

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

NZ Transport Agency

SH2 Te Marua to Masterton
Programme Business Case (Rev 2.4)

As submitted to the NZ Transport Agency Board, October 2016

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Executive Summary

Introduction

The purpose of this programme business case is to identify an optimal mix of alternatives and options for investing in the State Highway 2 (SH2) transport corridor between Te Marua and Masterton. The recommended programme outlined is aimed at addressing the problems identified for safety, travel time reliability and efficiency, and resilience along the corridor. In developing the programme options and recommended programme it is important to consider the following:

- SH2 between Masterton and Te Marua plays a critical transport accessibility role, providing the only direct road link between the Wairarapa and Wellington. The corridor passes through the Wairarapa townships of Featherston, Greytown, Carterton and Masterton, and provides access to Martinborough via State Highway 53, enabling access to hospitals, employment and other services. Due largely to the topography of the Rimutaka Hill section, delays and closures due to snow, high winds and other events often occurs
- As there is no viable alternative road route to this section of SH2, long-term resilience is of regional concern. Should this road be affected by a significant event such as a magnitude ~7.5 earthquake, the road is expected to take over three months to reopen
- An extreme storm event could result in numerous slips which would require considerable repair and likely close SH2 over the Rimutakas for a number of weeks
- The crash history for SH2 between Masterton and Te Marua indicates significant safety risks for vulnerable road users, particularly motorcyclists
- The Wellington region has experienced constrained economic and population growth for an extended period. Over the past decade Wellington has lagged behind New Zealand's two other main cities, Auckland and Christchurch. With the second largest economy in New Zealand, the region contributes 13.2% of New Zealand's GDP with 10.9% of New Zealand's population. The Wellington region has a population of 491,400, an employment rate of 67.7% with 5.7% unemployed. Average house prices are lower than the national average with the average household income 12.2% above the national average
- Throughout the Wairarapa region the primary industries are agriculture and forestry, alongside industries focused around beef, sheep, grapes for winery and dairy cattle. The primary sector accounts for 20.6% of employment with manufacturing (food and wood processing) accounting for approximately 14.6% of GDP in the region. The Wairarapa region is also considered to be increasingly important for tourism
- The reliable, timely, and safe movement of freight to and through the region is critical to support the region's economic growth and productivity
- The transport corridor includes a railway line that travels along a similar alignment to SH2 and provides public transport services between Wellington and the Wairarapa as well as facilitating the movement of freight goods to Wellington Port

Figure 1 Rimutaka Hill section of SH2



Context

This programme business case focuses on the entire transport corridor between Te Marua and Masterton, including State Highway 2, the Wairarapa to Wellington rail line, and their interface with other transport network services as shown in Figure 2. This section of State Highway 2 commences in Te Marua at the intersection of State Highway 2 and Plateau Road and traverses over the Rimutaka Range (the Rimutakas) for 23 km before reaching Featherston. This part of the route is very steep, winding and narrow, particularly the ascent of Rimutaka Hill which is around 555 metres above sea level. On the north eastern side of Rimutaka Hill, in the Wairarapa, the route passes through the townships of Featherston, Greytown, Carterton and Masterton for 32 km until it reaches the urban/ rural speed limit change on the southern side of Masterton. This part of the route is relatively flat and straight with isolated curves. State Highway 2 also provides access to the township of Martinborough via State Highway 53 and the south Wairarapa region and the Waingawa industrial estate just to the south-west of Masterton.

Figure 2 Local Context



This programme business case has been developed concurrently with the State Highway 2 Ngauranga to Te Marua programme business case as well as the Wellington Port Access programme business case. This collective approach recognises that end to end journeys between Wellington, the Wairarapa and beyond travel along parts of this route and that issues facing one section can have impacts on the other.

Current Situation and Future Considerations

The Masterton to Te Marua Programme Business Case is about providing a safer journey and a more reliable, efficient and resilient connection for those travelling between Wairarapa and Wellington. There are no major capacity constraints at present, however increases in demand for road and rail over the coming years will result in requirements for improvements of SH2 over Rimutaka Hill to reduce the impact of travel time reliability and also improvements in travel time reliability for the Wairarapa rail line.

The main issues for this section of SH2 are road user safety, travel time reliability and network resilience, which are common issues for State Highways in New Zealand. The specific issues for this corridor include:

- The crash history for SH2 between Te Marua and Masterton indicates significant safety risks for vulnerable road users, particularly motorcyclists
- As there is no viable alternative road route to this section of SH2, long-term resilience is of regional concern, particularly if this road were to be affected by a significant event such as a magnitude ~7.5 earthquake or extreme storm event
- Five of the Rimutaka Hill curves cannot be navigated by 19 metre semi-trailer design vehicles without them entering the opposing traffic lane
- The transport corridor (including the railway line) contributes to and facilitates the journeys between the Wairarapa and Wellington made for economic reasons including for moving freight. The corridor also facilitates economic activities within the Wairarapa.
- Downstream travel time reliability issues between Aotea Quay and Te Marua are likely to be reducing the attractiveness of road travel for this corridor
- Ongoing safety improvements on Rimutaka Hill since 2010 include crash barrier installation on the drop-off side, warning and educational signage, a major curve realignment project (\$16.5 M), and active truck warning signage

Traffic volume data has been obtained from the Transport Agency's State Highway Traffic Data Booklet (2011 and 2015) and is summarised in Table 1 below.

Table 1 State Highway 2 Te Marua to Masterton Traffic Volumes

Section	Average Annual Daily Traffic (2015)
Te Marua - Featherston	6,089
Featherston - Greytown	6,185
Greytown - Carterton	9,555
Carterton - Masterton	11,146

Growth over the past ten years has been relatively low at about 2%, however the past two years has seen a growth of just under 10%. Only 6% of traffic using State Highway 2 between Te Marua and

Featherston and between Featherston and Masterton are heavy vehicles. This is considered low as a percentage for a State Highway and is influenced by the relatively high level of local vehicle movements on SH2 in the Wairarapa area as well as the freight being moved on rail from Waingawa to Wellington Port.

There are a number of current and important issues and constraints:

- Even with the safety improvements undertaken since 2010 the road is still classified as a 2-Star road, significant work is needed to improve its Star rating
- Journey time reliability issues on State Highway 2 between Te Marua and Masterton are primarily a function of unplanned road closures/ delays, combined with insufficient prior warning and a lack of viable alternative transport choices or routes
- Downstream travel time reliability issues between Wellington and Upper Hutt are likely to be reducing the attractiveness of road travel for this corridor
- Physical constraints (topography and road geometry) affect the ease of freight access and journey times
- For journeys outside the Wairarapa for employment, the rail line is significantly used, followed by private vehicle use
- Lower confidence drivers view Rimutaka Hill as a dangerous road and may not be aware that the recent improvements have made the journey safer




There are a large number of future considerations. These include but are not limited to:

- It is envisaged that there will be growth in the Wairarapa, particularly in agriculture as a result of the Wairarapa Water Use Project and ongoing population growth, and this will impact on vehicle use and numbers
- While journey times on State Highway 2 are currently considered relatively reliable, this programme business case is considering a 30 year time frame. It is forecast that there will be impacts to journey times over this time frame due to the road environment, if improvements are not made

Problems and Benefits of Investment

The problem statements reflect the evidence that has been collected and analysed as well as through discussions and communication with stakeholders. The problem statements relate to safety, reliability, and efficiency, and resilience and are shown in Table 2 below.

Table 2 Problem and Benefit Statements

Themes	Problem Statements	Benefit Statements
 <p>Safety</p>	<p>Problem 1: Sub-standard road environment leads to poor safety performance.</p>	<p>Improved road safety Benefit 1: Improved 'system safety' - roads and roadsides, speeds, vehicles, and road use - so that if one part fails, other parts will still protect the people involved</p>
 <p>Reliability</p>	<p>Problem 2: Infrastructure constraints limit economic potential and access to essential services.</p>	<p>Reliability & Efficiency Benefit 2: More end-to-end journey alternatives and travel choice, particularly for people without private vehicles to access healthcare or other essential services Benefit 3: More reliable journeys for people travelling by car and public transport between the Wellington and the Wairarapa for employment, tourism and other purposes</p>
 <p>Resilience</p>	<p>Problem 3: Transport connections that are vulnerable to unplanned natural events.</p>	<p>Improved regional resilience Benefit 4: More reliable freight transport access by road and rail for businesses in the Wairarapa connecting to regional and overseas markets Benefit 5: Improved recovery timeframes after a high impact earthquake or other major events, facilitating shorter recovery times for utilities, the regional economy and communities</p>

Programme Options Assessment

The programme options were developed with investment partners and key stakeholders and assessed against a number of criteria. The key assessment criteria were the Investment Objectives which were focused on addressing the problems outlined in the previous section; improving safety, reliability and resilience outcomes. The assessment of the short listed options is shown in Table 3 over the page.

RELEASED UNDER THE OFFICIAL INFORMATION ACT

Table 3 Short List of Programme Options

Programme Option		IO#1: Improve Safety Outcomes		IO#2 Improved travel time reliability outcomes		IO#3 Ability of the corridor to withstand and recover as quickly as practical from events	
		Improved road safety risk assessment rating (KiwiRAP)	Reduction in deaths and serious injuries	Maintain or improve median travel time for Masterton - Te Marua	Maintain or improve difference in 50th and 85th travel time for Masterton - Te Marua	Reduced closures in a year	Reduced average closure periods
		KPI 1.1	KPI 1.2	KPI 3.1	KPI 3.2	KPI 2.1	KPI 2.2
Programme 1 - Business as Usual	Score	0	0	-1	-1	0	-1
	Measure	Predicted 80-85% of rural areas will have a Star Rating of 3 or better on 100 m sections	In 2046 there are estimated to be 23.8 DSI per five year period, a predicted 5%-10% reduction on current levels	Increased median travel time to 51¼ minutes (range 48-54) on average for both directions. 4% increase	Predicted increase travel time variation to 10¼ minutes (range 9.3-11.3) on average for both directions 24% decrease	Predicted 32 closures (range 29-35) and 20 delay events per five year period (0% and 7% increase from the baseline).	230 hours closed (range 198-258) and 24 hours of delay per five year period, averaging 7.1 hours per closure event and 1.2 hours per delay event .
Programme 5 - Low Cost Safety, Resilience and Reliability	Score	1	1	-1	0	1	2
	Measure	Predicted 87-93% of rural areas will have a Star Rating of 3 or better on 100 m sections.	Estimated 17.7 DSI per five year period, a predicted 30-40% reduction on current levels	Predicted median travel time of 50¼ minutes (range 47-53) on average for both directions 3% increase	Predicted increase travel time variation to 9 minutes (range 8-10) on average for both directions 7% decrease	Predicted 26 closure (range 23-29) and 19 delay events per five year period (19% and 0% decrease from the baseline).	158 hours closed (range 127-187) and 30 hours of delay per five year period, averaging 6.1 hours per closure event and 1.6 hours per delay event .
Programme 7 - Do Median Combination	Score	2	2	1	1	2	2
	Measure	Predicted 92-98% of rural areas will have a Star Rating of 3 or better on 100 m sections.	Estimated 10.1 DSI per five year period, a predicted 44-60% reduction on current levels	Predicted median travel time of 48 minutes (range 45-51) on average for both directions 1% decrease	Predicted increase travel time variation to 7½ minutes (range 6.5-8.5) on average for both directions 10% increase	Predicted 23 closure (range 20-26) and 16 delay events per five year period (29% and 16% decrease from the baseline).	154 hours closed (range 123-183) and 27 hours of delay per five year period, averaging 6.8 hours per closure event and 1.7 hours per delay event.

Recommended Programme

The recommended programme is Programme Option 7 – Do Median Combination. The recommended programme meets the investment outcomes sought for the corridor, proving a safer journey and a more reliable, efficient and resilient connection for those travelling between the Wairarapa and Wellington. This is achieved through targeted interventions in a number of areas along the corridor:

1. Masterton - Carterton improvements
2. Rimutaka Hill improvements

3. Urban Carterton, Greytown, and Featherston Town Centre Travel Choice and Safety amenity improvements
4. Rural Carterton - Featherston improvements
5. Traveller information improvements
6. Public transport improvements.

As part of this programme there would be an acceleration of low cost improvements to safety, resilience and reliability. This would include behavior change and minor safety improvements as well as resilience and reliability works.

There would be a focus on reducing demand on the transport corridor at peak times (particularly from single occupant car journeys) by educating road users and influencing behaviour change, without significant infrastructure investment (some minor investment in walking and cycling networks and public transport service improvements). Additionally, this would be combined with low cost improvements to safety to consistently upgrade the highway.

In the long term (and in conjunction with the State Highway 2 Ngauranga to Te Marua programme business case) there would be a focus on rail scenarios identified as 'Rail Scenario A' if patronage growth plateaus following Rail Scenario 1 or Rail Scenario 2, through improvements to decrease travel time; and 'Rail Scenario B' which expands network reaches.

Masterton to Carterton Improvements

- Masterton – Carterton Indicative Business Case
 - Improve safe and efficient access to and within the Waingawa Industrial Zone Access, also including improvements within Masterton such as the intersection of SH2 and Ngaumutawa Road and the heavy traffic bypass to the north of Masterton
 - Safety improvements along SH2 such as roadside hazard protection or removal, median treatments up to and including barriers, and intersection upgrades or rationalisation

Rimutaka Hill Improvements

- Speed limit reduction to reflect road environment as per Speed Management Guide as well as speed limit enforcement for all road users
- Geotechnical investigation and preventative slip or mitigation works to improve resilience
- Resurfacing frequency increased from 8 years to 6 years
- Realignment of horizontal curves to achieve a consistent speed environment staged over a ten year period
- Corridor safety improvements between Rimutaka Hill and Te Marua including protecting severe hazards (KiwiRAP assessment), wide centerlines where appropriate and intersection safety improvements

Town Centre Travel Choice and Safety Improvements

The travel choice and safety improvements to the town centres of Carterton, Greytown and Featherston include walking and cycling facilities and crossing places, traffic calming, and urban/ rural speed limit change reinforcement.

Rural Carterton to Featherston Improvements

- Carterton to Greytown and Greytown to Featherston Safety Improvements including roadside hazard protection or removal, wide centerline median treatments and intersection upgrades

- Carterton to Greytown and Greytown to Featherston median treatment upgrade when traffic volumes reach 10-12,000 vehicles per day

Traveller Information Improvements

- Behaviour change initiatives - information and awareness raising focused on replacing SH2 car journeys via walking, cycling, buses, trains, carpooling, working from home/ satellite office and travelling off-peak
- Targeted education programmes
- Variable messaging signs informing user regarding events and delays
- Event Management to mitigate delays from extreme flow events

Public Transport Improvements

- Real Time Passenger Information System / Integrated Fares and Ticketing System
- Revised bus routes/ frequencies
- Continue hazard protection between Te Marua and Featherston
- Improved passenger amenity (Wi-Fi, new carriages)
- Investigate measures to reduce demand, e.g. congestion charging/ tolls, parking policies, high occupancy vehicle lanes
- Rail Scenario A and or B based on demand (and in conjunction with the State Highway 2 Ngauranga to Te Marua programme business case):
 - **Rail Scenario A** – If patronage growth plateaus following Rail Scenario 1 or Rail Scenario 2, improvements decrease travel time (16 min for Wairarapa line) through faster passenger and freight services
 - **Rail Scenario B** - Expands network reach in response to demand through:
 - Refurbishment of Wairarapa SW Cars
 - New locomotives (Wairarapa Services)
 - Increased Wairarapa services
 - Potential electrification to Masterton
 - Integrated PT services
 - Phased modal connections
 - Shuttle services
 - Network extensions/new stations

Programme Assessment

When evaluating programmes and projects, the Government Policy Statement requires both local government and the Transport Agency to consider a number of matters, including achieving better value for money. The Assessment Framework involves rating programmes, projects and other activities across three factors:

- Strategic fit of the problem, issue or opportunity that is being addressed;
- Effectiveness of the proposed solution; and
- Economic efficiency of the proposed solution.

The project was assessed using the Transport Agency Investment Assessment Framework resulting in an indicative assessment profile of:

- High: The overall assessment rating for the ‘Strategic Fit’ of the programme interventions is High
- High: An indicative High rating for ‘Effectiveness’ is achieved on the basis the identified problems and potential investment meets the components of the criteria
- Low: The benefit cost ratio has been calculated to be in the range of 1.6 – 2.5

Programme Cash Flow

The indicative programme cash flow is shown in Table 4. This cash flow is to be confirmed with the Transport Agency during the subsequent Indicative and Detailed Business Cases.

Table 4 Indicative Programme Cashflow (un-escalated)

Year Number	Short Term (0-5 Years)	Medium Term (6-10 Years)	Long Term (11+ Years)	Total
Capital	\$20M - \$25M	\$60M - \$75M	\$30M - \$40M	\$110M - \$140M
Operational and Maintenance (additional to current funding levels)	\$10 M	\$10 M	\$40 M	\$9.6M - \$15M

Outcomes of Investment

The primary outcomes of investment (to 2046) are summarised below.

Safety

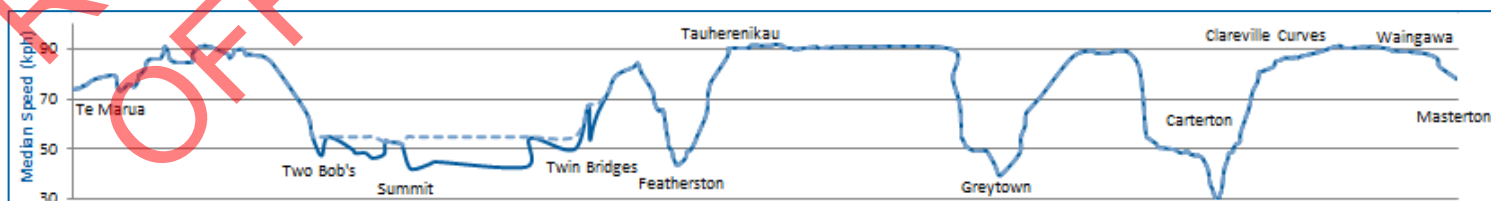
12-16 DSIs saved over a 5 year period.

KiwiRAP rating improvement - 95% of the corridor with a minimum of 3 stars.

Travel Times

Average travel time improvement from 49 minutes to 48 minutes and a reduction in travel time variability from 8.4 minutes to 7.5 minutes by 2046. Vehicle travel speeds consistency will improve as shown in Figure 3 (dashed line) when compared to the 2046 Do Minimum scenario (the solid line) which would see travel speeds increase to 51 minutes and the travel time differential to 10.3 minutes.

Figure 3 Travel Time Reliability Improvements



Resilience

9 less road closures over a 5 year period, from 32 to 23 closures per five years

74 less road closure hours over a 5 year period, from 227 to 153 hours over 5 years

Next Steps

The following are the key areas for further investigation and activities to deliver the programme:

Short Term Safety Improvements

There are a number of short term safety improvements that have been identified. These could be implemented through a number of mechanisms including the Safe Roads Alliance, existing Network Operating Contracts or through minor works packages. These will need to be assessed on a case by case basis and reflect the evidence provided in the Context Report.

Potential Indicative (then Detailed) Business Cases

There are two recommended projects within the programme which will require indicative business cases in the near future to investigate and further develop specific interventions to meet the investment objectives, as set out in Table 5.

Table 5 SH2 Te Marua to Masterton Potential Indicative Business Cases

Potential Indicative Business Cases	Potential interventions	Estimated Costs	Estimated Timeframe (in line with NLTP)
SH2 Carterton - Masterton	Short term temporary speed limit reduction until project safety improvements have been constructed	Low <\$100k	Short/ immediate By 2017/18
	Waingawa Industrial Estate Access Indicative Business Case which considers/ includes: <ul style="list-style-type: none"> Areas north of the Waingawa River Bridge in Masterton District including the Ngaumutawa Rd intersection and the heavy traffic bypass of Masterton Freight movement by rail and ability to increase intermodal freight movements 	High \$8 -12 M	Short By 2020/21
	Carterton - Masterton Safety Improvements including: roadside hazard protection or removal, median treatments up to and including barriers, and intersection upgrades or rationalisation	High \$5 - 10 M	Short By 2020/21
SH2 Rimutaka Hill section	Speed limit reduction to reflect road environment as per Speed Management Guide as well as speed limit enforcement for all road users	Low \$100-200k	Short/ immediate By 2017/18
	Geotechnical investigation and preventative slip or mitigation works to improve resilience	High \$1-4 M	Short to Medium By 2026/27
	Resurfacing frequency increased from every 8 to every 6 years	Low ~\$200-300k per year	Ongoing

	Realignment of horizontal curves to achieve a consistent speed environment, staged over a ten year period	Very high ~\$50-100 M	Short to Medium By 2026/27
	Corridor safety improvements between Rimutaka Hill and Te Marua including protecting severe hazards, wide centrelines where appropriate, and intersection safety improvements	High \$2-4 M	Staged Short to Medium By 2023/24

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Table of contents

Executive Summary	i
Introduction.....	i
Context.....	ii
Current Situation and Future Considerations.....	iii
Problems and Benefits of Investment	iv
Programme Options Assessment	v
Recommended Programme	vi
Programme Assessment.....	viii
Programme Cash Flow	ix
Outcomes of Investment	ix
Next Steps.....	x
Part A – The Strategic Case	1
1. Introduction.....	1
1.1 Programme Business Case Development.....	1
2. Programme Context.....	3
2.1 Partners and Key Stakeholders.....	3
2.2 Geographic and Environmental Context.....	4
2.3 Social and Economic Context.....	5
2.4 Transport Context	7
3. Strategic Assessment – Outlining the need for Investment.....	10
3.1 Defining the Problems and Benefits	10
3.2 Problem One: Safety.....	11
3.3 Problem Two: Reliability	14
3.4 Problem Three: Resilience	17
4. Investment Objectives.....	21
Part B – Developing the Programme	23
5. Alternatives and Options	23
6. Programme Options Development and Assessment.....	26
6.1 Programme Options Development and Refinement.....	26
6.2 Programme Options Assessment.....	27
6.3 Short List Programme Options Summary.....	28
6.4 Short List Programme Options Assessment.....	29
7. Recommended Programme – Description and Assessment.....	32
7.1 The Recommended Programme	32
7.2 Recommended Programme Assessment.....	34

7.3	One Network Road Classification: Customer Level of Service Outcomes (Provisional)	39
7.4	Programme Risk and Opportunity	40
8.	Programme Financial Case	41
8.1	Funding Arrangements	41
8.1	Indicative Cost and Programme Cash Flow	41
	Part C – Delivering and Monitoring the Programme	42
9.	Planning and Delivery Overview	42
10.	Management Case	45
10.1	Programme Performance and Review	45
10.2	Governance and Reporting	45
10.3	Stakeholder Engagement and Communications Plan	45
11.	Commercial Case	48

Table index

Table 1	State Highway 2 Te Marua to Masterton Traffic Volumes	iii
Table 2	Problem and Benefit Statements	v
Table 3	Short List of Programme Options	vi
Table 4	Indicative Programme Cashflow (un-escalated)	ix
Table 5	SH2 Te Marua to Masterton Potential Indicative Business Cases	x
Table 6	SH2 Te Marua to Masterton Programme Business Case Workshops	2
Table 7	2013 Census trips to work	7
Table 8	Workplace Destinations for Wairarapa Usual Residence Respondents	7
Table 9	Modal Share for main means of travel	7
Table 10	State Highway 2 Te Marua to Masterton Traffic Volumes	8
Table 11	Problem and Benefit Statements	10
Table 12	Communities at Risk Register – SH2 Te Marua to Masterton	12
Table 13	Wellington Region Hazards Risk Analysis	18
Table 14	Short List of Programme Options	29
Table 15	Short List Programme Options Assessment Summary	31
Table 16	Criteria for achieving medium or high Strategic Fit score	34

Table 17 Strategic Fit assessment against high rating requirements	35
Table 18 Summary of Identified Key Risks	40
Table 19 Indicative Programme Cash Flow (un-escalated)	41
Table 20 Summary of Identified Key Risks	42
Table 21 Regional Land Transport Programme (2015-18)	43
Table 22 SH2 Te Marua to Masterton Potential Indicative Business Cases	44

Figure index

Figure 1 Rimutaka Hill section of SH1	ii
Figure 2 Local Context	ii
Figure 3 Travel Time Reliability Improvements.....	ix
Figure 4 Local Context	3
Figure 5 Rimutaka Hill Snow Closure, July 2015 (source: Google).....	5
Figure 6 State Highway 2 through Greytown (source: Google)	5
Figure 7 Long-List to Short List of Programme Options.....	27
Figure 8 Assessment Criteria Tiers	30
Figure 9 Programme Option 7: Assessment against short listed options against effectiveness.....	36

Appendices

Appendix A –	Confirming the Context Report
Appendix B –	Alternatives and Options Report
Appendix C –	Programme Options Assessment Report
Appendix D –	Stakeholder Engagement and Communications Plan
Appendix E –	Resilience Risk Maps

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Part A – The Strategic Case

1. Introduction

Part A – The Strategic Case, summarises the strategic case following further evidence collection and analysis which reconfirmed and refined the Strategic Case problems and benefits or conversely, discounted them. The problems have been further developed and shaped into SMART investment objectives that form a line of sight between the problem statements and measureable outcomes.

During the development of the programme business case, the Strategic Case has been reconfirmed to refresh stakeholder understanding, account for any changes since it was completed, confirm the geographic extents of the problems and benefits, and understand the areas of overlap with other relevant programme business cases that are being developed at the same time.

This programme business case has been developed concurrently with the State Highway 2 Ngauranga to Te Marua programme business case as well as the Wellington Port Access programme business case. This collective approach recognises that end to end journeys between Wellington, the Wairarapa and beyond travel along parts of this route and that issues facing one section can have impacts on the other.

One key change from the Strategic Case is that the entire corridor from Te Marua to Masterton has been examined, whereas for the Strategic Case there was a greater focus on the Rimutaka Hill (Te Marua to Featherston) section¹. This has led to an identification of two distinct sections of State Highway 2 in terms of physical road features, journey types and purposes, as well as contribution to problems; Rimutaka Hill section (Te Marua to Featherston) and Wairarapa section (Featherston to Masterton)².

It should be noted that the programme also considers changes to technology in transportation over time including electronic and autonomous vehicles and associated infrastructure. The programme options and recommendations do not have specific investments identified but will be capable of accommodating these developments either by policy through Transport Agency national initiatives or private enterprise (i.e. charging stations within service centres).

1.1 Programme Business Case Development

Four workshops were held with investment partners and key stakeholders (see section 2.1) to develop the programme business case, as summarised in Table 6.

¹ In line with the corridor and end-to-end journey focus of the NZ Transport Agency business case approach

² Noting that there are two distinct sections within the Wairarapa section itself and the higher traffic volumes in the Carterton to Masterton section have led to recommendations for improvements in this area ahead of the Featherston to Carterton section.

Table 6 SH2 Te Marua to Masterton Programme Business Case Workshops

Workshop	Date (2016)
Workshop 1: Problems and Benefits Confirmation and Investment Objectives	Monday 15 February
Workshop 2: Alternatives and Options Development	Thursday 17 March
Workshop 3: Confirming Investment Objectives and Programme Option Development	Wednesday 20 April
Workshop 4: Programme Options Assessment	Wednesday 1 June 2016

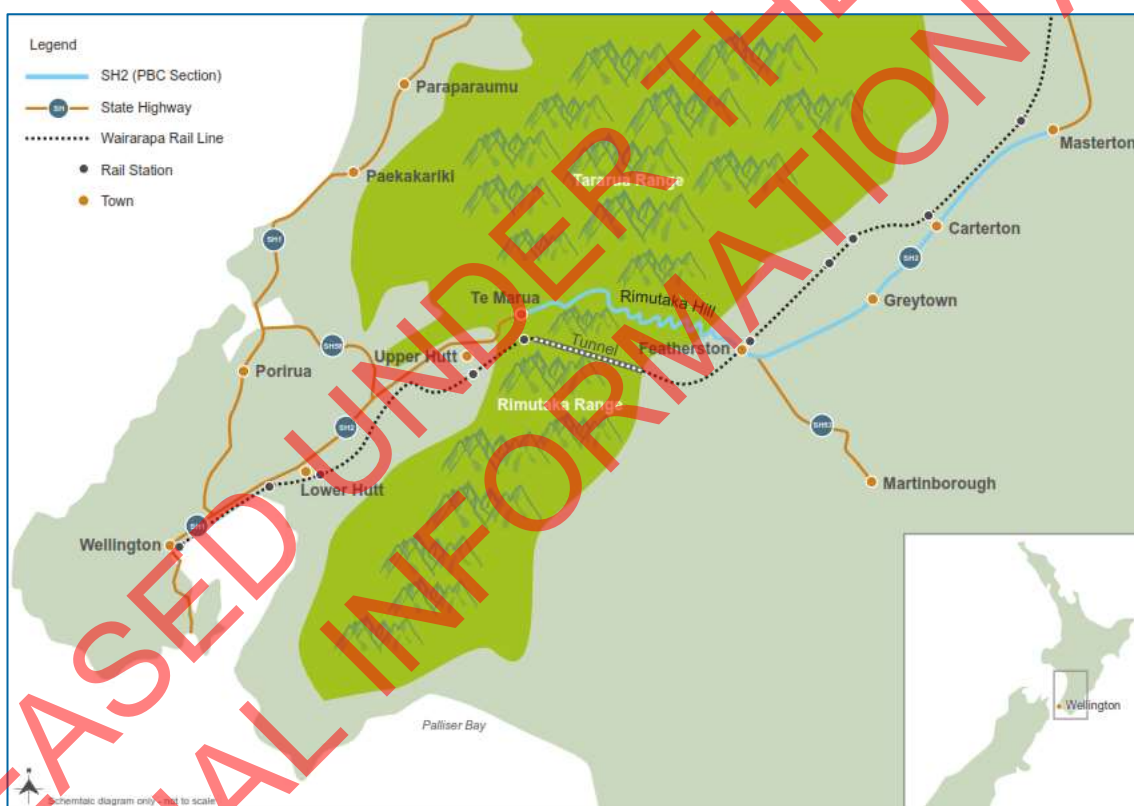
RELEASED UNDER THE OFFICIAL INFORMATION ACT

2. Programme Context

This programme business case focuses on the entire transport corridor between Te Marua and Masterton, including State Highway 2, the Wairarapa to Wellington rail line, and their interface with other transport network services as shown in Figure 4.

This section of State Highway 2 is located within the Wellington region and passes through the territorial authorities of Upper Hutt City, South Wairarapa District and Carterton District Councils. State Highway 2 between Te Marua and Featherston is the only road that provides access between the Wairarapa and Wellington, enabling access to hospitals, employment and other services. The Wairarapa to Wellington rail line provides public transport services between Wellington and the Wairarapa as well as facilitating the movement of freight goods to Wellington Port.

Figure 4 Local Context



2.1 Partners and Key Stakeholders

This programme business case has been developed collaboratively with the NZ Transport Agency, Greater Wellington Regional Council, Upper Hutt City Council, South Wairarapa District Council, Carterton District Council, Masterton District Council, and KiwiRail. These partners were also all closely involved in the development of the Strategic Case.

Other stakeholders including NZ Police, automotive advocacy groups and other representative groups have also been involved in the process.

2.1.1 Customer perspective

In 2015 the Transport Agency undertook an innovative research project to better understand customer requirements and experiences on this transport corridor. The aim of the research was

not to seek transport solutions from the customer, but rather gain a more in-depth understanding of the customer's experience and needs.

The customer perspective research identified five main purposes of transport journeys between the Wairarapa and Wellington:

1. People and businesses in the Wairarapa and Wellington accessing other parts of the region for 'obligatory' purposes, including:
 - a. People in the Wairarapa accessing health and education services unavailable in the Wairarapa
 - b. Businesses in the Wairarapa sending primary industry produce and other goods to market in Wellington, and beyond (via CentrePort and Wellington Airport)
 - c. Businesses in Wellington providing services to support the Wairarapa economy, for example IT or engineering services to farms, vineyards and other locations.
2. People travelling between Wairarapa and Wellington to maintain connections between family members and friends living in different parts of the region
3. People in Wellington and Wairarapa 'experiencing' the other location for shopping or leisure purposes, including:
 - a. People in Wairarapa visiting Wellington to shop or to attend sporting and entertainment events
 - b. People in Wellington visiting Wairarapa to enjoy outdoor activities, vineyards or other aspects of the rural lifestyle
4. People regularly travelling between the Wairarapa and Wellington to enjoy 'the best of both worlds', for example through living in the Wairarapa and working in Wellington City or the Hutt Valley.

The findings of this research were considered in the development of the Strategic Case.

Further customer insights were undertaken for the wider journey on the SH2 corridor from the Wairarapa, through the Hutt Valley and to Wellington and in particular, to Wellington Port. This study confirmed the above information and identified the trade-offs that commuters made when choosing their preferred form of travel on any given day due to time, cost, amenity and many other factors (reflecting the generalised costs to each commuter).

2.2 Geographic and Environmental Context

This section of State Highway 2 commences in Te Marua at the intersection of State Highway 2 and Plateau Road and traverses over the Rimutaka Range (the Rimutakas) for 23 km before reaching Featherston, this part of the route is very steep, winding and narrow, particularly the ascent of Rimutaka Hill which is around 555 metres above sea level. This section of SH2 is impacted by weather and other events resulting in closures, warnings and changing conditions, especially in winter (see Figure 5).

Figure 5 Rimutaka Hill Snow Closure, July 2015 (source: Google)



On the north eastern side of Rimutaka Hill, in the Wairarapa, the route passes through the townships of Featherston, Greytown and Carterton for 32 km (see Figure 6) until it reaches the bridge over the Waingawa River on the southern side of Masterton. This part of the route is relatively flat and straight with isolated curves. State Highway 2 also provides access to the township of Martinborough via State Highway 53, the South Wairarapa district and the Waingawa industrial estate just to the south-west of Masterton.

Figure 6 State Highway 2 through Greytown (source: Google)



2.3 Social and Economic Context

The Wellington region has experienced constrained economic and population growth for an extended period. Over the past decade Wellington has lagged behind New Zealand's two other main cities, Auckland and Christchurch. With the second largest economy in New Zealand, the region contributes 13.2% of New Zealand's GDP with 10.9% of New Zealand's population. The Wellington region has a population of 491,400, an employment rate of 67.7% with 5.7%

unemployed. Average house prices are lower than the national average with the average household income 12.2% above the national average³.

The Wellington region has a high proportion of employment in knowledge intensive services covering areas such as professional services, scientific and administration, nearly double the national average. In the Hutt Valley there are a number of specialist manufacturing and distribution industries and the Wairarapa has a strong focus in the primary sector.

Throughout the Wairarapa region the primary industries are agriculture and forestry, alongside industries focused around beef, sheep, grapes for winery and dairy cattle. The primary sector accounts for 20.6% of employment with manufacturing (food and wood processing) accounting for approximately 14.6% of GDP in the region⁴. The Wairarapa region is also considered to be increasingly important for tourism.

The transport corridor between Te Marua and Masterton, including State Highway 2 and the Wairarapa to Wellington rail line, contributes to and facilitates the journeys between the Wairarapa and Wellington made for economic reasons (as noted in section 2.1.1) including for moving freight. The corridor also facilitates economic activities within the Wairarapa.

Destination Wairarapa (the region's tourism organisation) is working to growing tourism revenue, in line with the New Zealand Tourism 2025 framework⁵, from \$136 million⁶ to \$232 million by 2025⁷. Destination Wairarapa's vision is more visitors, staying longer, spending more.

The five key areas of work which offer the greatest opportunity for Wairarapa tourism over the time frame of the strategy are:

- Touring routes and the Rimutaka Cycle Trail
- Growing online presence and facilitating development of members' online capability
- Winning conferences for the Wairarapa
- Partnerships with funders, KiwiRail, Tranz Metro, Department of Conservation
- Product development.

The Wellington Transport Strategy Model 2013 (WTSM) does not predict any significant growth in employed persons or jobs in the Wairarapa and only a small increase in employed persons commuting to Wellington City from elsewhere in the region (which also includes Lower Hutt, Upper Hutt, Porirua and Kapiti). However, it is envisaged that there will be growth in the Wairarapa, particularly in agriculture as a result of the Wairarapa Water Use Project (see below) and the ongoing population growth, and this will impact on vehicle use and numbers.

Wairarapa Water Use Project

The Wairarapa Water Use Project has the potential to develop more than 30,000 hectares of productive irrigated land and more than double its productive output for the region.

Providing a reliable water supply for Wairarapa farmers and growers has major potential to boost growth, creating jobs and exports⁸. Irrigating an additional 30,000 hectares would add \$157 million of GDP to the greater Wellington region per year and create over 1200 new jobs. A further

³ Ministry of Business, Innovation and Employment – Regional Economic Activity Report, 2015

⁴ Berl economics – Economic profile and projections for the Wairarapa region, 2008

⁵ www.tourism2025.org.nz

⁶ It has been assumed the date is 2013 for this figure, as it comes from the 2014-2016 Strategic Plan

⁷ Destination Wairarapa, Strategic Plan 2014-2016

⁸ <http://www.stuff.co.nz/business/farming/77806924/funding-boast-for-north-island-irrigation-schemes>

\$90 million in GDP would be added and more than 1,100 jobs created for one year as a one-off result of farmers converting to irrigation⁹.

2.4 Transport Context

As shown in **Error! Not a valid bookmark self-reference.**, approximately one quarter of the 20,000 trips to work by Wairarapa residents are to destinations outside the Wairarapa in the wider Wellington region.

Table 7 2013 Census trips to work

Trip Origin and Destination	Internal within Wairarapa	Live in Wairarapa, work in wider region	Live in wider region, work in Wairarapa
Number of Trips	14,763	4,713	300
Percentage	75%	24%	1%

Table 8 shows that for respondents who stated that their usual residence is the Wairarapa, 54% of trips (1014) are to Wellington (CBD), 10% (186) are to Wellington (non CBD), 18% (339) are to Lower Hutt and 12% (216) are to Upper Hutt.

Table 8 Workplace Destinations for Wairarapa Usual Residence Respondents

Workplace Destination	Wellington CBD	Wellington City (non CBD)	Lower Hutt	Upper Hutt
Number of trips	1014	186	339	216
Percentage of trips to workplaces outside Wairarapa	54%	10%	18%	12%

The modes used for these trips are shown in Table 9 and show that 60% of the 1000 trips to Wellington CBD are on the train and 23% are undertaken in cars (either as a driver or passenger).

Table 9 Modal Share for main means of travel

Trip	Internal within Wairarapa	Live in Wairarapa, work in Wellington CBD	Wellington Region Average
Did not go to Work	11.8%	8.4%	10.2%
Work from Home	15.5%	3.3%	6.2%
Private Auto	46.4%	16.8%	39%
Company Auto	9.5%	4.2%	8.5%
Passenger	3%	2.1%	4.5%
Train	0.3%	60.2%	6.3%
Bus	0.4%	0.6%	7.7%
Walk	5.4%	3%	9.7%
Cycle	2.5%	0%	2.5%

⁹ Wairarapa Water Use Project, Media information 8 June 2015.

Motorcycle	2.4%	0.3%	1.3%
------------	------	------	------

Traffic Volumes

Traffic volume data has been obtained from the Transport Agency's State Highway Traffic Data Booklet 2011 - 2015 and is summarised in Table 10.

Table 10 State Highway 2 Te Marua to Masterton Traffic Volumes

Section	Average Annual Daily Traffic (2015)
Te Marua - Featherston	6,089
Featherston - Greytown	6,185
Greytown - Carterton	9,555
Carterton - Masterton	11,146

Table 10 shows that in 2015 there was an average of approximately 6,100 vehicle trips per day for State Highway 2 between Te Marua and Featherston (as recorded at the Rimutaka Hill traffic count site) and 11,150 vehicle trips per day between Featherston and Masterton (as recorded at the Clareville traffic count site) with lower vehicle numbers downstream between Featherston and Greytown (6,200 vehicle trips per day) and between Greytown and Carterton (9,550 vehicle trips per day). Traffic volumes at the two traffic count sites have increased slowly over the past five years¹⁰.

The data shows that in the weekday morning peak (7-9 am) there are approximately 500 vehicles travelling over the Rimutaka Hill towards Wellington and an additional 260 between 6-7 am.

The data also shows that only 6% of traffic using State Highway 2 between Te Marua and Featherston and between Featherston and Masterton are heavy vehicles which equates to approximately 300 and 650 heavy vehicles respectively. The Waingawa Log Hub currently saves over 16,000 truck trips per annum on this stretch of State Highway (approximately 60 truck movements per weekday) and this figure may increase by 50% by the end of the year (2016)¹¹.

Wairarapa Railway Line

The Wairarapa Railway Line travels between Masterton and Wellington, stopping at 10 stations. The full journey takes between 1 hour 30 minutes and 1 hour 45 minutes. The station nearest to Te Marua is Maymorn and the journey between Maymorn and Masterton Stations takes approximately 1 hour.

There are five services in each direction on a weekday, four morning services from Masterton departing at 5.45 am, 6.21 am, 6.48 am and 10.25 am and one afternoon service departing Masterton at 3.40 pm. There is one morning service from Wellington at 8.25 am and four afternoon services departing at 12.55 pm, 4.25 pm, 5.30 pm and 6.22 pm. On Fridays there is an additional evening service departing Masterton at 8.20 pm and departing Wellington at 10.25 pm which arrives in Masterton at midnight. There are two services in each direction on Saturdays, Sundays and Public Holidays; departing Masterton at 7.50 am and 4.50 pm and departing Wellington at 9.55 am and 6.55 pm. Additional services for Wellington events, e.g. All Blacks vs Australia on 27 August 2016, are also provided.

¹⁰ New Zealand Transport Agency State Highway Traffic Data Booklet 2010 – 2014, March 2015

¹¹ <http://www.centreport.co.nz/information-library/news/173-new-waingawa-log-hub-underpins-regional-growth-and-trade>

In 2015-16 (July to June) the Wairarapa Railway Line carried approximately 734,530 passengers, of which 573,650 (78%) travelled during peak hours. This is an increase of 5% from the previous year which saw approximately 543,870 passengers travelling during peak hours.

Park and Ride free car park facilities are provided at Featherston, Woodside, Carterton, Solway and Masterton Stations in the Wairarapa.

Cycles can be taken on all train services on the Wairarapa Railway Line, subject to space available in the luggage compartment where cycles need to be placed. Cyclists must speak to staff prior to loading their bicycles onto trains.

Wairarapa Bus Network

The Wairarapa bus network provides services between Masterton and Featherston, between Featherston Station and Martinborough, and connects Greytown to nearby Woodside Station. Services are timed to connect with the train to/ from Wellington and provide access to Wairarapa Hospital and local schools.

Cycle Network

There are a number of cycle routes within the Wairarapa including the Rimutaka Cycle Trail, the Wairarapa Valley Cycleway, which forms part of the New Zealand Cycle Trail, and the Greytown – Woodside Trail.

For most of this section of State Highway 2 between Te Marua and Masterton, there are no dedicated cycle facilities, road markings, signage or parallel off-road path.

Freight

Nationally it is predicted that the freight task will increase by around 58% in tonnes, from 236 to 373 million tonnes and by 48 percent in tonne-kilometres, from 26 billion to 39 billion tonne-kilometres over the next 30 years as New Zealand's population and economy grows¹². Freight tonnage to Wellington is forecast to increase by around 65% (slightly higher than the national forecast) over the next 30 years, from about 8.5 million to 14 million tonnes by 2042¹³. Freight tonne kilometres to Wellington are predicted to increase by 38% (slightly lower than the national forecast) over the same period, from 0.9 billion to 1.24 billion tonne kilometres.

The current modal share for freight involves 70% of movements occurring by road, 15% by rail, and 15% by coastal shipping and these are predicted to remain largely the same, apart from rail freight movements from the Wairarapa. A significant increase in timber production in the Wairarapa is anticipated over the next twenty years and the majority of these are potentially to be transported to the Port via rail due to the increasing congestion on the Wellington road network causing delays to road freight¹⁴. It is understood that the majority of logging trucks from the Wairarapa currently travel to the Port outside peak times to avoid congestion.

¹² National Freight Demand Study March 2014 (NFDS) Ministry of Transport

¹³ Greater Wellington, Regional Land Transport Plan, 2015

¹⁴ Beca, Port of Wellington Access Strategy




3. Strategic Assessment – Outlining the need for Investment

The following section outlines the Strategic Assessment following further evidence collection and analysis which reconfirmed and refined the strategic case problems and benefits. More detail can be found in the SH2: Te Marua to Masterton - Confirming the Context for the Programme Report¹⁵.

3.1 Defining the Problems and Benefits

During the development of the programme business case these three problem statements have been confirmed as the three main issues facing the transport corridor. However, at Workshop 2 it was agreed with stakeholders that reference to ‘the hill’ would be removed from Problem Statement 1 to ensure the entire corridor from Te Marua to Masterton is included and some minor wording changes would be made to Problem Statement 3 to clarify the exact nature of the problem needing to be addressed, as follows:

Table 11 Problem and Benefit Statements

Themes	Problem Statements	Benefit Statements
 <p>Safety</p>	<p>Problem 1: Sub-standard road environment leads to poor safety performance.</p>	<p>Improved road safety Benefit 1: Improved ‘system safety’ - roads and roadsides, speeds, vehicles, and road use - so that if one part fails, other parts will still protect the people involved</p>
 <p>Reliability</p>	<p>Problem 2: Infrastructure constraints limit economic potential and access to essential services.</p>	<p>Reliability & Efficiency Benefit 2: More end-to-end journey alternatives and travel choice, particularly for people without private vehicles to access healthcare or other essential services Benefit 3: More reliable journeys for people travelling by car and public transport between the Wellington and the Wairarapa for employment, tourism and other purposes</p>
 <p>Resilience</p>	<p>Problem 3: Transport connections that are vulnerable to unplanned natural events.</p>	<p>Improved regional resilience Benefit 4: More reliable freight transport access by road and rail for businesses in the Wairarapa connecting to regional and overseas markets Benefit 5: Improved recovery timeframes after a high impact earthquake or other major events, facilitating shorter recovery times for utilities, the regional economy and communities</p>

¹⁵ SH2: Te Marua to Masterton - Confirming the Context for the Programme Report, September 2016

3.2 Problem One: Safety

Sub-standard road environment leads to poor safety performance

3.2.1 The Evidence

Death and Serious Injuries

In order to determine the actual crash risk for SH2 between Te Marua and Masterton, the Transport Agency's Crash Analysis System (CAS)¹⁶ has been interrogated. This revealed that there were 29 deaths and serious injuries (DSI) in the five year period from January 2010 to December 2014 of which four were fatalities.

One of the most notable issues identified is that almost half (14 of 29) of the DSI involved vulnerable road users, most notably motorcyclists on the Te Marua to Featherston (Rimutaka Hill) section (12 of the 17 DSI crashes, 71%) – this is considered very high as nationally motorcyclists account for 18% of these crash types.

Wet and Icy Road Conditions

52% of crashes which occurred on the Rimutaka Hill between Beehive Corner and Kaitoke Straight for the five year period 2010-2014 occurred in wet or icy conditions. Wet and icy conditions reduce available surface friction increasing likelihood of crashes. Surface friction provided from skid resistance decays with surfacing life. Skid resistance can be rehabilitated or rejuvenated through various treatment options or resurfacing.

Safe Ride Rimutaka Project, 2013

The Safe Ride Rimutaka Project sought to involve motorcyclists in identifying a range of actions to reduce crashes involving motorcycles on the Rimutaka Hill. Over 170 motorcyclists attended one of four meetings as part of the project and 33 respondents completed an online survey.

The hazards on the Rimutaka Hill Road that were identified as being of most concern to motorcyclists were, in order of priority, wind gusts, road surface quality, spills and debris, and drivers of other vehicles (particularly slow vehicles that do not pull over to allow others to pass, and vehicles that cross the centreline or cut corners).

The measures that motorcyclists thought were most likely to make a difference to the motorcycle crash rate on the Rimutaka Hill were, in order of priority:

1. Provide more passing lanes / passing bays
2. Improve the standard of maintenance, and faster response when road surface is damaged or deteriorates
3. Provide more opportunities for riders to attend on-road skills training sessions
4. Road safety campaigns with safe driving messages (awareness of motorcycles) for other road users
5. Straighten out some of the bends
6. Provide more opportunities for riders to attend skills training sessions covering general theory and basic handling skills

¹⁶ Accessed on 16 February 2016

Communities at Risk

The Communities at Risk Register¹⁷ was developed by the Transport Agency to identify communities of road users that are over-represented in terms of road safety risk. The Risk Register uses the same CAS data examined as part of this programme business case (January 2010 to December 2014) and considers this against road user use relative to the specific Safer Journeys topic.

The Risk Register identifies communities of concern on a local authority boundary basis and it is noted that only a portion of State Highway 2 Te Marua to Masterton is located in Masterton District and Upper Hutt City.

Table 12 sets out the strategic areas of concern that have been identified as either a medium or high concern in the local authority areas where State Highway 2 Te Marua to Masterton is located¹⁸.

Table 12 Communities at Risk Register – SH2 Te Marua to Masterton

Safer Journeys Strategic Area of Concern	District(s)	High or Medium concern
Young drivers (light vehicles aged 16-24 years)	Carterton	High
	South Wairarapa	High
Alcohol and drugs	Carterton	Medium
Speed (too fast for conditions)	South Wairarapa	Medium
	Carterton	Medium
Rural roads (loss of control and/or head-on (speed zones >70 km/h)	South Wairarapa	Medium
Motorcyclists	South Wairarapa	High

The Communities at Risk Register identifies South Wairarapa District as a community of high concern with regards to DSIs involving motorcyclists. It is important to note that this illustrates where the accidents are occurring as opposed to where the motorcyclists come from, which is understood to be from throughout the region and beyond. Other areas of high concern in the study area are DSIs involving young drivers (in both Carterton and South Wairarapa Districts).

Collective and Personal Risk

Collective risk (also known as crash density) is a measure of the number of the fatal and serious crashes that have happened per kilometre of road per year. Personal risk is a measure of the fatal and serious crashes per vehicle kilometre travelled. It differs to collective risk as it takes into account the traffic volumes on each section of state highway.

In 2012 a report¹⁹ was produced as part of New Zealand's Road Assessment Programme (KiwiRAP) that compared crash data for 2007-11 to that from 2002-06. State Highway 2 between Upper Hutt and Featherston was identified as one of only seven sections of the assessed state highway network that had seen an increase in fatal and serious crashes, from 20 in 2002-06 to 34 in 2007-11. The majority of this increase was attributed to motorcycle crashes which had increased from 8 to 18 over this time period, with motorcycle crashes accounting for 53% of the DSI crashes.

¹⁷ New Zealand Transport Agency, [Communities at Risk Register](#), October 2015

¹⁸ Upper Hutt does not feature on the Risk Register as having High or Medium concern areas

¹⁹ <http://www.kiwirap.org.nz/downloads.html>, accessed 18.02.16

This report identified State Highway 2 between Upper Hutt and Featherston as having the **third highest collective risk** and **seventh highest personal risk** of the assessed state highways. The section between Featherston and Masterton did not feature in the riskiest 30 links for either risk category.

Star Ratings

Star Ratings are a predictive measure of the personal safety of a road based on the presence or absence of road infrastructure features associated with the three major crash types on the New Zealand rural road network i.e. head-on, run-off road and intersection crashes. Between 1 and 5 Stars are awarded to road links (5 km lengths) with a higher star rating indicating a better road.

The KiwiRAP Analysis Tool (KAT)²⁰ has been used to determine the star ratings for State Highway 2 between Te Marua and Masterton.

Between Te Marua and Featherston 9 km of the 23 km (40%) section is rated as a 2-Star road, while 3.5 km of the 23 km (15%) non-urban sections between Featherston and Masterton is rated as 2-Star, with high levels of roadside risk.

The NZ Transport Agency's 'One Network Road Classification' (ONRC)²¹ categorises roads based on their function in the national network and defines the fit for purpose Customer Levels of Service (CLoS) outcomes. These are summarised in the CLoS Fit for Purpose Outcomes Table in Appendix 3 in the ONRC Guidelines²².

State Highway 2 between Te Marua and Masterton is categorised as a 'Regional' road and Regional roads are expected to meet the following level of service with regards to 'Safety':

Mostly KiwiRAP 3-star equivalent or better. Active road users are mostly provided with additional space in urban areas and in some rural areas. Some lower standards and/or winding sections may require lower speeds and extra care. High level of road user safety guidance provided.

The section of State Highway 2 between Te Marua and Featherston is not considered to meet this level of service as over a quarter (12.5 of 46 km) of the non-urban sections are rated as 2 Star.

Safety Improvements

Ongoing safety improvements since 2010 on Rimutaka Hill include crash barrier installation on the drop-off side, warning and educational signage, a major curve realignment project (\$16.5 M), and active truck warning signage. Since 2010 there have been two reported serious injuries which have impacted the guardrail, the previous fence, or gone down the bank.

Overtaking and Passing Provision

There are very few opportunities for overtaking or passing on the section of State Highway 2 between Te Marua and Featherston with 84% of the route having double yellow lines or insufficient forward sight distance. This indicates that there is insufficient sight distance for overtaking. The only place overtaking is permitted on this section is in dedicated passing lanes.

There are more opportunities for passing in the section of State Highway 2 between Featherston and Masterton with sections where overtaking is possible in both directions. However there is still just over a third (35%) that has double yellow lines which increases to 45% of this section of State Highway 2 when the urban sections are excluded (24% of the route is urban).

²⁰ Updated in December 2015

²¹ NZ Transport Agency, [Applying the One Network Road Classification - Guidelines](#), December 2013

²² Ibid

Trucks crossing centre line

The 2013 State Highway 2 Rimutaka Hill Vehicle Tracking Analysis²³ showed that a 19 m semi-trailer design vehicle could not navigate the alignment of five of the Rimutaka Hill curves without entering the opposing traffic lane.

From 2010 to 2014, there was one head-on crash between two trucks on the Rimutaka Hill; it did not result in injury. For the ten year period, 2005 to 2014, there were five head-on crashes between two trucks, which were all non-injury crashes.

Perception of Safety

The 2015 customer perspective research (see section 2.1.1) found that some lower confidence drivers viewed the hill as a dangerous road. Some of the specific points which contributed to this perception were a lack of opportunity to stop during the most stressful part of the route, and a lack of opportunities to overtake slow vehicles / allow faster vehicles to overtake.

3.2.2 Implications of the Evidence

The crash history for SH2 between Te Marua and Masterton indicates significant safety risks for vulnerable road users, particularly motorcyclists. Even with the safety improvements undertaken in late 2015 sections of road are still classified as a 2-Star road.

3.3 Problem Two: Reliability

Infrastructure constraints limit economic potential and access to essential services

3.3.1 The Evidence

Travel Time and Travel Time Reliability

Travel times along the two sections of SH2 have been examined using data made available by TomTom. The median (50th percentile) travel speed on the winding section of the Rimutaka Hill Road is 40 to 60 km/h. Speeds are generally higher either side of the Rimutaka Hill where the alignment is straighter and flatter. The 15th (slower vehicles) and 85th (faster vehicles) percentile speeds are typically within 10 km/h of the median speed, indicating relatively reliable travel times. An exception to this is at the eastbound uphill passing lane in the vicinity of the Kaitoke Loop Road intersection.

The average travel speed over this 23 km section of SH2 is 58 km/h which corresponds to a journey time of 24 minutes. The 15th percentile travel speed is 52 km/h with a corresponding travel time of 27 minutes and the 85th percentile travel speed is 70 km/h with a travel time of 20 minutes. This further suggests that journey times over this section of State Highway 2 are relatively reliable.

The median (50th percentile) travel speed along SH2 between Featherston and Masterton is 80 to 100 km/h in rural sections, and 30 to 50 km/h through town centres. The 15th and 85th percentile speeds are typically within 10 km/h of the median speed, the only exception to this is at Waingawa. This is expected to be a GPS tracking limitation where vehicles that exit State Highway 2 skew the lower percentile data.

The average travel speed over this 32 km section of State Highway 2 is 68 km/h which corresponds to a journey time of 28 minutes. The 15th percentile travel speed is 65 km/h with a corresponding travel time of 30 minutes and the 85th percentile travel speed is 81 km/h with a

²³ State Highway 2 Rimutaka Hill Vehicle Tracking Analysis, Spiire, 2013

travel time of 24 minutes. The data suggests that journey times over this section of State Highway 2 are relatively reliable.

While journey times on State Highway 2 are currently considered relatively reliable, this programme business case is considering a 30 year time frame. It is forecast that there will be impacts to journey times over this time frame due to the road environment, if improvements are not made.

Event impacts on Travel Patterns (Time Reliability)

Traffic volumes over long weekends or when there are events being held in the Wairarapa, such as the Martinborough Fair and Wairarapa Wines Harvest Festival, have been examined and the highest traffic volumes in 2015 were recorded on Saturday 7 February when the Martinborough Fair was held which was also a long weekend (Waitangi Day).

When there is an event on in the Wairarapa traffic volumes can increase to approximately 12,000 vehicles per day, almost doubling typical weekend volumes. Traffic volumes on the Te Marua to Featherston section are approximately 7,000 vehicles per day Thursday to Saturday.

For vehicles travelling from Wairarapa to Wellington the morning peak is typically between 7 am and 12 noon with volumes around 600 vehicles per hour (approximately double the typical weekday volume) and as high as 780 vehicles per hour between 10 am and 11 am. For the return journey the peak was between 12 noon and 6 pm with the peak reaching 870 vehicles per hour at 4 pm.

These increased traffic flows can result in congestion and significantly longer than typical journey times.

Heavy Vehicle Travel Time and Travel Time Reliability

Electronic Road User Charging (ERUC) data for HCV 15th%, Median, and 85th% travel times along SH2 for March 2015 was obtained and compared against 2015 from TomTom data.

The Featherston to Te Marua section appears consistent between the data sets, with slightly faster travel times for TomTom to reflect the faster moving general traffic through topography that features grade and curves. The Featherston to Masterton section has less variation between the data sets, which reflects that HCVs should be less constrained by the topography in this section. The 85th% travel times for TomTom are higher than the ERUC, which could indicate that HCV drivers have less low speed distribution for open road sections.

The issue of HCVs crossing the centre line on the Featherston to Te Marua section also has impacts on travel times when oncoming vehicles are forced to slow down, stop or manoeuvre out of the situation.

Commuting

Approximately one quarter of the 20,000 trips to work by Wairarapa residents are to destinations outside Wairarapa in the wider Wellington region. For census respondents who stated that their usual residence is Wairarapa, 54% of trips (1014) are to Wellington (CBD), 10% (186) are to Wellington (non CBD), 18% (339) are to Lower Hutt and 12% (216) are to Upper Hutt. The modes used for these trips show that 60% of the 1000 trips to Wellington CBD are by train and 23% are undertaken in cars (either as a driver or passenger).

Tourism

The international visitor survey indicates Wairarapa accounts for approximately 0.47% of international visitor numbers and 0.75% of international visitor spend. Wairarapa international

tourism spends increased 15% from 2011 to 2015, and accounts for approximately 7% of the Wellington region²⁴. There is a strong desire to grow tourism in the region.

Social Access and Perception of Safety

The 2015 customer perspective research found that some lower confidence drivers viewed the hill as a dangerous road. Some of the specific points which contributed to this perception were a lack of opportunity to stop during the most stressful part of the route, and a lack of opportunities to overtake slow vehicles/allow faster vehicles to overtake, contributing to conflict between road users. This perception is expected to result in some of the trips not being taken, including trips for health, education, visits to family and friends, and leisure. This suggests that social access is being suppressed by transport availability.

Impacts on freight

Heavy Commercial Vehicle (HCV) use of SH2 at 6% is considered low, and this is currently not a major HCV route. Further to this, the significant harvesting of timber in the Wairarapa is expected to be transported to the port via rail²⁵. If the transfer to rail is not realised, an additional 125 two way truck movements per day peaking in 2023 could be expected²⁶.

3.3.2 Implications of the Evidence

Travel Time and Travel Time Reliability

Journey time reliability issues on State Highway 2 between Te Marua and Masterton are primarily a function of unplanned road closures/delays, combined with insufficient prior warning and a lack of viable alternative transport choices or routes. Downstream travel time reliability issues between Aotea Quay and Te Marua are likely to be reducing the attractiveness of road travel for this corridor.

Physical constraints (topography and road geometry) affect the ease of freight access and journey times. The reliable, timely, and safe movement of freight to and through the region is critical to support the region's economic growth and productivity.

Tourism

While the international visitor survey would suggest that the value of tourism in the Wairarapa is relatively high per visitor, it does not account for a significant portion of regional tourism activity.

Commuting

The Census 2013 data confirms the perceptions expressed by stakeholders in workshops; that for journeys outside the Wairarapa for employment the rail line is significantly used, followed by private vehicle use.

Social Access and Perception of Safety

Due to the improvements on Rimutaka Hill in recent years the level of safety has improved and is reflected in the number of DSIs. It is important that this is continually monitored but also that the improved safety of State Highway 2, especially over the Rimutaka Hill is promoted and perception improved to reflect the nature of the journey as it currently is. The journey, especially at periods of

²⁴ Statistics New Zealand International Visitor Survey, <http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7573#>, accessed 14.3.16

²⁵ Wellington Regional Land Transport Strategy 2010-40, Wellington Regional Land Transport Plan 2015

²⁶ Data gathered by Greater Wellington as part of the Central North Island Freight Story

bad weather is challenging and can be less safe but when conditions are good the journey is safer than prior to the works undertaken.

3.4 Problem Three: Resilience

Transport connections that are vulnerable to unplanned natural events

National State Highway Resilience Assessment

The National State Highway Resilience Assessment²⁷ identified the section of SH2 between Featherston and Te Marua (Rimutaka Hill) as being at extreme resilience risk from storms and earthquakes (as set out in the maps included in Appendix C). The resulting hazards were identified as landslides, underslips, failure of retaining walls, debris flows and fault rupture, with the anticipated outcome being complete closure of the road for a period greater than 3 months.

Unplanned Natural Events

The Wellington Region Civil Defence Emergency Management (CDEM) Group has undertaken a risk analysis for the Wellington region, for the main hazards (natural and man-made) that require management by the Group²⁸. Risk was assessed on the combination of a hazard occurring and the degree of impact on the community and the results are set out in.

²⁷ NZ Transport Agency/ Opus, National State Highway Resilience: 9 Priority Programme Business Case Corridors, June 2016

²⁸ Wellington Region Civil Defence Emergency Management Group, Wellington Region Civil Defence Emergency Management Group Plan 2013-2018, 1 July 2013

Table 13 Wellington Region Hazards Risk Analysis

Hazard	Likelihood	Consequence	Risk Rating
Earthquake - Wellington Fault event	Unlikely	Catastrophic	Very High
Flood - Hutt River flood	Unlikely	Major	High
Tsunami - Local source	Unlikely	Major	High
Storm	Likely	Moderate	High
Human Pandemic	Possible	Major	High
Terrorism	Unlikely	Major	High
Drought	Possible	Moderate	Moderate
Tsunami - Distant source	Possible	Moderate	Moderate
Landslide	Unlikely	Moderate	Moderate
Lifeline Utility failure	Possible	Moderate	Moderate
Hazardous substances spill	Possible	Moderate	Moderate
Transport accident	Possible	Moderate	Moderate
Fire	Possible	Moderate	Moderate
Animal Pandemic	Possible	Moderate	Moderate
Volcanic eruption	Rare	Minor	Very Low

The results are based on the risk to the region as a whole and the report²⁹ notes that there are likely to be some variations for each territorial authority. The natural hazards considered to have a possible impact on State Highway 2 are earthquakes, Hutt River flooding, storms, landslides and fires.

A Wellington Fault earthquake has been assessed as the only hazard with a 'very high' risk rating and whilst the likelihood of an earthquake event occurring is considered low, the consequence is considered catastrophic (this type of event is also referred to as High Impact Low Probability).

The research project *It's Our Fault*, led by GNS Science, assessed the risk of a large (magnitude ~7.5) Wellington Fault earthquake³⁰ as having a 10% probability within the next 100 years³¹.

Another High Impact Low Probability event that could potentially impact on State Highway 2 is a flood of the Hutt River which has a 'high' risk rating, with a low likelihood but with major consequences. However, it is noted that most impacts would happen on the Ngauranga to Te Marua section of State Highway 2.

State Highway 2 through Wairarapa is also vulnerable to a seismic event/ flooding, but the topography of the area means that an alternative route/ recovery is likely to be achievable in a much shorter timeframe than the Rimutaka Hill section.

²⁹ Wellington Region Civil Defence Emergency Management Group, Wellington Region Civil Defence Emergency Management Group Plan 2013-2018, 1 July 2013

³⁰ There are at least four other active shallow faults that could lead to earthquakes in the Wellington region

³¹ <http://www.gns.cri.nz/Home/IOF/It-s-Our-Fault/Likelihood-Phase>

Unplanned Natural Events - Impacts

State Highway 2 and the adjoining Wairarapa Railway Line is one of only two transport networks that provide access into and out of the Wellington Central and Hutt Valley areas and both of these connections are expected to experience damage in the event of a significant earthquake.

State Highway 2 between Te Marua and Featherston is forecast to be closed by large landslides (at both Te Marua and on Rimutaka Hill), under slips and failure of retaining walls and fill following a significant earthquake and is estimated to take over three months to reopen³². The Rimutaka Rail Tunnel itself may be relatively unaffected by an earthquake, however the access to the portals of the tunnel are expected to be heavily affected by large landslips³³. The lack of transport access will heavily affect key lifelines including the water, power and telecommunications sectors.

Resilience risk of State Highways (SHAMP)

The Transport Agency's State Highway Asset Management Plan (SHAMP) has examined the resiliency risk of all state highways, using measures of likelihood of a disruptive event and the degree of impact on the network (thus numbers of network users and economic productivity affected). State Highway 2 between Te Marua and Masterton has been awarded a 'low' risk rating for resilience. Accordingly, in prioritising corridors to address in relation to resilience, between Te Marua and Masterton has been ranked priority four (with priority one as the highest and five as the lowest)³⁴. Wellington's other major transport network (State Highway 1) is awarded a 'high' risk rating.

Delays and Closures

The Transport Agency's Traffic Road Event Information System (TREIS) database contains details of events/ incidents that have affected traffic conditions across the state highway network. There is a level of uncertainty to the data, as it has not had a consistent input process since recording began in 2008. However, it does indicate some high level issues and trends.

State Highway 2 between Te Marua and Featherston had 26 unplanned closures in the last five years, averaging 142 hours closed per year. 19 of these closures were due to unplanned natural events (snow/ice, wind, slip) and led to State Highway 2 being closed for an average of 36 hours for each event. This section also had 18 unplanned delay events, averaging seven hours per year.

The largest source of delay/closure on the route is due to snow. This is consistent with user expectations of the road, where likely closure due to snow or ice is publicly broadcast through multiple media channels. This operational response has potentially improved due to the opening of the Wellington Traffic Operations Centre, providing coordination between maintenance contractors, media, and the general public.

Lack of viable alternative routes

State Highway 2 between Te Marua and Masterton is the only direct road access between the Wairarapa and Wellington metropolitan area. Travel times for this journey are relatively reliable and take approximately 25 minutes. The alternative road route via State Highway 2, State Highway 57 and State Highway 1 can increase journey times by more than three hours.

³² Ibid

³³ Wellington Lifelines Group/ Wellington Region Emergency Management Office, 'Lifeline Utilities Restoration Times for Metropolitan Wellington Following a Wellington Fault Earthquake' - Report to the Wellington CDEM Group Joint Committee from the Wellington Lifelines Group, November 2012

³⁴ Ibid

The Wairarapa Railway Line is also not considered a 'viable' alternative route, as current passenger service frequencies are five return services each weekday³⁵ and two return services on each weekend day and public holidays³⁶. 71% of services were on time within five minutes for March 2015 to February 2016. Despite these factors, patronage on the Wairarapa rail line increased 7% for 2013/14 to 2014/15, the largest relative increase within the Wellington region³⁷.

The NZ Transport Agency's 'One Network Road Classification' (ONRC)³⁸ categorises roads based on their function in the national network and defines the fit for purpose Customer Levels of Service (CLoS) outcomes³⁹. As a 'Regional' road, State Highway 2 between Te Marua and Masterton is expected to meet the following level of service with regards to 'Resilience':

Route is always available except during major-extreme weather or emergency events and viable alternatives nearly always exist. Rapid clearance of incidents affecting road users. Road users may be advised in advance of issues and incidents.

The section of State Highway 2 between Te Marua and Featherston is not considered to meet this level of service as a viable alternative route doesn't exist.

3.4.1 Implications of the Evidence

There is no viable alternative road route to State Highway 2 between Te Marua and Masterton. Should this road be affected by a significant unplanned natural event, such as a magnitude ~7.5 Wellington Fault earthquake, the road has been estimated to take over three months to reopen, with experience from the Manawatu Gorge suggesting a longer period of time than this due to the terrain.

³⁵ With the exception of Friday where there is an additional evening return service

³⁶ <https://www.metlink.org.nz/timetables/train/WRL>, accessed 05.02.16

³⁷ <https://www.metlink.org.nz/customer-services/public-transport-facts-and-figures/patronage/>, accessed 14.3.16

³⁸ NZ Transport Agency, [Applying the One Network Road Classification - Guidelines](#), December 2013

³⁹ As summarised in the CLoS Fit for Purpose Outcomes Table in Appendix 3 in the ONRC Guidelines

4. Investment Objectives

The investment objectives for this programme business case were developed with investment partners and key stakeholders at Workshop 1. At this workshop it was agreed that there was a need for investment objectives relating to safety, resilience and reliability/ efficiency. Workshop participants debated the need for an investment objective related to the economy and it was agreed that economic benefits would be the result of creating an efficient, resilient and safe transport network and a separate investment objective was not needed.

The investment objectives were further refined with investment partners and key stakeholders at Workshops 2 and 3. KPIs were developed to support the Investment Objectives and are listed below and are used to assess the various Programme Options and what they can potentially provide. The Investment Objectives and KPIs are how the Recommended Programme will be assessed in its effectiveness over time.

4.1.1 Investment objective #1: Improve Safety Outcomes

Baseline	9 km of the 23 km (39%) section between Te Marua and Featherston is rated as a <3-Star road and 3.5 km of the 23 km (15%) non-urban sections between Featherston and Masterton is rated as <3-Star
KPI 1.1	Improved road safety risk assessment rating (KiwiRAP)
Baseline	Between 2011 and 2015 there have been 23 deaths and serious injuries on SH2 between Te Marua and the Waingawa River Bridge Masterton
KPI 1.2	Reduction in deaths and serious injuries

4.1.2 Investment objective #2: Reliability and Efficiency

Baseline	Median travel times between Te Marua and Featherston are 22.8 minutes northbound and 23.2 minutes southbound Median travel times between Featherston and Masterton are 24.2 minutes northbound and 24.3 minutes southbound
KPI 3.1	Maintain or improve the median travel time
Baseline	The variation between the median and 85 th percentile travel times between Te Marua and Featherston are 3 minutes 47 seconds northbound and 4 minutes 12 seconds southbound The variation between the median and 85 th percentile travel times between Featherston and Masterton are 3 minutes 39 seconds northbound and 3 minutes 35 seconds southbound
KPI 3.2	Maintain or improve difference between the 50th and 85th percentile travel time

4.1.3 Investment objective #3: Ability of the corridor to withstand and recover as quickly as practical from events

Baseline	32 closure events and 19 events resulting in delays for 2011 – 2015
KPI 2.1	Reduce the annual number of unplanned closure and delay events (It should be noted that this KPI is estimated based on the previous five

	years and similar weather conditions, winters with very poor weather should be taken into account when assessing against this KPI)
Baseline	Average of 46 hrs of road closure per year with 14 unplanned delay events averaging five hours per year
KPI 2.2	Reduce the average duration of unplanned closure and delay events

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Part B – Developing the Programme

5. Alternatives and Options

A range of potential alternatives and options to address the three key problem areas of safety, reliability/ efficiency and resilience, were identified by investment partners and key stakeholders (including Project Leads for the State Highway 2 Ngauranga to Te Marua and Wellington Port Access programme business cases, to ensure consistency across alternatives and options being developed) at Workshop 2 and a preliminary assessment was undertaken at this workshop. A detailed assessment of the individual alternative areas and their respective options was then undertaken and is provided in the Alternatives and Options Report and summarised below.

Major Road Corridor Improvements (Te Marua – Featherston)

Major road corridor improvements can provide a step change in safety, reliability, or resilience between Te Marua and Featherston and all of the options proposed are considered to be able to deliver minor to moderate benefits in at least one of the investment objective areas.

These projects range from projects involving some minor geotechnical investigation or earthworks up to significant realignment work, tunnels and viaducts, including cut and fills on the scale of the recent Muldoon's corner easing (costing approximately \$10 million per kilometre) or possibly greater.

New Corridor (Te Marua – Featherston)

Construction of new road corridors such as tunnels or major viaducts or duplication of existing roads between the Hutt Valley and Wairarapa is likely to deliver major benefits and have positive impacts, in some cases across all three investment objectives. However, these options have high risks around attainability (affordability) and their likely environmental impact, geotechnical, and Iwi consideration.

Minor Road Corridor Improvements (Te Marua – Masterton)

Minor improvements to the existing State Highway 2 road corridor could be part of a holistic programme option; however these options are dependent on determinations made on the major road corridor improvements or new road corridor alternatives.

Minor improvements would focus on addressing high-need safety areas, noting that reliability and resilience issues are difficult to address without major works. These could include skid resistant surfacing, central median barriers, and centreline and edge rumble strips.

Twenty three options (predominantly infrastructure-related) were proposed for the Featherston to Masterton section of State Highway 2 and most of the options were considered to have minor to moderate safety benefits. Options considered to have moderate safety benefits include town bypasses (all traffic), central wire rope median barrier, urban speed management, trenching utilities and cycle facilities through towns. It is noted that most of these options also have relatively high costs.

Rail (Public Transport and Freight)

Improving the rail corridor to create a viable alternative route to State Highway 2 can make a significant contribution to resilience customer levels of service. It also has the ability to contribute towards safety and reliability outcomes on State Highway 2, through modal shift.

This alternative has significant cost and consenting implications if major improvements such as an additional rail line or second rail tunnel are sought, due to a need to address wider rail network constraints.

Larger scale investment would require improvements to other sections of the rail network. This scale of intervention may be suitable as a longer term programme to connect the Wairarapa and the rest of the Wellington region, at such time when investment is not as focused on the State Highway connection.

Public Transport (Road)

This alternative focuses on public transport improvements by road. Implementing park and ride facilities to encourage modal shift, and a shuttle service, would aim to improve accessibility to services in the Wellington region.

Operations and Maintenance

The NZ Transport Agency and stakeholders (i.e. emergency services) currently work collaboratively to operate and maintain the network. The options identified are generally divided into two areas. These are daily operation and during an event.

A number of the options can deliver moderate resilience benefits e.g. response plans such as tow trucks/ diggers in strategic locations, snow/ ice suppressing equipment and increased public transport (PT) services during weather events. The snow/ ice suppressing equipment option is also considered to deliver safety and reliability benefits.

ITS

Two broad types of Intelligent Transport Systems (ITS) have been proposed, those that give general messages about conditions on the corridor (e.g. via VMS) and those that are location specific (e.g. at high risk sites and triggered when certain conditions, such as high speeds of conflicting HCVs, are met). It is considered ITS can provide some minor benefits for the Te Marua - Masterton transport corridor, particularly for weather events, crashes and at high risk locations.

Walking and Cycling

Walking is an important element to support active travel in townships along the Featherston to Masterton section of the corridor and to address safety issues for vulnerable road users. Infrastructure improvements for walking such as town bypasses, traffic calming, and speed management can have positive benefits for cycling as the two alternative areas are interconnected.

Cycling is also an important element to support active travel in townships along the Featherston to Masterton section of the corridor (as it is for walking) and infrastructure improvements such as town bypasses and traffic calming are also included as options.

Policy

The options identified in the Policy alternative area are wide ranging and include interventions such as land use planning changes, banning cyclists/ HCVs, renaming the hill to reflect its 'real environment' and incentivising rail use. Policy options will largely be considered together with the infrastructure options to which they relate.

Freight Management

Freight management options include 'softer' measures such as information, signage, and education as well as more infrastructure-based options such as town bypasses. These road-based measures to manage freight movements are expected to realise minor to moderate benefits across all of the investment objectives.

Travel Planning and Behaviour Change

Travel planning and behaviour change options include those that reduce demand on the transport corridor at peak times (particularly from single occupant car journeys). Options include information and promotion of travel choices, including not travelling by working from home or working from satellite offices, as well as travelling off-peak. Travel planning initiatives can be targeted towards either end of the journey, e.g. at workplaces, education sites or residential areas.

Education

Education options include programmes targeting industry groups, drivers and motorcyclists with locally focussed information, as well as road side signage for tourists. Education initiatives can be relatively low cost (especially when compared to infrastructure options) and yet they can achieve important safety benefits. All ten options proposed were considered to deliver minor to moderate safety benefits. It is important to note that nine out of ten of the proposed options were not considered to deliver any reliability or resilience benefits.

It is noted that there is likely to be a need to ensure any programmes are aligned/ undertaken in conjunction with wider (local and national) education programmes.

Enforcement

The options proposed focus on managing speeds (linked to the use of appropriate speed limits), providing appropriate and targeted levels of Police presence and enforcing HCV weight limits (which could include time of day restrictions in urban areas or peak hour exclusions on the Rimutaka Hill).

Non-Transport Options

A range of non-transport options were identified that capture lateral thinking solutions. This includes amenity/ journey experience on Rimutaka Hill Road, reflecting character, toilets, refreshment stops, tourism signage and expanded radio/ phone coverage. Other options reflected the need to accommodate end to end journeys on the corridor, including the effect of downstream road improvements, a social access hospital appointment management system, and understanding that the day to day road capacity is not expected to become a critical issue unless something significant occurs.

6. Programme Options Development and Assessment

6.1 Programme Options Development and Refinement

Using the alternatives and options developed in Workshop 2, a long-list of 13 programme options compiling sets of alternatives in differing areas of focus were developed. These ranged from 'Business as Usual' through to low cost safety focus, freight focus and major capital investment focus, as follows:

1. Business as Usual
2. Do Minimum
3. Non Infrastructure/ Behaviour Oriented Response
4. Low Cost Safety
5. Safety Transformation
6. Connecting Communities
7. Do Maximum
- 7a. Do Maximum (Rail Focus)
- 7b. Do Maximum (Road Focus)
8. Separate tourist and freight road routes
9. Lead Infrastructure - Enabling Primary and Tourism
10. Abandon Rail Access
11. Slowly Enhance Status Quo

At Workshop 3, investment partners and key stakeholders reviewed the long-list of 13 programme options, made amendments, commented, and advised which could be combined and which new ones were required. As a result, three new programme options were identified:

12. Do Median/ Hybrid
13. Combination Programme
14. Major PT/ Minor Improvements

The long-list of 16 programme options were further developed and refined in line with feedback from investment partners and stakeholders. A three stage assessment process for each option was undertaken, as follows:

Assessment Criteria 1: Assessment against project Investment Objectives using a seven point scale that considers the relative size and scale of impacts

Assessment Criteria 2: Assessment against secondary factors such as:

- Strategic Fit
- Effectiveness
- Benefit and Cost Appraisal
- Significant Risks

Assessment Criteria 3: Assessment against factors such as:

- Dependencies - Other options or requirements to allow this option
- Interdependencies - Other options which make this option more effective
- Indicative Cost
- Indicative Timeframes – Short, Medium and Long Term
- Feasibility - From a technical standpoint, how straightforward will it be to implement?
- Affordability - What are the funding risks? Could the option be funded under traditional methods?
- Economy - How will the option affect traffic volumes, journey times, or the reliability of travel times?
- Environmental - Are there potential adverse impacts on the natural environment?
- Social - How does the option affect accessibility for transport users and for others, including access to jobs, services and other facilities?

6.2 Programme Options Assessment

At Workshop 4, investment partners and key stakeholders reviewed the long list of 9 programme options (with options 7 and 9 having sub-set options 7A, 9A and 9B) and identified their most preferred programme options and options they did not support at all. Each option was then discussed in turn, noting the level of support and together investment partners and key stakeholders identified the programme options to be short-listed, together with those that they thought were pragmatic responses to the problems that could be implemented. A summary of the shortlisting assessment is provided in Figure 7 with additional detail contained in the Programme Options Assessment Report (see Appendix C).

Figure 7 Long-List to Short List of Programme Options

No.	Description	Short Listing	Short List Assessment
1	Business as Usual	Carried forward as Comparator	Business as Usual. Carried forward as a comparator. Is included in all Programme Options (See Section 6.3).
2	Low Cost Education/ Behaviour Change	X Not progressed	Not a preferred programme option – deemed to be an under-investment as won't achieve investment objectives or address problem areas. Behaviour change measures should be part of Recommended Option.
3	Low Cost Safety	X Not progressed	Not a preferred programme option – deemed to be an under-investment as won't achieve investment objectives or address problem areas. Low cost safety measures are included in other Programme Options, e.g. 5 and 7.
4	Abandon Rail Access	X Not progressed	Discounted with 12 of 16 indicating that they do not support this option - would have major implications for freight and passenger vehicle movements in the Wairarapa and the Hutt Valley.
5	Low Cost Safety, Resilience and Reliability	Carried forward	Agreed to short list this option for further assessment and consideration. Noted that it represents a Do Minimum option that would address known issues along the corridor but may not address longer term issues such as road form and function consistency in a comprehensive way or ONRC aspirations.
6	Safe System	X	Not a preferred programme option – deemed to be an under-investment as won't achieve investment objectives

	Transformation	Not progressed	or address problem areas of reliability and resilience. Safe systems elements should be part of Recommended Option.
7	Do Median Combination Programme	<p style="text-align: center;">▶</p> Carried forward	Agreed to short list this option for further assessment and consideration. Multi-modal approach that includes an accelerated programme that will provide a more consistent road environment.
7A	Do Median with Public Transport	<p style="text-align: center;">X</p> Not progressed	Not a preferred programme option – as significant public transport improvements are more than 10 years away. Rail improvement elements that increase frequency and patronage should be part of Recommended Option.
8	Lead Infrastructure Enabling Primary Industries and Tourism	<p style="text-align: center;">?</p> Further consideration required	Option discussed prior to agreement of the short list. Agreed that it contained some good investments but as a whole was not deemed appropriate for short listing, particularly due to feasibility of rail elements which are dependent on investments and timeframes associated with the Hutt sections. However, elements such as realignments on Rimutaka Hill are to be included in the Recommended Option.
9	Multi Modal Do Maximum	<p style="text-align: center;">X</p> Not progressed	Not a preferred programme option - deemed to be over-investment in comparison to the level of problems experienced on this corridor.
9A	Rail Focused Major Investment	<p style="text-align: center;">X</p> Not progressed	Not a preferred programme option - rail improvements were agreed to be a significant over-investment based on forecast demand.
9B	Road Focused Major Investment	<p style="text-align: center;">X</p> Not progressed	Not a preferred programme option - road improvements (i.e. tunnel) were agreed to be a significant over-investment based on forecast demand.




6.3 Short List Programme Options Summary

Programme Option 1 is included in the short list assessments as the comparator (including baselines for KPIs). It was agreed by investment partners and key stakeholders that the current alignment, operation, form and function of SH2 needs improvements far greater than those proposed as part of the Business as Usual option; particularly in order to achieve ONRC aspirations.

The Business as Usual option was not supported by investment partners and key stakeholders as it does not achieve against the investment objectives and will not address the three key problem areas. It was noted that this option is focused on making minor short-term improvements and does not represent a long-term strategic approach. The short listed programme options are summarised in Table 14.

RELEASED UNDER THE OFFICIAL INFORMATION ACT

Table 14 Short List of Programme Options

Short List	Alignment Scheme
<p>1 Business as Usual (Do Minimum)- The Comparator <i>Follow/continue existing approach (Regional Land Transport Programme level of funding), with a small funding increase in existing corridor improvements.</i> <i>Note: The business as usual programme option is always carried forward as a 'comparator' for the assessment.</i></p>	
<p>5 Low Cost Safety, Resilience and Reliability <i>This programme looks at low cost improvements to safety, resilience and reliability. It includes Behavior Change and Low Cost Safety as well as resilience and reliability works.</i></p>	
<p>7 Do Median Combination Programme <i>This programme option falls between Do Minimum (Business as Usual) and Do Maximum with medium investment across multiple areas. Improvements to Rimutaka Hill Road timed with increases in demand, to maintain consistent operating speed on self-explaining road. Acceleration of low cost improvements to safety, resilience and reliability. It includes Behavior Change and Low Cost Safety as well as resilience and reliability works.</i></p>	

6.4 Short List Programme Options Assessment

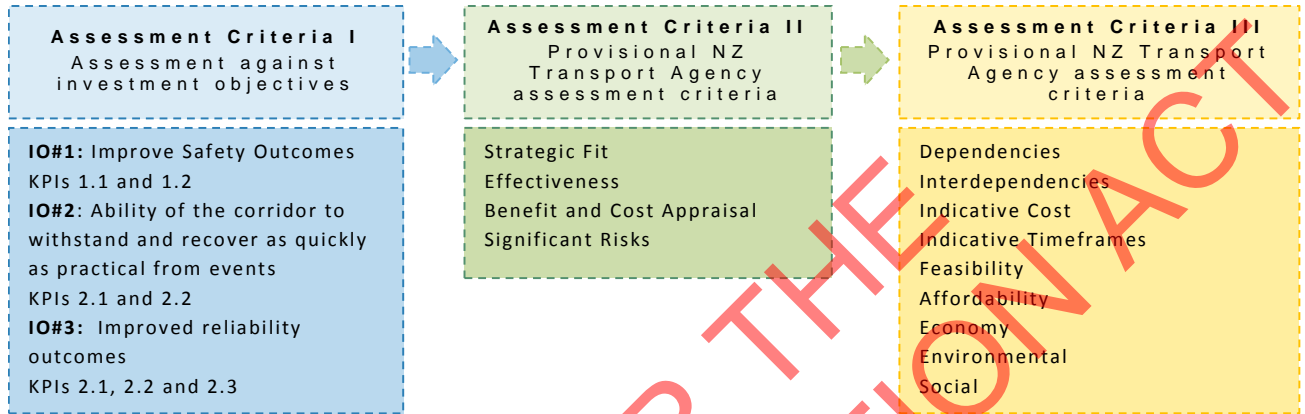
This section outlines the process utilised to assess programme short list and provides an assessment against of how each of the short listed programme options performs against the following criteria:

- **Assessment Criteria 1:** Assessment against project Investment Objectives;

- **Assessment Criteria 2:** Assessment against Strategic Fit, Effectiveness, Benefit and Cost Appraisal, Significant Risks; and
- **Assessment Criteria 3:** Assessment against Dependencies, Interdependencies, Indicative Cost, Indicative Timeframes, Feasibility, Affordability, Economy, Environmental, Social.

The tiered nature of these assessment criteria are shown in Figure 8.

Figure 8 Assessment Criteria Tiers





The assessment against the assessment criteria including the investment objectives (assessment criteria 1) is summarised in Table 15.

Detailed assessments of the Long List and Short List programme options are contained in the Programme Option Assessment Report.

RELEASED UNDER THE OFFICIAL INFORMATION ACT

Table 15 Short List Programme Options Assessment Summary

Programme Option	Investment Criteria 1						Investment Criteria 2				Investment Criteria 3					Summary	
	IO#1: Improve Safety Outcomes		IO#2 Improved travel time reliability outcomes		IO#3 Ability of the corridor to withstand and recover as quickly as		Strategic Fit	Effectiveness	Risk	BCA	Inter/dependencies	Indicative cost and timeframe	Feasibility	Affordability	Triple Bottom Line Assessment		
	Improved road safety risk assessment rating (KiwiRAP)	Reduction in deaths and serious injuries	Maintain or improve median travel time for Masterton - Te Marua	Maintain or improve difference in 50th and 85th travel time for Masterton - Te Marua	Reduced closures in a year	Reduced average closure periods											
	KPI 1.1	KPI 1.2	KPI 3.1	KPI 3.2	KPI 2.1	KPI 2.2											
<p>Programme 1 - Business as Usual</p> 	Score	0	0	-1	-1	0	-1	High	Low	-	2.0 - 2.5	++	\$10 - \$16M	+++	+++	Low	The continuation of operation and maintenance of this transport corridor will result in deterioration in travel time reliability and resilience over time. There will be a marginal safety improvement as a result of general safety (DSI) improvements experienced on the network. Travel time reliability for rail will continue to be at low levels and potentially decrease over coming years.
<p>Programme 5 - Low Cost Safety, Resilience and Reliability</p> 	Score	1	1	-1	0	1	2	High	Medium	+	1.5 - 2.5	++	\$70 - \$90M	+++	++	Medium	This programme will result in improvements to safety, resilience and reliability for road based transport across the corridor but will not provide a sufficient level of improvement. This programme may not address these areas in the medium to longer term with the level of increased transport demand and activity. This programme will not address improvements required for public transport travel time reliability improvements required between Masterton and Wellington.
<p>Programme 7 - Do Median Combination</p> 	Score	2	2	1	1	2	2	High	Medium	++	1.6 - 2.5	-	\$115 - \$155M	++	++	Medium	This programme will provide improvements in safety across the corridor with specific improvement to be made between Carterton and Masterton and on Rimutaka Hill. The programme will improve accessibility between Carterton and Masterton whilst aiming to maintain travel time reliability through this section. Improvements to Rimutaka Hill are also included to address travel time reliability and resilience constraints and impacts.

7. Recommended Programme – Description and Assessment

7.1 The Recommended Programme

The Recommended Programme is Programme Option 7. This programme will provide improvements in safety across the corridor with specific improvement to be made between Carterton and Masterton and on Rimutaka Hill.

The programme will improve accessibility between Carterton and Masterton whilst aiming to maintain travel time reliability through this section. Improvements to Rimutaka Hill are also included to address travel time reliability and resilience constraints and impacts. The recommended programme meets the investment outcomes sought for the corridor, proving a safer journey and a more reliable, efficient and resilient connection for those travelling between Wairarapa and Wellington. This programme has a higher level of investment and benefits compared with the Business as Usual (Do Minimum) and Low Cost Improvement programmes, with medium investment targeted in a number of areas along the corridor:

1. Masterton - Carterton improvements
2. Rimutaka Hill improvements
3. Town Centre Travel Choice and Safety improvements
4. Rural Carterton - Featherston improvements
5. Traveller information improvements
6. Public transport improvements.

It is recommended that improvements to Rimutaka Hill Road are timed with increases in demand, to maintain consistent operating speed and a self-explaining road. As part of this programme there would be an acceleration of low cost improvements to safety, resilience and reliability. This would include behavior change and minor safety improvements as well as resilience and reliability works.

There would be a focus on reducing demand on the transport corridor at peak times (particularly from single occupant car journeys) by educating road users and influencing behaviour change, without significant infrastructure investment (some minor investment in walking and cycling networks and public transport service improvements). Additionally, this would be combined with low cost improvements to safety to consistently upgrade the highway.

In the long term (and in conjunction with the State Highway 2 Ngauranga to Te Marua programme business case) there would be a focus on rail scenarios identified as 'Rail Scenario A' if patronage growth plateaus following Rail Scenario 1 or Rail Scenario 2, through improvements to decrease travel time; and 'Rail Scenario B' which expands network reaches.

Masterton to Carterton Improvements

- Masterton – Carterton Indicative Business Case
 - Improve safe and efficient access to and within the Waingawa Industrial Zone Access, also including improvements within Masterton such as the intersection of SH2 and Ngaumutawa Road and the heavy traffic bypass to the north of Masterton
 - Safety improvements along SH2 such as roadside hazard protection or removal, median treatments up to and including barriers, and intersection upgrades or rationalisation

Rimutaka Hill Improvements

- Speed limit reduction to reflect road environment as per Speed Management Guide as well as speed limit enforcement for all road users
- Geotechnical investigation and preventative slip or mitigation works to improve resilience
- Resurfacing frequency increased from 8 years to 6 years
- Realignment of horizontal curves to achieve a consistent speed environment staged over a ten year period
- Corridor safety improvements between Rimutaka Hill and Te Marua including protecting sever hazards (KiwiRAP assessment), wide centrelines were appropriate, and intersection safety improvements

Town Centre Travel Choice and Safety Improvements

- The travel choice and safety improvements to the town centres of Carterton, Greytown and Featherston include walking and cycling facilities and crossing places, traffic calming, and urban/ rural speed limit change reinforcement.

Rural Carterton to Featherston Improvements

- Carterton to Greytown and Greytown to Featherston Safety Improvements including roadside hazard protection or removal, wide centreline median treatments and intersection upgrades
- Carterton to Greytown and Greytown to Featherston median treatment upgrade when traffic volumes reach 10-12,000 vehicles per day

Traveller Information Improvements

- Behaviour change initiatives - information and awareness raising focused on replacing SH2 car journeys via walking, cycling, buses, trains, carpooling, working from home/ satellite office and travelling off-peak
- Targeted education programmes
- Variable messaging signs informing user regarding events and delays
- Event Management to mitigate delays from extreme flow events

Public Transport Improvements

- Real Time Passenger Information System / Integrated Fares and Ticketing System
- Revised bus routes/ frequencies
- Continue hazard protection between Te Marua and Featherston
- Improved passenger amenity (Wi-Fi, new carriages)
- Investigate measures to reduce demand, e.g. congestion charging/ tolls, parking policies, high occupancy vehicle lanes
- Rail Scenario A and or B based on demand (and in conjunction with the State Highway 2 Ngauranga to Te Marua programme business case):
 - **Rail Scenario A** – If patronage growth plateaus following Rail Scenario 1 or Rail Scenario 2, improvements decrease travel time (16 min for Wairarapa line) through faster passenger and freight services
 - **Rail Scenario B** - Expands network reach in response to demand through:

- Refurbishment of Wairarapa SW Cars
- New locomotives (Wairarapa Services)
- Increased Wairarapa services
- Potential electrification to Masterton
- Integrated PT services
- Phased modal connections
- Shuttle services
- Network extensions/new stations

7.2 Recommended Programme Assessment

When evaluating programmes and projects, the Government Policy Statement requires both local government and the Transport Agency to consider a number of matters, including achieving better value for money. The Assessment Framework involves rating programmes, projects and other activities across three factors, being the:

- Strategic fit of the problem, issue or opportunity that is being addressed
- Effectiveness of the proposed solution
- Economic efficiency of the proposed solution

The project was assessed using the Transport Agency Investment Assessment Framework (IAF) resulting in an indicative assessment profile of **H/H/L**.

7.2.1 Strategic Fit

In accordance with advice from the NZ Transport Agency *Planning and Investment Knowledge Base*, a road improvement activity must only be given a high or medium strategic fit rating if it successfully addresses a problem, issue or opportunity involving the factors set out in Table 16. The column on the right of Table 16 shows that this stretch of SH2 from Te Marua to Masterton does not have the capacity and demand constraints that would warrant a medium or high strategic fit rating. However, as it does have areas of significant crash risk (high and medium crash risk), and significant gaps in customer level of service for public transport travel time reliability and for resilience, it should be considered for a high strategic fit rating.

Table 16 Criteria for achieving medium or high Strategic Fit score

Strategic Fit Criteria for achieving score of High:	Present in SH2 Te Marua to Masterton
Journeys for: employment, access to economic opportunities, tourism, or freight;	Yes
Has a significant gap in the customer levels of service for: <ul style="list-style-type: none"> • journey time reliability • resilience 	Yes Yes
Mismatched capacity and demand that results in severe congestion, and/or	No
Mismatched capacity and demand that results in capacity constraints	No

Or,

Medium	High
A medium crash risk	A high crash risk
	Yes – Some areas of high crash risk

The default strategic fit is low until evidence is provided otherwise.

Table 17 summarises the evidence to support a **high** strategic fit rating.

Table 17 Strategic Fit assessment against high rating requirements

Criteria	Assessment
<p>A road improvement activity must only be given a high strategic fit rating if the problem, issue or opportunity involves journeys for:</p> <ul style="list-style-type: none"> • employment • access to economic opportunities, including activities identified in regional economic growth strategies and in support of special housing area orders • tourism • freight 	<p>The SH2 (and rail, bus, walking and cycling) corridor between Te Marua and Masterton is a regional road that enables employment purpose trips within the Wairarapa and between the Wairarapa and Wellington metropolitan area. There are 4,713 people who live in the Wairarapa and work in the Wellington region (Census 2013).</p> <p>The Wairarapa Water Use Project which is in the planning stages has the potential to develop more than 30,000 hectares of productive irrigated land and more than double its productive output for the region when completed.</p> <p>While this SH2 corridor is not one of the five primary tourist routes in New Zealand, it does enable tourism movements, particularly intra-regional tourism for events such as (list events, Wairarapa wine festival, Toast Martinborough, Round the Vines and Golden Shears, New Zealand premier shearing competition).</p> <p>This corridor is the primary road and rail connection between the Wairarapa and Wellington metropolitan area, supporting the regional economy. It enables the movement of export freight from the Wairarapa to CentrePort, and other intra-regional movements including horticulture goods, access to employment, other primary production, and general freight movement. These volumes are an average 10,900 between Carterton and Masterton and 5,700 on Rimutaka Hill with approximately 6% being HCV. In addition there are 4 freight trips per day and five train services between Masterton and Wellington</p>

<p>There is a significant gap in the customer levels of service for:</p> <ul style="list-style-type: none"> • journey time reliability • resilience (including lifelines) • mismatched capacity and demand that results in severe congestion • mismatched capacity and demand that results in capacity constraints 	<p>The transport corridor between Te Marua and Masterton is not considered to have the capacity and demand constraints that would warrant a medium or high strategic fit rating.</p> <p>The travel reliability for the Wairarapa rail line is 73.8% of trips within 5 minutes of scheduled timetable for 2014/2015. Additionally, if increases in corridor demand are not catered for across modes, then there is potential for deterioration for travel time reliability on SH2 on the Rimutaka Hill Road.</p> <p>There is no viable alternative route to the SH2 corridor. The shortest alternative road route can increase travel times by more than three hours, and the alternative rail line frequency can be as much as five hours between services during the day.</p> <p>Although a regional view of resilience is beyond the scope of this PBC, it is also worth noting that the SH2 corridor is one of the four roads out of the Wellington metropolitan area that is vulnerable to a major seismic event (over three months to restore access).</p>
<p>OR</p> <ul style="list-style-type: none"> • a high crash risk 	<p>Sections of the SH2 corridor have Medium-High to High collective risk. Most notably this includes the Rimutaka Hill Road and the section between Carterton and Masterton.</p> <p>It is noted that recent investment in the SH2 Rimutaka Hill Road is expected to translate into a reduced level of risk in the future. This includes realignments (e.g. Muldoon's corner), motorcyclist education, and roadside barriers.</p> <p>There are also some shorter or intersection risks along the route, such as near the Te Marua golf course (Medium-High collective risk) and the Medium-High risk intersections between Carterton and Masterton (Somerset Road and near Waingawa).</p>

The overall assessment rating for the 'Strategic Fit' of the programme interventions is **High**.

7.2.2 Effectiveness

An indicative 'high' rating for Effectiveness is achieved on the basis the identified problems and potential investment meets the components of the criteria as follows:

Figure 9 Programme Option 7: Assessment against short listed options against effectiveness

3 Point Scale	Assessment
High	<p>Outcomes Focused:</p> <p>Programme option 7 delivers significant outcomes when considering the investment objectives identified. It therefore achieves a high score. It is anticipated that the following outcomes would result occur in the long-term if this programme option is adopted:</p> <ul style="list-style-type: none"> • Significant reductions in deaths and serious injuries (54% reduction); • Slightly improved travel time reliability and maintained travel time; • A 29% reduction in total closure and delay hours from the baseline; and • A predicted 95% of rural areas will have a Star Rating of 3 or better.

3 Point Scale	Assessment
High	<p>Integrated:</p> <p>Programme option 7 delivers good outcomes when considering integration with current network and future transport plans achieving a medium score.</p> <p>The good outcomes integrate well with the corridor's role as the main connection between the Wairarapa and Wellington region through providing strategic corridor improvements, safety improvements and curve easing.</p> <p>The programme also considers future electrification of the rail line and acceleration of other rail improvements and has been developed in conjunction with the State Highway 2 Ngauranga to Te Marua and Wellington Port Access programme business cases.</p>
High	<p>Correctly scoped</p> <p>The following baseline information for the corridor, puts the problems experienced on the corridor into context:</p> <ul style="list-style-type: none"> • On average there are 28 DSIs on the corridor annually (comp.) • 77% of rural areas on SH2 between Te Marua and Masterton have a Star Rating of 3 or better • 10 minute difference between 50th and 85th percentile travel time • 32 Events resulting in closure of the road in 2011-2015 and the average duration of closure is 7.3 hrs per event. <p>The baseline information does not reflect the seriousness of the problems and this is reflected in the scope of works entailed in programme option 7 which targets safety improvements on Rimutaka Hill through curve easing and improvements for managing the network via ITS. It therefore achieves a high score.</p>
High	<p>Affordable</p> <p>At this stage of the programme business case a funding plan has not typically been identified. As such this is a preliminary comment on affordability based on limited information. It is likely that this programme option would be affordable. It is a low cost programme with long timeframes for completing modest works.</p>
High	<p>Timely</p> <p>This programme option is timely as interventions would be undertaken on a demand basis and deemed to be provided in a timely manner accelerated in comparison to programme option 5.</p> <p>This programme would likely deliver enduring benefits over the timeframe.</p>
High	<p>Confidence</p> <p>High confidence this option manages current and future risks and outcomes</p>
Medium	<p>Overall</p> <p>Note: This overall is based on the lowest rating of all components.</p>

7.2.3 Benefit Cost Appraisal

The benefit cost ratio has been calculated to be in the range of 1.6 – 2.5.

This is based on a NPV benefit of \$145 M – \$165 M and a NPV cost of \$65 M.

Key Assumptions of the BCR calculations”

- 40 year analysis period with 6% discount rate;
- Benefits are calculated based on the Programme One costs of maintenance, travel time, vehicle operating costs and safety compared with the Recommended Programme;
- Traffic growth rate range of 1% to 2%; base on the traffic growth at the Clareville count-site in the last three, five, and ten years. Heavy vehicles were assumed to be 6% of traffic.
- Travel time used the 2015 update factor, 1.44;
- Vehicle Operating Costs (VOC) and Safety used the updated 2016 values;
- Heavy Vehicles considered proportionally for gradient VOC and travel time;
- Roughness and speed cycle VOC were not included as a contributors;

- Crashes considered social cost based on crashes being - all vehicles, all movements. These at a future point can be broken down into User Class and Movement Types;
- Maintenance costs from 2011-2015 have been annualised and applied each future year, excluding periodic works.
- Increased resurfacing frequency for the Rimutaka Hill is for the 10 km between Beehive Corner and Kaitoke Straight assuming average resurfacing cycle
- Passing and overtaking is taken into account under safety and travel time calculations.
- Resilience has been included within vehicle operating costs and travel time costs; this includes closures and delays from planned (roadworks).

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

7.3 One Network Road Classification: Customer Level of Service Outcomes (Provisional)

Road Category	Mobility		Optimal Speeds (safety and efficiency)	Safety	Amenity	Accessibility
	Travel time reliability	Resilience				
Regional	The majority of road users experience consistent travel times with some exceptions in urban heavy peak, holidays, during major events or during severe weather events.	Route is always available except during major-extreme weather or emergency events and viable alternatives nearly always exist. Rapid clearance of incidents affecting road users. Road users may be advised in advance of issues and incidents	Higher speeds depending on assessed level of risk. Lower if mixed use, high intersection density, schools, shopping, and concentrations of active road users.	Mostly KiwiRAP 3-star equivalent or better. Active road users are mostly provided with additional space in urban areas and in some rural areas. Some lower standards and/or winding sections may require lower speeds and extra care. High level of road user safety guidance provided.	High level of comfort, infrequent roughness. Aesthetics of adjacent road environment reflects journey experience needs of both through traffic and active road users. Character of scenic / tourist routes protected and enhanced. Amenity outcomes of active road users are mostly provided with additional space in urban areas and in some rural areas. Clean and secure	Landuse access for road users in rural areas often restricted, and some restrictions in urban areas. Limited road user connections to other National roads and Arterials, with priority over lower category road users. Network access and journey continuity for active road users are mostly provided with additional space in urban areas and in some rural areas. Extra care required around activity centres due to mixed use, including goods vehicles. Provision of quality information relevant to regional road user needs.
Business as Usual to 2046	Predicted to increase travel time variation between median and slow to 10¼ minutes on average for both directions due to increasing traffic conflict, intersection improvements south of Masterton, and walking and cycling projects consuming road space. 24% decrease in travel time reliability.	Predicted 230 hours closed and 24 hours of delay per five year period , averaging 7.1 hours per closure event and 1.2 hours per delay event	Predicted 23.8 DSI per five year period (9% reduction). Includes long term crash trends as well as influences of urban walking and cycling projects, Masterton to Carterton Safety Improvements, and minor safety work.	Predicted 83% of rural areas will have a Star Rating of 3 or better on 100 m sections. This is large improvement from the baseline due to the likely outcomes of the Masterton to Carterton Safety Improvements, and ongoing Rimutaka Hill Hazard Protection improvements.	Amenity of the journey is reasonable at present and expected to be maintained without major interventions.	Accessibility has been raised for this corridor but is not deemed to be a major issue due to the reasonably low level of freight, high number of local movements along the highway. Some areas for improvement were highlighted including accessibility for the Waingawa Industrial Estate.
Programme Option 7 Assessment to 2046	Predicted to improve travel time variation between median and slow to 7½ minutes on average for both directions due to increasing traffic conflict and intersection improvements south of Masterton. Improvements to rural sections are expected to significantly improve travel time reliability on Rimutaka Hill. 10% increase in travel time reliability.	154 hours closed and 27 hours of delay per five year period, averaging 6.8 hours per closure event and 1.7 hours per delay event (29% reduction in total closure and delay hours from the baseline)	Predicted 10.1 DSI per five year period (61% reduction) due to the do median approach in creating consistent corridors with uniform feel. There is sufficient infrastructure with rail to provide for both PT and freight needs in addition to SH capacity.	Predicted 95% of rural areas will have a Star Rating of 3 or better on 100 m sections. Consistency improvements between Masterton and Featherston lift a few addition sections to three star or better; however improvement works on the Rimutaka Hill and on the approaches from Featherston and Te Marua are the majority of the change contribution. Other improvements will include increased sight lines.	Recommended Programme includes increased resurfacing for sections of SH2 for safety reasons and thus will provide higher level of amenity for road surface. Improvements along the corridor are proposed improve other aspects of amenity. Improved park and ride, especially safety and lighting, facilities within the Wairapa.	The Recommended Programme includes further investigation into improvements along SH2 between Carterton and Masterton. The aim of that investigation and potential works is to identify a range of interventions that improve access to the Waingawa Industrial Estate as well as land uses nearer Carterton whilst maintaining travel time reliability and improving safety.

*Note: The customer levels of service criteria are subjective and provisional

7.4 Programme Risk and Opportunity

There are a number of risks to this programme of works that are being assessed with the individual programme elements. These risks will need to continue to be managed and assessed during subsequent business case stages. It is recommended that ongoing risk assessment, including thorough risk identification, mitigation actions, and action owners, continue to be undertaken during the Indicative and Detailed Business Cases and other delivery mechanisms. The key risks are outlined in Table 18 below.

Table 18 Summary of Identified Key Risks

Risk Area	Description	Treatment Strategy
Land acquisitions	There is likely to be a number of minor land acquisitions required to enable improvements along the corridor	Work with stakeholders to identify the land required and engage as early as possible
Latent Ground Conditions	There are some areas of the Rimutaka Hill route that may provide some geotechnical and engineering challenges for design and construction	Undertake geotechnical and other investigations at the appropriate time to confirm design and engineering responses and to mitigate time delay and cost escalations
Consenting (RMA)	Consenting approval will likely be required for works undertaken along the corridor	Early assessment (during the Indicative Business Case stage) should be undertaken to identify the specific areas that may require consenting
Operational	Need to maintain the operational efficiency of SH2 or the rail line during improvements	Operational plan prepared prior to procurement of the works and be an assessment criteria
Financial (Co-Funding)	There are likely to be some investments across the corridor that require co-funding from investment partners	Agreement on the scope of works, funding levels and timeframes to be undertaken at the appropriate times
Environmental and social responsibility	Works to be undertaken will have some level of environmental impact	Works to be undertaken to minimise environmental impact in accordance with Transport Agency or other delivery guidelines and policies

8. Programme Financial Case

8.1 Funding Arrangements

The proposed programme of works and associated costs are considerable. It is anticipated that the majority capital and operational costs will be incurred by the NZ Transport Agency for the road based elements of this programme. All major realignments or improvements to SH2 will be at the cost of the Transport Agency.

There is potential co-investment with councils and third party contributors for improvement between SH2 and the Waingawa Industrial Estate. This would be confirmed during the development of the Indicative Business Case.

Improvements to the rail corridor are likely to be undertaken by KiwiRail and Greater Wellington Regional Council. These improvements are anticipated to occur after investment in rail infrastructure within the Hutt Valley and other areas within Wellington has been implemented.

Other co-investment opportunities are likely to be with the district and regional councils for improvements along State Highway 2, policy, behaviour change and other activities.

8.1 Indicative Cost and Programme Cash Flow

An indicative, escalated programme cost has been estimated at approximately \$100 million. The breakdown by intervention type is shown in Table 13 below.

Table 19 Indicative Programme Cash Flow (un-escalated)

Year Number	Short Term (0-5 Years)	Medium Term (6-10 Years)	Long Term (11+ Years)	Total
Capital	\$20M - \$25M	\$60M - \$75M	\$30M - \$40M	\$110M - \$140M
Operational and Maintenance (additional to current funding levels)	\$10 M	\$10 M	\$40 M	\$9.6M - \$15M

Part C – Delivering and Monitoring the Programme

9. Planning and Delivery Overview

Table 20 below outlines the investments for the development of the programme in the short, medium and longer term periods (aligned with NLTP 3 year funding periods).

Table 20 Summary of Programme Investments

	Road	Rail/Active	Other
Short Term (1-5 years)	Improved town threshold signage and speed warning. Urban traffic calming.	Amenity and park & ride improvements	Traveller information systems (integrated road and rail)
	Masterton to Carterton speed limit reduction followed by Safer Corridors and intersection improvements Carterton to Featherston minor safety improvements (rumble strips and widening)	Regional PT improvements such as integrated ticketing	Education and behaviour change campaigns - Freight by rail - Off-peak travel and mode choice encouragement - Improved event management
	Rimutaka Hill Road speed management and hazard protection improvements	Walking and cycling improvements in urban areas	Regional Resilience PBC outcomes
	Rimutaka Hill Road Slip Identification	Rail reliability improvements in line with regional rail plan to complement downstream PT improvements	
	Rimutaka Hill resurfacing frequency and event responsiveness improvements		
	Rimutaka Hill curve easing/realignments		
Medium Term (6-10 years)	Masterton Freight Access Improvements	Rail level crossing improvements	
	Carterton to Featherston	Rail frequency	

	Safer Corridors and intersection improvements	improvements in line with regional rail plan to complement downstream PT improvements	
	Te Marua to Rimutaka Hill Safer Corridors and intersection improvements	Revised PT routes – Potential shuttle rail service between Upper Hutt and Featherston	
	Rimutaka Hill Road Slip Intervention		
	Rimutaka Hill curve easing/realignments		
Long Term (11 + years)	Ongoing minor safety improvements		
	Carterton to Featherston Safer Corridors and intersection improvements		

These investments are in addition to those already planned/ underway in the current (2015-21) Regional Land Transport Plan (as set out in below) and will need to be programmed accordingly. Note - the programme outlined below is for the whole Wellington region.

Table 21 Regional Land Transport Programme (2015-18)

Organisation	Description	Completing	Costs (\$m)	
NZTA	SH2 Rimutaka Hill Guardrails	2015/16	0.14	Committed
GW	Regional Rail Plan - Passenger Rail Improvements (RS1)	2019/20	51.67	Significant Activities
GW/ NZTA	Transport Network Resilience Programme Business Case	2016/17	0.26	Non-Prioritised Activities
NZTA	SH2 Buchanan Place/ Ngaumutawa Road Intersection (Masterton)	2016/17	1.0	Non-Prioritised Activities
NZTA	SH2 Corridor Improvements PBC/ DBC/ Implementation	Ongoing	250	Significant Activities
NZTA	SH2: Carterton to Masterton Safety Improvements	2016/17	2.7	

Table 22 SH2 Te Marua to Masterton Potential Indicative Business Cases

Potential Indicative Business Cases	Potential interventions	Estimated Costs	Estimated Timeframe (in line with NLTP)
SH2 Rimutaka Hill section	Speed limit reduction to reflect road environment as per Speed Management Guide as well as speed limit enforcement for all road users	Low \$100-200k	Short/ immediate By 2017/18
	Geotechnical investigation and preventative slip or mitigation works to improve resilience	High \$1-4 M	Short to Medium By 2026/27
	Resurfacing frequency increased from every 8 to every 6 years	Low ~\$200-300k per year	Ongoing
	Realignment of horizontal curves to achieve a consistent speed environment, staged over a ten year period	Very high ~\$50-100 M	Short to Medium By 2026/27
	Corridor safety improvements between Rimutaka Hill and Te Marua including protecting severe hazards, wide centrelines where appropriate, and intersection safety improvements	High \$2-4 M	Staged Short to Medium By 2023/24
SH2 between Carterton and Masterton	Short term temporary speed limit reduction until project safety improvements have been constructed	Low <\$100k	Short/ immediate By 2017/18
	Waingawa Industrial Estate Access Indicative Business Case which considers/ includes: <ul style="list-style-type: none"> ○ Areas north of the Waingawa River Bridge in Masterton District including the Ngaumutawa Rd intersection and the heavy traffic bypass of Masterton ○ Freight movement by rail and ability to increase intermodal freight movements 	High \$8 - 12 M	Short By 2020/21
	Carterton - Masterton Safety Improvements including; roadside hazard protection or removal, median treatments up to and including barriers, and intersection upgrades or rationalisation	High \$5 - 10 M	Short By 2020/21

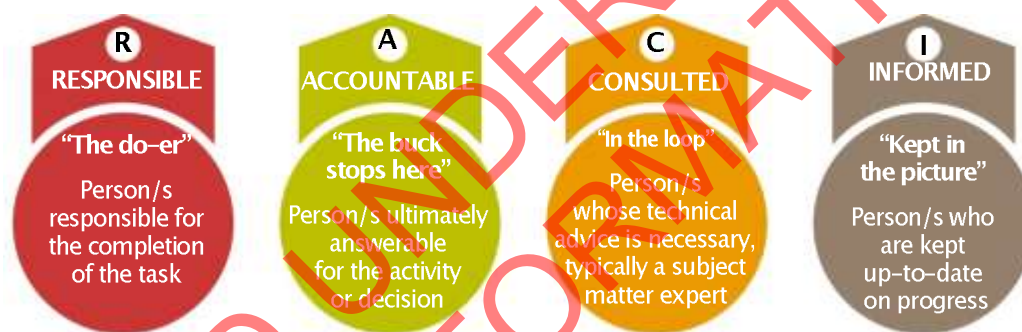
10. Management Case

10.1 Programme Performance and Review

The investment objectives identified in the programme business case have been developed in a manner that they are attributable to investment on this corridor as well as can be easily assessed and monitored over time. This should be undertaken on an annual basis by the regional Transport Agency HNO team and other teams where relevant.

10.2 Governance and Reporting

Governance and reporting of the programme will be dependent on the various methods of delivery, i.e. minor works or major projects. It is recommended that the HNO Wellington (Central) Regional office have ultimate responsibility for the outcomes of the planning, improvements and monitoring for the programme.



10.3 Stakeholder Engagement and Communications Plan

The programme business case has been developed by working closely with investment partners and key stakeholders over a six month period to gain a greater insight into the problems, constraints, investment needs and drivers, and opportunities for improvement of this section of SH2 and the transport needs of the wider region.

The Stakeholder Engagement and Communications Plan developed for this programme business case (see Appendix B) should be reviewed and updated acknowledging the recommended option and the need for specific strategies for the programme components identified.

11. Commercial Case

The Commercial Case will be developed during the Indicative Business Case stage of the programme's development. This will consider the current suite of procurement and commercial arrangements available to the NZ Transport Agency as well as the potential funding partners.

It is anticipated that due to the physical length of the corridor considered in this programme business case as well as the large number of programme elements that a number of procurement and commercial arrangements will be required to successfully deliver the programme.

Engagement with potential funding partners including councils in the Wairarapa indicates that delivery of the proposed programmes is achievable through traditional procurement and delivery methods. These stakeholders are keen to progress the programme and in particular the improvements between Masterton and Carterton in the immediate future.

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Appendices

Appendix A – Investment Logic Map

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Appendix B – Benefits Map

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Appendix C – Stakeholder
Engagement and
Communications Plan

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Appendix D - Risk Assessment

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Appendix E – Resilience Risk Maps

RELEASED UNDER THE
OFFICIAL INFORMATION ACT