking and cycling connections to rail stations, multi-storey park & ride facilities and a managed motorway.
MULTI-MODAL HIGH (+ Multi-modal - Medium)	<ul style="list-style-type: none"> A multi-modal programme, including a range of option types from physical improvements, PT improvements to driver behaviour. This programme builds on the Multi-Modal Medium programme, including further medium to large scale options. Example projects include; 6 laning SH2 Petone to Ngauranga, access rationalisation, further grade separated interchanges, Rail Scenarios' A & B and additional park & ride facilities (including some multi-storey facilities).

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SH2 Ngauranga to Te Marua - Programme Evaluation

			1	2	3	4	5	6	7	8	9	10
Investment Objectives	Objective	Baseline	Do-minimum	Base (+ Do-minimum)	Roading Do-Maximum	Maximise existing assets (+ Base) / Optimisation	Public Transport / Travel Demand Management 1 (+ Base)	PT / Travel Demand Management 2 (+ PT/TDM 1 with P2G)	Safe System (+ Base)	Multi-Modal - Low (+ Base)	Multi-Modal - Medium (+ Multi-Modal - Low)	Multi-Modal - High (+ Multi-Modal - Medium)
	Improve Travel time reliability Reduction in 95th percentile travel time	65 mins AM peak 95th percentile travel time	Neutral	Minor Benefit	Major Benefit	15-25% Minor Benefit	Minor Benefit	20-40% Moderate Benefit	Minor Benefit	15-25% Minor Benefit	30-45% Moderate Benefit	40-55% Major Benefit
	Improve Public transport Punctuality	Rail: 93% On time (HVL) 20min peak services (HVL) 14,000 peak capacity Bus: 5-10min avg lateness	Neutral	Minor Benefit	Moderate Disbenefit	10min peak services, +60% peak capacity Moderate Benefit	Major Benefit	10min peak services, +60% peak capacity, 6min journey reduction, extended network reach Major Benefit	Minor Benefit	10min peak services, +60% peak capacity Moderate Benefit	10min peak services, +60% peak capacity, 6min journey reduction Major Benefit	10min peak services, +60% peak capacity, 6min journey reduction, extended network reach Major Benefit
	Improve Road Safety DSI Saved/5 years	59 DSI in the last 5 years.	Neutral	Minor Benefit	Major Benefit	<20 Major Benefit	Minor Benefit	<10 Moderate Benefit	Major Benefit	<20 Major Benefit	25-30+ Major Benefit	30+ Major Benefit
	Improve quality of infrastructure KiwIRAP Star Rating	3-4 Star KiwiRAP Rating	Neutral	Minor Benefit	Major Benefit	4+ Moderate Benefit	Minor Benefit	3-4 Minor Benefit	Major Benefit	4+ Moderate Benefit	4.5 Major Benefit	4.5+ Major Benefit
	Improve Resilience Number of closures	7 closures in the last 5 years	Neutral	Moderate Benefit	Major Benefit	2 Moderate Benefit	Moderate Benefit	2 Moderate Benefit	Moderate Benefit	2 Moderate Benefit	2 Moderate Benefit	1 Major Benefit
	Stakeholder Ranking Note: Shortlisted programmes include further detailed outcomes			-	-	-	Shortlisted	-	Shortlisted	-	Shortlisted	Recommended
Implementability Risks (Feasibility, Affordability, Public/Stakeholder)			Low	Low	Very High	Medium	Medium	Very High	High	Medium	High	Very High
MCA	Safety		Neutral	Minor Benefit	Major Benefit	Major Benefit	Minor Benefit	Moderate Benefit	Major Benefit	Major Benefit	Major Benefit	Major Benefit
	Economy		Neutral	Minor Benefit	Major Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Minor Benefit	Minor Benefit	Moderate Benefit	Major Benefit
	Environmental		Neutral	Minor Disbenefit	Major Disbenefit	Neutral	Neutral	Moderate Disbenefit	Neutral	Minor Disbenefit	Minor Disbenefit	Moderate Disbenefit
	Social		Neutral	Moderate Benefit	Minor Disbenefit	Minor Disbenefit	Minor Benefit	Minor Benefit	Neutral	Minor Benefit	Neutral	Minor Benefit
	Cultural		Neutral	Minor Disbenefit	Moderate Disbenefit	Minor Disbenefit	Neutral	Neutral	Neutral	Minor Disbenefit	Minor Disbenefit	Moderate Disbenefit
IAF	Strategic Fit		L	H	H	H	H	H	H	H	H	H
	Effectiveness		L	L	H	M	L	M	M	M	H	H
	Efficiency		L	L	L	L	L	L	L	L	L	L
Economics	Cost Range (\$M)		\$0	\$500 - \$700	\$1800 - \$2800	\$1000 - \$1500	\$1000 - \$1400	\$1300 - \$1900	\$800 - \$1200	\$900 - \$1500	\$1400 - \$2100	\$2500 - \$3600
	BCR Range			1.3 - 2.7	0.6 - 1.7	1.0 - 2.2	1.0 - 2.0	0.9 - 1.9	1.0 - 2.4	0.9 - 2.2	0.9 - 2.0	0.7 - 1.6

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APPENDIX H - IMPLEMENTATION PLAN

To be confirmed

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Next Step	Next Step Timing	Activity	Owner	Status	Implementation Timing
Underway	Short	Melling Grade Separated Interchange	NZTA	Core	Short
Underway	Short	Petone to Grenada	NZTA	Core	Short
Underway	Short	Additional network infrastructure and renewals to deliver RS1 (e.g. overhead power-supply upgrades) Rail Scenario 1 (Network upgrades, capacity, frequency and reliability improvements)	KiwiRail	Core	Short
			GWRC		
Underway	Short	Ngauranga to Melling Cycleway	NZTA	Core	Short
Underway	Short	Port Access Study	NZTA	Core	Short
Implement	Short	Cycle racks on front of buses	HCC/UHCC	Desirable	Short
Implement	Short	Improve speed enforcement Speed enforcement at high risk intersections	NZ Police	Desirable	Short
Implement	Short	Improve flood protection on SH2 at Te Marua	UHCC	Core	Short
Study	Short	Ensure no more access in the urban 70km/h area	NZTA	Core	Short
		Ensure development near town centres and PT corridors	HCC/UHCC		Medium
		Ensure safe and efficient access to new developments	HCC/UHCC		Medium
Study	Short	Speed limits consistent with road environment	NZTA	Core	Short
Study	Short	Increase current behaviour change programmes	GWRC	Desirable	Short
		Large step change in behaviour change		Core	Long
PBC	Short	Identifying and remedying LIHP events and locations	NZTA	Core	Short
		Resilience Programme Business Case			Long
IBC/DBC	Short	Extension of managed motorway from Petone to Melling	NZTA	Core	Short
		Extension of managed motorway from Melling to SH58	NZTA		Medium
		Communicating multi-modal transport status	GWRC		Long
IBC/DBC	Short	Kennedy Good Grade Separated Interchange	NZTA	Core	Medium
IBC/DBC	Short	Improve Hutt Valley East West Connections	HCC	Core	Long
IBC/DBC	Short	Whakatiki St Intersection Upgrade	NZTA	Core	Short
		Remove at grade right turns south of Upper Hutt			Medium
		Improve at grade intersections in rural areas through and north of Upper Hutt			
		Improve intersections through urban areas on SH2			
		Rationalise all access in rural 80-100km/h areas			Long
Rationalise access on River Road to the Hutt River	Desirable	Medium			

Next Step	Next Step Timing	Activity	Owner	Status	Implementation Timing
IBC/DBC	Short	Improved walking and cycling links and infrastructure between communities and public transport hubs (e.g. access to Totara Park)	GWRC	Core	Medium
		New walking and cycling link between Lower Hutt CBD and Melling station	HCC		Long
IBC/DBC	Short	Increase park and ride	GWRC	Core	Short
		Multi Storey park and ride			Long
IBC/DBC	Short	Ramp metering at Ngauranga	NZTA	Core	Medium
		Ramp metering at Petone			
		Ramp metering at other interchanges			
DBC	Short	Ngauranga Off ramp extension	NZTA	Core	Short
DBC	Short	Crash Barriers or removal of hazards on SH2 - Moderate and Severe	NZTA	Core	Short
		Shoulder widening to 1.5m			Medium
Underway	Medium	Regional fares and ticketing improvements	GWRC	Core	Long
Study	Medium	Increase capacity and frequency of buses in the Hutt Valley	GWRC	Core	Medium
IBC/DBC	Medium	Silverstream Grade Separated Interchange	NZTA	Core	Long
		Realignment of out of context curves (Moonshine Bridge)			Medium
		Four laning Silverstream to Upper Hutt			
IBC/DBC	Medium	Realignment of out of context curves	NZTA	Core	Medium
IBC/DBC	Medium	Upgrade Hutt Road - Eastern Arterial	HCC	Desirable	Medium
IBC/DBC	Medium	Upgrade Fergusson Drive - Silverstream to Fergusson Drive North	UHCC	Desirable	Medium
IBC/DBC	Medium	Hutt River Trail Extension and Connections	HCC/UHCC	Desirable	Medium
DBC	Medium	Rail Scenario A (Network upgrades for journey time improvements)	GWRC	Core	Medium
		Rail Scenario 2 (Further capacity, frequency and reliability improvements)	GWRC	Core	Long

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