

## Ngauranga Triangle Strategy Study



### SHORT LIST OPTIONS ASSESSMENT REPORT

- Final
- 22 January 2010



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The Ngauranga Triangle Strategic Study is a technical report, outlining potential long-term transport solutions for the Ngauranga Triangle transport network. The public release of the document means it is now available as an input into the Hutt and Western Corridor Plan reviews, which are scheduled to be undertaken by Greater Wellington Regional Council over the coming year. As a technical report, the study has not been presented to the NZTA Board for its support, endorsement or approval. Accordingly, publication of the report does not constitute any form of commitment by NZTA to the recommendations contained in this report.



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## 1. Introduction

The purpose of the Ngauranga Triangle Strategy Study is to develop a multimodal, integrated, strategic transport plan for the triangular area between Ngauranga – Tawa, Ngauranga – Dowse and across from SH2 to Gracefield. The Study looks to:

- Improve safety, access and mobility;
- Increase integration between the transport system and surrounding land uses; and
- Sustainably ease peak congestion on state highways and local roads.

The study considers integration with the local road network, public transport services, walking and cycling as well as how the benefits gained from reducing congestion in the Ngauranga Gorge and on SH2 between Petone and Ngauranga can be “locked in”.

The preferred long term strategy for the Ngauranga Triangle Study area will satisfy New Zealand Transport Agency (NZTA), Hutt City Council (HCC) and Wellington City Council (WCC) statutory responsibilities under the Land Transport Management Act 2008 (LTMA), contribute towards the objectives of the New Zealand Transport Strategy (NZTS), and take account of the Wellington Regional Land Transport Strategy (RLTS) and corridor plans. In doing this, the study will provide a strategy that will:

- Assist safety and personal security;
- Improve access and mobility;
- Assist in economic and regional development;
- Protect and promote public health; and
- Ensure environmental sustainability.

The options presented in this report have been identified through previous analysis, workshops and discussions with key stakeholders. The work undertaken to get to this stage of the project includes:

- Functional Goals Identification and Workshop (21/11/2008);
- Constraints Identification, Analysis and Workshop (10/12/2008);
- Stage 1 Discussions “Fireside Chats” with identified stakeholders (February 2009)
- Identification of all possible projects (Long List) and project assessment;
- Long List Workshop (07/04/2009) to form Short List of options to be carried forward;
- Short List project assessment; and
- Short Options Workshop (15/05/2009).



The next phase of the project involves the detailed technical report of the short options. The detailed report will drill down into more detail for each of the short list options by undertaking further transportation modelling and deriving benefits and costs suitable for this level of strategic assessment.



## 2. Background

This section details the projects that have been identified through the Long List assessment and Long List workshops as promising candidates that would have positive impacts within the project area. These projects were analysed at a high level against the key performance indicators and functional goals, which can be found in Section 3. Each of the projects have been considered with *high level* design, benefit cost analysis, traffic modelling and environmental analysis being carried out during this phase of the project.

### 2.1. Ngauranga to Tawa

The following projects have been investigated as potential projects between Ngauranga and Tawa:

- Tawa Interchange Improvements; and
- Additional Southbound Bus Shoulder between the Newlands Ramps and Hutt Road.

### 2.2. Ngauranga to Dowse

The following projects have been investigated as potential projects between Ngauranga and Dowse:

- Road, Rail and Cycleway Realignment between Ngauranga and Petone and construction of a seaward side cycleway;
- Petone Interchange Rebuild (including provision for cyclists and walkers);
- Completion of the off-road pedestrian/cycle facility on SH2;
- Great Harbour Way cycleway;
- “Beach to Bush” (crossing of SH2 and the Wairarapa Line); and
- Traffic Management on SH2 (Ramp Signalling at Ngauranga NBD and Petone SBD on ramps).

### 2.3. SH1-SH2 Link

The proposed Petone-Grenada Link Road will connect SH1 and SH2 without the need to travel through the Ngauranga Interchange. The link will have a connection at Tawa; the alignment heads south to the boundary of the Lincolnshire Farm (A1). The route passes through Lincolnshire Farm on the path designated by the “Lincolnshire Farm Structure Plan dated 2001” (B3). The route then continues south east towards SH2 between Horokiwi Road and the Horokiwi Quarry (C3).

Approximately 150m from the intersection of SH2, it will continue north east, running parallel to SH2 (D5), and then connect to The Esplanade, just north of the existing SH2/Petone off ramp, via a





new grade separated interchange. There is also an opportunity to connect to Johnsonville in the future, through new SH1 on and off ramps at the Helston overbridge.

#### **2.4. SH2 to Seaview-Gracefield**

The following projects have been investigated as potential projects that form a Cross Valley Link (CVL):

- Wakefield to Whites Line Alignment;
- Wakefield to Rail Alignment;
- Wakefield to Rail Alignment with connection to Elizabeth Street;
- Udy Street to Cuba Street to The Esplanade to Waione Street (Udy Street “Wiggle”);
- Two Way Pairs – a combination of the Udy Street “Wiggle” and The Esplanade; and
- The Esplanade operated as a 4-lane, 50 kph road.

In addition to the elements listed above, and whilst not directly forming the CVL, the following project has also been considered as complimentary to the CVL:-

- The Esplanade and Jackson Street west traffic calming and HCV access permit required;

The existing SH2 on and off ramps serving Petone have capacity problems with long queues forming back from SH2 into The Esplanade in the am peak, and back onto SH2 in the pm peak. The consideration of the CVL has been undertaken to examine the provision of a suitable transportation corridor that is capable of accommodating increased traffic flows resulting from the Tawa-Petone Link Road connection and to provide a dedicated route away from The Esplanade. This may also improve the regeneration of this area and may provide some intangible benefits.

#### **2.5. Additional Options for the Short List**

It should be noted that the following options were not considered as part of the Long List assessment. They were identified by the Governance Group and study team during the Short Options assessment and are therefore included in the analysis set out in this report:

- Two Way Pairs – a combination of the Udy Street “Wiggle” and The Esplanade;
- The Esplanade operated as a 4-lane, 50 kph road; and
- Ramp Signalling at Ngauranga NBD and Petone SBD on ramps.



### 3. Study Process

Based on the national, regional and local policy context and the project-specific objectives and goals, a high level evaluation framework has been developed. This framework has been used to undertake the high level assessment of the “long-list” of options to provide a coarse sieve to shortlist a number of options which will be investigated in more detail. The same evaluation framework is used for the short list assessment, but the options have been assessed in more detail to determine the short list. The evaluation of short list options has also included an indicative high level economic evaluation<sup>1</sup> and cost estimate.

The Evaluation Framework used is described below and includes objectives (*in italics*) followed by the supporting key performance indicators (KPI's):

#### *Ensure environmental sustainability*

Primarily, each of these environmental KPIs was derived from the NZTA Environmental Plan. Issues selected from the plan were determined by the relevance to the study area constraints and the stage of the project in terms of level of information available.

A measure for determining climate change mitigation opportunities was considered. However, at this time considering the high level nature of the project it was considered that a measure on this would not provide meaningful criteria to be assessed against, particularly because a road alignment is required.

The evaluation criteria used is outlined below:

- Enhance and contribute to community cohesion;
- Proactively limit the disturbance of significant cultural and heritage features along state highways;
- Ensure no net loss of native vegetation, wetlands, critical habitat or endangered species;
- Plan and design new state highway infrastructure to avoid or reduce adverse vibration effects;
- Identify areas susceptible to erosion and sediment deposition and implement control measures appropriate to each situation with particular emphasis on high-risk areas;
- Manage increased hazards of climate change impacts on state highway infrastructure; and
- Collect and analyse information on greenhouse gas emissions and the impact of climate change on the functioning of the state highway to support decision-making.

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<sup>1</sup> Economic Analysis is carried out at a high level and is indicative only



### ***Assist in economic development***

The KPIs which relate to this objective stem from objectives and targets from high level documents such as the NZTS and GPS targets. Specific site constraints were then considered in order to produce KPI's which would evaluate the best options.

Assisting economic development was of particular importance due to the updated GPS objectives, which were released following the change in government, raising the importance of assistance in economic development in relation to transport projects.

The evaluation criteria used is outlined below:

- Maintain or reduce average peak period journey times and improve journey time reliability particularly between SH1, SH2 and the Seaview / Gracefield area;
- Support redevelopment of the Seaview / Gracefield area;
- Support development of the Lincolnshire Farm area;
- Improve amenity of The Esplanade to enable redevelopment of the area and integrating the foreshore with Petone CBD; and
- Reduce all day average journey times; improve travel time reliability and HCV operating costs between SH1, SH2 and the Seaview / Gracefield area.

### ***Assist safety and personal security***

The evaluation criteria which relate to safety and personal security have been developed to reflect network wide exposure to crashes (vehicle-kilometres travelled) and to take into account specific site constraints. There is an awareness of safety issues surrounding the large number of heavy vehicles on The Esplanade. Recognition of options which would reduce that number was considered important for the current strategy.

The evaluation criteria used is outlined below:

- Reduce vehicle kilometres travelled; and
- Reduce the volume of heavy vehicles on The Esplanade.

### ***Improve access and mobility***

Improving access and mobility was important for the strategy, particularly in regards to the current policy direction which encourages improving transport conditions for public transport modes, pedestrians and cyclists.

The evaluation criteria developed by the Study Team with input from the Governance Group is outlined below:



- Increase public transport mode share within the Ngauranga Triangle;
- Increase the number of walking and cycling trips within the Ngauranga Triangle;
- Maintain or reduce the average peak period journey times and journey time; and
- Provide alternative routes within the Ngauranga Triangle Area.

### ***Protect and promote public health***

Policy related to public health refers to reducing the adverse environmental effects of noise and air pollution, as well as encouraging walking and cycling. Reducing heavy vehicles along The Esplanade was considered to positively impact on noise and air pollution because of the recreational opportunities it provides and therefore the potential to impact upon people.

The evaluation criteria developed by the Study Team with input from the Governance Group is outlined below:

- Reduce volumes of heavy vehicles on The Esplanade; and
- Increase the numbers of walking and cycling trips within the study area.

Each of the projects was assessed against the key performance indicators (outlined above) during the long list options assessment. The assessment graded each project on whether it delivered very good, good, negligible, negative or very negative performance against the key performance indicator. The results were collated to give an overall measure of how the project performed against each of the objectives.

### ***Benefit Cost Ratios (BCR)***

High level indicative BCR's were calculated for the short list options. Approximate cost estimates have been carried out which include the further improvements (identified as part of this study) and presented as present value (PV) costs. Where previous costs have not been available, high level cost analysis has been carried out.

Assumptions made as part of cost analysis include:

- Single Payment Present Worth Factor (SPPWF) taken from the Economic Evaluation Manual used to account for one off payment in 2016;
- Costs updated with 3% yearly increase for years before 2006, and update factors taken from the Economic Evaluation Manual for cost updates from 2006 onwards.

Where applicable, benefits have been generated from traffic models. The benefits are based on the following assumptions:



- Based on Total Travel Time, Delays and Travel Distance from network statistics and uses the difference between Tests 2 - 17 and the Do Minimum (Test 1)<sup>2</sup>;
- Multiplied by the respective Value of Time factor from the Economic Evaluation Manual to account for congestion and respective update factor;
- Benefits summed up for each time period and multiplied by respective time period factor (2 for AM & PM, 12.4 for IP) to achieve daily benefit;
- Multiply by 350 to achieve yearly benefit;
- Use Uniform Series Present Worth Factor (USPWF) from the Economic Evaluation Manual to achieve 30 year benefit.

BCRs were developed at a high level appropriate for a Strategy Study. Where benefits were not available from the traffic models, high level calculations were carried out based on the Economic Evaluation Manual.

### *Consentability*

A high level consentability assessment was undertaken to identify which projects may have difficult statutory approval processes or projects that have a fatal flaw. The ranking system used was done with a coarse sieve approach, whereby a project received a ranking based on the complexity of statutory approval required, whether the effects could be mitigated and likely public opposition. See Appendix A for the consenting methodology and ranking provided for each project.

### **3.1. Key issues to take into account in option selection**

Before the Long list options were developed, a constraints plan was developed identifying all constraints and opportunities associated with the study area. This exercise involved planning, environmental specialists, urban design advice and infrastructure specialist advice from the consultant team and client representatives. Following the constraints plan, through long list and short list option development, constraints relevant to these options have been identified and developed in more detail.

The outcome of this assessment for the short list options report is the high level urban design contextual summary shown in Figure 3-1 and the key environmental constraints map in Figure 3-2 which provide an overview of what needs to be considered through option development. A full list of issues is provided in the Constraints Plan. These urban design and environmental issues were

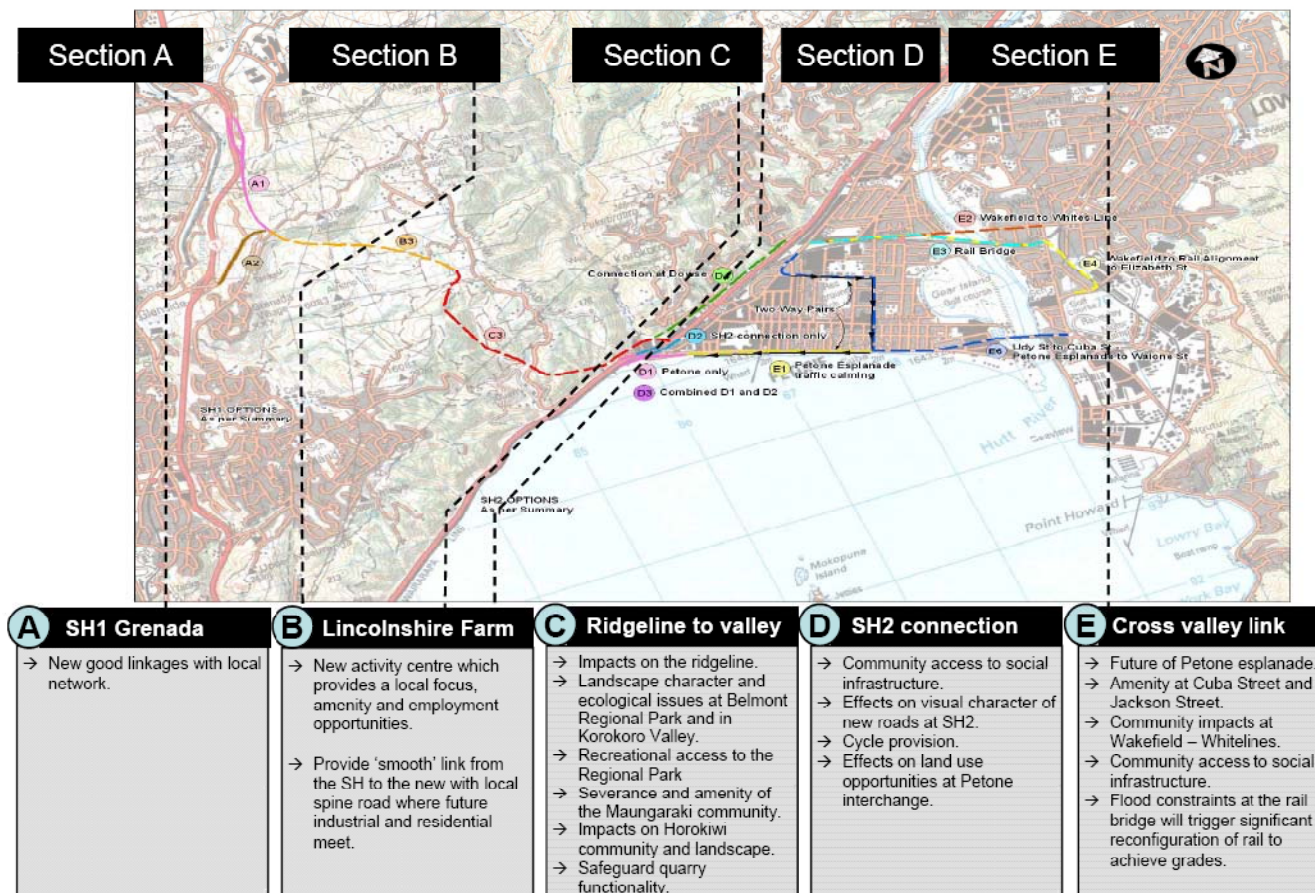
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<sup>2</sup> See Appendix D for description of the tests.

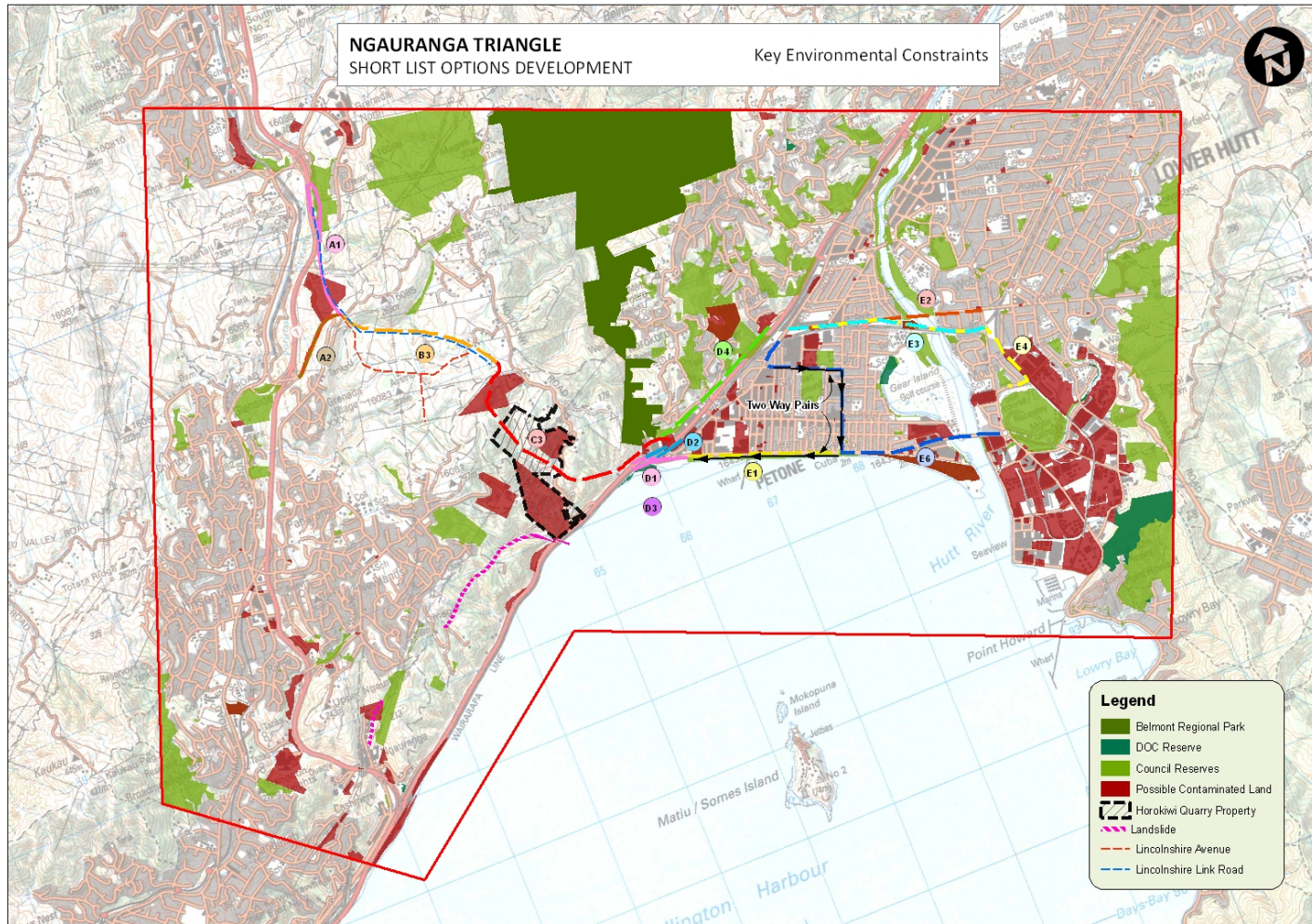


taken into account by evaluating the high level route alignments completed for each option against the identified issues document in the constraints plan. The evaluation identified any positive or negative effects and whether they were able to be avoided, remedied or mitigated. Ease of consentability was also discussed. In some cases the degree of potential effect could not be determined at this stage as more detailed design was required, this will happen at the investigation stage of a project.

## URBAN DESIGN CONTEXTUAL SUMMARY



■ Figure 3-1: Urban Design Contextual Summary



■ **Figure 3-2: Key Environmental Constraints**





## 4. Option Identification

### 4.1. Ngauranga to Tawa

The various options considered under the routes between Ngauranga to Tawa are detailed in this section of the report. This section also details and summarises the assessment and analysis undertaken with the results presented in a visual format for each of the projects. In these diagrams a point further from the centre indicates an improved performance against the relevant objective<sup>3</sup>. Table 4-1 provides a summary of the weightings given to the projects under each of the high level evaluation criteria and the corresponding scale on the radar diagram.

#### ■ Table 4-1: Performance of Projects

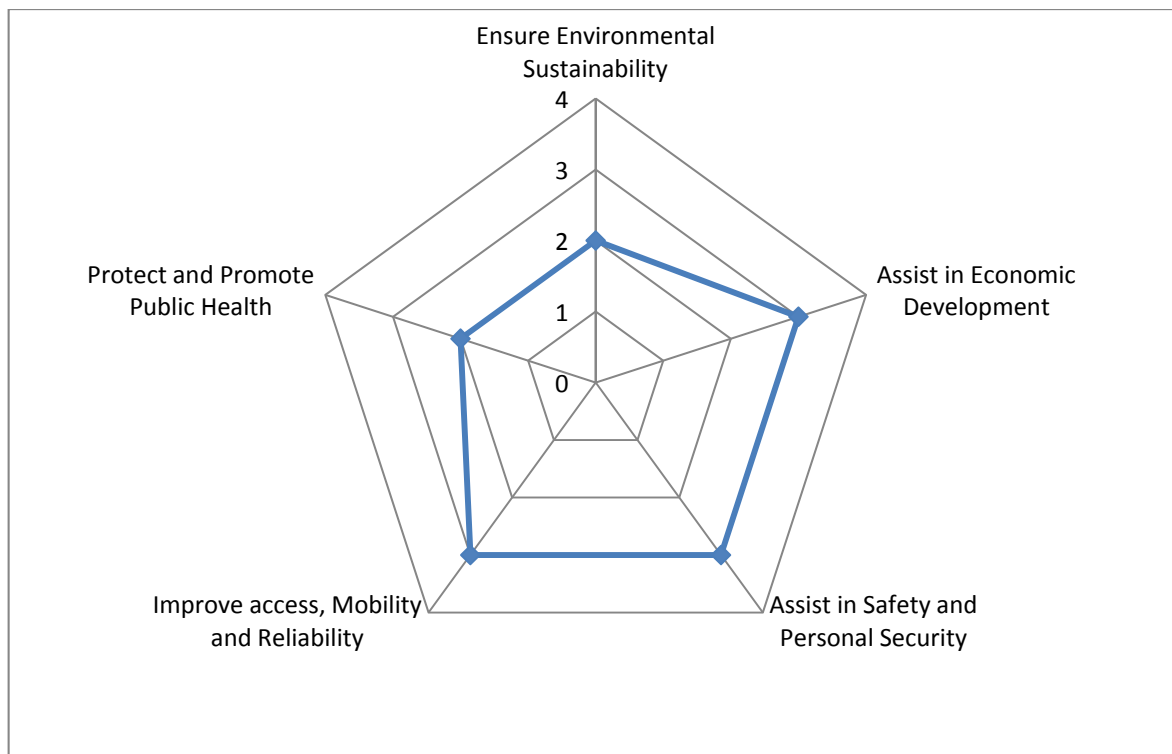
Very Negative (--)	0
Negative (-)	1
Negligible (0)	2
Good (+)	3
Very Good (++)	4

#### 4.1.1. Tawa Interchange Improvements

The Tawa Interchange improvements seek to improve the alignment of three curves on SH1 near Tawa. The curves are immediately north and south of the interchange with the third at the interchange. A high number of accidents have been reported along this section of the highway; of these a number can be attributed to the horizontal and vertical alignment of the road in this area. This conclusion is reached by noting the number of accidents that have been listed as loss of control accidents that have happened in good weather conditions. Figure 4-1 and Table 4-2 summarise the key study objectives contributed to by the implementation of this project.

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<sup>3</sup> Note: Diagrams show how each project performs under the project objectives and cannot be compared across the objectives.



- **Figure 4-1: Objectives supported by Tawa Interchange Project**
- **Table 4-2: Objectives by Tawa Interchange Project**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	Based on the assessment undertaken, it is considered the project is unlikely to have significant adverse impacts on the environment. There may be minor effects from a noise and landscape perspective, but these effects should be able to be mitigated. This will need to be confirmed through further assessment and will depend on the final alignment.
Assist Economic and Regional Development	The improvement in alignment will reduce accidents and hence will have a benefit of reducing travel costs to road users.
Assist in Safety and Personal Security	Improved design speeds and safer alignments are likely to result in a reduction in accidents. The new alignments will be designed to comply with the appropriate design curves.
Improve Access, Mobility and Reliability	A higher design speed will have a minor impact on the throughput of vehicles.
Protect and Promote Public Health	There will be safety benefits as a consequence of improved horizontal and vertical alignment.
<b>Conclusion</b>	
This project appears to be economically viable and delivers primarily safety benefits. This project can be built as a stand-alone project in which case it should be built to allow for the Petone Grenada Link Road. Alternatively this project can be built in conjunction with the Petone Grenada Link Road.	



## Transport and Rooding

Previous work carried out on this project and documented in the report “*Tawa Interchange Area – Project Feasibility Report.*<sup>4</sup>” identifies three curves along SH1 in the vicinity of the Tawa Interchange which could be realigned to a design speed of 110km/h. The primary aim of this project will be to improve safety for motorists. A number of the design characteristics of the current alignment do not comply with the standards set out in the State Highway Geometric Design Manual (SHGDM) and Austroads. These include:

- Safe Stopping Sight Distance;
- Super Elevation;
- Changes in Speed Environment (changes in speed); and
- Acceleration Lane Length.

Crash Analysis System (CAS) Analysis was undertaken to identify accidents between the start of the northern curve and the end of the southern curve. A summary of the results of this analysis can be found in Table 4-3 and Table 4-4.

### ■ Table 4-3 : Tawa Interchange / Alignment Crashes (2004-2008)

Year	Fatal	Serious	Minor	Non Injury
2004	0	0	3	18
2005	0	1	6	16
2006	0	1	3	10
2007	0	1	7	14
2008	0	0	4	20
<b>TOTAL</b>	<b>0</b>	<b>3</b>	<b>23</b>	<b>78</b>

### ■ Table 4-4: Type of crashes - Tawa Interchange / Alignment

Crash type	Number	Percentage (%)
Overtaking	25	24
Straight Road: Lost Control / Head On	11	11
Bend: Lost Control / Head On	33	32
Rear End / Obstruction	30	29
Crossing / Turning	2	2
Pedestrian Crashes	0	0
Miscellaneous	3	3
<b>Total</b>	<b>104</b>	<b>100</b>

<sup>4</sup> Transit New Zealand (2007). *Tawa Interchange Area, Project Feasibility Report*, September 2007, written by MWH.



It can be seen from Table 4-4 above that 32% of these accidents can be attributed to losing control on a bend. Improving the alignment of the curves to meet design requirements is likely to significantly reduce the number of accidents at this location. The Economic Evaluation Manual (EEM) indicates that there could be a reduction in accidents as high as 60% associated with the implementation of this project.

Upgrading these three curves would address the current inadequacies of the alignment (described above) and provide for a design speed of 110km/h. To maintain continuity with the current motorway environment the cross sections will have the following features:

- Four Lanes (two in each direction) with a width of 3.5m each;
- Hard Shoulders with a width of 1.5m each (to maintain consistency with the surrounding shoulder widths); and
- Central Median with a width of 2m and a barrier.

Typical cross sections of this segment of road are shown in Appendix B.

Each of the alignments has been considered as a separate project for the benefit-cost analysis. The previous Project Feasibility Report by MWH has calculated a Benefit-Cost Ratio which has been updated to 2008 values as part of the present study. The do minimum option includes annual and periodic maintenance over a 20 year period with resurfacing in porous asphalt. The results are presented in Table 4-5

■ **Table 4-5 Costs, Benefits and BCR of Tawa Interchange Alignment**

	<b>2008 Capital Costs</b>	<b>Accident Benefits</b>	<b>Travel Time Benefits</b>	<b>Vehicle Operating Cost Benefits</b>	<b>BCR</b>
Do Minimum	\$1,400,000	--	--	--	--
Northern Curve	\$4,600,000	\$3,600,000	\$4,200,000	-\$940,000	1.7
Interchange Curve	\$6,400,000	\$1,900,000	\$3,800,000	-\$630,000	0.9
Southern Curve	\$4,500,000	\$5,200,000	\$7,300,000	\$600,000	3.2
<b>Combined Route</b>	<b>\$15,500,000</b>	<b>\$10,800,000</b>	<b>\$15,300,000</b>	<b>-\$960,000</b>	<b>1.8</b>

### **Environmental / Urban Planning**

The environmental / urban planning considerations relating to the Tawa Interchange improvements are summarised below:



- *Community Cohesion<sup>5</sup>*

The improvements have limited additional benefits in terms of improving access across SH1. However, the overall safety benefit of the works can contribute to connecting suburban communities to their place of work.
- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

The disturbance of significant cultural and heritage features is considered to be neutral as there are no known features in the vicinity of the site. This would need to be confirmed through further assessment.
- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

There would be some loss of planted and regenerating native vegetation alongside the northern and southern curves. This vegetation has habitat and amenity values but effects could be mitigated by appropriate restorative planting.
- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

There could be some potential effects on surrounding residents, if the distance between the road and receivers were halved. This is likely to be a minor effect, however if the realignment causes noise sensitive locations (such as residences, especially in Taylor Terrace) to be more exposed to the road, due to changes in vertical alignment or embankments being removed the adverse effects could be increased. Further investigations would be required to confirm the scale of the effects and the appropriate mitigation measures.
- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

Erosion and sedimentation effects are likely to remain neutral, however further investigation would be required to determine any potential impact.
- *Manage increased hazards of climate change impacts on state highway infrastructure.*

It is considered that climate change effects at this location are likely to be limited. However, this would need to be confirmed through further assessment, particularly when further assessment on slope stability and susceptibility to storm events is understood.
- *Support local development.*

This is dependent on the design of the interchange. The interchange connection may improve access to additional residential catchment for retail/commercial activities in Tawa. How the

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<sup>5</sup> Community cohesion considers the connectivity of a community, its ability to access employment and service centres with relative ease and without unreasonable delay. Where applicable it also considers impacts on places where communities meet.



design interacts with the new development currently being built at Tawa would need to be investigated further.

- *Landscape Issues.*

Aligning the three curves would in the long term be similar to existing landform and visual landscape values. In the short to medium term removal of existing vegetation that screens the road in places and the exposed cut face would be visible until mitigation planting similar to the existing has established.

- *Consenting Issues.*

In terms of statutory approvals, an alteration to designation and outline plan of works would most likely be required to accommodate the additional space for the ramps. This could be difficult, as it would require consultation with the surrounding neighbours and community and council buy in. However, as the works are consistent with the WCC's vision for the town centre the project should be viewed positively by Council.

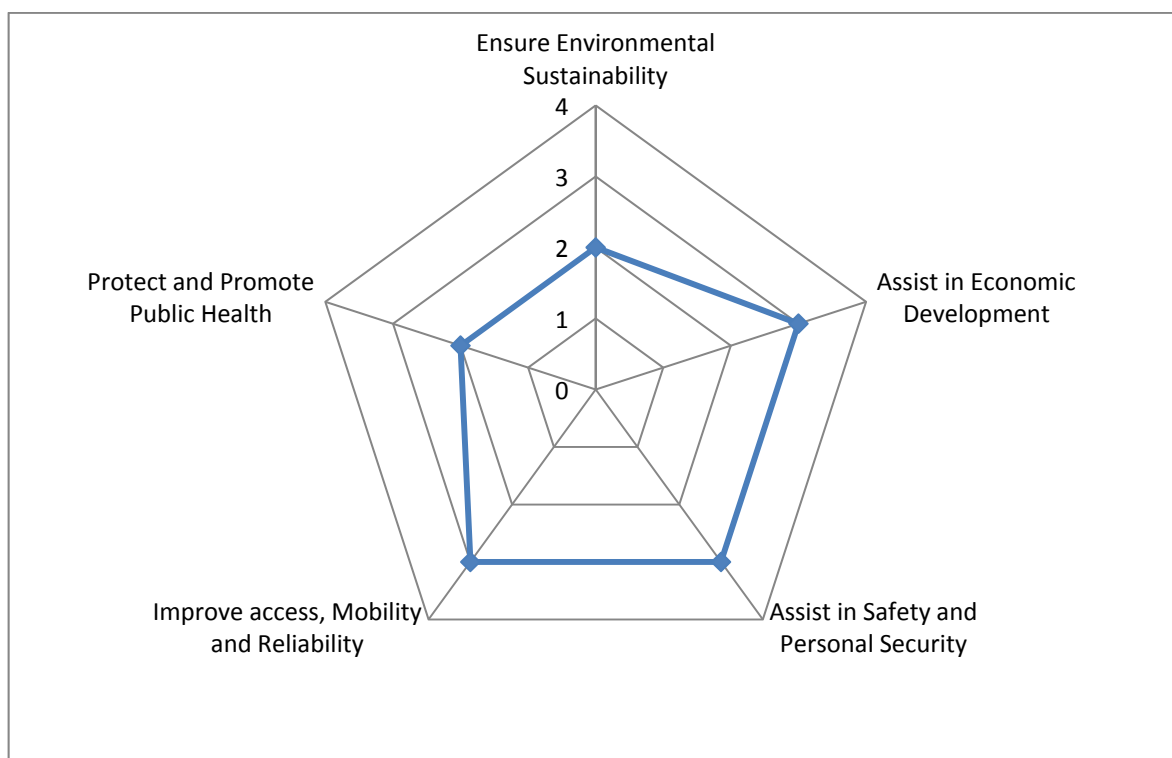
### **Next Steps**

As Table 4-5 indicates, the southern curve has the greatest economic return while the curve at the interchange has the lowest. It is recommended that to get the greatest benefit from these projects, reduce costs of construction and to limit the risk of accident migration, it should be considered as one project with all three curve improvements carried out simultaneously.



#### 4.1.2. Additional Southbound Bus Shoulder

This project provides a southbound bus shoulder along State Highway 1 between the Newlands Interchange ramps and Hutt Road. This will provide a dedicated express lane for buses travelling down the Ngauranga Gorge and will join the proposed bus lane at Hutt Road. This will provide an express bus route between the Newlands Interchange and Wellington City. Figure 4-2 and Table 4-6 summarise the key study objectives met by the implementation of this project.



■ **Figure 4-2: Objectives by Additional Bus Shoulder Project**

■ **Table 4-6: Objectives by Additional Bus Shoulder Project**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	Improves the access between the communities along SH1 and Wellington City. It could also reduce environmental impacts such as noise/air quality from mode shifts from the use of state highways to buses. Improved travel times on buses are likely to attract patrons potentially allowing for more sustainable development in areas around PT nodes.
Assist Economic and Regional Development	Improves the PT travel times down Ngauranga Gorge which will attract patrons from private vehicles; reducing travel times for all road users. Reduced travel times and improved travel time reliability will attract development and encourage travel to outlying areas for employment.



Assist in Safety and Personal Security	Increasing PT likely to reduce the overall VKT. Buses have a lower accident rate per pax-km. Increasing patronage on buses may improve the overall accident rate on the network.
Improve Access, Mobility and Reliability	Provides a more reliable and efficient bus service along SH1. Will attract PT users which will reduce travel times for PT and other vehicles. Walking trips may increase as people make the journey to and from the bus stops.
Protect and Promote Public Health	Walking trips may increase as people make the journey to and from the bus stops.
<p><b><u>Conclusion:</u></b></p> <p>This project would generate good travel time and reliability benefits for bus users. However, the likely number of buses using this facility is insufficient to operationally justify a bus lane and the BCR indicates that it has poor economic justification.</p>	

### Transport and Rooding

Existing travel patterns in the vicinity of the junction of SH1 and SH2 frequently generates slow moving or static queues during the AM peak. This often leads to queues along SH2 and up Ngauranga Gorge on SH1. Buses travelling southbound on the Ngauranga Gorge during the morning peak are often delayed by this congestion.

There is potential for the construction of an additional southbound bus shoulder within the Ngauranga Gorge to improve travel times and travel time reliability along SH1 and promote public transport. The proposed bus lane would be located in an increased shoulder and the current travelling lanes would need to be relocated towards the quarry to accommodate the bus shoulder in the southbound direction. The current alignment provides three lanes in each direction. In the location of the merge lane from Hutt Road (northbound) and the diverge road to Hutt Road / Centennial Highway (southbound), the motorway reduces to two lanes in each direction.

The proposed southbound bus shoulder would be constructed by widening the highway in the northbound direction (towards the existing quarry) and shifting the lane markings and median over. It is proposed that the bus shoulder is 4.0m wide and sealed in a way that clearly differentiates it from general traffic lanes. The new bus shoulder will follow the same vertical and horizontal alignment as the current road and as such, the grades will be the same as those currently in the Ngauranga Gorge. There may be some changes to the intersection at Hutt Road to allow smooth transition of buses into the lanes provided along Hutt Road. For the northbound buses (which are not provided a separate lane), this may include phasing the lights to allow buses to go before other traffic.

The bus services that currently travel along this section of the expressway are shown in Table 4-7.





■ **Table 4-7: Southbound Bus Services which Run through the Ngauranga Gorge**

Bus No.	Service	Weekday Frequency <sup>6</sup>
52	Wellington – Newlands – Woodridge – Paparangi – Johnsonville	30min during off-peak times.
54	Courtney Place – Wellington Station - Ngauranga – Newlands Mall – Churton Park - Johnsonville	Approximately 15min during peak periods;
55	Courtney Place – Wellington Station - Ngauranga – Newlands Mall – Newlands College – Paparangi – Grenada Village - Johnsonville	15 or 30min peak periods; 60 min during off-peak times.
56	Wellington – Paparangi – Johnsonville	15min during peak periods;
57	Wellington – Newlands – Woodridge	15min during peak periods;
58	Wellington – Newlands – Baylands	Approximately 15min during peak periods;

It can be seen from Table 4-7 that during two hour morning peak time there are approximately 35 southbound buses using the Ngauranga Gorge. This is an average of 17.5 buses per hour or one bus every 3.4 minutes. Operationally, to have a bus lane that is perceived to be justified by other road users so that it becomes self enforcing, there is a need to have approximately 30 buses an hour or one bus every two minutes. In this respect, this proposal cannot be operationally justified unless there is a significant increase in bus numbers on this route.

The bus shoulder will allow these services to travel in free flow conditions, improving travel times and travel time reliability into the city. These improvements are likely to encourage the use of public transport, thus contributing to the Government Policy Statement (provide more transport choices, particularly to those who have limited access to a car) and the Updated NZTS Long Term Target to increase the use of public transport). Walking and cycling mode share may increase as bus patronage increases as passengers consider options for travel to and from bus stops. Options to support this bus shoulder include strategically located park and ride facilities in residential areas served by buses using the proposed bus shoulder.

Provision of an uncongested and free flowing bus shoulder may increase patronage of the bus service, and assist in making these areas more accessible for those who are unable to drive. These improvements will mean during morning peak times, passengers have a more reliable and efficient service through the Ngauranga Gorge. Travel to and from these northern suburbs from Wellington will be improved which will support development in these areas.

Table 4-8 summarises the benefits, costs and BCR of the implementation of a southbound bus shoulder down Ngauranga Gorge.

<sup>6</sup> Times are approximate and based on the 28 October 2008 GWRC timetables. Peak times based on AM peak



■ **Table 4-8 Costs, Benefits and BCR of southbound bus shoulder through Ngauranga Gorge**

2008 Capital Costs	Benefits	BCR
\$34,000,000	\$1,800,000	0.05

**Environmental / Urban Planning**

The environmental / urban planning considerations relating to the construction of an additional southbound bus lane are summarised below:

■ *Community Cohesion*

It is anticipated that an additional bus shoulder would decrease travel time for those using public transport, which would have a positive effect to community cohesion. In addition, it has the potential to make Wellington City more accessible during peak hours for those using the bus services, encouraging more commuters to use these services.

■ *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

An additional bus shoulder would require major excavations along the side of the quarry to provide for the additional space required. However, the effect of this excavation is anticipated to be neutral as there does not appear to be any heritage or cultural sites within the area.

■ *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

Due to the major excavations required, there would be some loss in vegetation on the western side of the current motorway. A small area adjacent to the Newlands off-ramp has been identified as bush remnant in WCC vegetation inventories. However, effects on the mainly planted or regenerating vegetation should be able to be mitigated by appropriate planting. Any encroachment on the eastern side of the current motorway would affect more significant bush areas and stream values. There are no known wetlands, critical habitat or endangered species in this area.

■ *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

It is considered that the noise and vibration effects are likely to remain neutral due to the high volume of traffic already using this route. The additional bus lane and any potential increase in bus services are unlikely to have a major effect on the surrounding environment.

■ *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

Due to the major excavations required, there is potential to cause erosion and sediment to enter nearby streams (tributaries of the Ngauranga Stream). The effect of this would be negative and



appropriate mitigation measures would need to be clearly identified and implemented to reduce the scale of effect.

- *Support local development.*

An additional southbound bus shoulder will improve the quality of the PT service which has benefits such as increasing accessibility between the northern suburbs and the Wellington CBD and more reliable, faster travel times to the local community. This has the potential to support local retailing and other commercial activities in the Johnsonville, Newlands, Paparangi areas through increased numbers of people being encouraged to commute from these suburbs into Wellington.

- *Landscape Issues.*

Widening the road to accommodate the additional bus shoulder on the quarry side of the road would in the long term be similar to existing landform and visual landscape values. In the short to medium term the exposed cut face would be visible until any mitigation planting has established.

- *Consenting Issues.*

An Outline Plan of Works or alteration to designation will be required. If an alteration to designation is required there may be some difficulty in obtaining statutory approvals.

### **Next Steps**

As the likely number of buses using this facility is insufficient to operationally justify a bus lane; and the BCR indicates that it has poor economic justification, it is not recommended that this option is considered further.

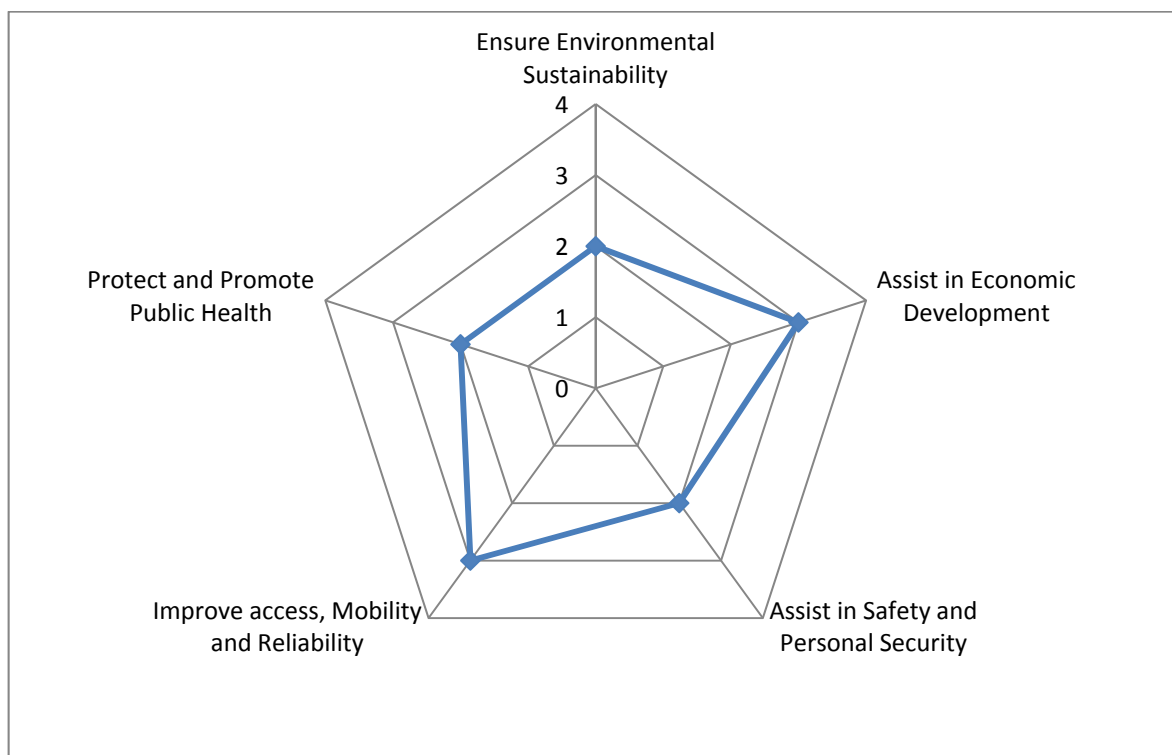


## 4.2. Ngauranga to Dowse

The various options considered under the routes between Ngauranga to Dowse on SH2 are detailed in the following sections.

### 4.2.1. Road, Rail and Cycleway Realignment between Ngauranga and Petone and Construction of a Seaward Cycleway

This project realigns sections of SH2 and rail between Ngauranga and Petone to a *design speed* of 120 km/h. A seaward cycleway may also be constructed as part of this option. The primary reason for a realignment of the highway is to improve the safety for motorists and the efficiency of the rail network. The rail network has several sections which are currently designed with 70km/h curves; by realigning the road these curves can be straightened out so that the rail line can be configured to accommodate operating speed of 105km/h. This would result the section of rail line being consistent with the operating speed of the rest of the Hutt Line. There will also be some small improvements to travel times for motorists on SH2. A seaward cycleway will have a number of benefits in terms of safety and accessibility. Figure 4-3 and Table 4-9 summarise the key study objectives met by the implementation of this project.



■ **Figure 4-3: Project Benefits of Ngauranga to Dowse Road and Rail Realignment**



■ **Table 4-9: Project Benefits of Ngauranga to Dowse Road and Rail Realignment**

<b>Project Objectives</b>	<b>Project Benefits</b>
Ensure Environmental Sustainability	There are potential impacts from sea level rise/storm surge if a new route is developed. Potential reclamation of the harbour could also have a significant impact on the marine ecology and landscape values.
Assist Economic and Regional Development	There has been a high number of accidents along this route, improving the alignment will allow improved and safer access and reduce travel costs. There will be improved travel time for trains and an opportunity to develop a recreational cycleway which can be promoted to tourists.
Assist in Safety and Personal Security	Will improve the safety and reduce accidents along the route. Currently there is poor road geometry and a history of accidents; improved alignment will significantly reduce the number of accidents. Improvements to rail services will attract patrons and reduce crashes (rail has a lower crash rate per pax-km). There may be an increase in walking and cycling as a consequence of a high quality cycle track.
Improve Access, Mobility and Reliability	Minor decreases in travel times (to motorists) as a result of the improved alignment along the road. The trains will be able to travel faster along this section of the network, reducing public transport travel times. The provision of the seaward pedestrian/cycle facility will provide protection at Ngauranga for rail which experiences unreliability issues in the event of storm surge.
Protect and Promote Public Health	There may be an increase in walking and cycling as a consequence of a high quality pedestrian/cycle track and faster and more reliable train services.
<b><u>Conclusion:</u></b>	
This project produces significant benefits for road users, rail and pedestrians and cyclist in terms of reduced travel times and safety benefits. However, the large cost of the project means that these benefits are not sufficient to make this project economically justified.	

### **Transport and Rooding**

This project provides an improved alignment to the road and rail between Ngauranga and Petone. The improved road alignment would have a design speed of 120km/h and would be designed according to the requirements in the State Highway Geometric Design Manual, Austroads and other supporting documents. The current alignment of this section of SH2 does not comply with these design standards in areas in terms of horizontal alignment and cross-sectional design.

The cycle path will be designed to provide a two-way, safe route for commuter cyclists and is designed to encourage cyclists to use the facility rather than the highway shoulder. It will be designed to a high standard (as per the Austroads design code) to provide a safe, convenient and efficient cycling facility. It should be noted that this cycleway may attract a latent demand of people who do not currently cycle along this route due to safety concerns.

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In the last five year period (2004-2008) there have been 328 reported crashes along SH2 between the Ngauranga Interchange and the Petone overbridges. Eighty-nine of these accidents have resulted in injuries. Accident analysis has been carried out and Table 4-10 and Table 4-11 provide a summary of these crashes.

■ **Table 4-10 : SH2 crashes between Ngauranga Interchange and Petone overbridges (2004-2008)**

Year	Fatal	Serious	Minor	Non Injury
2004	0	1	13	40
2005	0	0	9	33
2006	0	0	16	52
2007	0	1	21	53
2008	0	6	22	61
<b>TOTAL</b>	<b>0</b>	<b>8</b>	<b>81</b>	<b>239</b>

■ **Table 4-11: Type of crashes - SH2 between Ngauranga Interchange and Petone overbridges (2004-2008)**

Crash type	Number	Percentage (%)
Overtaking	49	15
Straight Road: Lost Control / Head On	35	11
Bend: Lost Control / Head On	56	17
Rear End / Obstruction	175	53
Crossing / Turning	9	3
Pedestrian Crashes	1	0
Miscellaneous	3	1
<b>Total</b>	<b>328</b>	<b>100</b>

Rear ending and loss of control accidents account for 70% of all accidents; an improvement in the alignment could reduce this type of accident. Improvements in rail will allow the trains to increase their speeds from 70km/h to 100km/h along this section of the tracks. This will assist in reducing travel times, and could contribute to a more frequent service.

The provision of a high quality cycling facility on the seaward side of the railway will provide a separate cycleway between Ngauranga and Petone. This will connect to Wellington City via the existing Hutt Road cycleway. There are also options for connections to the Hutt City cycle path and Petone foreshore. Approximately 430 cyclists travel along SH2 per day (2006 counts); a significant number of these cyclists use the highway shoulder rather than the cycling facility. The existing dedicated cycleway facility is incomplete, terminating approximately 1km south of the Petone overbridges. The less than ideal condition of the facility makes it unsuitable for high speed



commuter cyclists. Provision of a new high quality cycleway will encourage the use of the cycleway rather than the shoulder, increasing the safety for all road users.

These improvements will contribute to the objectives of the NZTS and GPS through promotion of walking and cycling; improvement of the current alignment to reduce accidents and improvements to the level of service of the public transport. This project will also contribute to enhancing access between the Hutt Valley and Wellington City and may attract development to both areas.

Table 4-12 gives a summary of the benefits, costs and BCR achieved with the implementation of a road, rail and cycleway upgrade of SH2 between Ngauranga and Petone.

■ **Table 4-12: Costs, Benefits, and BCR of road, rail and cycleway upgrade between Ngauranga and Petone**

2008 Capital Costs	Benefits	BCR
\$468,000,000	\$41,400,000	0.1

**Environmental / Urban Planning**

The environmental / urban planning considerations relating to the road and rail realignment (120km/h *design speed*) and cycleway are summarised below:

■ *Community Cohesion*

Overall, community cohesion effects of this option are considered to be positive. The rail realignment would provide a faster service, meaning that it would be quicker and easier for patrons to get around the greater Wellington region, and would also improve inter-community connections. The additional cycleway would provide a continuous cycling and walking route between Petone and Ngauranga (and then to Wellington). This is a positive effect particularly for those cyclists who are not confident cycling on the shoulder to make the journey between the two destinations. The effect as a result of the road realignment would increase the speed of the route, which would decrease the travel times, however this positive effect is considered to be minor.

■ *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

Whilst it is recognised that there are a number of historical sites along this route, it is considered that (subject to further investigations and detailed design), the works associated with this option would be contained within the existing state highway designation, which would avoid these historical sites. Overall effect on the disturbance of these sites is considered to be neutral.

■ *No net loss of native vegetation, wetlands, critical habitat or endangered species.*



The proposed road and rail realignments may require reclamation of the coastal marine area (CMA) to increase the width of the corridor. The effect of this reclamation is therefore negative and would require regional consents under the Regional Coastal Plan and could potentially be classified as a Restricted Coastal Activity under the Regional Coastal Plan and subject to additional Minister of Conservation approval. The actual coastal resources affected by such reclamation are not yet known. As the realignment would involve a minor extension of an existing reclamation its effect may be minor.

Subject to further investigations and design, the route may result in the loss of some native vegetation if it cuts into the coastal escarpment, particularly as there are areas of vegetation zoned as Open Space B and identified in WCC inventories as primary forest and bush areas, which are significant ecological resources. Construction may also have a negative impact on the Horokiwi Stream and other small streams flowing into the harbour due to reclamation and sedimentation.

Similarly, the route may result in the loss of some native vegetation if it cuts into the hillside, particularly as there are conservation areas identified under the Wellington District Plan which are significant ecological resources. Construction may also have a negative impact on the Horokiwi Stream due to sedimentation.

In respect of the proposed cycleway, it is anticipated that effects would remain neutral as the route would be contained within the current highway designation.

- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*  
Noise and vibration effects associated with this option are likely to be neutral as there are few sensitive receivers such as residential areas in close proximity. Most houses along this route are located on the western side and are elevated in relation to the alignment. Increasing the design speed up to 120km/h may increase the traffic noise level by up to 1.5dB, as the route alignment allows for operating speeds up to 100km/h. This effect would be considered to be less than minor. Increasing the speed from the Petone off ramp to Dowse would increase the traffic noise level by up to 4dB. This would be considered to be a minor effect. Construction effect of the cycleway is considered to be positive as it potentially takes people out of vehicles onto cycles reducing noise generation.
- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*  
Erosion and sedimentation effects associated with the rail and road realignments are likely to be negative and will affect the CMA, particularly if the design for additional width was to be on the land side. Appropriate erosion and sediment control measures would need to be adopted to ensure minimum erosion and sediment runoff.
- *Manage increased hazards of climate change impacts on state highway infrastructure.*





The proposed road realignment to be provided for through reclamation has the potential to be affected by future sea level rise and storm surge. Use of the landward side may also increase potential for slips from increased storms over time, this may potentially result in landslides. The highway is also prone to flooding, so this risk may increase. The future structures would need to take these potential impacts into consideration to ensure these effects are avoided, remedied or mitigated.

- *Support local development.*

**120km/hr Design Speed:** The proposed option would have a positive effect on local development as the increased speed and reduction in travel times along SH2 would make the Petone area and Hutt City area more attractive to employment, commercial activities and potentially increase desirability for people to live in Lower Hutt and travel to work in the Wellington CBD. This is true for both rail and road realignment. Residential development, particularly around existing public transport nodes may increase due to the increased level of service provided by the improved travel times. Residential development can help create wealth in the local economy.

**Cycle way:** The provision of a purpose built cycle way will encourage commuter trips between Petone and Ngauranga (and then onto Wellington) thus helping with local economic development. Cycling as a sustainable travel mode also helps to reduce traffic congestion on local roads, thus improving the overall economic efficiency of getting goods, people and services between locations. Less money spent on fuel means more money for other productive sectors.

- *Landscape issues*

This is a modified landscape but further modification to the landform such as cuts into the escarpment from Ngauranga to Dowse would have a significant effect on recognised values of the visual landscape, particularly in the short to medium term, but also in the long term as vegetation on the coastal escarpments would most likely take some time to establish. The vegetated escarpment along the western edge of the harbour is visible from Wellington, the harbour, Petone and Eastbourne and is perceived as a natural landscape. The vegetated escarpment along the western side of SH2 is visible from the road and the valley floor, creating a 'green ribbon' and the landscape character of this side of the valley. Depending on the location of escarpment modification, reserves and conservation areas may be affected. Reclamation on the harbour side would also have an effect. However, this reclamation provides an opportunity to improve the entrance to Petone and the Hutt Valley for cyclists, walkers and vehicles.

- *Regional Parks.*

The proposed route would pass close to the Korokoro Valley end of Belmont Regional Park. The further the road is away from the coastal edge and the closer to the valley entrance and Korokoro Stream, the greater the effect on the landscape and recreational experience of



Korokoro Valley and this entrance to Belmont Regional Park. This valley is perceived as a natural area and a contrast to urban Petone. This contrast and the valley's proximity to the built area heighten the experience of its naturalness. However the road could increase recreational access to Korokoro Valley and the regional park and is an opportunity to create a major entrance to the park accessible from the Wellington metropolitan area and SH1, connecting the park to a wider population

- *Consenting Issues.*

Complex statutory approvals may be required, including Alteration to Designation and regional resource consents and possibly Restricted Coastal Activity approval for reclamation of the CMA.

### **Next Steps**

Further investigation has been carried out into the types of accidents that have occurred along SH2 between Ngauranga and Petone. Analysis was carried out on the number and location of serious injury accidents within the last 5 years (2004 – 2008). Appendix C provides details of the serious and fatal accidents along the section of SH2 between Ngauranga and Petone. It has been identified that the majority of the “serious accidents”<sup>7</sup> have been in the following locations:

- Petone off ramp
- Petone overbridge area
- Horokiwi area
- Ngauranga on and off ramp

The Petone off ramp and the Petone overbridge present a number of issues in terms of design and safety. The current overbridge has an “S” bend and speed restriction which motorists are required to negotiate. The off ramp also has a tight curve on the approach to the Hutt Road and The Esplanade roundabout. In these locations, the speed environment does not match that of the surrounding highway and improvements to these alignments could significantly improve the accident rate. As discussed in Section 4.3 it is proposed that with the construction of the SH1 – SH2 Link Road, there will be improvements made to the alignment of SH2 and the overbridge will be rebuilt to accommodate safe on and off ramps. It is considered that the key issues in the location of the Petone Interchange will be addressed as part of this upgrade. Short term (before 2016) mitigation options will be expensive and may not provide any significant benefits.

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<sup>7</sup> As identified in the CAS database



There have been a number of accidents at the right hand turn lane from the south bound SH2 lane into the Horokiwi Road, the type of accidents are typically:

- a) right turners pulling out in front of northbound traffic, and
- b) right turners being “rear-ended”

NZTA is currently investigating options to close this right hand turn facility, and this will reduce the number of accidents in this location.

An investigation has also been carried out into the accidents occurring in the vicinity of the Ngauranga on and off ramps to SH2. Two out of the three accidents that occurred in this location were as a result of lane changes. It is not believed that there is any works that can be carried out in this location to improve the safety for road users.

Although there have been a number of serious accidents along SH2 between Ngauranga and Petone in the last five years, it is believed that work carried out in key locations (the Petone overbridge and the Horokiwi right hand turn) will assist in improving the safety along this route. It can be seen from the summary table that 54% of the accidents along this route also occur during peak times. The introduction of the SH1 – SH2 Link Road (discussed in Section 4.3) is expected to reduce congestion on SH2, and may assist in reducing the accident record.

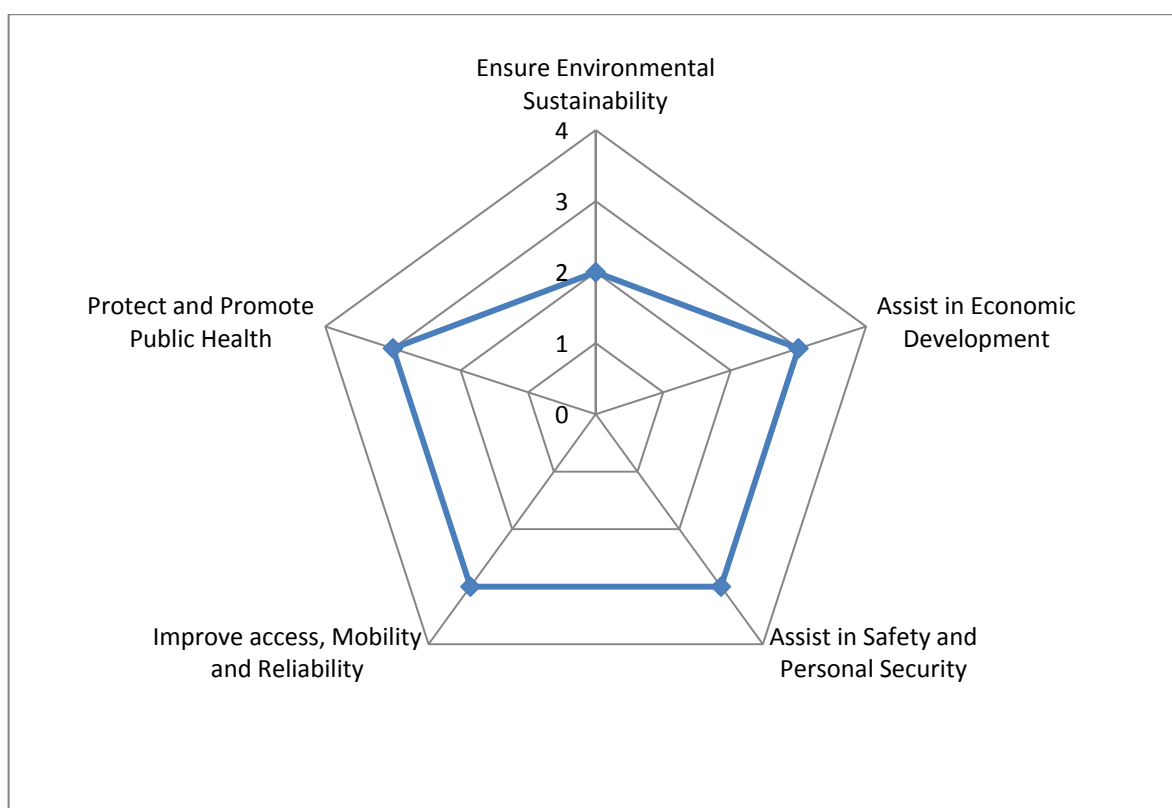
In terms of environmental impacts, without the realignment of SH2 there remains an issue with storm surge having an impact on the operation of the railway service. Ontrack has advised that this can be an issue once or twice a year. Reclamation of the harbour to allow for this realignment could also have ecological impacts on the marine environment and would change the visual character of the area.

In summary, although there appears to be a high number of accidents along SH2 between Ngauranga and Petone, it is expected that the key safety issues will be addressed through the implementation of other projects, and as a consequence the realignment of SH2 will not provide any significant safety benefits. Therefore it is not recommended that this project is considered further.



#### 4.2.2. “Great Harbour Way” - Seaward Cycleway

This option involves the construction of a cycleway on the seaward side of the railway between Ngauranga and Petone (with the possibility of continuing between Petone and Seaview) and would form part of the “Great Harbour Way – Te Whanganui-a-tara”<sup>8</sup>: a facility that would be a “continuous, safe, signposted walkway and cycleway around the whole perimeter of Te Whanganui-a-Tara – Wellington Harbour from Fitzroy Bay in the east to Sinclair Head in the west”. Figure 4-4 and Table 4-13 summarise the key study objectives contributed to by this project.



■ **Figure 4-4: Project Benefits of the Great Harbour Way**

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<sup>8</sup> <http://www.greatharbourway.org.nz/index.shtml> - Note: this report only considers the section of the “Great Harbour Way” between Ngauranga and Petone.



■ **Table 4-13 Project Benefits of the Great Harbour Way**

<b>Project Objectives</b>	<b>Project Benefits</b>
Ensure Environmental Sustainability	There are potential impacts from sea level rise/storm surge if a new route is developed. Potential reclamation of the harbour could also have a significant impact from an ecology and landscape point of view. However, there could also be positive impacts by encouraging cycling to other recreational facilities and reducing commuter traffic through changing modes. Depending on the design of the cycleway this could also provide a recreational space that provides positive landscape benefits.
Assist Economic and Regional Development	Will provide a fully integrated purpose built facility that can be used as a commuting route during peak times and promoted as a recreational tourist facility.
Assist in Safety and Personal Security	Attracting people from private motor vehicles onto bicycles will reduce the overall number of VKT. The cycleway will be on the seaward side of the railway (providing shelter from the highway) and improving safety for both highway users and cyclists.
Improve Access, Mobility and Reliability	More novice cyclists, currently using private vehicles, will consider cycling. Travel times may reduce as motorists move from private vehicles to cycles. This will reduce crash exposure to nervous or novice cyclists. There will be a purpose built facility for walkers and cyclists to enjoy. Commuters will have a purpose built facility for high speed cycling.
Protect and Promote Public Health	Will provide a fully integrated facility for all walkers and cyclists. Will attract new cyclists and encourage active modes of transport.
<p><b><u>Conclusion</u></b></p> <p>This project provides a cycleway adjacent to SH2 which will provide a comprehensive cycling and walking facility as well as connect facilities south of Ngauranga and north of Petone.</p> <p>This project is expected to generate amenity and safety benefits for cyclists and is likely to induce new cyclists. New cyclists will provide a minor reduction in travel time for motorists on SH2. The level of inducement of cyclists is uncertain at this stage.</p>	

### **Transport and Rooding**

As outlined above, the proposal is for the construction of a “Greater Harbour Way”; a cycling and walking track around the Wellington harbour. One of the key “problem” areas with this track is the section between Ngauranga and Petone. There is a cycleway between Ngauranga and Petone, but it is of low standard (drainage, surfacing and maintenance) and terminates approximately 1km south of the Petone overbridge. The proposed Great Harbour Way would replace the existing cycleway with a new walking and cycling track on the seaward side of the railway. With the “Great Harbour Way” on the seaward side of the highway cycling *could* be banned from the state highway reserve; this would allow the highway to be considered for re-designation as a motorway.



The new cycleway would serve a number of purposes including providing a two way, high speed track for commuter cyclists. Previous reports<sup>9</sup> have determined that approximately 430 cyclists use this stretch of road per day; the majority of these cyclists are commuter cyclists travelling between Wellington City and the Hutt Valley during peak times. The facility will also be promoted as a “tourist attraction” for recreational cyclists and would be one of very few tracks in the world where you can “safely walk or cycle the entire coastline of a major city harbour<sup>10</sup>”. The facility would need to accommodate both pedestrians and cyclists in a safe and efficient manner.

As previously discussed, the existing cycling facilities are not suitable for two way commuter cycling and the cycleway terminates before Petone. The “Great Harbour Way” will be designed to accommodate two directional commuter traffic. A cycleway on the seaward side of the rail will provide a significant distance and physical barrier between cyclists and motorists. This will reduce the probability of an errant vehicle coming into contact with cyclists. NZTA Crash Analysis System (CAS) analysis with the latest data has shown that in the past 5 years (2004 – 2008) there have been 5 accidents involving cyclists along this section of the highway. All accidents involving cyclists have resulted in injuries. Accident analysis has been carried out and Table 4-14 and Table 4-15 provide a summary of these crashes.

■ **Table 4-14: Quantity of Cycle Crashes between Ngauranga Interchange and Petone overbridge**

Year	Fatal	Serious	Minor	Non Injury
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	0	1	1	0
2008	0	2	1	0
<b>TOTAL</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>0</b>

■ **Table 4-15: Type of Cycle crashes - SH2 between Ngauranga Interchange and Petone overbridges (2004-2008)**

Crash type	Number	Percentage (%)
Overtaking	0	0
Straight Road: Lost Control / Head On	1	20
Bend: Lost Control / Head On	0	0

<sup>9</sup> Ngauranga to Petone Cycleway, Scheme Assessment Report (including Addendum), October 2006 for Transit New Zealand by Opus International Consultants.

<sup>10</sup> Note that this is only the case when the full scheme is provided; this report only considers the Ngauranga to Petone Section.



Crash type	Number	Percentage (%)
Rear End / Obstruction	2	40
Crossing / Turning	2	40
Pedestrian Crashes	0	0
Miscellaneous	0	0
<b>Total</b>	<b>5</b>	<b>100</b>

“Austroads Guide to Traffic Engineering Practice: Part 14 Bicycles” recommends that for a major recreational path an overall width of 4.0m should be provided. A clearance of 0.5m should be provided on either side of the cycleway to allow cyclists to safely pass obstacles such as fences and lighting poles. A fence should be provided between the railway corridors (as required by Ontrack). The alignment of the cycleway will follow the alignment of the highway and railway reserve. As such, the cycleway will have a similar grade to that of the highway and rail reserve.

The proposed “Great Harbour Way” is designed to promote all types of cycling and walking. It will provide a continuous, high quality walking and cycling facility between Petone and Ngauranga and encourage active forms of transport, whether this is walking, running, commuting or recreational cycling. This facility will encourage commuting cyclists to move from the highway shoulder (currently 97 – 98%<sup>11</sup> of commuting cyclists use the shoulder) by providing a high quality surface, designed to accommodate high speed cyclists. The transferral of cyclists from the shoulder to a separate path will improve the safety for both cyclists and SH2 motorists. Similar cycle ways have attracted significant tourism and boosted development in the area with “Central Otago Rail Trail increasing local business revenues by 25%<sup>12</sup>”.

Table 4-16 summarises the benefits and costs of a proposed new seaward side cycleway between Ngauranga and Petone.

■ **Table 4-16: Costs, Benefits and BCR associated with the Great Harbour Way**

2008 Capital Costs	Benefits	BCR
\$47,000,000	\$37,300,000	0.8

The benefit cost analysis carried out as part of this project has been carried out at a high level with a number of assumptions being made; these assumptions include

- The new facility will double the number of cyclists;
- The length of the cycleway is approximately 4.5km in total;

<sup>11</sup> Ngauranga to Petone Cycleway, Scheme Assessment Report (including Addendum), October 2006 for Transit New Zealand by Opus International Consultants.

<sup>12</sup> [http://www.greatharbourway.org.nz/SubmPresns/NZTA\\_Presn\\_20081023.pdf](http://www.greatharbourway.org.nz/SubmPresns/NZTA_Presn_20081023.pdf)



- Benefits are only calculated over the section between Ngauranga and Petone (although most cyclists will continue into Wellington City)
- Benefits are considered over all 365 days of the year ; and
- Cycle accidents have not been considered as part of the analysis.

As pointed out, this cycleway is only a section of the total “Great Harbour Way” and if completed in full, cyclists using this section will also use other sections of the proposed route. For the purposes of benefit cost analysis, the benefits to cyclists are considered only on this section of the route. Although this may be considered conservative, it will allow this project to be considered as a stand-alone project without the need construct the whole “Great Harbour Way”.

The “Great Harbour Way” is consistent with the goals and principles of the LTMA, NZTS, and GPS, and takes account of the RLTS and NEECS.

This project was initiated under the GPS that was released in August 2008. The most pertinent target identified in this document is, “Increase number of walking and cycling trips by one percent per year through to 2015.” Implementing the “Great Harbour Way” is consistent with this objective.

The “Great Harbour Way” is also consistent with and supports the NZEECS, the RLTS, and numerous other pertinent policy documents. It is mentioned specifically in the Ngauranga to Airport Corridor Plan and in the Regional Cycling Plan, both of which identify support for development of the Great Harbour Way concept. This would also be consistent with the intentions of the Hutt Cycling Plan as Hutt City seeks to have a continuous and integrated cycle network which includes a route along the Petone foreshore and routes parallel to SH2 north of Petone. Clearly the connectivity of the wider network will be enhanced by completing a Ngauranga to Petone cycle path.

### **Environmental / Urban Planning**

The environmental / urban planning considerations relating to seaward cycleway are summarised below:

- *Community Cohesion*  
Overall, community cohesion effects of this option are considered to be positive. The proposed cycleway would provide a continuous cycling and walking route between Petone and Ngauranga (and then to Wellington). This is a positive effect particularly for cyclists who are not confident cycling on the shoulder to make the journey between the two destinations.

- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

While it is recognised that there are a number of historical sites along this route, it is considered that (subject to further investigations and detailed design), the works associated

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with this option would be contained within the existing state highway designation, which would avoid these historical sites. Overall effect on the disturbance of these sites is considered to be neutral.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

Effects of the proposed cycleway are likely to be adverse on the marine environment. The cycleway require foundations into the CMA, whereby regional consents for occupation of the CMA would need to be applied for, and any potential effects on marine life would need to be carefully considered and mitigated.

- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

Noise and vibration effects associated with this option are likely to be neutral to positive as there are few sensitive receivers such as residential areas in close proximity. Construction effect of the cycleway is also likely to be minor and would be of a temporary nature.

- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

The proposed cycleway to be provided for through reclamation has the potential to be affected by future sea level rise and storm surge. The highway is also prone to flooding, so this risk may increase if this is not addressed in design. The future structures and management plans would need to take these potential impacts into consideration to ensure these effects are avoided, remedied or mitigated.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

The proposed cycleway to be provided for through reclamation has the potential to be affected by future sea level rise and storm surge. The future structures or reclaimed land would need to take these potential impacts into consideration to ensure these effects are avoided, remedied or mitigated. For example, through increasing height of new reclaimed land or providing higher levels of service for storm protection structures.

- *Support local development.*

The proposed option could be positive to local development as providing a link between Ngauranga (and the rest of Wellington) and Petone (and potentially to Seaview) could mean that more people are likely to travel between Wellington and Petone for employment. This option may also encourage local economy spend in the Petone area from the recreational walkers and cyclists potentially being attracted to this route.

- *Landscape Issues.*

The seaward cycleway/walkway route is in a highly modified landscape and is an opportunity to create new linear public open spaces along the route including access to the water for recreational purposes and rest areas.

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- *Regional Parks.*  
The proposed route would not pass through the regional park but would increase access to Belmont Regional Park by adding capacity to the networks that lead to the park.
- *Consenting Issues.*  
Complex significant statutory approvals are required for regional resource effects, including Alteration to Designation and Restricted Coastal Activity consents.

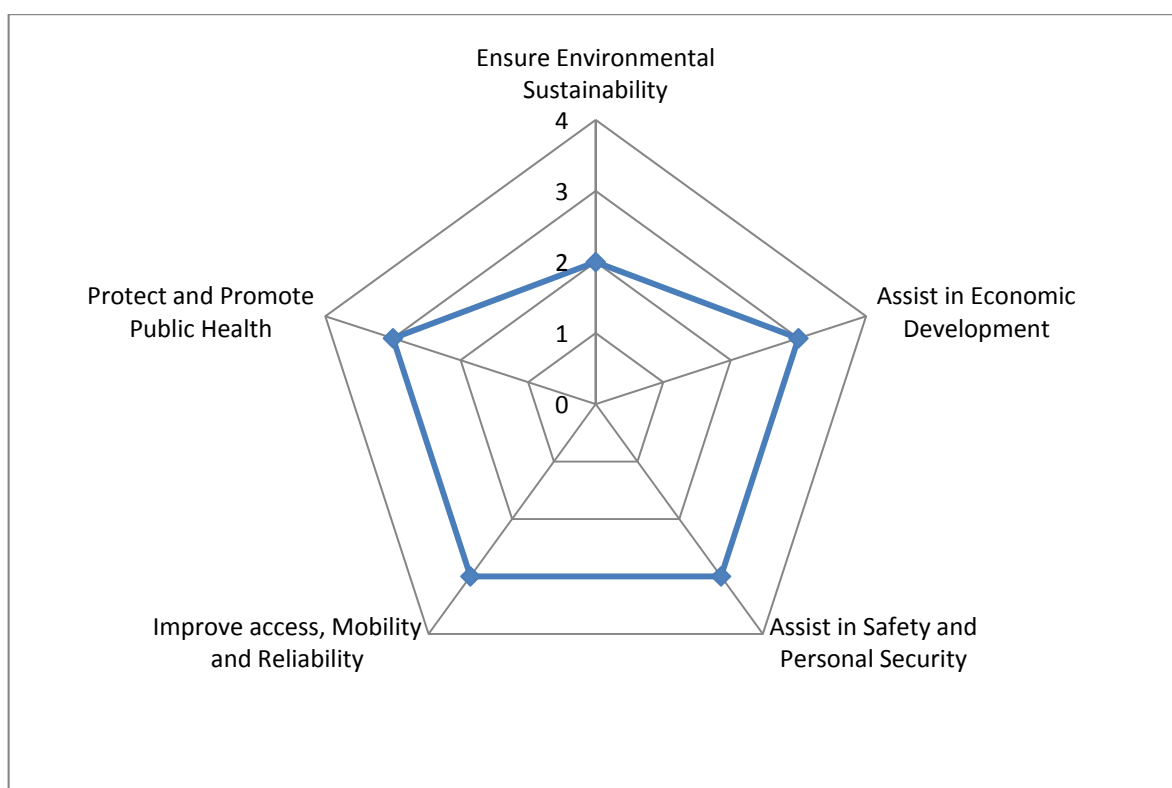
### **Next Steps**

At this stage, it is not considered economical to proceed with the investigation and construction of the “Great Harbour Way” cycleway. As part of the strategy for the corridor between Ngauranga and Petone, it is considered important to provide a completed cycleway, but this can be done through improvements and completion of the existing cycleway. The following Section of the report describes in more detail a project that will complete the existing cycleway facility. It has been developed in such a way that it could form part of a wider “Great Harbour Way” in the future. Therefore it is not recommended that this project is considered further.



#### 4.2.3. Completion of the Off-road Pedestrian/Cycle Facility on SH2

This project will improve the cycling facility along SH2 by completing the existing cycleway with a connection to Petone. The current cycleway terminates approximately 1km south of the Petone overbridge where cyclists are forced to travel along the shoulder of State Highway 2. This option completes, improves and widens the existing cycleway. There have been a number of previous reports on the options for the completion of this cycleway; these have formed the basis of this investigation. Figure 4-5 and Table 4-17 summarises the key study objectives that this project contributes to.



- **Figure 4-5: Benefits of Completion of the Off-road Pedestrian/Cycle Facility on SH2**
- **Table 4-17: Benefits of Completion of the Off-road Pedestrian/Cycle Facility on SH2**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	The provision of a useable, efficient cycleway will encourage more people to cycle rather than taking other transport modes such as cars.
Assist Economic and Regional Development	More novice cyclists currently using private vehicles may consider cycling. This may reduce the number of motor vehicles and may <i>slightly</i> improve travel times. A completed cycleway will form part of a “greater” cycle facility.
Assist in Safety and Personal Security	Attracting people from private motor vehicles onto cycles will reduce the overall number of VKT.



Improve Access, Mobility and Reliability	More novice cyclists, currently using private vehicles, will consider cycling. Travel times may reduce as motorists in private vehicles consider cycling. This will reduce crash exposure to nervous or novice cyclists
Protect and Promote Public Health	Improvements to cycling facilities with a completed link between Petone and Hutt Road will attract new cyclists (both commuter and recreational).
<p><b>Conclusion</b></p> <p>This project completes the separate pedestrian/cycleway adjacent to SH2 by bridging the Hutt line in the vicinity of the Horokiwi intersection. This will complete the existing facility as well as connect facilities south of Ngauranga and north of Petone.</p> <p>A new facility is provided on the seaward side that completes the facility to Petone. This is provided to a standard consistent with the 'Great Harbour Way' concept. This project is expected to generate amenity and safety benefits for cyclists and is likely to induce new cyclists. New cyclists will provide a minor reduction in travel time for motorists on SH2. The level of inducement of cyclists is uncertain but a doubling of cyclists numbers generates a benefit cost ratio that indicates that the project is more than viable. This project can be understood as the first stage of the 'Great Harbour Way' along SH2.</p>	

## Transport and Rooding

At present, there is a cycleway that runs from the edge of Wellington Central (starting in the Thorndon Area) along the Hutt Road to the Ngauranga Interchange; this continues from the interchange to approximately 1km south of Petone. At Petone there is a cycleway that proceeds along the foreshore towards the Eastern Bays; furthermore between Hutt Road and the Hutt line sufficient room exists for an off road cycleway to take cyclists further north, potentially connecting to the Western Hills and the central Hutt.

The existing facility has a number of design issues which need to be addressed to improve the cycling facility. The current issues which will be addressed as part of this project include:

- The cycleway is currently only designed (and only provides sufficient width) for southbound cyclists and does not cater for northbound cyclists;
- The cycleway currently commences approximately 1km south of the Petone overbridge, this means cyclists are required to travel along the SH2 shoulder to gain access to the cycleway;
- The existing surfacing tends to lead to ponding and there are issues with the quality i.e. smoothness (especially for high speed cyclists), drainage and maintenance; and
- There is no safe access to and from Petone.



**Completing the Existing Cycleway**

Opus International Consultants (Opus) have produced a Scheme Assessment Report<sup>13</sup> for completing the cycleway between Petone and Horokiwi and improving the quality of the current cycleway. The key issues in completing the cycleway arise from the tight space constraints between Petone and Horokiwi.

Table 4-18 describes the preferred options that have been identified in the Scheme Assessment Report (SAR) and includes the corresponding benefit cost ratios (as per the SAR) which have been updated to present day values.

■ **Table 4-18: Cycleway options between Petone and Horokiwi**

Project	Brief Description	2008 Capital Costs (\$m)	BCR
Option 1: Bridge	This option would involve the cycleway running along the land side of the railway line between Ngauranga and an area just south of the Horokiwi Intersection; at this point there will be a new bridge crossing the railway (with a clearance of 5.5m) to the seaward side of the railway where the cycleway will run along reclaimed land (approximately 370m length at a width of 4m). Opus undertook discussions with GWRC, Department of Conservation and Iwi who all indicated they had no major issues with reclamation in this location. There would then be a connection to both Hutt Road and The Esplanade. The new cycleway would need to cross the Korokoro stream, and would do so using the existing redundant piers.	13.0 – 15.5	1.3
Option 5 Rail Realignment (B)	This option would involve the relocation of the railway (approximately 1100m) between the Horokiwi intersection and just north of the Petone Overbridge with the closure of the right turn at Horokiwi and minimal (approximately 150m) reclamation of land.	16.0 – 19.5	~1.1

■ **Table 4-19 : Option 1 Costs, Benefits, and BCR of road, rail and cycleway upgrade between Petone and Horokiwi**

2008 Capital Costs	Benefits	BCR
\$13,000,000 to \$15,000,000*	\$17,900,000	1.3

■ **Table 4-20: Option 5B Costs, Benefits, and BCR of road, rail and cycleway upgrade between Petone and Horokiwi**

2008 Capital Costs	Benefits	BCR
\$16,000,000 to \$19,500,000*	~\$17,900,000	~1.1

\*Costs include improvements to existing cycleway facilities

<sup>13</sup> Ngauranga to Petone Cycleway, Scheme Assessment Report (including Addendum), October 2006 for Transit New Zealand by Opus International Consultants.



The main use of this cycleway will be for commuter cyclists travelling to and from Wellington during peak times. This cycleway will need to be provided at a width to accommodate two-way cycle flows, a width of 3.6m as required by the Transit Supplement to the Austroads Guide to cycle ways would be sufficient. The accepted minimum for this cycleway is 2.6m with an absolute minimum of 2.1m. The widths quoted include a 0.3m clearance to hazards. A cross section of the proposed cycleway can be found in Appendix B.

The cycleway will follow the alignment of the State Highway (for the most part), and as such will have similar grades; these grades are considered acceptable for commuter cyclists. For Option 1 it will be necessary to provide ramps to access the proposed bridge across the rail line; these will be designed to comply with the requirements of the Austroads design code.

Completing and upgrading this cycle path will provide a continuous dedicated cycleway facility between Ngauranga and Petone. If designed appropriately and maintained regularly the cycleway may attract new cyclists; promoting active transport.

Both of the options described above offer significant benefits. Option 1 will mean that the cycleway will move onto the seaward side of the railway in the approximate location of the Horokiwi Interchange and any future development of the “Great Harbour Way” (discussed in section 4.2.2) will connect directly to this facility. However, the need for cyclists to negotiate a bridge and the associated ramps will mean that the highway shoulder will be a more attractive route for high speed commuter/leisure cyclists (95-97% of cyclists currently use the highway shoulder<sup>14</sup>). Option 5B will avoid the need for cyclists to negotiate this type of structure, but this cycleway will become redundant if the “Great Harbour Way” is constructed.

#### **Improvements to the Existing Facilities (Ngauranga to Horokiwi)**

Providing a cycle facility between Horokiwi and Petone is not expected to attract a significant number of cyclists due to the fact that the quality of the remaining cycleway is low. As part of the cycleway upgrade; the section between Ngauranga Interchange and Horokiwi will also need to be upgraded. As indicated above, the improvements to the existing cycleway will include surfacing, widening, drainage and maintenance.

#### ***Surfacing***

The existing cycleway will need to be completely resealed to improve drainage (a cross fall of 2% will be required and may need building up in some locations) and improvements to the smoothness of the ride for cyclists.

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<sup>14</sup> p7, Ngauranga to Petone Cycleway Scheme Assessment Report, Opus, 2006



### ***Widening***

Widening will be carried out along the cycleway to try and achieve the absolute minimum width of 2.1m. There are two sections along the cycleway where to achieve this width the highway shoulder will need to be reduced. Opus in conjunction with NZTA and other stakeholders concluded that it would be unacceptable to reduce the shoulder width and a reduced cycleway width would be the preferred option.

### ***Drainage***

The cross section of the cycleway will be adjusted to provide a 2% cross fall on the cycleway towards the highway, this will allow the existing drainage channels at the edge of the highway to be utilised. There will be some locations along the cycleway where new kerb and channel will need to be installed.

### ***Maintenance***

In order for the upgraded cycleway to attract as many users as possible, adjustments will need to be made to the maintenance programme in terms of frequency and inspections. The highway shoulder is currently swept approximately once a week and the sweeping of the cycleway should be carried out as part of this. Future improvements and routine maintenance requirements of the state highway should also consider the cycleway.

## **Environmental / Urban Planning**

The environmental / urban planning considerations relating to seaward cycleway are summarised below:

- *Community Cohesion*

Overall, community cohesion effects of this option are considered to be positive. The continuous cycling and walking route between Petone and Ngauranga (and then to Wellington) is a positive effect particularly for cyclists who are not confident cycling on the shoulder to make the journey between the two destinations.

- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

Whilst it is recognised that there are a number of historical sites along this route, it is considered that (subject to further investigations and detailed design), the works associated with this option would be contained within the existing state highway designation, which would avoid these historical sites. Overall effect on the disturbance of these sites is considered to be neutral.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

Preference has been given to retaining the existing number of traffic lanes along SH2 i.e. keeping within the designation to avoid unnecessary destruction of the embankment and vegetation. The project does require reclamation of the coast which could affect marine life.

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- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*  
Noise and vibration effects associated with this option are likely to be neutral/to positive as vehicles would not travel on this route.
- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

The proposed road realignment to be provided for through reclamation has the potential to be affected by future sea level rise and storm surge. Use of the landward side may also increase potential for slips from increased storms over time, which may potentially result in landslides. The highway is also prone to flooding, so this risk may increase. The future structures would need to take these potential impacts into consideration to ensure these effects are avoided, remedied or mitigated.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*  
The use of existing infrastructure to complete the cycleway is considered to be negative when assessing climate change impacts. This is based on the assumption that the route will not be upgraded significantly to ensure it is protected from future climate change impacts such as storm surge combined with sea level rise. This could result in damage to infrastructure or closure of the cycleway in storm conditions.
- *Support local development.*  
The proposed option could be positive to local development as providing a link between Ngauranga (and the rest of Wellington) and Petone could mean that more people are likely to travel between Wellington and Petone for employment. The additional cycleway would provide an improved cycling and walking route between Petone and Ngauranga (and then to Wellington). This is a positive effect particularly for cyclists who are not confident cycling on the shoulder to make the journey between the two destinations.
- *Landscape Issues.*

The seaward cycleway/walkway route is in a highly modified landscape and is an opportunity to create new linear public open spaces along the route including access to the water for recreational purposes and rest areas.

As part of the 2006 Scheme Assessment Report completed by Opus on this project, it was identified that the Department of Conservation, GWRC and Iwi indicated that the stretch of coastline that would be subject to reclamation is of low significance and they expressed no concerns about reclamation works. It is also likely that even if the cycleway does not proceed, further protection works may be required to repair and protect the railway formation in this area.

- *Regional Parks.*

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The proposed route would not pass through the regional park but would increase access to Belmont Regional Park by adding capacity to the networks that lead to the park.

The project also provides an opportunity to improve the entrance to Petone and the Hutt Valley for cyclists, link with the beach to bush project and make the Regional Park more accessible from the Wellington metropolitan area.

■ *Consenting Issues.*

As outlined in the Scheme Assessment Report, the resource consent requirements include resource consent from GWRC under Rule 1 of Regional Coastal Plan for reclamation work. Discharge consent is also likely to be required to cover any discharges into the marine area during construction works (Rule 57) and consent for the deposition of material on the foreshore and seabed (Rule 48). As reclamation works is a restricted coastal activity it must be publicly notified under section 117 of the RMA. The crossing of Korokoro Stream to link the cycleway with Hutt Road will be permitted under Rule 31 of the Regional Freshwater Plan if it is less than 6 metres in total length, however, it is likely to be over 6 metres and be a Controlled Activity. Minor earthworks to construct a bridge will be permitted by both the Railway and Transit designations but they will be required to submit an Outline Plan of Works.

### **Next Steps**

Opus has considered a number of options for the completion of the cycleway between Horokiwi and Petone. The “Ngauranga to Petone Cycleway Addendum to the Scheme Assessment Report – October 2006” concludes and recommends:

- 1) Either the construction of Option 1 (rail over bridge) over the rail line;
- 2) Or the realignment of the existing double track rail and closure of the right hand turn bay into Horokiwi;
- 3) And that the existing cycleway between Horokiwi and Ngauranga be upgraded to cater for two way commuter cyclists.

After consideration of the future projects and the current cycling deficiencies along the SH2 corridor, it has been concluded that the construction of option one, with a bridge over the rail corridor will provide the best opportunity for a scheme that will cater for current and future cyclists as well as providing the opportunity for the future development of the “Great Harbour Way”. As discussed in Section 4.2.2 the “Great Harbour Way” is a proposed seaward side cycleway that will traverse the Wellington coastline and involve crossing the railway line and reclaiming approximately 380m of coastal land. The cycleway along the seaward side of the rail will be designed for commuter cyclists, with a total width (including clearances) of 4.6m.

Although this solution will provide a completed cycleway between Ngauranga and Petone, a bridge will slow commuter cyclists down, and a significant proportion of high speed commuter cyclists



are likely to continue using the highway shoulders. For this reason, consideration has been given to how safety could be improved for those cyclists that will still use the shoulders.

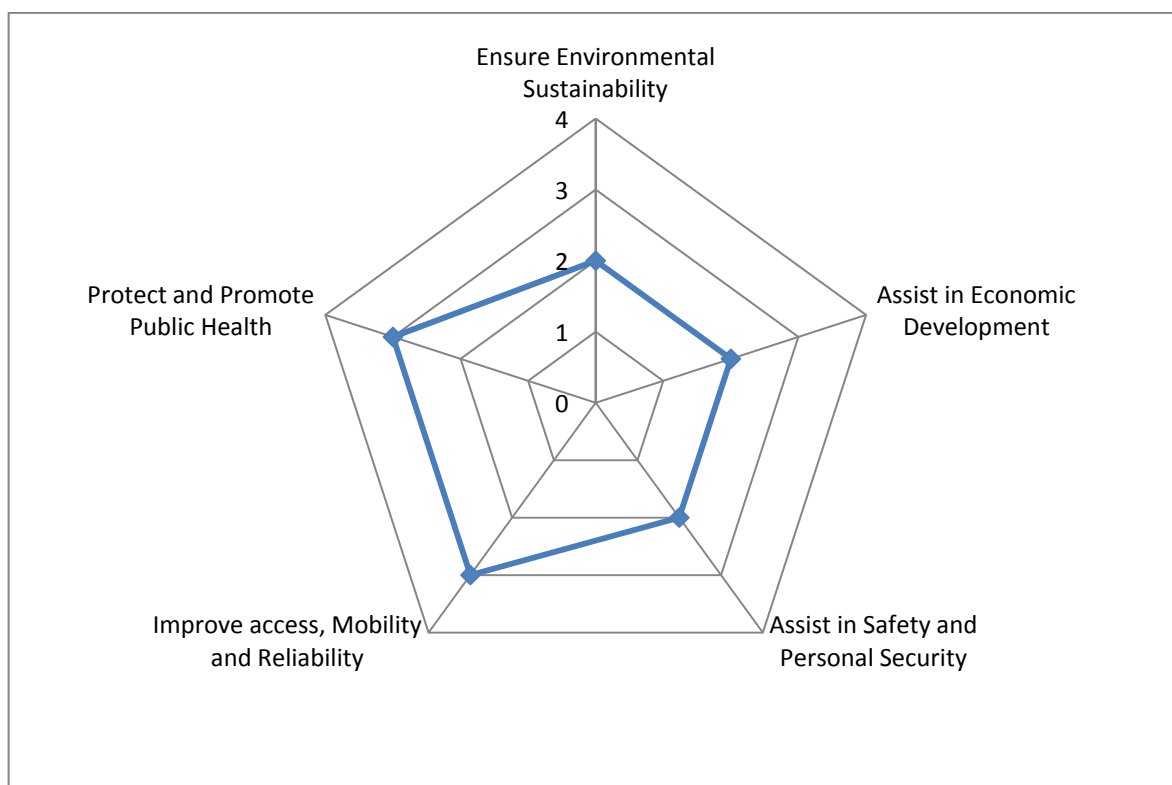
Part of the study examines the options for the Petone overbridge, and how the proposed SH1 - SH2 link road will connect to Petone and SH2. A preliminary layout design has been carried out for a new interchange; as part of this design it is recommended that the current SH2 off ramp (northern Petone overbridge) is retained and modified for use as a cycleway and walkway. This will provide northbound cyclists with a facility providing a safe route across the providing access to Petone.

Design of a new Petone Interchange has also provides for southbound cyclists using SH2 from the Hutt Road and The Esplanade as well as considering cyclists who will travel on SH2 below the new Petone Interchange.



4.2.4. **“Beach to Bush”**

This project provides a combined walking and cycling facility across SH2 and the railway enhancing safety and efficiency and improving access to the regional park from the Petone foreshore. This is likely to increase use of the regional park area and provide a well integrated connection between “the beach” and “the bush”. Figure 4-6 and Table 4-21 summarise the key study objectives contributed to by this project.



- **Figure 4-6: Benefits of Beach to Bush Crossing**
- **Table 4-21: Benefits of Beach to Bush Crossing**

Objective	Summary
Ensure Environmental Sustainability	This crossing would promote active mode access to regional parks and potentially improve community cohesion.
Assist in Economic and Regional Development	With possible improvements to the foreshore and a purpose built crossing to the regional park, the area can be promoted as a recreational facility.
Assist in Safety and Personal Security	Provides a safe route for walkers and cyclists across SH2 and will improve access to the regional park.
Improve Access, mobility and Reliability	Will attract walkers and cyclists and will give improved access to the regional park from the Petone side of SH2. Access will be improved to the



Objective	Summary
	Korokoro community.
Protect and Promote Public Health	Will improve access to the regional park and promote walking and cycling in the region.
<p>Conclusion</p> <p>The Beach to Bush project provides access across SH2 and the Hutt Line to connect the Petone foreshore to Korokoro Valley and Belmont Regional Park for pedestrians and cyclists. This project is difficult to quantify in terms of an economic analysis but can piggy back the proposed Petone Interchange as this allows the re-use of existing structures that span SH2 and the Hutt line for pedestrians and cyclists.</p>	

### Transport and Rooding

The “Beach to Bush crossing” is a crossing of SH2 that would connect the Regional Park area on the western side of SH2 to the foreshore on the eastern side of the highway. There is an existing crossing across the railway track which does not cross SH2 and is nearing the end of its design life.

The proposed facility would be designed as a recreational walking and cycling path. The alignment will be designed to provide a safe path for both cyclists and walkers. It will have a width of 3m with a 0.5m clearance of any obstacles and the design speed is approximately 20km/h.

The key objective of this facility is to provide safe and efficient access between the foreshore and the regional park. This will promote use of these areas and encourage recreational walking and cycling. There are a number of options for the type of facility that could be offered:

- Incorporate a facility into the proposed Petone Interchange upgrade;
- Provide a new, separate facility;
- Upgrade the existing facility; and
- A clip-on to the Petone overbridges

As part of the construction of the SH1 – SH2 Link Road, a new interchange will be constructed to accommodate traffic from SH2 (both northbound and southbound), the SH1 – SH2 Link Road and traffic coming to and from Petone via the Hutt Road and The Esplanade. The new interchange as outlined in Section 4.3 will be constructed to the north of the existing Petone overbridge and will leave the current facilities redundant. One option to provide a “Beach to Bush” crossing facility would be to utilise the SH2 off ramp overbridge as the crossing. This would require the bridge to be moved to a new pier (that is currently not used) so that the highway below could be realigned and the existing off ramps would be closed and used to provide a connection into the Belmont Regional Park.

A second option would be the construction of a new facility (similar to the existing walkway bridge) spanning across the Hutt Road, the railway line and SH2. Connections would be made from the Hutt Road and the Regional Park Side of SH2. Intermediate connections could also be made to



the railway side of SH2. A new facility would need to consider the location of The Esplanade and how access would then be made to the Beach and the Regional Park.

It is understood that the existing facility is coming to the end of its design life and significant works would be required to upgrade and extend the facility to cross SH2. The existing facility does not integrate well with The Esplanade, and a number of crossings are required to gain access to the Petone foreshore. Due to the short design life left on the existing structure and the connectivity issues, this option is considered unacceptable and has not been considered any further.

There is a possibility of a “clip-on” of a walking and cycling facility onto the existing Petone overbridge. This option allows walkers and cyclists to travel across SH2. The current facility would need to be kept to provide access across Hutt Road and allow connections onto the railway side of SH2. Consultation with Hutt City Council indicates that the existing facility is nearing the end of its design life; in this case, using the existing facility would require significant upgrades.

Table 4-22 summarises the benefits and costs of a proposed new seaside cycleway between Ngauranga and Petone.

■ **Table 4-22: Costs, Benefits and BCR associated with the Beach to Bush Crossing**

Option	2008 Capital Costs	Benefits	BCR
Upgrade of the Existing Facility	\$1,600,000	Intangible	N/A
New Structure	\$2,800,000	Intangible	N/A
Clip- on to Petone Overbridges	\$2,100,000	Intangible	N/A

### Environmental / Urban Planning

The environmental / urban planning considerations relating to the “Beach to Bush” crossing are summarised below:

■ *Community Cohesion*

Overall, community cohesion effects of this option are considered to be positive. The crossing over SH2 would provide a safe access for both cyclists and pedestrians, which is a positive step towards community cohesion.

■ *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

It is recognised that there may be some historical sites in the location of this option. Depending on the design, including the location of a potential overbridge the overall effect on the disturbance of these sites is considered to be neutral.

■ *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

Effects from the crossing are likely to be neutral as while there is some vegetation in the area, it is not expected that the crossing would have a significant impact.



- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*  
Noise and vibration effects associated with this option are likely to be neutral as vehicles would not travel on this route.
- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*  
There is unlikely to be any erosion and sediment effect as a result of this crossing.
- *Manage increased hazards of climate change impacts on state highway infrastructure.*  
The effect of the crossing on climate change impacts is likely to be neutral as the proposal only provides better pedestrian and cycling access to the regional parks. Depending on the access arrangements for the crossing, it could potentially be affected by flooding, but this needs to be confirmed through further assessment.
- *Landscape Issues.*  
This option provides an opportunity to improve the visual landscape and create spaces that link the Petone foreshore and reserve areas with Korokoro Valley and stream and development of coastal landscape character at this end of the foreshore.
- *Regional Park.*  
The proposal would provide a safe link between Belmont Regional Park and Petone without the need to cross SH2. It would significantly improve access to Korokoro Valley and Belmont Regional Park for recreation, link the valley to the Petone foreshore reserve areas and potentially create ecological corridors along walkways from the foreshore to Belmont Regional Park.
- *Support local development*  
This option may encourage local economy spend in the Petone from the recreational walkers and cyclists traveling to/from the Regional Park.
- *Consenting Issues.*  
Depending on the design, an outline plan of works should only be required. However, if the overbridge footprint is outside the designation then an alteration to designation will be required. In terms of regional consents, drainage consents may be required.

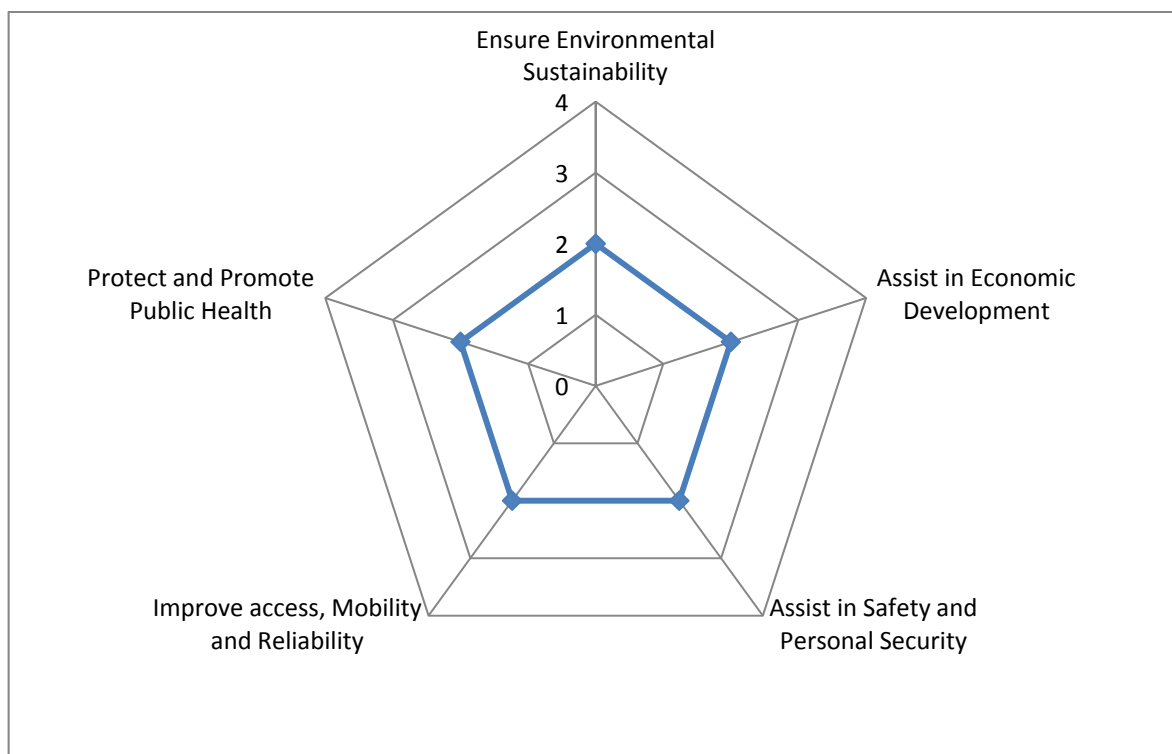
### **Next Steps**

This project is difficult to quantify in terms of an economic analysis, but can piggyback the proposed Petone Interchange as this allows the re-use of existing structures that span SH2 and the Hutt line for pedestrians and cyclists. Combining the project with the Petone Interchange project may produce higher BCR values.



#### 4.2.5. Petone Overbridge

This option involves upgrading the Petone Overbridge. In the vicinity of the existing overbridge there is an “S” bend with a posted speed limit of 70km/h. This bend has been associated with a number of accidents over the past five years and the design of the on-ramps and acceleration lanes contributes to significant delays during peak times. The current Petone Overbridge have a number of design deficiencies which compromise the integrity of the structure. The Petone Overbridge option involves either upgrading the existing Petone Overbridge or constructing a new Petone Interchange. Either project will aim to remove the “S” bend and increase the design speeds as well as improving current Levels of Service. Work would be carried out to improve the on ramps with the possibility of improved safe access for cyclists. Figure 4-7 and Table 4-23 summarise the key study objectives met by the implementation of this project.



- **Figure 4-7: Benefits of the Petone Overbridge**
- **Table 4-23 Benefits of the Petone Overbridge**

Objective	Summary
Ensure Environmental Sustainability	Potential to provide a more efficient link for commuters into the Petone area. Depending on the final form there could be adverse effects from the industrial/commercial area and on a historic marble wall registered with the Historic Places Trust. However it provides a significant opportunity



Objective	Summary
	to restore the lower Korokoro stream by the harbour.
Assist in Economic and Regional Development	Removing the “S” bend may decrease the travel times and travel time reliability. There is a “bottle neck” at the Petone onramp during peak times and careful design may help ease congestion. Improving access in this area and easing the congestion will improve travel time reliability and may attract business to the area and employment in Petone.
Assist in Safety and Personal Security	Removing of the “S” bend and improving the onramps will reduce accidents.
Improve Access, mobility and Reliability	Design could incorporate cyclists and pedestrians and encourage alternative forms of transport. Traffic on the highway will move more efficiently
Protect and Promote Public Health	Depending on design, may improve options for walkers and cyclists.
<p>Conclusion:</p> <p>This project has potential to provide a more efficient link for commuters into the Petone area. There is potential to reduce travel times, travel reliability and accidents by removing the “S” bend and bottle neck at the Petone onramp. Design could incorporate pedestrians and cyclists. The economic benefits of this project have not been assessed as there is no set procedure in the EEM.</p>	

## Transport and Rooding

The current Petone Overbridge have a number of design and safety issues and do not meet the requirements of a number of design codes. The alignment of SH2 beneath the overbridge is inconsistent with the surrounding highway and there have been a number of accidents in the area. Opus International Consultants were commissioned by NZTA in 2008 to investigate the feasibility of replacing the bridges; the report “SH2: Petone Overbridges (BSN 9741) Bridge Replacement Feasibility Report”<sup>15</sup> dated September 2008 has been used as part of this investigation. The report identified a number of issues that would need to be addressed as part of the any upgrade. Table 4-24<sup>16</sup> summarises these issues.

### ■ Table 4-24: Current and Required Level of Service of the Petone Overbridge

Design Issue	Current Level of Service	Required Level of Service
Vertical Railway Clearance	4.75m	5.5m
Horizontal Railway Clearance	2.44m	2.75m

<sup>15</sup> “SH2: Petone Overbridges (BSN 9741) Bridge Replacement Feasibility Report” by Opus international Consultants September 2008

<sup>16</sup> Obtained and Modified from Opus Report “SH2: Petone Overbridges (BSN 9741) Bridge Replacement Feasibility Report”





Pier Impacts (railway)	Not Met	
Horizontal Road Clearance <sup>1</sup>	7.32m	12.0m
Vehicle Impact on Piers	Test Level <sup>3</sup> (TL3)	Test Level 4 (TL4)
Vertical Clearance <sup>1</sup>	4.55m	4.9 – 6.0m
Live Load Capacity <sup>2</sup>	87%	100%
Concrete Condition	Not Met	
Bridge Width	8.84m	8.2 – 10.0m
Cycle Lanes	1	4
Seismic Capacity	According to the NZTA Wellington Region's screening exercise (1999) Petone Bridges are 8th equal in the Wellington Region	
Side Protection	~TL2	TL5
Approach Alignment <sup>3</sup>	70km/h (Legal) 55km/h (Advisory)	100km/h
Remaining Life	5 – 10 years	43 years

1 – Underneath the Bridge; 2 – Percentage of Class 1; 3 - Worst Case Curve Speed

It can be seen from Table 4-24 above, that there are a number of deficiencies that will need to be addressed as part of the Petone Overbridge Project.

The form of the Petone Overbridge project is going to be influenced greatly by the proposed SH1 – SH2 Link Road. If the proposed SH1 – SH2 link Road was to be constructed, a new Petone Interchange would form part of the connection between the Link Road, SH2, Hutt Road and The Esplanade. The new Petone Interchange allows for careful consideration of walkers and cyclists and connectivity to key locations of importance (e.g. the Belmont Regional Park and the Petone foreshore). It has been identified that a significant number of cyclists travel along SH2; as such it is important to cater for these cyclists. Providing a new structure leaves the existing structure redundant and this could be utilised to provide walking and cycling access across SH2, access can then be developed to and from SH2 (for northbound and southbound cyclists), the Belmont Regional Park, Petone foreshore and Hutt Road. The proposed Petone Interchange would include the following features:

- Connections between SH2, Hutt Road, The Esplanade and the proposed Link Road;
- Walking and Cycling connections from Hutt Road, The Esplanade (foreshore); SH2 and the Belmont Regional Park;
- Safer access to Petone for northbound and southbound Cyclists heading from Wellington City along SH2;
- Wide shoulders and painted areas across on and off ramps for cyclists who wish to travel along SH2;
- A realignment of SH2 beneath the existing Petone Overbridge;
- Better connections to SH2 from The Esplanade and Hutt Road; and

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- Would meet all the level of service requirements not currently met.

If for some reason the SH1 – SH2 Link Road does not go ahead a new Petone Interchange may not be fundable; in this instance, the do minimum option is the replacement of the existing bridge structures. Work to improve the existing structures could be designed to address all the identified issues on the existing Petone Overbridges. The “SH2: Petone Overbridges (BSN 9741) Bridge Replacement Feasibility Report”<sup>17</sup> calculates the rough order costs of this option as shown in Table 4-25.

■ **Table 4-25: Costs of Upgrading the Petone Overbridge**

Item	2008 Capital Cost
Land Purchase	\$1.5m
Design Fees	\$0.5m
Approach re-alignment	\$2.0m
Bridge Replacement	\$3.8m
Contingency (50%)	\$7.8m
Total	\$16.6m

There have been a number of accidents at the Petone Overbridge. In the last five years there have been 53 reported accidents. Nine of these crashes have resulted in injuries. CAS Analysis has been carried out with results shown in Table 4-26 and Table 4-27.

■ **Table 4-26: Quantity of Accidents at Petone Overbridge**

Year	Fatal	Serious	Minor	Non Injury
2004	0	1	1	1
2005	0	1	1	9
2006	0	0	1	14
2007	0	1	1	6
2008	0	0	2	14
<b>TOTAL</b>	<b>0</b>	<b>3</b>	<b>6</b>	<b>44</b>

■ **Table 4-27: Type of Crashes at Petone Overbridge**

Crash type	Number	Percentage
Overtaking	4	8
Straight Road Lost Control / Head On	3	6
Bend: Lost Control / Head On	44	83

<sup>17</sup> “SH2: Petone Overbridges (BSN 9741) Bridge Replacement Feasibility Report” by Opus international Consultants September 2008



Crash type	Number	Percentage
Rear End / Obstruction	1	2
Crossing / Turning	1	2
Pedestrian Crashes	0	0
Miscellaneous	0	0
<b>Total</b>	<b>53</b>	<b>100</b>

It can be seen in Table 4-27 above that 83% of these accidents can be attributed to loss of control on a bend and/or head on accidents. Removing the S-Bend beneath the Petone Overbridge could reduce the likelihood of this type of accident significantly.

A Petone Overbridge upgrade will contribute to the objectives of the NZTS and GPS through promotion of walking and cycling and improvement of the current alignment and reduction in crashes. These improvements will also make Wellington City and the Petone area more accessible and may attract development both in the Petone area and in Wellington City.

### Environmental / Urban Planning

The environmental / urban planning considerations relating to the Petone Interchange improvements are summarised below:

- *Community Cohesion*

The proposed interchange will provide full access allowing for a strategic connection from Petone, to SH2, to SH1 (via the Link Road), the Petone rail station and to Gracefield (via the Cross Valley Link). The existing connection between the access road and Priests Avenue north of SH2 to the Petone railway station and Koro Crescent connecting to Hutt River is retained. This will create an efficient link for commuters into the Petone area.

- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

Within the potential footprint of a proposed Petone Interchange is a Marble Wall registered with the Historic Places Trust at the old Woollen Mill on the Corner of Western Hutt Road and Cornish Street. At this stage it is likely that this wall would be adversely affected by a potential interchange. To the south of the interchange, a treaty claim has been made on the Korokoro reclamation area which is currently managed as recreation reserves under the Conservation Act.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

The preferred route avoids the most sensitive ecological areas e.g. Belmont Regional Park, Percy Scenic Reserve and habitats between SH1 and SH2. There are some identified HCC reserves on the Korokoro side of the interchange at the end of Cornish Street and east of the interchange on the escarpment that edges SH2. There are also some recreation reserves registered under the Conservation Act 1982 to the south of the interchange. At this stage, the design indicates that these



could be avoided. With the southern reserves, there is also the potential to significantly improve the reserves with a realignment of the interchange.

- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

There could be some potential effects on surrounding residents, especially if the height of the interchange ensures surrounding residents have exposure to road noise. Further investigations would be required to confirm the scale of the effects and the appropriate mitigation measures.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

It is considered that climate change effects at this location are likely to be limited. However, this would need to be confirmed through further assessment, particularly when further assessment on slope stability and susceptibility to storm events is understood.

- *Support local development.*

If carefully designed this piece of infrastructure, located at the 'front door' of Lower Hutt, can in itself, provide an important gateway statement, and serve to enhance the sense of place and identity of Hutt City. Alternatively, the interchange should aim to provide for creative built form 'gateway' outcomes through protecting key pieces of land. The preferred interchange design also avoids impact to the current Petone Gateway concept.

Similarly, the proposal could improve access to Petone area. How the design fits with the surrounding environment would need to be investigated further to confirm the benefits of this project. The interchange is located in an industrial/commercial area with residential uses unlikely to develop in the future. If carefully designed, the interchange and pockets of land use redevelopment potential can function as a visual gateway to Petone, helping to strengthen community identity. Alternatively, the interchange should aim to provide for creative built form 'gateway' outcomes through protecting key pieces of land.

- *Regional Park*

The further the highway and interchange is away from the coastal edge and the closer to the valley entrance and Korokoro Stream, the greater the effect on the landscape and recreational experience of Korokoro Valley and this entrance to Belmont Regional Park. This valley is perceived as a natural area and a contrast to urban Petone. This contrast and the valley's proximity to the built area heighten the experience of its naturalness. However the road could increase recreational access to Korokoro Valley and the regional park and is an opportunity to create a major entrance to the park accessible from the Wellington metropolitan area and SH1, connecting the park to a wider population.

- *Consenting Issues.*

Statutory approvals are mainly around the requirement for an Outline Plan of Works and or an Alteration to Designation. There could also be potential regional consents depending on the final form and location and if the beach to bush project is combined with this project. However,



depending on the interchange design the route could also require Historic Places Trust approval for moving a registered building.

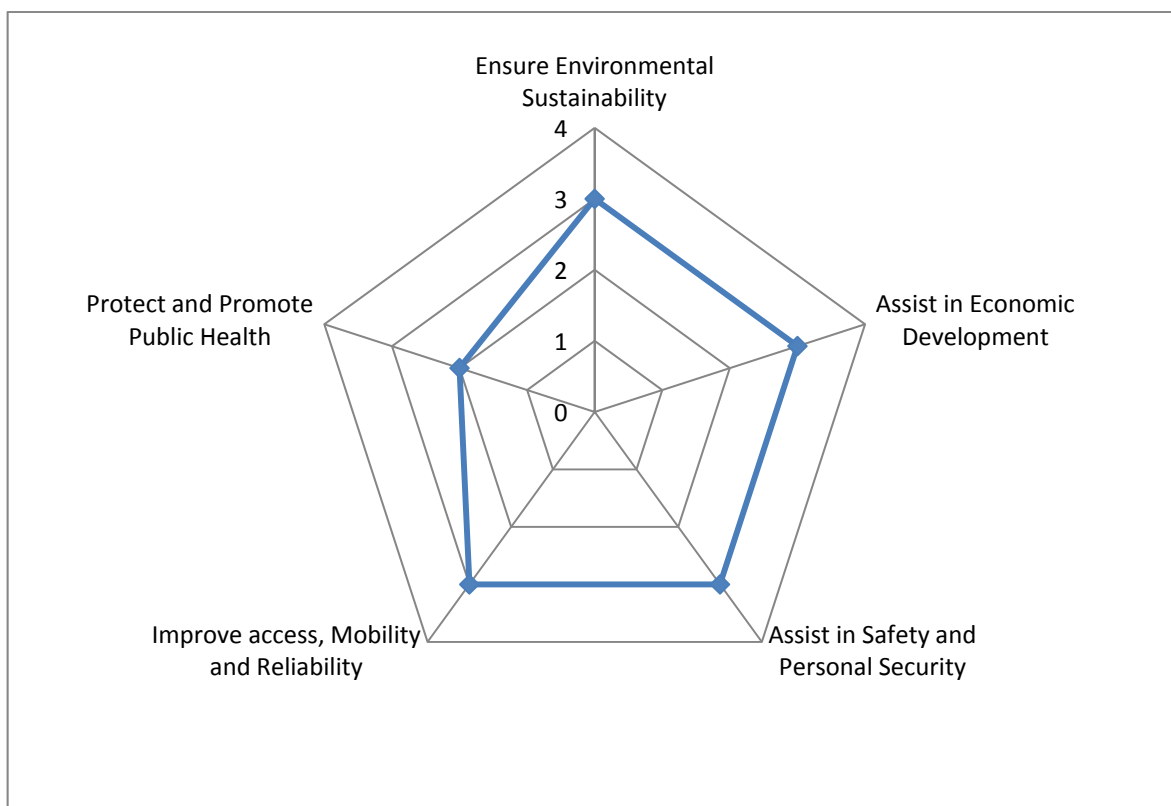
**Next Steps**

It is recommended that this project be incorporated into the redesign of the Petone Interchange as part of a Petone-Grenada project.



#### 4.2.6. Traffic Management on SH2

Ramp signalling (or ramp metering) is a method of traffic management that can be used to allow more efficient access for traffic coming onto the network from onramps. Past studies and projects have seen more consistent and reliable travel times, reduced number of accidents and increased throughput of vehicles with the implementation of ramp metering. It is expected that ramp signalling would be implemented on the Ngauranga and Petone onramps to SH2. Figure 4-8 and Table 4-28 summarise the key study objectives met by the implementation of this project.



- **Figure 4-8: Benefits of Ramp Signalling**
- **Table 4-28: Benefits of Ramp Signalling**

Objective	Summary
Ensure Environmental Sustainability	Limited impact, there could be improved emissions created from smoother traffic flows.
Assist in Economic and Regional Development	Ramp signalling can provide more reliable and consistent travel times and increase throughput, this will make travelling in the area more reliable and may attract future development.
Assist in Safety and Personal Security	Allows more controlled and safer merging. In past studies there has been a reduction in accidents as a result of the implementation of ramp signalling.
Improve Access, mobility and Reliability	Will provide more efficient merging into the highway traffic streams and improve throughput and travel time reliability.

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Objective	Summary
Protect and Promote Public Health	Negligible Impact
<p>Conclusion:</p> <p>This project constrains the onramp capacity at Ngauranga on SH2, and Petone on SH2. It provides useful travel time and travel time reliability benefits for mainline traffic in the evening peak for Ngauranga and in the morning peak for Petone. This comes at the expense of increased delay for the users of the onramp.</p> <p>The Ngauranga project has synergies with the Petone Grenada Link proposal as it will discourage large volumes of traffic entering SH2 from SH1 at the Ngauranga Interchange in the pm peak period by inducing delay. Without the Petone Grenada Link in place, delays at the Ngauranga onramp are unacceptable in the evening peak.</p> <p>The Petone project has synergies with the Cross Valley Link proposal as it discourages extensive through traffic on The Esplanade in the morning peak. Without the Cross Valley Link delays at the Petone onramp are unacceptable in the morning peak. Ramp signalling at both Ngauranga and Petone is economically justified.</p>	

### Transport and Rooding

Ramp signalling is a method of reducing congestion and “bottlenecking” of traffic at onramps. Ramp signalling could be implemented at the Petone and Ngauranga SH2 onramps, where bottlenecks occur in the AM and PM peaks respectively. This would involve inserting induction loops under the road surface which will be used to detect the approaching traffic volumes and activate the ramps signals when flows dictate. Ramp signalling has been used around the world to improve traffic flow and safety during peak traffic flow periods and is in place on the Auckland motorway network. Ramp signalling is designed to deliver the following benefits:

- Consistent and predictable travel times;
- Safe merging; and
- Better throughput of vehicles on the motorway.

Table 4-29 below gives a summary of the results obtained from the NZTA website ramp signalling has achieved on the Auckland Motorway Network<sup>18</sup>:

■ **Table 4-29: Results of Ramp Signalling in Auckland**

Scheme	Peak Period Travel Speeds	Vehicle Throughput
Curran Street	+12%	+18%
Wellington Street	+4.5%	+6%
Hobson Street <sup>1,2</sup>	+16%	+15%

1 Commuter times cleared 20 – 30 minutes earlier during afternoon peaks

<sup>18</sup> <http://www.transit.govt.nz/projects/rampsignalling/about/#>



Ramp signalling has also been used extensively overseas; Table 4-30 summarises results associated with ramp signalling projects overseas.

■ **Table 4-30: Results of Ramp Signalling Internationally**

Measure	Result
Throughput	+9%
Speed	+14%
Travel Time	-14%
Crashes	-24%
Travel Time Reliability	+91%

This data suggests that there can be significant improvements associated with implementation of ramp signalling. Travel times, travel time reliability and vehicle throughput show improvements. In the case of the present study, these improvements would mean that travelling between Petone to Wellington Central during the peak times will be more reliable. This may attract business to both Petone and Wellington. The data shows that there has been almost a 25% reduction in crashes in locations where ramp signalling has been implemented. This can be attributed to decreased stress levels in drivers at peak times which can result in reduced accidents during peak periods.

It should be noted that the Ngauranga ramp signalling option is complementary to the link road between SH1 and SH2. In addition ramp signalling of the Petone southbound on-ramp supports initiatives to reduce traffic volumes along The Esplanade.

Table 4-31 and Table 4-32 summarises the benefits and costs of a proposed Ramp Signalling between Ngauranga and Petone.

■ **Table 4-31: Costs, Benefits and BCR associated with Ramp Signalling at Ngauranga On-Ramp to SH2**

2008 Capital Costs	Benefits	BCR
\$700,000	\$1,440,000	2.1

■ **Table 4-32: Costs, Benefits and BCR associated with Ramp Signalling at Petone On-Ramp to SH2**

2008 Capital Costs	Benefits	BCR
\$850,000	\$1,450,000	1.7

**Urban Planning/Environmental Assessment**

Improved traffic flows associated with this project may provide additional benefits in terms of improved accessibility and reduced journey times contributing to the economic development of surrounding land uses that rely on commuter traffic. As the ramps are on SH2 at Ngauranga this should provide for an appropriate method for managing traffic flow on SH1, SH2 and The Esplanade. Ramp signalling can favour outlying areas as longer distance travel is given priority





over shorter distance travel and may result in less sustainable remote development which requires more travel.

In terms of environmental effects, this project may reduce air pollution and greenhouse gas emissions. In terms of statutory approvals, the Ngauranga onramp project would most probably be packaged with the Petone-Grenada Link Road and Petone Interchange and the Petone onramp project packaged with the Cross Valley Link project so it would be assessed as part of these applications.

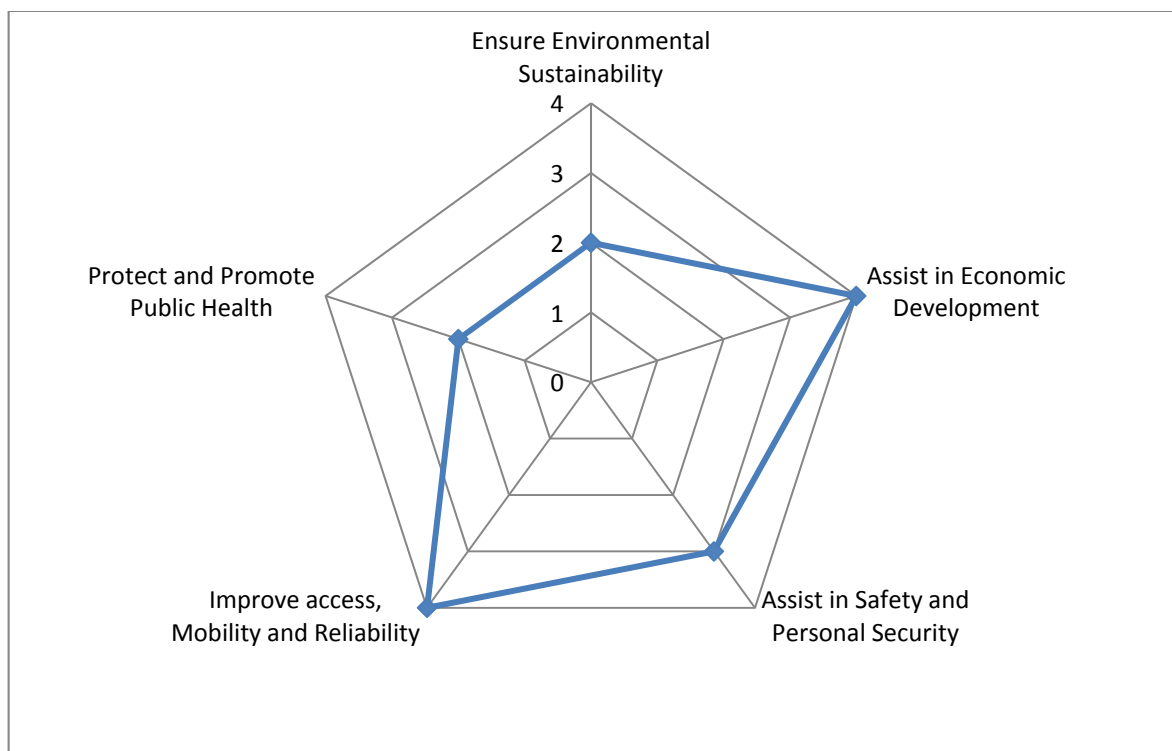
### **Next Steps**

This project constrains the onramp capacity at Ngauranga on SH2, and Petone on SH2. It provides useful travel time and travel time reliability benefits for mainline traffic in the evening peak for Ngauranga and in the morning peak for Petone. The projects have synergies with the Petone Grenada Link and the Cross Valley Link proposals as they discourage diversion of trips onto the less congested SH2. It is recommended that these projects should be included in the Strategy.



### 4.3. SH1 to SH2 Link (Petone-Grenada Link)

This project provides a link road connecting SH1 to SH2. It will provide an alternative route for vehicles travelling between SH1 and SH2 without the need to go via the Ngauranga Interchange or SH58. There are a number of options for linking the proposed road at each end (SH2 and SH1). These options have been explored through traffic modelling and preliminary interchange design to determine which option will provide the best benefits to motorists, cyclists, pedestrians and other road users; possible options will also be explored with local community representatives. The proposed road will connect to the Tawa Interchange; it will continue south to the boundary of the Lincolnshire Farm (A1) and passes through Lincolnshire Farm on the path designated by the “Lincolnshire Farm Structure Plan dated 2001” (B3). The road then continues south-east towards SH2 between Horokiwi Road and the Horokiwi Quarry (C3). Approximately 150m from the intersection of SH2, it will pass north east, running parallel to SH2 (D5). Figure 4-9 and Table 4-33 below describe the proposed route.



■ **Figure 4-9: Objectives met with Development of the Petone-Grenada Link**



■ **Table 4-33: Objectives met with Development of the Petone-Grenada Link**

Objective	Summary
Ensure Environmental Sustainability	Route travel distance is shortened improving community cohesion and potentially reducing environmental impacts (air and noise impacts) on SH1 and SH2. However, there are multiple adverse impacts that need to be mitigated including locating the road so as to ensure contaminated land is not too much of an issue, landscape values are not adversely impacted and impacts on surrounding landforms and vegetation.
Assist in Economic and Regional Development	<p>A direct link between SH1 and SH2 will reduce the travel time and travel time variability between SH1, SH2 and the Seaview area, and reduce overall travel times on the network. Reducing travel times to Seaview may attract new development in the area. A direct route will reduce the travel costs and increase the efficiency of production; this will reduce costs and will allow for reinvestment and increases in the economic activity.</p> <p>The road will pass through Lincolnshire Farm and this will assist in promoting development. An interchange will be constructed in the vicinity of the quarry; this will reduce waiting times for trucks. This link will assist in regional agglomeration.</p>
Assist in Safety and Personal Security	The link road will provide a shorter travel distance (approximately 6km less) between SH2 and SH1; this will assist in reducing the overall VKT on the network and reduce crash exposure on a VKT basis.
Improve Access, mobility and Reliability	Provides an alternative route between SH1 and SH2, adding resilience to the network and reduces travel times and travel time reliability. Travel time reduction will occur on the rest of the network as congestion decreases. The link will continue through Lincolnshire Farm providing access to the industrial area and also passes in the vicinity of the Quarry. The link will be designed to accommodate cyclists and walking tracks to and from areas of interest (historical areas, regional parks etc). Importantly it provides opportunity for direct bus services between Wellington north and the southern Hutt Valley
Protect and Promote Public Health	As described above this link will be designed to accommodate cyclists and may attract people from private vehicles to cycles. Access to the regional parks will be improved, and this may be complemented by walkways to and from this and other areas of interest such as historical and cultural locations.
<p><b>Conclusion:</b></p> <p>The Petone-Grenada Link is an economically viable proposal that directly links SH2 to SH1. This project provides travel time and route shortening benefits for road users travelling between these locations. In addition, this project provides relief to SH1 and SH2 in the study area with consequential travel time and travel time reliability benefits. Further, this project improves overall network resilience in this area of the</p>	

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Objective	Summary
	<p>network as it provides an alternative route in the event of some incident either on SH1 or SH2.</p> <p>This project provides an opportunity to reconfigure on and off ramps in the Johnsonville area so that Johnsonville Road can be reconfigured as a shopping street. This project has synergies with the Tawa and Petone Interchange projects and consequently the Beach to Bush facility for pedestrians and cyclists. The Petone-Grenada Link supports the Lincolnshire Farm development. This project is most effective when linked with the Cross Valley Link.</p> <p>The Petone-Grenada Link is economically viable. It has a good benefit cost ratio for a project of this scale. Further development of this project may include a link to SH1 in the vicinity of Johnsonville/Westchester Drive in the longer term.</p>

### Transport and Rooding

The proposed Petone-Grenada Link will travel from the Tawa Interchange (with a possible connection at the Grenada Interchange) through Lincolnshire Farm, as designated in the structure plan, towards SH2 (crossing the quarry) and then proceed parallel to SH2. At the eastern end there will be a new interchange that will provide access to SH2 (in both the northbound and southbound directions), Hutt Road and The Esplanade.

### Horokiwi Residents Site Walkover

A site walkover has been undertaken with Horokiwi residents to identify possible route selections and constraints. As identified in the constraints plan, there are a number of areas of native vegetation and contaminated land in addition to a land slide in the vicinity of the quarry. There are a number of properties in the Horokiwi area which need to be protected. The proposed link, addresses a number of issues, including:

- Avoiding the identified historic landslide;
- Avoiding (as much as possible) native vegetation;
- Avoiding major disturbance to Horokiwi Residents;
- Avoiding Belmont Regional Park; and
- Ensuring the link integrates well with Lincolnshire Farm in terms of access and minimising potential effects on future land uses.

The Horokiwi Residents had a number of concerns regarding the Petone-Grenada Link and these have been accommodated in the design.

A number of residents had concerns regarding the vicinity of the link road to their dwellings; as a consequence of discussions on the site walkover, a route has been identified that keeps a satisfactory buffer between the road and residents while avoiding all other identified constraints.

Access to and from the Horokiwi settlement was also a significant issue that was identified by the Horokiwi residents. Although no access has been designed at this stage, during a Scheme Assessment; consultation would be carried out with the Horokiwi residents to identify where they wish to have access to the link. To minimise potential conflict points, and avoid stopping vehicles



on the steep gradients, a grade separated access is highly recommended, this will allow access to and from the Horokiwi settlement in both directions on the link road.

### **Horokiwi Quarry**

The proposed Petone-Grenada Link will pass through the northern extent of the quarry. Access to and from the quarry will be an important consideration when designing the link road. It is recommended that consultation be undertaken with the quarry operators to gauge the type of access they require and base any design on accommodating their requirements. The Petone-Grenada Link will provide a number of benefits for vehicles travelling to and from the quarry by removing the “priority” intersection at SH2, providing better access to SH1 and providing more options for accessing SH2 (i.e. the proposed Petone Interchange allow access in both the northbound and southbound directions).

### **Design Criteria**

While design criteria will be further defined at the Scheme Assessment stage, the link road is proposed to be designed with an operational speed of 70km/h and will meet the requirements of the State Highway Geometric Design Manual, Austroads, and other supporting documents (where possible). The link will have two lanes in each direction, which will be divided by either a wire rope or concrete barrier, and will accommodate cyclists in the wide shoulders. Footpaths have not been explicitly designed for but there are options for connections to off road “tracks” and areas of significant interest. A cross-section of the proposed road can be found in Appendix B.

Due to the mountainous terrain that this road will follow, significant earth works and construction of a number of bridges will be required. The maximum gradient along the link is designed to be 9.5%, and although this is high, it will avoid the need for tunnels. The gradient should not pose any significant safety issues because this will be a dual carriageway road meaning slow vehicles can use the “slow lanes”. A long section of the proposed road can be found in Appendix B.

There are a number of possible connections at either end of the road. At the northern end there will be a connection to SH1 in the vicinity of the Tawa Interchange with the possibility of a connection to the Grenada Interchange. At the southern end there will be connections to SH2 (in both the northbound and southbound directions), Hutt Road and The Esplanade via a newly constructed Petone Overbridge.

Public transport can also be developed along this route with no further infrastructure requirements other than bus shelters and bus stops. This option connects the northern suburbs of Wellington such as Johnsonville, Churton Park, Newlands, Grenada, Linden and Tawa with the Lower Hutt suburbs of Petone, Seaview, Gracefield, Eastern Bays, Wainuiomata, Alicetown, Hutt CBD, Woburn and Waterloo. Further, it integrates and provides access to the Lincolnshire Farm development and Horokiwi. The provision of bus services on this road has a small positive benefit in reducing the emissions and noise caused by motor vehicles on the surrounding community. The



bus services increase the connectivity between the southern Hutt Valley and north Wellington as well as integrating Lincolnshire Farm and Horokiwi.

### **Traffic Modelling of the Petone-Grenada Link**

Traffic modelling for the link was carried through a series of tests. The connections at the eastern end of the link road are slightly different for each test, these are listed below:

- Dowse (Tests 2 and 3)
- The Esplanade (Test 4)
- SH2 at Petone (Test 5)
- Petone /SH2 combination (Test 6).

As a result of these different connections, travel times have been collated on the following routes:

- **Link EB/WB SH2:** Grenada to Dowse interchange via the link road (Tests 2, 3, 5 and 6);
- **SH EB/WB SH2:** Grenada to Dowse interchange via SH1 and SH2 (Tests 1, 2, 3, 5 and 6);
- **Link EB/WB Pet:** Grenada to The Esplanade via the link road (Tests 2, 3, 4 and 6); and
- **SH EB/WB Pet:** Grenada to The Esplanade via SH1 and SH2 (Tests 1, 2, 3, 4 and 6).

The following sections detail the key outputs from the model for the differing tests and combinations of test that reflect the varying connection points.

### **Petone-Grenada Link Road vs. State Highway (Grenada to SH2) -Travel Times**

Modelling has shown that the major differences in travel time between Grenada and SH2 (in the eastbound direction) occur in the am peak period. The modelling has identified a number of key points (all relate to the future year of 2016):

- All options remove a significant volume of traffic from SH1 southbound and hence traffic travelling on the state highways in the eastbound direction is in the order of two minutes quicker
- For traffic travelling between Grenada and Petone, the Petone-Grenada Link improves the travel time by approximately six minutes when compared with the corresponding travel time on both state highways.; and
- It has been assumed in Tests 2 and 3 that vehicles travel from Dowse to Petone via Udy Street and Cuba Street.

The 2026 (eastbound direction) modelling shows similar qualitative trends with general increases in travel times of approximately 4% between 2016 and 2026 for Test 2 to Test 6. The Test 1 (Do minimum) travel times increase on SH2 by approximately 10% during the am peak period. There is



a less than 5% increase in travel time in the inter peak and PM Peak for all tests. The travel time increases between 2016 and 2026 modelling only occur on both state highways, there are no changes in travel times on the link road between 2016 and 2026.

In the 2016 westbound direction, link road travel times are of the order of five minutes quicker during the am and pm peak periods when compared with travel times on the State Highway. The travel time on the State Highway also improves in the PM peak by of the order of one minute with the introduction of the link road.

The modelling results for the 2026 westbound direction show the same patterns as the 2016 modelling. For Test 1 (Do Minimum) there is a minor increase in travel time between 2016 and 2026 in the AM peak in the order of less than one minute. In the inter peak the travel times increase between 2016 and 2026 by about 4 minutes and in the PM peak travel times increase in the order of 6 minutes. The travel time for the link road stays approximately the same in both future years of 2016 and 2026.

Modelling has shown that without the construction of the Petone-Grenada Link, westbound travel times along the State Highway may increase by as much as six minutes during the am and pm peak periods. The introduction of the link road will assist in reducing the congestion and delay on the highway. Modelling has indicated that in 2026 there will be only minor changes in travel times on the Petone-Grenada Link.

There are minor changes in the southbound flows in the am peak (less than 100 vehicles per hour change). A larger reduction in the order of 300 and 600 vehicles per hour in the inter and pm peaks respectively. The largest impact on travel time is the reduction in the pm peak with a reduction in the order of one minute. The impact of the flow reduction in the inter peak is limited due to the lower levels of congestion in this period. The full traffic model report can be found in Appendix D.

### **Petone-Grenada Link Road vs. State Highway (Grenada to The Esplanade) - Travel Times**

Due to the different connectivity of Test 4 and Test 5, the travel time to The Esplanade (east of Cuba Street) has also been assessed.

The eastbound travel times, in 2016, on the proposed link road for Tests 2 and Test 3 (Connection to Dowse) are approximately two minutes higher than for Tests 4 (Connection to The Esplanade) and Test 6 (Connection to both SH2 and The Esplanade). This can be attributed to the additional distance to travel via Udy Street and Cuba Street rather than feeding straight on to The Esplanade. In 2026 the difference in travel times is slightly less between Tests 2/3 and Tests 4/6 at approximately one and a half minutes.

The link road provides travel time savings over using the state highway, although in the inter peak this is limited for Tests 2 and 3 due to the quicker travel time on SH2 between Petone and Dowse with similar levels of congestion in Hutt City as in the am and pm peaks.



In 2016 in the westbound directions, the pm peak shows the largest reductions in travel time. It should be noted that Test 5 has increased traffic volumes from WTSM matrix with no mechanism for this traffic to easily get to Petone. This means that volumes turning onto SH2 are larger in Test 5 when compared with all other tests. A reduced capacity was implemented in the base model at the merge onto SH2 to reflect the observed levels of delay at the existing interchange. In 2016 the traffic demands from The Esplanade onto SH2 approach this capacity and hence the delays become unstable with very small fluctuations in flow causing significant changes in delay. Test 5 has slightly higher traffic volumes making this turn which means that volumes exceed capacity and an additional three minutes delay is experienced when compared with Tests 4 and 6, and approximately two minutes additional delay over Tests 2 and 3.

Travel times in the westbound direction in 2026 have similar patterns to those in 2016. The general increases in travel time from 2016 to 2026 are relatively minor in the am and inter peaks (in the order of 4%). In the pm peak, with the Hutt Road roundabout at capacity, there are significant increases in delay here, of the order of 20-40% (approximately 3 minutes). With this intersection at capacity the routing becomes unstable with vehicles switching to routes via Jackson Street and Hutt Road.

### **Link Road Traffic Flows**

In 2016 (eastbound and westbound directions) there is very little difference in flows on the link road between Tests 2 to 6. This is in part due to the use of a fixed trip matrix meaning that only vehicle rerouting affects influence the total volumes with mode choice and distribution assumed to be fixed. The flows are tidal, predominantly eastbound (Grenada to Petone) in the am peak, westbound (Petone to Grenada) in the pm peak with an approximately equal split in the inter peak. Similar total flows are indicated by the 2026 models for each time period. The overall flows increase by approximately 100 vehicles per hour.

The formula developed as part of the Transmission Gully toll study (based on traffic counts on SH1 in Wellington) was used to factor up peak hour volumes to daily flows:

$$\text{Daily flow} = 2 \times \text{AM} + 12.4 \times \text{IP} + 2 \times \text{PM}$$

Results in the daily flows in 2016 are consistent with the peak hourly volumes, with small variations in two-way daily flow on the link road between the tests with volumes varying between 23,500 and 25,500 vehicles per day. In 2026 the traffic volumes range from 26,000 to 30,000 vehicles per day.

### **SH1 Traffic Flows and Travel Times**

The construction of the proposed Petone-Grenada Link will have an impact on the traffic volumes on SH1. Modelling has shown that the construction of the proposed Petone-Grenada Link is likely to result in a reduction in flow in 2016 of between 400 and 500 vehicles per hour on the





SH1 southbound lanes during the congested am peak hour. In the northbound direction on SH1 the changes in flow are less in the am peak in 2016 of between 100 and 200 vehicles per hour.

It should be noted that as a consequence of the southbound volumes during the 2016 am peak (approximately 6000 vehicles per hour) being significantly higher than the inter and pm peaks (approximately 2000 vehicles per hour) the travel times are still of the order of three minutes quicker during the inter peak and pm peak. The lower southbound flows in the 2016 inter peak and pm peak indicate that the applied speed flow curves are having only a minor influence on the travel time for larger changes in flow.

The lower northbound flows for SH1 in all three peaks mean that any reductions due to the inclusion of the Petone-Grenada Link have limited effect on the travel times. The full traffic model assessment can be found in Appendix D.

## **SH2 Traffic Flows and Travel Times**

As discussed previously, the construction of the Petone-Grenada Link can have a significant impact on the operation of the current highway network. This section investigates the likely impact that the proposed Petone-Grenada Link will have on the operation of SH2.

With the introduction of the Petone-Grenada Link northbound traffic on SH2 significantly reduces in the order of 600 vehicles per hour and 400 vehicles per hour in the 2016 am peak and inter peak respectively with slight increases in the pm peak (this can be attributed to a change in matrix from WTSM). There are small reductions in northbound travel times in the less congested am peak and inter peak with a slight increase in the pm peak. The changes in travel time are limited due to the additional congestion at the Petone interchange once the additional traffic from the link road joins SH2.

There are limited changes in the southbound 2016 flows in the am peak (less than 100 vehicles per hour change). The model shows that there are larger changes in flows of between 300 and 500 vehicles per hour in the inter and pm peak periods. The largest impact on travel time is the reduction in the pm peak with a reduction of approximately one minute. Lower levels of congestion in the inter peak mean that flow reduction is minimal during this period.

In 2026 travel times are a minute higher in the am peak southbound direction and less than two minutes higher in the pm peak northbound direction. There are minimal changes in the inter peak direction travel times.

In 2026 travel times in the am peak southbound direction remain largely unchanged by the introduction of the link road. In the northbound direction flows reduce by around 500 to 600 vehicles per hour in the am peak. In the inter peak volumes reduce in the northbound direction and southbound direction by 500 vehicles per hour and 400 vehicles per hour respectively. In the pm peak flows remain largely unchanged in the northbound direction, in the southbound direction flows reduce by approximately 500-600 vehicles per hour.



### **Flows on SH2 between Petone and Dowse**

With the additional linkage provided between Grenada and Petone, there may be considerable impacts on the traffic volumes on SH2. The new link is likely to cause reductions in flows on SH2 south of Petone as traffic reroutes to the link road, but there are likely to be increases on SH2 north of Petone due to the increased attractiveness of travel between Grenada and the Hutt area facilitated by the link road which is implicit in the WTSM matrices used.

In 2016, with Test 2 and Test 3 joining SH2 at Dowse interchange, any increase in traffic from Grenada is not added to this portion of SH2 and so maximum one way flows are approximately 2800 vehicles per hour. Tests 5 and 6 which tie in to SH2 at Petone have maximum flows in excess of 3200 vehicles per hour which is approaching two lane's capacity. For a theoretical saturation flow of 4000 vehicles per hour, a rule of thumb for flow breakdown is a V/C ratio of 85% which would be reached at a flow of 3400 vehicles per hour.

The hourly flow outputs for the 2026 model show the same patterns. As in the 2016 traffic models, Test 5 and 6 have higher maximum flows per hour than the other 4 tests. Test 5 reaches approximately 3500 vehicles per hour and would exceed the V/C ratio of 85%.

In 2016 the overall (incorporating non peak direction travel) daily flows on SH2 (from Test 2 and Test 3) show a reduction of 8,000 vehicles per day from around 50,000 vehicles per day to around 42,000 vehicles per day. Test 6 and Test 5 show marked increases of between 8,000 and 12,000 vehicle per day to increase daily flow to 58,000 and 62,000 vehicles per day respectively. The outputs for 2026 show similar patterns to the 2016 outputs.

### **Flows on SH58**

The proposed Petone-Grenada Link offers an alternative east-west route to the existing SH58. As such, the impacts of the proposed Petone-Grenada Link on SH58 traffic volumes are considered important. In summary, the presence of the link road is likely to result in a reduction in AADT from approximately 15,000 to 12,000 vehicles per day in 2016, a reduction of approximately 20%. The precise form of the link road and its associated connections does not appear to greatly affect the traffic volumes on SH58. Modelling indicates relatively consistent traffic volumes on SH58 with approximately 12,000 vehicles per day for Tests 2 to 6.

Previous work (Western Corridor Study- 2005) has been modelled using fixed trip matrices. For this analysis we used variable trip matrices as it better represents reality and congested conditions. What is happening on SH58 and elsewhere is that the Petone-Grenada link does remove larger volumes of traffic from SH58. As a result of removing this traffic road space on SH58 is freed up and this makes SH58 a more attractive route. This leads to more traffic being induced on to SH58 meaning the net reduction of traffic on SH58 is less. This more accurately demonstrates the reality and the phenomenon of induced traffic.



Test 5 and Test 6 with the link road tying directly into SH2 and The Esplanade appear to attract slightly more traffic from SH58, but this is only of the order of 500 vehicles per hour.

Between 2016 and 2026 the daily total flow on SH 58 changes by about 2000 vehicles a day.

### **Flows on The Esplanade**

During the am peak flows on The Esplanade are predominantly westbound and during the pm peak the flows are predominantly eastbound; during the inter peaks the flows are balanced between the westbound and eastbound directions.

During the 2016 am peak, flows are slightly reduced in Test 2 and Test 3 when compared with Test 1 (the Do Minimum), this can be attributed to the link road feeding traffic in at Dowse. Test 5 also shows a reduction when compared with Test 1 due to the Petone-Grenada link road having no direct connection to The Esplanade. Tests 4 and 6 which have a direct connection to The Esplanade have significant increases in volumes by approximately 200 vehicles per hour in both the eastbound and westbound direction. Changes are less marked in the inter peak period (although the percentage changes are similar). The PM peak has a slightly higher increase in flow in the westbound direction for Tests 4 and 6. The large increase westbound is due to the release of the bottleneck at the Petone interchange reducing delays here significantly.

The 2026 total flows eastbound and westbound show the same patterns as the 2016 outputs. Again, the westbound direction for Test 4 and Test 6 show slightly higher increases in the flows. The flows change in each test in the order of 100 to 200 vehicles per hour.

HCV volumes on The Esplanade are of the order of 30-100 vehicles per hour during each of the peak hours modelled. The changes in flows with each of the options displayed similar patterns to that of the total vehicles. The HCV flows for the year 2026 show the same pattern as for the 2016 outputs. The HCV flows for all three time periods increase by approximately 20 HCVs per hour.

The 2016 daily flows show the same trends as for the peak hours with increases in volume in the order of 20% for Test 4 and 10% for Test 6 and decreases of the order of 5% for all other Tests compared to Test 1. Between 2016 and 2026 daily flow changes increase by about 2000 - 4000 vehicles with the highest increase for Tests 4 and 6.

### **Benefits**

The Petone-Grenada Link provides significant benefits in the “whole” Ngauranga Triangle Study area. The link road will reduce travel distances by approximately 6km for vehicles travelling between Grenada and Petone, this reduction in travel distance and corresponding decreases in travel times will have an impact of development along the route (especially the Lincolnshire Farm area) and also promote development in Grenada and Gracefield.

There are improvements to the travel times on the whole network as a result of the construction of the link road. Accessibility between key locations such Grenada, Petone and Gracefield is



improved significantly as a consequence and this improves the likelihood of development being attracted to the areas. The link road has been designed to accommodate cyclists and implementing bus services will provide a connection between key locations in Greater Wellington.

The new link road will provide added security to the network by offering an alternative route from SH2 (at Petone) to SH1 (at Tawa / Johnsonville). Currently SH2 is the only connection between Petone and Ngauranga without the need for significant detours; this section of the highway is a two lane road and any major incident which could close the road results in significant delays for motorists. The construction of the link road will improve this situation by offering an alternative route to travel during any major event.

Table 4-34 summarises the benefits and costs of the Petone-Grenada Link options.

■ **Table 4-34: : Costs, Benefits and BCR associated with SH1 - SH2 Link Road**

Option	2008 Capital Costs	Benefits	BCR
Link Road with Connection at Tawa Interchange and Dowse Interchange	\$255,000,000	\$157,000,000	1.1
Link Road with Connection at Tawa Interchange, Grenada North interchange and Dowse Interchange	\$264,000,000	\$159,000,000	1.0
Link Road with Connection at Tawa Interchange and The Esplanade	\$240,000,000	\$182,000,000	1.3
Link Road with Connection at Tawa Interchange and SH2	\$230,000,000	\$171,000,000	1.3
<b>Link Road with Connection at Tawa Interchange and both SH2 and Petone</b>	<b>\$250,000,000</b>	<b>\$192,000,000</b>	<b>1.3</b>

### Urban Planning / Environmental Assessment

The urban planning and environmental assessment considerations relating to the link road are summarised below:

■ *Community Cohesion*

The link road provides a connection between SH1 and SH2 and would provide a direct route between Grenada and Petone. A direct route is anticipated to have a significant positive effect on community cohesion due to improved connectivity between Lincolnshire Farm, Horokiwi and Petone. In addition, a direct connection is consistent with the development aspirations contained in the Lincolnshire Farm structure plan.

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- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

It is understood that the majority of the proposed route would not cross any significant cultural or heritage features and as such the effect of the project would remain neutral. However, this effect would need to be confirmed following further consideration of the design and location of the route.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

The northern end of the Petone-Grenada Link would pass through greenfields and no significant effects on native vegetation, wetlands or critical habitat and endangered species are expected.

There would be some loss of small stream sections in the headwaters of the Horokiwi and Belmont Stream, and some loss of regenerating native vegetation in the vicinity of the northern Horokiwi Quarry fill site. These losses could be mitigated by appropriate planting and stream restoration.

Subject to further investigations and design, the southern part of the route is likely to result in the loss of native vegetation where it crosses from the Horokiwi Stream towards and along the coastal escarpment, particularly as there are areas of vegetation zoned as Open Space B and identified in WCC inventories as primary forest and bush areas, which are significant ecological resources. The route could also affect vegetation included in Hutt City Significant Natural Areas. Construction will also have a negative impact where it crosses the Korokoro Stream. Effects would be minimised if the crossing point was within or close to current commercial area in Cornish Street.

- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

Noise and vibration effects associated with the Petone-Grenada Link are likely to be negative particularly in the northern and southern end of the route as the alignment options could be in close proximity to Horokiwi residential areas. Based on the Transit New Zealand Guidelines, even at a 500m distance, there is potential for adverse noise effects to be more than minor without mitigation in place.

The noise and vibration effects of the middle section of the route is however likely to be neutral as it passes industrial and suburban centre land, rather than residential.

- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

Erosion and sediment effects are anticipated to be negative due to issues relating to the proposed route running through a number of streams, three sites identified on the GWRC's Selected Land Use Register as being potentially contaminated land (Northern Landfill, Cottles Landfill and Horokiwi Quarry) and having significant gradient in parts of the proposed route. Construction of the link would have a significant impact on the natural drainage channels and terrain. Careful design and construction would need to be carried out to minimise sedimentation effects on waterways and ensure that there are no long term erosion issues. In addition, dust could also be a



significant issue that needs to be considered due to the existence of power lines over the proposed route.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

The effect of the Petone-Grenada Link on climate change impacts is likely to be neutral on the majority of the route; however it is considered that further investigation would still be required to determine any actual or potential effect. Climate change impacts on the southern end of the proposed route could however be negative as increased storms could result in increased landslides by the ridge which the route would need to pass through.

- *Support local development.*

The proposed option could be positive to local development as the link would assist in providing a direct connection between Tawa, Grenada and Petone, as well as Grenada and the Lincolnshire Farm development. In the Lincolnshire Farm location, creating viable retail as a setting for other employment opportunities beyond larger scale industrial uses is paramount. The Lincolnshire Farm link has the potential to have a meaningful relationship to the node condition by encouraging local connectivity to the effective main street. This option would also assist in making Seaview more accessible from SH1, making the area more attractive for development.

- *Contaminated Land*

Extensive investigations would be required to be completed to determine the level and extent of contamination present at each of the sites and, to determine what remedial actions may be required. This could be a relatively expensive exercise depending on how the excavated material has to be treated for disposal. Cottles Landfill could be highly contaminated due to the previous activities carried out at the site. It was effectively a landfill with limited control where commercial, industrial and hazardous waste was disposed and open burning of waste occurred. The contaminants that could be present are extensive and could be quite difficult to manage, they include polycyclic aromatic hydrocarbons, metals, dioxins and potentially asbestos. Odour from excavations into waste in the Northern Landfill and Cottles Landfill will need to be assessed and relevant discharge consents acquired. Cutting into buried waste at the Northern Landfill, which will be in an anaerobic state, will result in the integrity of the landfill capping to be broken and therefore allowing landfill gas (a significant odour source) to be released. Odour from the landfill will be a key issue during its consenting process. Engineering solutions will be required for any cuts through the landfill in order to reinstate the integrity or equivalent of the landfill cap and reduce odour impact. Special controls may be required during the period the landfill is opened to prevent odour nuisance to residential properties on Middleton Road.



■ *Landscape – Visual Assessment*

The link road itself and changes to landform with areas of cut and fill and removal of vegetation will have a permanent visual impact and will bring about changes to experience of place. The degree of change will depend on:

- the extent of landform change,
- removal of existing vegetation,
- distance from the viewpoint,
- degree of movement and noise,
- the background against which the road is viewed,
- changes to character; and
- mitigation of these changes.

A preliminary assessment of the visual impact of the link road has been undertaken and is shown in Appendix E. In summary there will be a strong localised impact at all stages along the route. These impacts can be mitigated, but not removed. Mitigation includes contouring of cut and fill areas to match existing landforms, planting or other techniques such as tunnelling.

■ *Geotechnical issues*

Due to the significant geotechnical issues associated with this route, the following assessment has been provided. From the alignment to the south east of Horokiwi Quarry, there is a hazard of 3 (moderate) to 4 (between moderate and high) as the alignment runs in an east-west direction.

Geotechnical implications of this section may include:

- significant cut slopes with benching or slope retention systems;
- potential bridge over the buildings on Cornish Street;
- significant fill embankments; and
- potential slope instability in the overlying soils or within the greywacke.

The middle of the alignment skirts the eastern side of Horokiwi Quarry, where the earthquake induced slope failure hazard map indicates a hazard of 3 (moderate) to 5 (high) around the eastern Horokiwi quarry slopes. The alignment crosses Horokiwi Road and an existing quarry access road. To the north of the quarry, the alignment traverses a landfilled area. The contamination and geotechnical properties of the fill material are unknown and would require assessment.

Geotechnical implications of this section may include:

- significant cut slopes with benching or slope retention systems;
- potential half bridging of carriageways;
- fill embankments;
- bridges over existing roads/realignment of existing roads; and

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- potential slope instability in the overlying soils or within the greywacke.

Differential settlement and potential contamination issues could be encountered over landfilled area. Ground improvement may be required.

Leaving the quarry to the north, the alignment climbs through the side of a gully to a former landfilled area. The alignment then follows generally flat high ground, crossing Lincolnshire Road and a second unnamed track through a second landfilled area, joining SH1 just before the Takapu Road junction. Geotechnical implications of this section may include:

- Slope instability within the gully just north of the quarry in the overlying soils or within the greywacke
- cut slopes and/or half bridging of carriageways through the gully;
- Cut slopes with benching or slope retention systems;
- Fill embankments.
- Differential settlement and potential contamination issues over landfilled areas. Ground improvement may be required.

An extensive geotechnical investigation should be carried out to aid the design of the road to minimize these geotechnical risks.

#### ■ *Consenting Issues.*

A new Notice of Requirement (NoR) and regional resource consents will be required and while the potential route has been identified in the Lincolnshire Farm Structure Plan, the landscape assessment is identified as an important issue to be considered. Multiple resource consents will also be required. Compared to the rejected long list options, this option is positive, however, overall consenting issues are considered to be negative for this route. Other than granting the NoR the proposed route would cut through a number of potential contaminated sites listed on GWRC's Selected Land Use Register including the closed Northern Landfill, closed Cottles Landfill and Horokiwi Quarry, Odour and air discharge consents would be required.

#### ■ *Regional Parks.*

The proposal would provide better access to the Belmont Regional Park, which is a positive benefit.

### **Next Steps**

The Petone-Grenada Link is an economically providing travel time and route shortening benefits for road users. In addition, this project provides relief to SH1 and SH2 in the study area with consequential travel time and travel time reliability benefits. Further, this project improves overall network resilience in this area of the network as it provides an alternative route in the event of some incident either on SH1 or SH2. It is recommended that these projects should be included in the Strategy.

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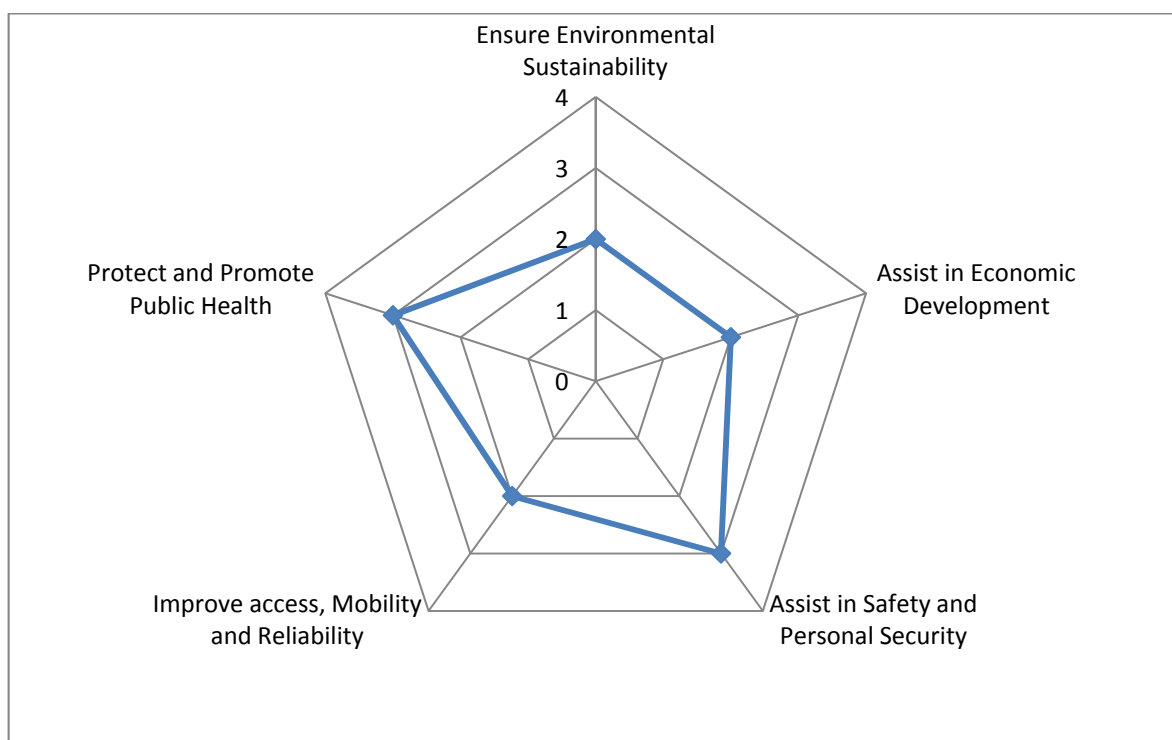




#### 4.4. SH2 to Seaview-Gracefield (Cross Valley Link Options)

##### 4.4.1. Traffic Calming works on The Esplanade

This option involves the construction of traffic calming devices along The Esplanade and Jackson Street West to encourage motorists to use alternative links and reduce the traffic volumes on The Esplanade. The project can be implemented as a “stand alone” project or be used to complement other cross valley projects described in this section. Figure 4-10 and Table 4-35 summarise the key study objectives met by the implementation of this project.



- **Figure 4-10: Benefits of Traffic Calming on The Esplanade**
- **Table 4-35: Benefits of Traffic Calming on The Esplanade**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	This option will be able to improve community cohesion and provide improved access to the Petone foreshore. There is also a possibility to improve the existing environment through specimen planting along the route and improving planning controls over time to allow for redevelopment of the land uses.
Assist Economic and Regional Development	This option will assist in reducing the HCVs and commuter vehicles travelling along The Esplanade west of Cuba Street. It will allow the redevelopment and integration of the foreshore and could attract additional tourist / recreational activity.
Assist in Safety and Personal Security	Reducing HCVs travelling along The Esplanade will improve safety for those accessing and using the foreshore area. Traffic will be diverted down other



	routes within Petone; however although improving safety of The Esplanade, this leads to a reduction in safety in the other areas.
Improve Access, Mobility and Reliability	This option will lead to a reduction in the number of HCVs travelling along The Esplanade, improving the safety of the area and “attractiveness” for walkers and cyclers.
Protect and Promote Public Health	Reducing the number of HCVs along The Esplanade will mean that the foreshore is more accessible to the public attracting walkers and cyclers to the area.
<p><b><u>Conclusion:</u></b> This option on its own will increase delay on the network and needs to be coupled with the Cross Valley Link project.</p>	

### Transport and Rooding

Traffic calming measures such as a posted speed limit of 30km/h along The Esplanade (between Hutt Road and Cuba Street) and Jackson Street west and a permit based access system for HCVs would increase the travel times between the Seaview area and SH2 along The Esplanade and encourage motorists to use alternative routes. This will lead to the reduction of traffic volumes and HCV’s along The Esplanade and allow for redevelopment and integration of the foreshore.

The key objectives for implementing traffic calming along these routes is to reduce speeds and encourage motorists to use alternate routes, thereby reducing traffic volumes. Traffic calming methods that will achieve **both** these goals include<sup>19</sup>:

- Raised tables;
- Wombat crossings;
- Road humps;
- Raised intersection platforms;
- Roundabout control at intersections
- Slow points (one lane or two lane);
- Blister islands; and
- Perimeter threshold treatments.

Each of these traffic calming techniques offers solutions to assist in lowering the speed and encouraging alternative routes. This will increase delay on the network and produce negative transportation benefits. Measures such as wombat crossings and blister islands will offer benefits to pedestrians and assist in moving priority from vehicles to pedestrians. If designed correctly, the traffic calming measures used along these sections of road (especially The Esplanade) can

<sup>19</sup> Austroads Guide to Traffic Engineering Practice: Local Area Traffic Management



accommodate cyclists, while still having the desired impact of reducing traffic volumes and heavy vehicle numbers.

A range of traffic calming measures can be implemented along the route. With careful design these traffic calming measures can assist in integrating the local community with the foreshore.

Consideration will need to be given to possible routes for oversized vehicles and this may govern the appropriate traffic calming techniques.

In the past five years (2004 and 2008) there have been 92 crashes along The Esplanade. Twenty five of these crashes have resulted in injury. Table 4-36 and Table 4-37 present a breakdown of the accidents occurring over the last five years and a summary of the main types of accident.

■ **Table 4-36: Quantity and Characteristics of Crashes along The Esplanade**

Year	Fatal	Serious	Minor	Non Injury
2004	0	1	2	14
2005	0	0	4	5
2006	0	0	2	11
2007	0	1	9	19
2008	0	0	6	18
<b>TOTAL</b>	<b>0</b>	<b>2</b>	<b>23</b>	<b>67</b>

■ **Table 4-37: Type of Crashes along The Esplanade**

Crash type	Number	Percentage
Overtaking	5	5
Straight Road: Lost Control / Head On	3	3
Bend: Lost Control / Head On	3	3
Rear End / Obstruction	51	55
Crossing / Turning	29	32
Pedestrian Crashes	0	0
Miscellaneous	1	1
<b>Total</b>	<b>92</b>	<b>100</b>

It can be seen from this data that just over half of the accidents that occur along The Esplanade are Rear End / Obstruction accidents. Further analysis has shown that 42% of these accidents occur between 6.00am and 9.30am or 3.30pm and 7.00pm. During these times The Esplanade is prone to high levels of congestion which explains the high number of rear end accidents. Traffic calming along this route will reduce the congestion and number of accidents. Careful design and planning will need to be carried out to ensure that these crashes are not displaced to another part of the network. Improving the network, as described in sections 4.4.3 through 4.4.6 will assist in reducing the number of crashes and not just “moving” them.



Table 4-38 summarises the benefits and costs of the implementation of traffic calming along The Esplanade and Jackson Street west (as a standalone project).

- **Table 4-38: Costs, Benefits and BCR associated with Traffic Calming Along The Esplanade**

Capital Costs	Benefits	BCR
\$1,000,000	NEGATIVE BENEFITS	N/A

### Environmental / Urban Planning

The environmental / urban planning considerations relating to traffic calming on The Esplanade are summarised below:

- *Community Cohesion*

The proposed traffic calming may have a negative effect on communities affected by traffic moving from The Esplanade onto a new cross valley route. The severity of this effect however will depend on the design put forward for the alternative route. It is likely that traffic would use Udy and Cuba Streets, which could effectively provide a degree of severance for the Petone community if the route is not designed appropriately. Providing for adequate cross connections for local traffic, cycling and pedestrian movements along and across the route is paramount. For the local community in Petone adjacent to the foreshore route, traffic calming alone may positively provide for community cohesion as heavy traffic diverts to other streets to travel between Seaview and SH2. This has the potential to allow for redevelopment of the surrounding land uses maximising development potential.

- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

There are a number of heritage and cultural sites throughout Petone. If traffic is moved into these heritage areas after traffic is moved off The Esplanade, there is the possibility of degrading the precinct. However, if the link road is located and designed appropriately this should not be an issue.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

At this time, no significant native vegetation, wetlands, critical habitats or endangered species have been identified. There could be potential to improve the foreshore environment with replanting of native vegetation in selected locations.

- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

This option may divert traffic through Udy and Cuba Streets, potentially increasing the noise and vibration impacts that may occur in the Petone Main Street area and other surrounding areas. There is potential for increased noise and vibration to occur in these areas. However, there is potential for a reduction in noise and vibration effects along the foreshore as heavy vehicles are moved off this route due to traffic calming.

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- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

At this time, it is expected that erosion and sediment deposition should not be a significant issue for this option. However, further investigation should take place to confirm this.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

This option provides positive impacts as it takes the main transportation route further away from potential climate change impacts, particularly from sea level rise combined with storm surge and future tsunami risk.

- *Support local development.*

The effect on local development is overall considered to be neutral. Effect on the redevelopment potential in the Seaview/Gracefield area is likely to be negative as the option would serve to divert traffic onto the local road network and make it more difficult for HCVs to access the area. This would also increase travel times and may repeal employment into the area.

However, traffic calming may divert traffic (including heavy vehicles) into the local network from The Esplanade which would significantly decrease traffic volumes that travel along The Esplanade. This may improve amenity and enable redevelopment of the area to better integrate the urban environment (including the Jackson Street retail core) with the foreshore.

- *Landscape Issues.*

This option would have positive effects on the visual landscape, landscape character, land use and amenity, public open space, sites of value to tangata whenua and heritage landscape and sites along The Esplanade and foreshore. It would improve links between the foreshore and built areas for recreation and amenity, and create opportunities for development along the built edge. It would have a positive impact on surrounding reserve areas, enabling safer pedestrian linkages such as access to Hikoikoi Reserve. It would create opportunities to further develop greenways along and to the Petone foreshore. A more detailed visual assessment (as undertaken for the Petone to Grenada Link Road) was not carried out as visual impacts were not seen as a key risk to this project.

- *Regional Park.*

The proposal may increase access to Korokoro Valley the Belmont Regional Park for cyclists and pedestrians and greenways linking the foreshore with the park.

- *Consenting Issues.*

Statutory approvals include an Outline Plan of Works from the Hutt City Council assuming all works are able to be carried out within HCC designation. This should be a relatively straightforward process. There would also need to be assessments outlining the potential traffic effects on the Main Street.



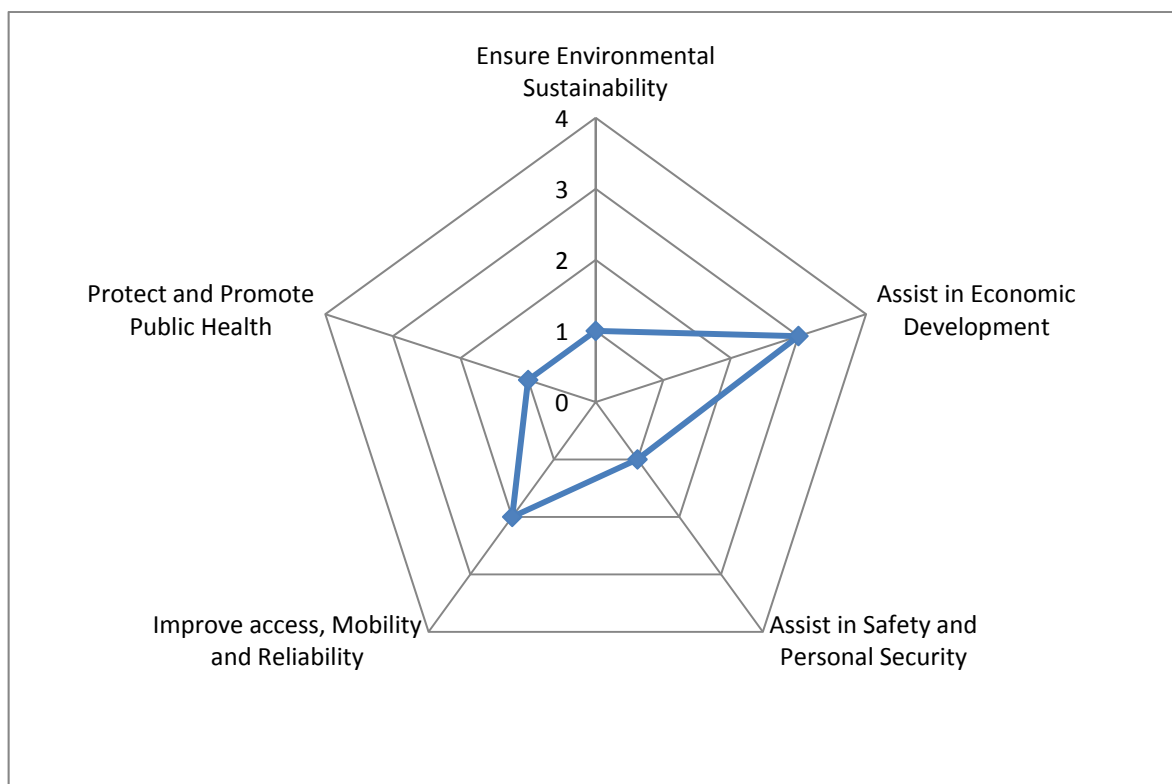
### **Next Steps**

This project on its own will increase delay on the network. Therefore, it is recommended that this project be considered as part of the Cross Valley Link project as part of the Strategy.



#### 4.4.2. The Esplanade Multi Lane Efficient Arterial

This option would involve the upgrading of The Esplanade to a multi lane efficient arterial. This would involve upgrading so that two lanes are provided in each direction and turning bays are provided at key intersections with traffic signals prioritised for through traffic. To ensure that the arterial is as efficient as possible, it is recommended that intersections be designed (where possible) as left in left out to limit delays. Figure 4-11 and Table 4-39 summarise the key study objectives met by the implementation of this project.



■ **Figure 4-11: Benefits of The Esplanade multi lane arterial**

■ **Table 4-39: Benefits of The Esplanade multi lane arterial**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	This project provides for a more efficient transportation system that will provide reduced GHG emissions. However, it would not provide substantial social and environmental benefits to immediate residents as the road would have noise effects on the surrounding properties and potentially reduce connectivity with the waterfront.
Assist Economic and Regional Development	Providing increased capacity between SH2 and Seaview will attract development to the industrial area. The increased capacity will reduce the travel times and improve travel time reliability.
Assist in Safety and Personal Security	The multi lane efficient arterial will increase the capacity along The Esplanade; this will allow for



	further traffic growth to occur and increase the total vehicle kilometres travelled. The increased capacity will promote development in the Seaview area and likely result in an increase in the number of HCVs travelling along The Esplanade.
Improve Access, Mobility and Reliability	An increase in the capacity of The Esplanade will reduce the amenity of the foreshore and surrounding areas and will not encourage alternative forms of transport. Increased capacity will reduce congestion and result in a reduction in travel times.
Protect and Promote Public Health	The multi lane efficient arterial adds capacity to The Esplanade and will result in a higher number of HCVs using the route. Increased capacity will not encourage the use of alternative forms of transport such as walking cycling and buses.
<p><b><u>Conclusion:</u></b> Although The Esplanade Multi Lane Arterial will add capacity to the network and encourage development in the Seaview area, it will significantly reduce the amenity of the Petone Foreshore and surrounding areas. A key objective of this study is to improve the amenity of the Petone Foreshore for future integration with the surrounding area and possible development; the multi lane arterial will not assist in improving the amenity of the area, and will in fact make it worse. For this reason, the multi-lane arterial does not meet a number of the project drivers, and as such will not form part of the Strategy.</p>	

## Transport and Rooding

The Esplanade multi lane efficient arterial would be a 50 km/h, 4 lane arterial that would travel between the Hutt Road roundabout and the Seaview roundabout. The arterial would be designed to prioritise traffic signals for those travelling in the east west direction (i.e. travelling along The Esplanade), but would also provide crossing facilities for walkers and cyclists.

To ensure that there was sufficient capacity at the intersections, the road has been designed to accommodate 3m turning bays. Although this is not a full lane width, there is sufficient shoulder space and median to ensure that turning bays and stacking space will not impede through traffic. There are a number of local roads that currently join onto The Esplanade, although these have not been looked at in detail at this stage, it is recommended movements onto The Esplanade are limited where possible to left in, left out to assist in improving the efficiency of the network, reducing delays and improve travel times.

To accommodate pedestrians the multi lane efficient arterial would provide a 2.5m footpath. The carriageway cross section would comprise 3.0m parking (on both sides of the road) and two 3.5m travelling lanes in each direction. There is an existing off road cycleway that runs along the Petone foreshore; to encourage cyclists to use this facility no specific on road cycleway has been designed. However, the parking lane with a width of 3.0m provides sufficient room for cyclists to travel along if they desire to travel on road.





To provide the above facilities, property acquisition will need to take place along the southern side of The Esplanade (seaward side). The current road reserve averages 20m at the western end, and increases at the eastern end. The proposed road reserve is 28m and some locations as much as 8m of land will be required.

To ensure that there is not a “choke point” at the existing bridge, there will be a need for two additional lanes across the Hutt River. Clip-on extensions were considered as a solution in previous studies. However, due to the high number of services and the type and age of the structure, this is not a feasible option. A new bridge would need to be constructed to the north of the existing structure carrying one direction of traffic and the existing bridge would carry the other direction.

In the past five years (2004 and 2008) there have been 92 crashes along The Esplanade. Twenty five of these crashes have resulted in injury. Table 4-40 and Table 4-41 present a breakdown of the accidents occurring over the last 5 years and a summary of the main types of accident.

■ **Table 4-40: Quantity and Characteristics of Crashes along The Esplanade**

Year	Fatal	Serious	Minor	Non Injury
2004	0	1	2	14
2005	0	0	4	5
2006	0	0	2	11
2007	0	1	9	19
2008	0	0	6	18
<b>TOTAL</b>	<b>0</b>	<b>2</b>	<b>23</b>	<b>67</b>

■ **Table 4-41: Type of Crashes along The Esplanade**

Crash type	Number	Percentage
Overtaking	5	5
Straight Road Lost Control / Head On	3	3
Bend: Lost Control / Head On	3	3
Rear End / Obstruction	51	55
Crossing / Turning	29	32
Pedestrian Crashes	0	0
Miscellaneous	1	1
<b>Total</b>	<b>92</b>	<b>100</b>

Table 4-41 shows that over half of the accidents are Rear End / Obstruction accidents. More detailed analysis of accident data shows that 42% of accidents occur between 6.00am and 9.30am or 3.30pm and 7.00pm; typical times for high levels of congestion. The high number of rear end accidents and typical time of day in which these accidents are occurring can be attributed to the typical peak period congestion seen along The Esplanade. Increasing the capacity of The Esplanade



through the construction of the multi lane efficient arterial will assist in reducing the high number of accidents.

Although this option does provide a solution that will meet traffic demands, it will not assist with improving the amenity and allowing for future redevelopment of The Esplanade. The Seaview and Gracefield areas are significant industrial regions with capacity for future development. Improving the capacity and function ability of The Esplanade is likely to attract further development, but increase HCVs and traffic volumes along The Esplanade.

Table 4-42 summarises the benefits and costs of the implementing of traffic calming along The Esplanade and Jackson Street west (as a standalone project).

■ **Table 4-42: Costs, Benefits and BCR associated with The Esplanade multi lane efficient arterial**

Capital Costs	Benefits	BCR
\$90,300,000	\$4,300,000	0.08

**Environmental / Urban Planning**

The proposed option will be positive for economic development for the greater Wellington region as the routes would add capacity between SH2 and Seaview. However, access difficulties and amenity reductions may negatively impact on future economic development opportunities east of Cuba Street and along Cuba Street. More provision for traffic capacity (mostly HCVs) would result in associated air quality, vibration and noise effects. This is likely to introduce reverse sensitivity, which is likely to discourage activities such as residential and retail from locating there. In saying this, its proximity to the Seaview area and freight movements may support flexible light industrial or commercial servicing activities.

The preferred option enables local movement and access as it does not disconnect any part of the movement network in Petone and in some areas may improve vehicle congestion and capacity locally. However, local movement and access may be disadvantaged where the freight route is located along local streets. These impacts may include:

- Reduced ability of pedestrians to cross at mid block and intersection conditions (relating to the frequency and speed of vehicles and the width of the road);
- Reduced access to land uses (relating to possible removal of parking, and a lack of access management, restriction of property ingress/egress); and
- Discouraging of pedestrian activity -walking next to multiple high intensity traffic lanes can expose people to vehicle noise, exhaust fumes, intimidation by the sheer intensity of movement occurring, and physical wind shear associated with the close passage of rapidly moving large vehicles. Safety may also be adversely affected.



The community east of Cuba Street and along Cuba Street may be adversely impacted on by the route. Loss of amenity and some reverse sensitivity effects will arise for adjacent land uses.

The proposed alignment could have a negative effect on community cohesion as having a high volume of traffic along this route may provide a degree of separation between the southern parts of Petone including the waterfront. However this is dependent on the final design of the street and crossing points. The area near Waione Street is also currently being redeveloped by Housing New Zealand Corporation through a master planning process. How the route upgrade complements this work will help determine how successfully this project contributes to community cohesion. The route also passes through the 'Nicholson Block' which is currently under Treaty claim.

### **Environmental Assessment**

#### ■ *Noise*

In terms of noise effects, both the Transit Guidelines and the draft standard DZ6806 recognise residential activities and educational facilities (schools, early childhood centres etc) as facilities requiring protection from the adverse effects of traffic noise. There is a early childhood centre that could be affected by this project.

For traffic travelling along the Esplanade, lane widening and property purchase may expose receivers to more noise from traffic, and with an increase in traffic capacity, traffic noise will also increase. At this stage, it is unclear if mitigation would be required, as there has been no assessment completed to identify the current noise level in this area.

#### ■ *Air Quality*

Due to increased vehicle numbers on the proposed route there could be an increase in local air quality effects on residential properties located along the route, especially from heavy commercial vehicles.

#### ■ *Climate Change impacts*

The route may be affected by future storm surge, sea-level rise and Tsunami risk decreasing overall route security. Because of these factors, overall climate change impacts on the route are likely to be negative however the route could be designed to take these impacts into account.

#### ■ *Ecology/landscape*

The Esplanade gives access to the foreshore reserves including Hikoikoi Reserve. Maintaining accessibility to these foreshore reserves is also extremely important and crossing points would need to be created and/or maintained. Crossing points and linkages would need to be created and/or maintained.

#### ■ *River Crossing*

This site is proposed to have a new two lane road bridge immediately to the north of the existing road bridge. Under this option, the existing bridge will be retained to carry west bound traffic and the bulk water mains.

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The river reach upstream of the existing bridge is protected by flood defence embankments but only to a 100 year return period standard. GWRC have plans to upgrade these defences to the full 440 year standard but timeframes for this are not yet known. Downstream of the existing bridge there are only minor flood defences on the left bank. These are maintained by HCC.

The existing bridge is some 50 years old and has significant residual life. The existing bridge is clear of the design flood and has piers which are well aligned with flood flows.

Any new bridge will need to provide the required 2800m<sup>3</sup>/s flood conveyance with an additional 900mm clearance to allow for uncertainties. The bridge abutments will need to maintain the integrity of the existing and proposed flood defences and maintain at least the existing flow path. Provision will be needed to allow continued maintenance of the flood banks and GWRC will need to be involved in any design process.

Any new bridge should have a minimum number of piers in the flood channel. Piers will need to be aligned with the river flow but should also align with the position of the existing bridge piers. The Hutt River can cause considerable scour and the pier depth will need to account for this. Deep piers will have the potential to impact on the aquifer below and mitigation measures will be required to avoid creation of pollution vectors.

The Te Momi stream passes under the western approach to the existing bridge and is provided with flood gates. Any new structures would need to make continued provision for this.

The bridge approaches will need to be graded for the expected traffic requirements. GWRC would prefer that the approaches are kept as near to natural ground level as possible to avoid the creation of new floodplain barriers.

■ *Contaminated Land*

There are a number of potentially contaminated sites on the GWRC's Selected Land Use Register that the route would pass through on East Street. These include the rear of Unilever Australasia's site on 480 Jackson Street, Sika's site at 69 Waione Street and Te Momi Stream. The extent and types of contaminants present are not known and investigations along the route would be required.

■ *Geotechnical constraints*

The geology beneath the alignment from west to east consists of the following:

- Petone Marine Beds
- Alluvium on Gear Island which consists of loose to dense silts, sands and gravels. The fine sand lenses within the Alluvium are liable to liquefaction, lateral spreading can occur along stream and river banks and soft silt lenses have low bearing strength;
- Reclamation Landfill on the eastern banks of the Hutt River;
- Alluvium from approximately 50m west of the roundabout.



Reference to the GWRC geological hazard maps has indicated the following within or close to the proposed option:

- Possible contaminated land to the south of The Esplanade and to the north of Waione Street;
- Combined earthquake hazard of 5 (high);
- High liquefaction hazard;
- Ground shaking earthquake hazard of 4 (moderate to high) to 5 (high).

The potential impacts of these geohazards on the design and construction are:

- Road widening and bridge construction in Petone Marine Beds susceptible to liquefaction, lateral spreading and cutting instability;
- Road widening and bridge construction in Alluvium liable to liquefaction, lateral spreading and low bearing strength for foundation construction;
- Road widening over reclaimed land causing possible differential settlement of highway resulting in increased maintenance costs and shorter serviceable life;
- Construction in the vicinity of contaminated land mobilising contamination;
- Piling in the vicinity of liquefiable Petone Marine Beds causing damage to adjacent structures during construction.

For a full assessment of the risks of each of these geohazards see Appendix F.

■ *Statutory approvals*

Statutory approvals will be difficult to obtain with an alteration to designation, or new designation, significant community consultation and regional consents required to build a new bridge and to take account of the flood risk and for contaminated land. Other regional consents may also be required.

### **Next Steps**

The construction of The Esplanade multi lane efficient expressway will increase The Esplanade capacity allowing for future traffic growth, reductions in travel time and increases in travel time reliability. It will also encourage development in the Seaview industrial area.

However, there are also significant community and environmental issues with the construction of the multi lane efficient arterial. One of the main objectives of this study is to improve the amenity of the Petone foreshore and surrounding areas, which identifies this should be done by reducing the traffic volumes and the number of heavy vehicles along The Esplanade. This project will do directly the opposite and encourage traffic growth and heavy vehicles. Walking and cycling may also reduce as a consequence of the reduced amenity along the foreshore and reduced integration with the surrounding community. Ultimately, this will result in a reduction of the attractiveness of the area for developers.



Further, it can be seen that the benefits from The Esplanade multi lane efficient arterial are low. When comparing the “do minimum” (2016) to the base (2006) approximately 150 fewer vehicles choose to go via Hutt Road roundabout which relieves pressure at this intersection; this is a consequence of the upgrade of Dowse Interchange which has increased flows on SH2 and not the upgrade to The Esplanade. There are no considerable delays along The Esplanade in the “do minimum” model and hence changes in delays between “do minimum” and The Esplanade multi lane efficient arterial are insignificant.

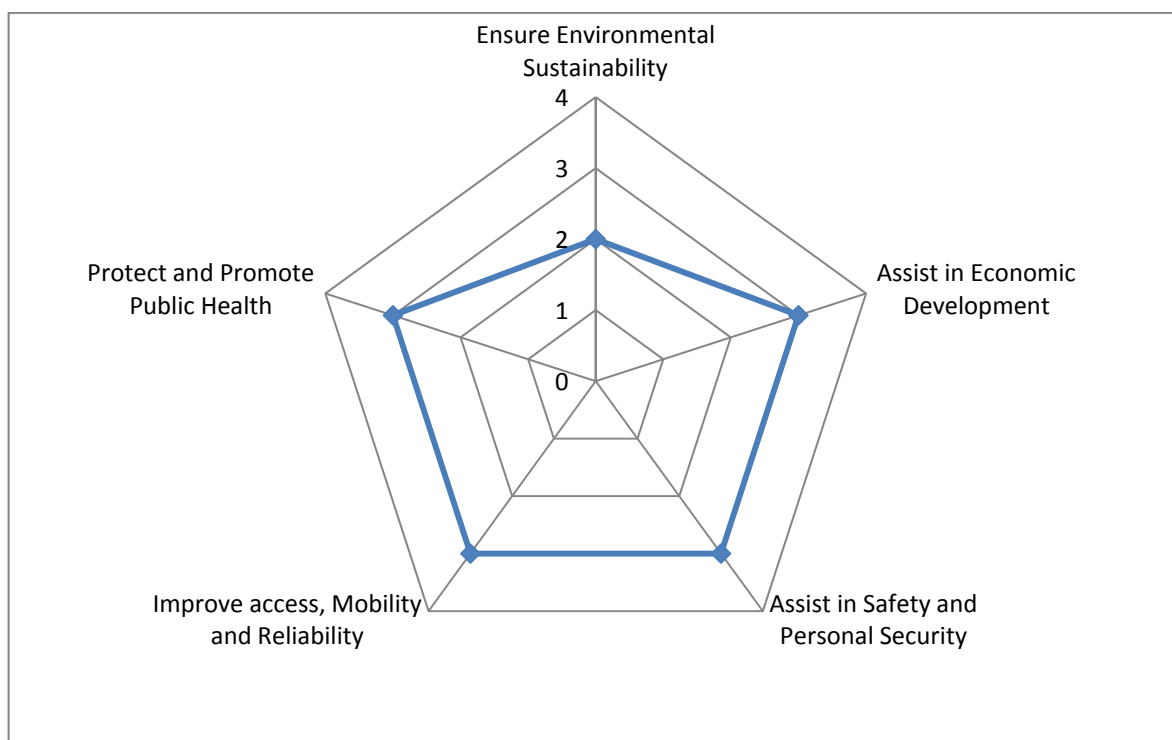
The delays in the 2006 base model (which cause congestion on The Esplanade) are as a result of the traffic merging from the ramp to SH2 resulting in significant delay to motorists of approximately 30 seconds as a consequence of the merge. Upgrading The Esplanade to a four lane road in each direction has not assisted in solving the key problem that causes congestion to form along The Esplanade in the AM peak, and as such the benefits of this upgrade are minor.

Due to the impact that this project will have on the Petone community, the low benefits seen with the implementation of the project and the fact that it does not meet some of the key strategic drivers for the project, The Esplanade multi lane arterial will not be carried through to the next stage of the project.



#### 4.4.3. Wakefield Street to Rail Alignment

The Wakefield Street to Rail Alignment option seeks to improve the existing road carriageway along Wakefield Street between Hutt Road and Cuba Street. Near the intersection of Cuba Street the proposed link will move into the rail corridor and run along the railway reserve crossing the Hutt River on a new bridge and connecting at Randwick Road. Figure 4-12 and Table 4-43 summarise the key study objectives contributed to by this project.



- **Figure 4-12: Benefits of the Wakefield Street to Rail Alignment**
- **Table 4-43: Benefits of the Wakefield Street to Rail Alignment**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	This route could provide for future redevelopment of the Petone foreshore. Following the rail alignment also provides for reduced effects on the surrounding community up to the bridge. If the combined rail/road bridge option is pursued this would also reduce effects on the river. However, there could be significant localised community disruption along the new route where some property purchase may be necessary depending on the final alignment chosen and detailed design.
Assist Economic and Regional Development	Improved access and capacity for vehicles accessing the Seaview and Gracefield area. Added capacity and increased speed may lead reduced travel times during the peaks. Provides an alternative route to The Esplanade and improves the amenity of the foreshore area. This route provides for agglomeration of the



	Seaview area into the wider region.
Assist in Safety and Personal Security	This project (especially if implemented in conjunction with traffic calming) will assist in removing traffic from The Esplanade, allowing safer access to the foreshore area and provide traffic using Wakefield Street a purpose built road designed to be safe.
Improve Access, Mobility and Reliability	Removing HCV's from The Esplanade will improve access for those wishing to make use of the foreshore area. The route will also improve capacity and travel time to the Seaview area.
Protect and Promote Public Health	Removing vehicles from The Esplanade will mean that the foreshore is more accessible to the community; this may lead to increases in walkers and cyclists.
<p><b><u>Conclusion:</u></b></p> <p>This option needs further work to prove that it is economically viable. This will require the quantification of the amenity and economic regeneration benefits for The Esplanade and Seaview/Gracefield. This project clearly provides greater transport efficiencies to the network and enables the redevelopment of the foreshore for more of a community focus.</p>	

### Transport and Rooding

Initially this project considered the construction of a four-lane, 70km/h (operating speed) link between SH2 and Randwick Road. It was proposed the road would run along Wakefield Street. At the Cuba Street overbridge, it would diverge away from the existing street and transverse adjacent to the rail reserve. It would continue towards the Hutt River (between the rail and the existing properties), crossing the river and then connect in at Randwick Road. It was proposed that there would be two 3.5m travelling lanes in each direction with a 1.0m shoulder on each side of the road. There would be a 2.4m raised median and a footpath and berm of 3.5m. The cross-section of the proposed route would vary depending on the local surroundings. In some locations a footpath was only provided on one side of the road, but in other locations where pedestrian access was required, a footpath was provided on both sides. In the initial design of the Wakefield to Rail link, the proposed road reserve was 28m wide; this would have required the acquisition of a number of properties (at a later stage of this project this was reviewed and the cross-section area reduced). Typical cross-sections taken from along the proposed Wakefield to Rail Link Road can be found in Appendix B.

The proposed road will have similar grades to that currently existing on Wakefield Street. A climb will be required at the eastern end to rise above the stop bank and gain access to the bridge. There will be a similar fall in grade back down to a connection onto Randwick Road. The intersections at both ends, and those along the link will need to be upgraded to accommodate the increased traffic volumes. For this route to be an efficient and attractive alternative option for travelling between SH2 and the Seaview area, access to and from the side streets should be minimised. If an access cannot be closed completely (i.e. there is no alternative access) left in, left out access would be recommended.

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There is an existing railway bridge that extends across the Hutt River. Ontrack has advised that this railway bridge has at least another 20 years before it reaches the end of its design life; as such there will no requirement for a replacement in the foreseeable future. There are a number of options for a crossing in this location including:

- Modifications to the existing structure to accommodate motor vehicles;
- Construction of a new structure to accommodate both rail and road; and
- Construction of a parallel bridge to carry the road.

This link will provide an alternative route for accessing the Seaview area and will assist in reducing the volumes of traffic on The Esplanade. Implementation of the traffic calming and a permit access system for HCV's along The Esplanade will further assist in reducing traffic volumes and encouraging motorists to use the proposed link. This link will provide a higher capacity to the network, less-congested link to and from the Seaview area and improve accessibility during peak times. This will lead to the Petone foreshore area being more attractive for development.

Table 4-44 provides a summary of the costs, benefits and BCR resulting from implementation of this project.

- **Table 4-44: Costs, Benefits and BCR associated with the Wakefield Street to Rail Alignment**

Option	2008 Capital Costs	Benefits	BCR
Stand Alone Project	\$102,034,550 <sup>20</sup>	\$23,000,000	0.38
With Traffic Calming	\$103,034,550	NEGATIVE BENEFITS	N/A

### Environmental / Urban Planning

The environmental / urban planning considerations relating to the Wakefield Street to Rail Alignment are summarised below:

- *Community Cohesion*

A bridge adjacent to the railway line would provide better connectivity between the communities on either side of the river, and will have lesser impact on the community than the Whites Line alignment (discussed in Section 4.4.4) option because the route aligns with the railway and not through existing built fabric. The proposed alignment along Wakefield Street is likely to have a negative effect on community cohesion in the immediate vicinity of the route as having a high volume of traffic along this route will provide a degree of separation between the southern part of

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<sup>20</sup> This costs considers a road bridge parallel to the existing railway bridge and was revisited during the next stage of the investigation



Petone including the waterfront and main street area from the community north of Wakefield Street.

If this route is combined with the traffic calming option then it will have the least local social and environmental damage to Petone while enhancing movement efficiency of freight as it avoids passing through urban areas which potentially slows movement.

- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

The effect on cultural and heritage features is likely to be neutral as the route follows existing infrastructure.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

The proposal would have negligible impact on vegetation, wetland and critical habitat/species due to it following the existing infrastructure. Any concern would be centred on the river crossing, however the existing railway structure may be utilised to minimise impacts.

- *Flood risk/river crossing*

The existing rail bridge is some 90 years old and presents a major constraint to the passage of flood flows. The bridge deck is too low to pass the design flood event and the ten bridge piers are not well aligned with the river flow direction causing significant afflux. It is understood that this bridge only has some 20 years of residual life. For these reasons the GWRC strongly favours the option which removes the old bridge and provides for a new combined bridge.

The river reach in the vicinity of the rail bridge and any new crossing is protected by flood defence embankments. GWRC is in the process of completing a major upgrade of these defences to provide for protection against a 2800m<sup>3</sup>/s (440 year return period) flood event. It is not envisaged that there will be any realignment of these defences.

Any new bridge will need to provide the required 2800m<sup>3</sup>/s flood conveyance with an additional 900mm clearance to allow for uncertainties. The bridge abutments will need to maintain the integrity of the flood defences and maintain the existing flow path. Provision will be needed to allow continued maintenance of the flood banks and the GWRC will need to be involved in any design process.

Any new bridge should have a minimum number of piers in the flood channel. Piers will need to be aligned with the river flow but also need to account for the position of the existing rail bridge piers. The Hutt River can cause considerable scour and the pier foundation depth will need to account for this. Deep piers will have the potential to impact on the aquifer below and mitigation measures will be required to avoid creation of flow paths from the river to the aquifer.

The bridge approaches will also need to be graded for the expected traffic and rail requirements. GWRC would prefer that the approaches are kept as near to natural ground level as possible to avoid the creation of new floodplain barriers. Elevated approaches may need some provision for cross flow to prevent elevated flood levels in the event of a flood defence beach.

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The confluence of Black Creek is on the left bank just upstream of the existing rail bridge. This confluence is fitted with flood gates and an over pumping system. Any new bridge alignment should avoid interference with this area.

There may also be an increased potential flood risk in the future through climate change. However the new bridge would be designed to take this risk into account.

Through discussions with Greater Wellington it has also been identified that there is a whitebait spawning area to the south of the existing rail bridge. If a road bridge beside the rail bridge is pursued then this could be affected. Freshwater species in the river may also be impacted if a second river crossing is pursued. However, if one combined bridge is pursued the proposal would have negligible impact on vegetation, wetland and critical habitat/species due to it following the existing infrastructure. Any concern would be centred on the river crossing. Effects will be determined by the pier placement, materials (cladding) used on banks and whether riparian planting is possible.

- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

This option would increase traffic through residential areas, which could have adverse noise and vibration effects on community facilities in the vicinity, such as local schools. Based on the current traffic modelling for this project, up to an additional 7200 vph would use the road. This could have an adverse effect on noise sensitive properties of up to 3dB. However, if additional lanes required the removal of houses currently adjacent to the street then the houses behind these properties could be exposed to noise from traffic, whereas they would be currently receiving a 5 dB or more traffic noise reduction.

Consequently, for these houses the traffic noise levels would increase by 5 dB and the effect from the increased traffic volume. Whether mitigation is required for this is unclear at this stage.

In addition to the residential dwellings along this route there is at least one school in the vicinity, although this currently does not appear to be in use. Both the Transit Guidelines and the draft standard DZ6806 recognise residential activities and educational facilities (schools, early childhood centres etc) as facilities requiring protection from the adverse effects of traffic noise.

- *Air Quality*

In terms of air quality, due to increased vehicle numbers on the proposed route there could be an increase in local impacts on residential properties located along the route. The level of impact will depend on the level of increase in vehicle numbers.

- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

At this time, it is anticipated that there may be some erosion and sediment deposition issues particularly by the Hutt River. Likely effects should be able to be minimised through best practice construction processes. Further investigation should take place to confirm this.

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The alignment is generally underlain by Alluvium which is underlain by Petone Marine Beds, except for a 150m section of Petone Marine Beds 400m south of the start (north) of the section.

Reference to the GWRC geological hazard maps has indicated the following constraints are within or close to the proposed option:

- Combined earthquake hazard of 3 (moderate) then 4 (moderate to high) 100m north of Elizabeth Street;
- Liquefaction hazard variable then high 100m north of Elizabeth Street;
- Ground shaking earthquake hazard of 4 (moderate to high).

The potential impacts of these geohazards on the design and construction are:

- Road and bridge construction in Alluvium and Petone Marine Beds susceptible to liquefaction, lateral spreading, cutting instability and low bearing strength for foundation construction;
- Construction in the vicinity of contaminated land mobilising contamination.

For further detail on the risks associated with these GeoHazards see Appendix F.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

There may be an increased potential flood risk in the future through climate change. However the new bridge would be designed to take this risk into account. By moving traffic away from The Esplanade this could be viewed as positive development, as it moves traffic away from an area susceptible to sea level rise and storm surge. It is therefore considered that climate change effects are likely to be positive.

- *Support local development.*

The proposed option may be positive to local development as the routes (especially at the Hutt River crossing) would add capacity between SH2 and Seaview, helping to decrease the volume of Heavy Commercial Vehicles traveling on The Esplanade. This may improve amenity and enable redevelopment of the area to better integrate the urban environment (including the Jackson Street retail core) with the foreshore.

The preferred project provides an alternative route to The Esplanade. This may encourage local development along The Esplanade through associated amenity improvements. However, access and land use management will be required to mitigate the adverse effects from the intense movement function of passing traffic along Wakefield Street.

- *Landscape Issues.*

This option should not greatly affect Wakefield Street or the river corridor, but will have significant impact on the residential character and sense of place of properties on Randwick Crescent and Trevethick Grove.



There are several reserves along or near the railway line on Wakefield Street. Impacts on the existing character of the Wakefield Street section would be less because of the rail corridor and associated landscape character.

The main area of open space along this route is the esplanade reserves along either side of the Hutt River, a major area of open space in the Hutt Valley. A new bridge over this area would not affect the use of the Hutt River trail which already crosses underneath several bridges along its path. The esplanade reserves are currently open grassed areas and bridge construction would not result in a loss of vegetation.

Awamutu Stream runs underneath the railway line where it joins the esplanade reserve running along the Hutt River and eventually meets the river itself. The proposal has potential to impact upon the character of the stream, either negatively or positively, and on HCC strategies to over time improve the natural qualities of streams including their ecological health and indigenous character and to provide linear access to Hutt River.

Another reserve to the east close to the Ava Rail Bridge is an open grassed area with trees which provides access between Randwick Crescent and the footbridge over the Gracefield branch railway. Another access way on the northern side of the railway line links to Richmond Grove. Maintaining these pedestrian linkages is considered especially important.

■ *Consenting Issues.*

Statutory approvals for this route are considered to be difficult to obtain, but positive compared to the White Lines route option. There are potential impacts on the surrounding urban areas in terms of reduced amenity and increased noise, air and vibration effects could be significant depending on the design of the route. A Notice of Requirement would be required depending on how much land is required, a new bridge and whether the effects are no more than minor.

Regional consents may also be required related to a new bridge and potentially contaminated land. Based on advice from Greater Wellington, if a second bridge is required next to the railway, this would not be seen favourably from Council and could result in further delays in gaining statutory approval.

There is an old landfill to the north of Ava Rail Bridge is a listed on Greater Wellington's Selected Land use Register as a confirmed potentially contaminated site which may need to be investigated depending on the final alignment. It may also affect the seriousness of the potential sediment deposition issue. Due to the age of the waste material present landfill gas should not be a large issue, but investigations will be required to confirm the types and concentration of contaminant present. If it is affected by construction it could increase the seriousness of the potential sediment deposition issue.

## **Next Steps**

When comparing the Wakefield to Rail project with the Wakefield to Whites Line project described in Section 4.4.4 it was found that the traffic benefits were very similar. The Wakefield to



Whites Line option has significant negative impacts on the community, and increased environmental risks due to the construction of a second crossing of the Hutt River. Due to the comparative benefits of each option, and the impacts on the community of the Wakefield to Whites Line project, only the Wakefield to Rail Alignment will be considered during the next stage of the project.

As described in section 4.4.3 the initial design of the Wakefield to Rail Alignment was for 2 lanes in each direction. Upon analysis of the traffic volumes shown in Table 4-45 and Table 4-46 it became apparent that a two lane road would have sufficient capacity for the predicted 2016 traffic volumes. As such, the next stage of the project will consider a two lane road. Providing a two lane road will reduce the cross sectional area required, reducing the number of properties impacted and reducing the overall cost of the project. Further cost estimates and benefit cost analysis for the reduced cross-sectional area will be carried out during the next stage of the study.

■ **Table 4-45: Capacity Analysis of Wakefield to Rail Alignment (Test 8) – Flows Taken between Victoria Street**

	<b>Eastbound</b>	<b>Westbound</b>
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
<b>AM Peak</b>	<b>548 pcu</b>	<b>575 pcu</b>
<b>Inter Peak</b>	<b>785 pcu</b>	<b>619 pcu</b>
<b>PM Peak</b>	<b>810 pcu</b>	<b>941 pcu</b>
Daily	12453 pcu	10708 pcu
Total Daily Flow	24868 pcu	

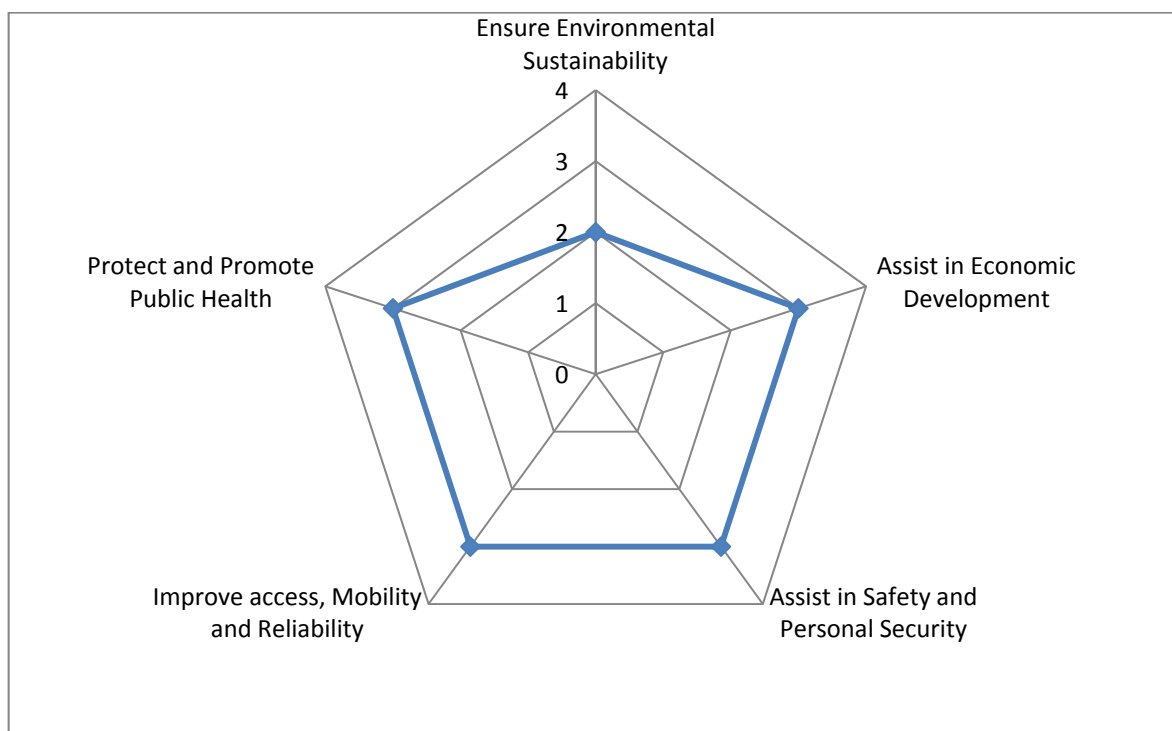
■ **Table 4-46: Capacity Analysis of Wakefield to Rail Alignment with traffic calming on The Esplanade (Test 11) – Flows taken between Hutt Road and Victoria Street**

	<b>Eastbound</b>	<b>Westbound</b>
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
<b>AM Peak</b>	<b>558 pcu</b>	<b>716 pcu</b>
<b>Inter Peak</b>	<b>810 pcu</b>	<b>673 pcu</b>
<b>PM Peak</b>	<b>938 pcu</b>	<b>1029 pcu</b>
Daily	13032 pcu	11836 pcu
Total Daily Flow	24868 pcu	



#### 4.4.4. Wakefield Street to Whites Line Alignment

This option seeks to improve the existing road carriageway along Wakefield Street and the Hutt River. A bridge would be constructed at the Hutt River where the link will cross the Hutt River and continue along Whites Line with a connection directly to Randwick Road. Figure 4-13 and Table 4-47 summarise the key study objectives contributed to by this project.



- **Figure 4-13: Benefits of Wakefield Street to Whites Line Alignment**
- **Table 4-47: Benefits of Wakefield Street to Whites Line Alignment**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	Provides an opportunity to enhance the Petone amenity values along the foreshore as traffic shifts from The Esplanade to the new link. However, other negative effects may result such as community severance to the east of the bridge, noise effects for the surrounding community, particularly schools and residential areas and how the new bridge may affect river passage.
Assist Economic and Regional Development	Provide improved access and capacity for vehicles accessing the Seaview and Gracefield area. Will reduce the cost of transport serving Seaview. Provides for agglomeration of the Seaview area into the wider region. Added capacity and increased speed will lead to a reduction of travel time. Will provide an alternative route to using The Esplanade (especially if traffic calming is put in place) and will improve the amenity of the foreshore area, this may attract new development.



Assist in Safety and Personal Security	This project (especially if implemented in conjunction with traffic calming) will assist in removing traffic from The Esplanade, allowing safer access to the foreshore area and provide traffic with a purpose built road designed to be safe.
Improve Access, Mobility and Reliability	Removing heavy commercial vehicles from The Esplanade will improve access for those wishing to make use of the foreshore area. The new route will improve capacity and travel time to the Seaview area.
Protect and Promote Public Health	Removing vehicles from The Esplanade will make the foreshore more accessible to the community, and may increase walking and cycling.
<p><b><u>Conclusion:</u></b></p> <p>Provides some benefits in terms of increased road capacity and access into Seaview – Gracefield area. Provides an alternative route to The Esplanade. Removal of heavy vehicles from The Esplanade is positive and makes the area more community friendly, negatives are community severance in other residential areas around the new route in particular schools will be affected.</p>	

### Transport and Rooding

This project involves construction of a four lane, 70km/h design speed link between SH2 and Randwick Road. A cross-section of the proposed carriageway along the route will be very similar to that described for the Wakefield to Rail project (Section 4.4.3). Due to the extent of the proposed road reserve a number of properties may need to be purchased on Wakefield Street and along Whites Line West depending on chosen alignment and detailed design.

The proposed link would follow the alignment of Wakefield Street and have similar grades to the exiting carriageway. There will be a slight climb at the eastern end of Wakefield Street in order to rise above the stop bank and gain access to the bridge. There will be a similar fall in grade back down to the level of Whites Line with a connection onto Randwick Road. The intersections at either end of the proposed link, and possibly those along the route, will need to be upgraded to have sufficient capacity for the traffic expected on the road. To ensure that link is as efficient as possible, there will be a need to limit access to side streets from the proposed link.

This link will provide an alternative route for accessing the Seaview area, and will assist in reducing the volumes of traffic on The Esplanade. Implementation of the previously discussed traffic calming measures along The Esplanade and Jackson Street west will further assist in reducing traffic volumes and encouraging motorists to use the proposed link. This link will provide a high capacity, less congested link to and from the Seaview area improving accessibility during peak times. This will lead to the area being more attractive for development. Table 4-48 summarises the costs, benefits and BCR of the Wakefield Alignment.





■ **Table 4-48: Costs, Benefits and BCR associated with the Wakefield Street to Whites Line Alignment**

Option	2008 Capital Costs	Benefits	BCR
Stand Alone Project	41,000,000	\$23,000,000	0.9
With Traffic Calming	42,000,000	NEGATIVE BENEFITS	N/A

**Environmental / Urban Planning**

The environmental / urban planning considerations relating to the Wakefield Street to Whites Line Alignment are summarised below:

■ *Community Cohesion*

The proposed alignment is likely to have a negative effect on community cohesion as having a high volume of traffic along this route will provide a degree of separation between the southern part of Petone including the waterfront and main street area from the community north of Wakefield Street. In addition, it may create potential severance with local roads just past the Hutt River Crossing. Whilst a bridge would provide better connectivity between the communities on either side of the river, converting a low volume local road into a high volume road could also have serious adverse community amenity effects exacerbating existing severance issues if the road is not designed appropriately.

■ *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

The effect on cultural and heritage features is likely to be neutral as there are no known sites along the route.

■ *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

The proposal would require the construction of a bridge crossing on the Hutt River, which would need to be built to meet the Greater Wellington Flood Standards. There may also be adverse impacts on the Lower Hutt River environment and freshwater species, however details and the scale of this impact are not known until further investigation and design is available.

■ *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

This option would increase traffic through residential areas, which could have adverse noise and vibration effects on community facilities in the vicinity, such as local schools. Based on the current traffic modelling for this project, up to an additional 7200 vph would use the road. This could have an adverse effect on noise sensitive properties of up to 3dB. However, if additional lanes required the removal of houses currently adjacent to the street then the houses behind these properties could be exposed to noise from traffic, whereas they would be currently receiving a 5 dB or more traffic noise reduction.

Consequently, for these houses the traffic noise levels would increase by 5 dB and the effect from the increased traffic volume. Whether mitigation is required for this is unclear at this stage.

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Regarding the Hutt River crossing, depending on the final location and design it is likely that the traffic noise received at the houses closest to the proposed bridge would increase, e.g. at Mudie Street and in Richmond Grove. At the closest houses, this could be up to 70 dB LAeq(24h) without the implementation of mitigation measures. At this stage it is not clear how this compares with the current noise level in this area, and if mitigation would therefore be necessary.

In addition to the residential dwellings along this route there is at least one school in the vicinity, although this currently does not appear to be in use. Both the Transit Guidelines and the draft standard DZ6806 recognise residential activities and educational facilities (schools, early childhood centres etc) as facilities requiring protection from the adverse effects of traffic noise.

- *Air Quality*

Due to increased vehicle numbers on the proposed route there could be an increase in local air quality effects on residential properties located along the route.

- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

At this time, it is anticipated that there may be some erosion and sediment deposition issues particularly by the Hutt River. Further investigation should take place to confirm this. There is an old landfill to the north of Ava Rail Bridge listed on Greater Wellington's Selected Landuse Register confirmed as a potentially contaminated site.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

There may be an increased potential flood risk in the future through climate change. However the new bridge would be designed to take this risk into account. By moving traffic away from The Esplanade this could be viewed as positive development, as it moves traffic away from an area susceptible to sea level rise and storm surge. It is therefore considered that climate change effects are likely to be positive.

- *Support local development.*

The proposed option may be a positive to local development as the routes (especially at the Hutt River crossing) would add capacity between SH2 and Seaview, helping to decrease the volume of HCVs travelling on the esplanade. This may improve amenity and enable redevelopment of the area to better integrate the urban environment (including the Jackson Street retail core) with the foreshore.

- *Landscape issues.*

Effects from this option would be greater at the eastern end on the route where the quiet suburban character, particularly in Whites Line West, but also in Ava St. Impacts on the existing character of the Wakefield Street section would be less because of the rail corridor and associated landscape character. There is a small area of open space along Wakefield Street where the railway line begins to diverge from the existing road, but this would not be affected.

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The main area of open space along this route is the esplanade reserves along either side of the Hutt River, a major area of open space in the Hutt Valley. A new bridge over this area would not affect the use of the Hutt River trail which already crosses underneath several bridges along its path. The esplanade reserves are currently open grassed areas and bridge construction would not result in a loss of vegetation.

The Awamutu Stream runs underneath Whites Line West where it joins the esplanade reserve along the Hutt River and eventually meets the river itself. The proposal has potential to impact, either negatively or positively, upon the character of the stream and HCC strategies to over time improve the natural qualities of streams including their ecological health and indigenous character and to provide linear access to Hutt River.

A reserve on the corner of Randwick Road and Whites Line East is fenced and may not be impacted.

There is opportunity to develop greenways along the road corridor, connecting to the Hutt River and improving amenity and recreational opportunities in the Central Hutt area as per Hutt City Council Reserves Strategic Directions.

- *Consenting Issues.*

Consenting effects are considered to be negative and significant. There are potential impacts on the surrounding urban areas in terms of reduced amenity and increased noise, air and vibration effects could be significant depending on the design of the route. A new Notice of Requirement would be required depending on how much land is required, a new bridge and whether the effects are no more than minor. Regional consents will also be required for the new bridge and possibly for activities related to contaminated land. There is an old landfill to the north of Ava Rail Bridge listed on Greater Wellington's Selected Landuse Register as a confirmed potentially contaminated site which may need to be investigated depending on the final alignment. Due to the age of the waste material present landfill gas should not be a major issue, but investigation will be required to confirm the types and concentration of contaminant present.

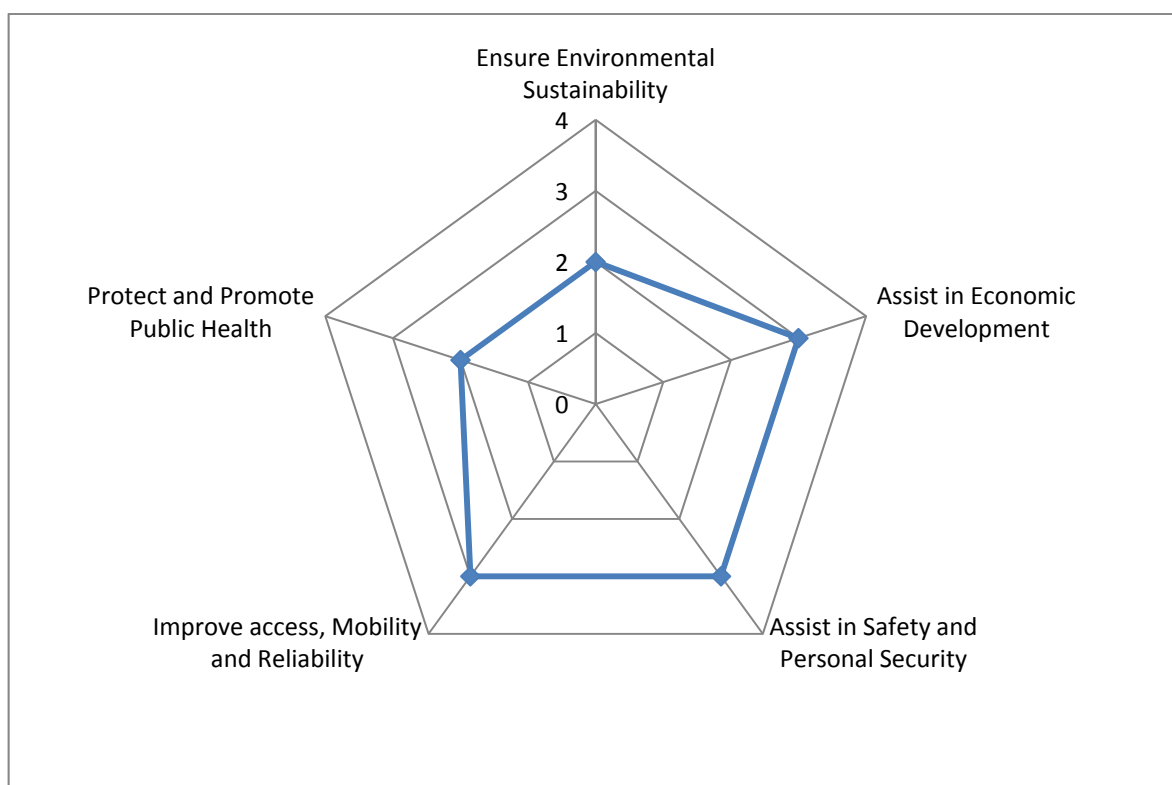
### **Next Steps**

As noted above, when comparing the Wakefield to Rail project described in Sections 4.4.3 with the Wakefield to Whites Line it was found that the traffic benefits were very similar. The Wakefield to Whites Line option has significant negative impacts on the community, and increased environmental risks due to the construction of a second crossing of the Hutt River. Due to the comparative benefits of each option, and the impacts on the community of the Wakefield to Whites Line project, only the Wakefield to Rail Alignment will be considered during the next stage of the project.



#### 4.4.5. Gracefield Multi Modal Hub

This option opens the Gracefield line and constructs a multi-modal transport hub. This is designed to efficiently transport freight to and from the Seaview/Gracefield area. This contributes to the transport and logistics activities at Seaview/Gracefield. This would mean that Seaview/Gracefield area freight activities would be served by road, rail and sea. Figure 4-14 and Table 4-49 provides a summary of the key project objectives met with the implementation of this project.



- **Figure 4-14: Benefits Associated with the Gracefield Rail Line option**
- **Table 4-49: Benefits Associated with the Gracefield Rail Line option**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	This project could potentially reduce the noise, and emissions generated by reducing truck volumes on roads. Depending on the design it could have adverse landscape and pedestrian impacts.
Assist Economic and Regional Development	This project will reduce the transport costs associated with goods movement, making production more efficient.
Assist in Safety and Personal Security	Reducing truck numbers on roads will reduce crash exposure.
Improve Access, Mobility and Reliability	The provision of rail as an option for moving freight increases the access options. The multi modal hub enables transport efficiency for all modes to be



	optimised in the context of moving freight.
Protect and Promote Public Health	The reduction of truck numbers reduces the adverse health effects of noise, vibration and emissions to persons living adjacent to the road corridor to be reduced.
<p><b><u>Conclusion:</u></b> This project provides greater transport efficiency particularly for the Wainuiomata area and significantly reduces traffic on The Esplanade. However, this may require the Cross Valley Link to have four lanes and may create problems on SH2 between Petone and Dowse.</p>	

### Transport and Roading

This option integrates road, rail and sea as a means of moving freight to and from the Seaview/ Gracefield area. As freight movement decisions are driven by commercial cost, this option will happen if it is commercially viable. From an economics perspective, a ‘kick start’ subsidy may be an investment with a high return to ensure transfer of freight between modes occurs as efficiently as possible. The option is largely low cost and relies on good logistics planning.

### Environmental / Urban Planning

As the concept has not been fully developed yet, only limited assessment has been completed.

- *Community Cohesion*

The preferred route which follows the rail line as an alternative to the Randwick Road option is preferable from a community severance perspective as it avoids the through movement of freight and heavy vehicles past residential uses within the Moera community. Further isolation of Moera (already a social-economically disadvantaged area) is likely to manifest in less social and business interaction and a poorer sense of community/social capital. By locating the route adjacent to the rail line adjacent to a predominance of industrial uses, the air quality, noise and vibration effects can be more contained.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

A pedestrian bridge over the railway line links Awamutu Grove with York Street. It will be important to maintain this pedestrian link; this could be developed further along with the ecological sustainability of the linking reserves. Two reserves lie in the immediate vicinity of this route – one off the end of Awamutu Grove is an open grassed area with trees which supports the Awamutu Stream. The other is an open grassed area known as York Park; the stream also runs through here. This reserve is accessible from Elizabeth Street and York Street and provides a pedestrian link between the two. There is potential to further develop these reserves by increasing their ecological sustainability as part of the wider Awamutu Stream catchment.



- *Local development*

This option strengthens the transport and logistics function of the Seaview/Gracefield area. It also improves the linkages of Seaview/Gracefield to other areas so that production activities are more efficient. It will provide the greatest efficiency of access and directness of connection into the Gracefield industrial area for freight movements compared with the other options assessed which caused issues such as interrogated routes through Moera and increased delays from greater local traffic movements.

A direct route into Gracefield will reduce the travel costs and increase the efficiency of production. This may in turn allow for reinvestment and increased economic activity and development of remaining vacant sites in this area. It will also help to protect local movement and access in Moera.

- *Landscape effects*

Two reserves lie in the immediate vicinity of this route – one off the end of Awamutu Grove is an open grassed area with trees which supports the Awamutu Stream. The other is an open grassed area known as York Park; the stream also runs through here. This reserve is accessible from Elizabeth Street and York Street and provides a pedestrian link between the two. There is potential to further develop these reserves by increasing their ecological sustainability as part of the wider Awamutu Stream catchment.

- *Consent issues*

Depending on the final form of the alignment and integration with a future transport hub a designation will be required. Regional consents may possibly be required due to contaminated land in the area. An alteration to designation may also be required if adding to the existing rail line.

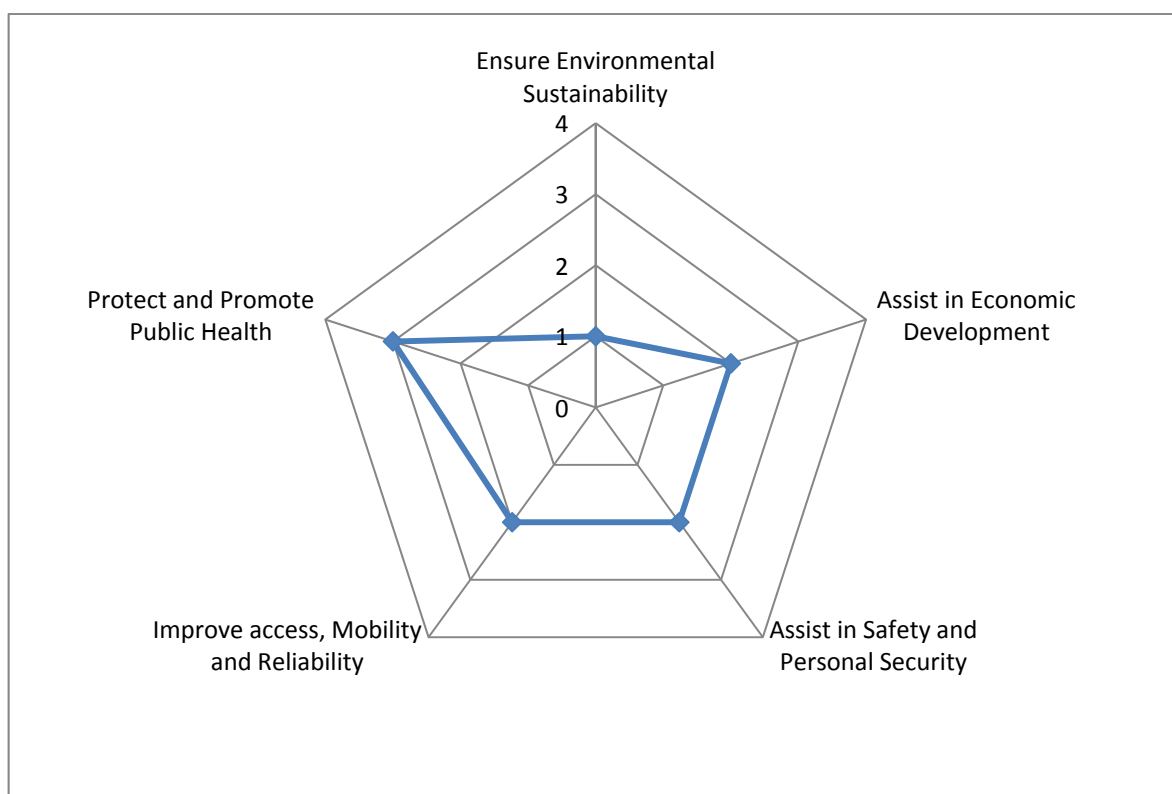
## **Next Steps**

This option integrates road, rail and sea as a means of moving freight to and from the Seaview/Gracefield area. As freight movement decisions are driven by commercial cost, this option will happen if it is commercially viable. It is not recommended that this option is included within the Strategy, but could be progressed by KiwiRail should they consider it commercially viable.



#### 4.4.6. Udy Street “Wiggle”

This option seeks to improve a number of existing roads and provide a cross-valley link, without construction of new roads or bridges, between SH2 and Seaview. The new route would involve vehicles travelling along Udy Street to the intersection with Cuba Street, along Cuba Street to the intersection with The Esplanade and along The Esplanade and Waione Street. Figure 4-15 and Table 4-50 summarise the key study objectives contributed to by this project.



- **Figure 4-15: Benefits of the Udy Street “Wiggle” Option**
- **Table 4-50: Benefits of the Udy Street “Wiggle” Option**

Objective	Summary
Ensure Environmental Sustainability	If this route is developed as a 4 lane option, this could have environmental impacts on the surrounding residential land uses in the area, in terms of noise, air quality and community cohesion. However there are positive benefits in potentially improving amenity through street design and moving the route away from The Esplanade, reducing potential coastal hazards and allowing for redevelopment of the area.
Assist in Economic and Regional Development	Will assist in removing HCV’s and commuters from The Esplanade and allow development of the area. It is not expected that there will be significant changes in the travel times as this is a longer



Objective	Summary
	travel distance (when compared with The Esplanade but will have increase speed, and additional capacity.
Assist in Safety and Personal Security	Removing HCV's from The Esplanade will allow safer access to the foreshore from the Petone CBD. Providing a well designed purpose built facility along this link will improve safety however the new route will have traffic travelling directly through the CBD and this may present a number of new safety issues
Improve Access, mobility and Reliability	Removing HCV's from The Esplanade will assist in making the foreshore area more accessible to the public. Increased speed and capacity along the new route may improve the accessibility of the Seaview area from SH2.
Protect and Promote Public Health	Improving access to the foreshore may attract walkers and cyclists and will improve the facility for those currently using the area. This will also mean that traffic is diverted through the town area and local streets; this will have a negative impact safety.
<p><b><u>Conclusion:</u></b> This option will remove HCV's and commuter traffic from The Esplanade. It will not result in significant benefits in travel times over other options for the CVL but will provide more capacity than The Esplanade. The removal of heavy traffic volumes from the foreshore area will improve the amenity of the area and may stimulate regeneration and development. However, increasing traffic volumes through the commercial centre of Petone will have negative impacts.</p>	

## Transport and Rooding

The Udy Street “wobble” is a route that provides a purpose-designed link between SH2 and Seaview by upgrading the existing roads and avoiding a new crossing of the Hutt River. It was proposed that the link would proceed along Udy Street to the intersection with Cuba Street at an operating speed of 70km/h. It then proceeded along Cuba Street to The Esplanade with an operating speed of 50km/h, and finally along The Esplanade to Waione Street. During the initial investigation, modelling and preliminary design, the link provided two lanes in each direction with intersections reconfigured to ensure that the Udy Street “Wobble” was given priority. Due to the tight space constraints along Udy Street and Cuba Street, the initial preliminary design had significant compromises in safety as an attempt to construct the link within the existing road reserve and avoid the need for property acquisition. (It was established that to provide a safe link with two lanes in each direction was going to be difficult without property acquisition. After initial modelling results it was found that a two lane road would provide sufficient capacity and the design could be revisited.





During the initial investigations the travelling lanes were 3.5m each, a shoulder of 1.0m and the existing footpaths reduced to a width of 1.5m; all parking along the link was removed to improve the efficiency and allow sufficient space for construction to occur within the existing road reserve. Cycling was not catered for and it was believed that cyclist would be encouraged to use The Esplanade and foreshore. At the approaches to intersection there would be a requirement for local widening to ensure that there was sufficient capacity to cater for all turning movement without causing unacceptable delays. Taking account all of the above, the total proposed road reserve of the Udy Street “Wiggle” (along Udy and Cuba Street) was 19.0m. A high level desktop review of the existing road reserve as shown in Table 4-51 shows that there would be sufficient space within the existing road reserve to construct the proposed link.

■ **Table 4-51: High Level Desktop Road Reserve Widths**

Measurement Location	Road Reserve (m)	Sufficient Space
4B Udy Street	20.1	Yes
10 Udy Street	19.3	Yes
54 Udy Street	23.1	Yes
78 Cuba Street	19.5	Yes
64 Cuba Street	20.0	Yes
20 Cuba Street	19.9	Yes

Although this option will use part of The Esplanade, it joins in an area that is primarily residential; the foreshore area further to the west will still have urban amenity enhancement opportunities. It is recommended that traffic calming be implemented along The Esplanade (between the Hutt Road and Cuba Street) to discourage motorists from “cutting” through on this more direct route.

Table 4-52 summarises the costs, benefits and BCR of this project. It must be noted that these costs have been established based on the fact that no property acquisition would be required. During a Scheme Assessment stage, more detailed design and analysis would be carried out and the costs refined.

■ **Table 4-52: Costs, Benefits and BCR associated with the Udy Street “Wiggle”**

Option	2008 Capital Costs	Benefits	BCR
Stand Alone Project	\$9,300,000	\$3,200,000	0.6
With Traffic Calming	\$10,300,000	NEGATIVE BENEFITS	N/A



## **Environmental / Urban Planning**

The environmental / urban planning considerations relating to the Udy Street “Wiggle” are summarised as follows:

- *Community Cohesion*

The proposed alignment is likely to have a negative effect on community cohesion as having a high volume of traffic along this route will provide a degree of separation between the southern part of Petone including the waterfront and main street area from the community north of Udy Street, east of Cuba Street and north of Waione Street. In addition, this area is also currently being redeveloped by Housing New Zealand.

- *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

The effects on cultural and heritage features are likely to be negative as there are a number of sites along this route. Whilst the option would not have any direct impact on the sites, it has the potential to adversely affect public enjoyment. The route also passes through the ‘Nicholson Block’ which is currently under Treaty claim.

- *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

The effects of the proposed route are considered to be neutral as it is not expected that there would be any effect on vegetation, wetland or habitat.

- *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

For the Hutt Road- Udy-Cuba Street section, this would increase traffic through residential areas, which could have adverse noise and vibration effects on community facilities in the vicinity, such as local schools. This traffic volume increase could have an adverse effect on noise sensitive properties. If additional lanes require the removal of houses currently adjacent to the street then the houses behind these properties could be exposed to noise from traffic, whereas they would be currently receiving a 5 dB or more traffic noise reduction.

Consequently, for these houses the traffic noise levels would increase by 5 dB and the effect from the increased traffic volume. Whether mitigation is required for this is unclear at this stage. In addition, increasing the Udy Street posted traffic speed limit from 50km/h to 70/km/h would increase the traffic noise by 2 dB.

Finally, in addition to the residential dwellings along this route there is at least one school in the vicinity, although this currently does not appear to be in use. Both the Transit Guidelines and the draft standard DZ6806 recognise residential activities and educational facilities (schools, early childhood centres etc) as facilities requiring protection from the adverse effects of traffic noise. For traffic travelling on Waione Street, the noise effect from this is likely to remain at an order of magnitude similar to the current situation.



- *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

Limited impact on the surrounding area is expected, however further investigations are required to confirm this. Likely effects should be able to be minimised through sound construction processes.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

The route may be affected by future storm surge, sea-level rise and Tsunami risk. Overall climate change effect is likely to be negative however the route could be designed to take this into account.

- *Support local development.*

The proposed option may be positive to local development as the routes would add capacity between SH2 and Seaview, helping to decrease the volume of Heavy Commercial Vehicles traveling on The Esplanade. This may improve amenity and enable redevelopment of the area to better integrate the urban environment (including the Jackson Street retail core) with the foreshore.

- *Air Quality*

Due to increased vehicle numbers on the proposed route there could be an increase in local air quality effects on residential properties located along the route (Udy, Cuba, and Adelaide Streets).

- *Landscape issues*

Currently Udy Street is a reasonably quiet suburban street, and this proposal would change perceptions of the urban residential character of the entire street length with increased traffic and potentially change shared and recognised values of the visual landscape and sense of place.

The option has the potential to impact on three important public open spaces and facilities. The Petone Recreation Ground, North Park and the McKenzie Swimming Pool are all accessed from Udy Street. The Petone Recreation Ground and North Park have sports fields and the Recreation Ground also provides a link between Elizabeth Street and Udy Street. The reserves are well used by sporting codes – currently Petone Rugby Football Club Inc and Petone RFC and the Petone Cricket Club. As the Petone RFC uses both grounds, allowing for players to safely cross between one ground and the other will be extremely important. Parking in an area heavily used by sports groups on weekends will also need to be considered.

Cuba Street is a reasonably busy connecting road. Developing the road corridor further may interrupt connections between areas to the west and east of a widened and busier road corridor and possibly change the character of the area. No reserve areas are accessed directly from Cuba Street, and there is opportunity to develop greenways along Cuba Street connecting to the Petone foreshore.

The Esplanade gives access to Petone foreshore reserves including Hikoikoi Reserve. Maintaining accessibility to these foreshore reserves is also extremely important and crossing points would need to be created and/or maintained.



- *Flood risk*

Any new structure at Waione Street over the Hutt River would have to meet the 2800m<sup>3</sup>/s requirement. See discussion on The Esplanade Multi Efficient Arterial for discussion on the river crossing requirements.

- *Consenting Issues.*

Consenting issues are significant; consents will be required for the work to implement bridge upgrades and to take account of the flood risk. A new Notice of Requirement is also required, taking into account the above environmental impacts. There are a number of potentially contaminated sites on the GWRC Selected Land Use Register that the route would pass through on East Street. These include the rear of Unilever Australasia’s site on 480 Jackson Street, Sika’s site at 69 Waione Street and Te Mome Stream. The extent and types of contaminants present are not known and investigations along the route would be required.

### Next Steps

A capacity analysis of the traffic modelling results has indicated that a two lane road with one lane in each direction would be sufficient to provide of the proposed 2016 traffic volumes. It can be seen in Table 4-53 through Table 4-56 that there is more than sufficient capacity in both directions, with and without traffic calming to cater for the proposed traffic volumes.

- **Table 4-53: Capacity Analysis of Udy Street Wiggle (Test 10) – Flows taken on Udy Street between Kensington Ave and Cuba Street**

	<b>Eastbound</b>	<b>Westbound</b>
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
AM Peak	<b>156 pcu</b>	<b>401 pcu</b>
Inter Peak	<b>278 pcu</b>	<b>337 pcu</b>
PM Peak	<b>242 pcu</b>	<b>286 pcu</b>
Daily	4247 pcu	5553 pcu
Total Daily Flow	9780 pcu	



■ **Table 4-54: Capacity Analysis of Udy Street Wiggle (Test 10) – Flows taken on Cuba Street between Jackson Street and The Esplanade**

	<b>Southbound</b>	<b>Northbound</b>
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
<b>AM Peak</b>	<b>210 pcu</b>	<b>214 pcu</b>
<b>Inter Peak</b>	<b>219 pcu</b>	<b>282 pcu</b>
<b>PM Peak</b>	<b>275 pcu</b>	<b>204 pcu</b>
Daily	3680 pcu	4335 pcu
Total Daily Flow	8015 pcu	

■ **Table 4-55: Capacity Analysis of Udy Street Wiggle with traffic calming on The Esplanade (Test 13) – Flows taken on Udy Street between Kensington Ave and Cuba Street**

	<b>Southbound</b>	<b>Northbound</b>
	Eastbound	Westbound
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
<b>AM Peak</b>	<b>156 pcu</b>	<b>429 pcu</b>
<b>Inter Peak</b>	<b>279 pcu</b>	<b>363 pcu</b>
<b>PM Peak</b>	<b>279 pcu</b>	<b>326 pcu</b>
Daily	4326 pcu	

■ **Table 4-56: Capacity Analysis of Udy Street Wiggle with traffic calming on The Esplanade (Test 13) – Flows taken on Cuba Street between Jackson Street and The Esplanade**

	<b>Southbound</b>	<b>Northbound</b>
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
<b>AM Peak</b>	<b>178 pcu</b>	<b>261 pcu</b>
<b>Inter Peak</b>	<b>165 pcu</b>	<b>289 pcu</b>
<b>PM Peak</b>	<b>301 pcu</b>	<b>209 pcu</b>
Daily	3007 pcu	4525 pcu
Total Daily Flow	7532 pcu	

Based on the above analysis, and the fact that the current cross sectional design compromises on safety, reduces the footpath width, removes car parking facilities and does not cater for cyclists, any future work carried out on the Udy Street “Wiggle” would consider a link with only two lanes and improve on the road design.



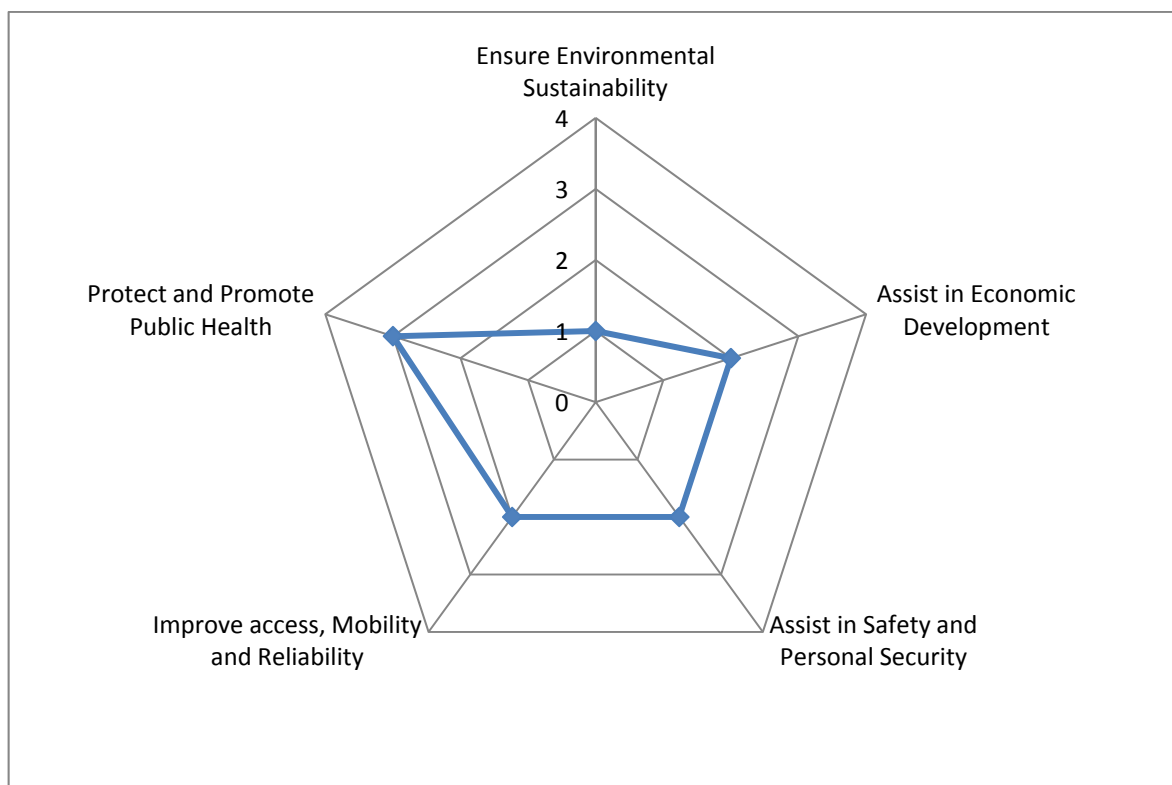
Further to the above, traffic modelling results indicate that the benefits from this project will be minor as a consequence of traffic is being diverted from a more direct route (this is the case even with the implementation of traffic calming and a speed restriction to 30km/h on The Esplanade west of the Cuba Street Intersection). Furthermore, although the project will provide community and environmental benefits by reducing the traffic on The Esplanade and improving access to the Petone foreshore, it will have significant impact on properties by the Udy and Cuba Streets by diverting traffic along these primarily residential streets. Increasing the volumes on these streets may also separate the local communities.

As a consequence, based on the limited transport benefits and adverse environmental effects, this option will not be considered further.



4.4.7. **Two Way Pairs – Petone Esplanade and Udy Street “Wiggle”**

This option retains one direction of traffic on The Esplanade (westbound traffic) while the other uses the Udy Street “wiggle” via the Hutt Road (eastbound traffic). Each road, however, remains two-way. Figure 4-16 and Table 4-57 summarise the key study objectives contributed to by this project.



- **Figure 4-16: Benefits Associated with the Two Way Pairs Option**
- **Table 4-57: Benefits Associated with the Two Way Pairs Option**

Project Objectives	Project Benefits
Ensure Environmental Sustainability	Where the route is developed as a 3 lane option, this could have environmental impacts on the surrounding residential land uses in the area, in terms of noise, air quality and community cohesion. However there are positive benefits in potentially improving amenity through street design and moving the route away from The Esplanade, reducing potential coastal hazards and allowing for redevelopment of the area.
Assist Economic and Regional Development	Will assist in reducing the number of heavy vehicles and other traffic (in one direction) along The Esplanade and provide opportunities for further development.
Assist in Safety and Personal Security	Removing HCV's from The Esplanade will allow safer access to the foreshore from Petone however the proposed increase in speed will have negative safety

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	benefits for those in the residential areas and accessing the Petone foreshore.
Improve Access, Mobility and Reliability	Removing HCV's from The Esplanade will assist in making the foreshore area more accessible to the public.
Protect and Promote Public Health	Improving access to the foreshore may attract walkers and cyclists and will improve the facility for those currently using the area.
<p><b><u>Conclusion:</u></b></p> <p>The removal of heavy traffic volumes from the foreshore area will improve the amenity of the area and may stimulate regeneration and development. Where the route is developed as a 3 lane option, this could have environmental impacts on the surrounding residential land uses in the area, in terms of noise, air quality and community cohesion.</p>	

### Transport and Rooding

This option provides a two-direction link between Seaview and SH2 without the need for the construction of a new bridge. Traffic travelling from Seaview to SH2 will continue to travel westbound along The Esplanade, which will be improved to provide two lanes in the westbound direction between the western abutment of the bridge and the Hutt Road roundabout. This section will have an operational speed of 70km/h. Traffic travelling from SH2 to Seaview will travel north up the Hutt Road, east along Udy Street, south along Cuba Street and then connect to The Esplanade where it will travel eastbound to the existing bridge. Improvements will be made to the infrastructure along this route to accommodate two lanes for traffic travelling eastbound (the other side of each of these streets will remain single lane) and a speed increase to 70km/h. Traffic calming techniques (similar to that discussed in section 4.4.1) will be implemented along The Esplanade between Hutt Road and Cuba Street to discourage vehicles from travelling along this link.

This option will provide a solution that does not require the construction of a ***new*** bridge over the Hutt River while still reducing the volumes of vehicles along the key sections of The Esplanade. Reducing the traffic volumes along The Esplanade will assist allowing the integration of the community with the foreshore and may attract development in the area. Walking and cycling can be accommodated by providing cycle paths along The Esplanade where not already provided.

Table 4-58 summarises the costs, benefits and BCR of this project.

■ **Table 4-58: Costs, Benefits and BCR associated with the Two Pairs Option**

2008 Capital Costs	Benefits	BCR
\$9,300,000	\$6,800,000	1.3





## **Environmental / Urban Planning**

### ■ *Community Cohesion*

This option assumes that all the potential community severances will be halved when compared to two way options. There will be some severance and amenity effect between the foreshore and the Petone community as a higher volume of traffic (including heavy vehicle) will travel along The Esplanade, as well as a degree of separation between the Petone community north of Udy Street, east of Cuba Street and north of Waione Street.

### ■ *Proactively limit the disturbance of significant cultural and heritage features along state highways.*

The effects on cultural and heritage features may be negative as there are a number of sites along this route. This will need to be confirmed once more detailed assessment has been completed to identify land that may be taken.

### ■ *No net loss of native vegetation, wetlands, critical habitat or endangered species.*

The effects of the proposed route are considered to be neutral as it is not expected that there would be any effect on vegetation, wetland or habitat.

### ■ *Plan and design new state highways to avoid or reduce adverse noise and vibration effects.*

For the Hutt Road- Udy-Cuba Street section, this would increase traffic through residential areas, which could have adverse noise and vibration effects on community facilities in the vicinity, such as local schools. If additional lanes required the removal of houses currently adjacent to the street then the houses behind these properties could be exposed to noise from traffic, whereas they would be currently receiving a 5 dB or more traffic noise reduction.

Consequently, for these houses the traffic noise levels would increase by 5 dB and the effect from the increased traffic volume. Whether mitigation is required for this is unclear at this stage. In addition, increasing the Udy Street posted traffic speed limit from 50km/h to 70/km/h would increase the traffic noise by 2 dB.

Finally, in addition to the residential dwellings along this route there is at least one school in the vicinity, although this currently does not appear to be in use. Both the Transit Guidelines and the draft standard DZ6806 recognise residential activities and educational facilities (schools, early childhood centres etc) as facilities requiring protection from the adverse effects of traffic noise. For traffic travelling on Waione Street, the noise effect from this is likely to remain at an order of magnitude similar to the current situation.

This option would divert traffic through the Petone suburban area which could potentially have a negative effect from noise and vibration on the community.

### ■ *Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.*

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Limited impact on the surrounding area is expected, however further investigations are required to confirm this. Likely effects should be able to be minimised through sound construction processes.

- *Manage increased hazards of climate change impacts on state highway infrastructure.*

The route may be affected by future storm surge, sea-level rise and Tsunami risk at The Esplanade. Overall climate change effect is likely to be negative however the route could be designed to take this into account.

- *Supports redevelopment*

The proposal will have a neutral effect on local development. The route may provide economic benefits to the Seaview / Gracefield area by improving access for trucks, with heavy commercial traffic then travelling along The Esplanade going east to west on the seaward side of the street. This design will enable other vehicles to complete right hand turning movements into the retail and commercial heart of Petone thus helping to ensure the on-going viability of the centre as the ability to capture passing trade is continued. Conversely, there may be a negative effect to businesses along Jackson Street such as retailers with outdoor dining, who rely on a high amenity environment with lower noise and air pollution. Any redevelopment of the surrounding area to the foreshore may be subject to adverse amenity effects given likely increases in noise, air pollution and vibration.

- *Air quality*

Due to increased vehicle numbers on the proposed route there could be an increase in local air quality effects on residential properties located along the route (Udy, Cuba, and Adelaide Streets).

- *Landscape Issues.*

Impacts from this option would be similar to those as commented in the *Landscape Issue* section of the Udy Street “Wiggle”. However, as The Esplanade gives access to the Petone foreshore reserves including Hikoikoi Reserve, maintaining accessibility to these foreshore reserves is extremely important and may be disrupted by the increase in speed limit proposed with this option. Crossing points would need to be allowed for at various points.

- *Consenting Issues*

Notice of Requirement will most likely be required, particularly where an additional lane needs to be added. Overall, while there would be numerous environmental effects on the surrounding neighbours who are affected by the route particularly along Udy Street and Cuba Street the overall impact could be less than other options. There are a number of potentially contaminated sites on the GWRC’s Selected Land Use Register that Udy Street “wiggle” would pass through on East Street. These include the rear of Unilever Australasia’s site on 480 Jackson Street, Sika’s site at 69 Waione Street and Te Mome Stream. The extent and types of contaminants present are not known and investigations along the route would be required.



### Next Steps

A capacity analysis of the traffic modelling results has indicated that a two lane road with one lane in each direction would be sufficient to provide for the proposed 2016 traffic volumes. It can be seen in Table 4-59 through Table 4-60 that there is more than sufficient capacity in the east and southbound direction on which the two way pair traffic will travel. It is considered that having a 70km/h operating speed within the confined residential of Udy Street and Cuba Street is unacceptable. The increase in speed will increase the noise impact to the residents and increase the safety risk to all users of the network. Unfortunately without increasing the speed of the link there is little attraction to motorists when compared with the more direct route offered by The Esplanade (even if The Esplanade is traffic calmed). The only method of preventing motorists from travelling along The Esplanade would be to close the western end off completely.

■ **Table 4-59: Capacity Analysis of Two Way Pairs (Test 17) – Flows taken on Udy Street between Kensington Ave and Cuba Street**

	Eastbound	Westbound
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
<b>AM Peak</b>	<b>577 pcu</b>	<b>238 pcu</b>
<b>Inter Peak</b>	<b>671 pcu</b>	<b>182 pcu</b>
<b>PM Peak</b>	<b>409 pcu</b>	<b>254 pcu</b>
Daily	10292 pcu	3242 pcu
Total Daily Flow	13535 pcu	

■ **Table 4-60: Udy Street Wiggle (Test 17) – Flows taken on Cuba Street between Jackson Street and The Esplanade**

	Southbound	Northbound
4 Lane Capacity (each direction)	3600 pcu	3600 pcu
2 Lane Capacity (each direction)	1800 pcu	1800 pcu
AM Peak	629 pcu	108 pcu
Inter Peak	490 pcu	137 pcu
PM Peak	339 pcu	146 pcu
Daily	8014 pcu	2203 pcu
Total Daily Flow	7764 pcu	

As for the Udy Street “Wiggle” project described in section 4.4.6, the two way pairs project will provide community and environmental benefits by reducing the traffic on The Esplanade and improving access to the Petone foreshore. However, it will have a significant impact on Udy and Cuba Streets. Increasing the travelling volumes and operating speeds on these links will have a significant impact on the local communities. Although this project appears to provide “reasonable



benefits” this is as a consequence of increasing the operating speed on Udy Street and Cuba Street (which is considered unacceptable) and reducing the speed on The Esplanade in the eastbound direction (between Hutt Road and Cuba Street). Further to this, the majority of the benefits come from the increased westbound speed on The Esplanade, the benefits for those travelling eastbound are minor.

As a consequence, it is believed that this project has significant negative impacts with very few viable positive benefits. For this reason it will not be considered during the next stage of the project.



#### 4.4.8. Traffic Volumes on The Esplanade

Each of the options considered (excluding The Esplanade multi lane efficient arterial and Two Way Pairs) has reduced traffic volumes on The Esplanade to some degree. In the AM peak flows are predominantly westbound where as in the PM peak the flows are predominantly eastbound. Flows during the inter peak are reasonably consistent between the westbound and eastbound directions. It must be noted that the flows are generally lower in Tests 2 through Test 6 due to no additional connectivity from Grenada (or implicit in the WTSM matrices used), and the various measures tested generally detract from the relative attractiveness of The Esplanade as a viable route choice. In the AM peak, the effect of the traffic calming on The Esplanade and Jackson Street can be determined by comparing:

- Test 1 with Test 7 (noting that these Tests use different trip matrices);
- Test 8 with Test 11; and
- Test 10 with Test 13.

There is an approximate 30% reduction in volumes in eastbound direction and a 20% reduction in westbound direction as a consequence of implementing traffic management during the pm peak; this indicates that there is still a significant number of vehicles using The Esplanade. The reductions are similar in the inter peak, with a more marked reduction in the eastbound direction during the pm peak. (This is likely to be due to an increase in demand flow westbound across the Hutt Valley inherent in the WTSM matrices for the PM peak).

Test 11 which incorporates both the Cross Valley Link and traffic calming on The Esplanade and Jackson Street has the largest total impact on total traffic volumes on The Esplanade with an approximate 30% reduction in the AM and inter peaks and 50% reduction in the PM peak compared to Test 1. Test 17 (Two Way Pairs) has the highest flow westbound and the lowest flow eastbound on The Esplanade. It is noted that although traffic from SH2 has been banned from joining The Esplanade at the Hutt Road roundabout, there is an element of rerouting via Hutt Road and Jackson Street rather than the intended alternative route of SH2 and Udy Street via the Dowse interchange.

Total flows for the 2026 outputs show similar patterns to the 2016 outputs with an increase of traffic of approximately 50 to 100 vehicles.

In 2016 HCV volumes on The Esplanade are of the order of 30 to 100vph during each of the peak hours modelled. The changes in flows with each of the options, follow similar patterns discussed for total vehicles above. The 2016 daily flows show the same trends as for the peak hours with the highest two-way daily flows being for Test 10 and 16. The 2026 outputs show similar patterns to the 2016 outputs with an increase of about 5-50 vehicles. Between 2016 and 2026 there is an increase of approximately 5,000 vehicles on The Esplanade.



## 5. Projects Recommended for Inclusion in the Strategy

From this short list, a suite of projects will be included within the Draft Ngauranga Triangle Strategy. These projects are as follows:

### **Ngauranga to Tawa**

- Tawa Interchange Improvements

### **Ngauranga to Dowse**

- Completion the off-road pedestrian/cycle facility on SH2
- Beach to Bush
- Traffic Management on SH2

### **SH1 to SH2 Link**

- Petone-Grenada Link

### **SH2 to Seaview-Gracefield (Cross Valley Link Options)**

- Wakefield Street to Rail Alignment