The Ngauranga Triangle Strategic Study: Technical Report Summary

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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.

Quality Assurance Statement

Project Manager: Andrew Bell
Prepared by: Tony Brennand
Reviewed by: Andrew Bell
Approved for issue by: Tony Innes

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Contents

Abbreviations:

GDP	Gross Domestic Product
GPS	Government Policy Statement
GWRC	Greater Wellington Regional Council
HCC	Hutt City Council
LTMA	Land Transport Management Act 2008
NSHS	National State Highway Strategy
NZTA	New Zealand Transport Agency
RLTS	Regional Land Transport Strategy
RoNS	Roads of National Significance
SH1	State Highway One
SH2	State Highway Two
vpd	Vehicles per day
WCC	Wellington City Council
WRS	Wellington Regional Strategy
WTSM	Wellington Transport Strategy Model

1. Introduction

The purpose of the Ngauranga Triangle Strategy Study is to develop an integrated long-term transport strategy for the "triangle" between State Highway One (SH1) Tawa - Ngauranga Gorge, State Highway Two (SH2) Dowse – Ngauranga and a possible link from the SH1 corridor to the SH2 corridor. The study also considers links from the SH2 corridor to Gracefield and the areas that surround these corridors. The findings of this study will become a key technical input into the Hutt Corridor Plan review. This study area is shown in Figure 1.1. The Strategy looks to:

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

In response to these needs, the New Zealand Transport Agency (NZTA), Hutt City Council (HCC) and Wellington City Council (WCC) have been working in partnership, with support from Greater Wellington Regional Council (GWRC), to develop a transportation plan to support activities and improve accessibility in the study area.

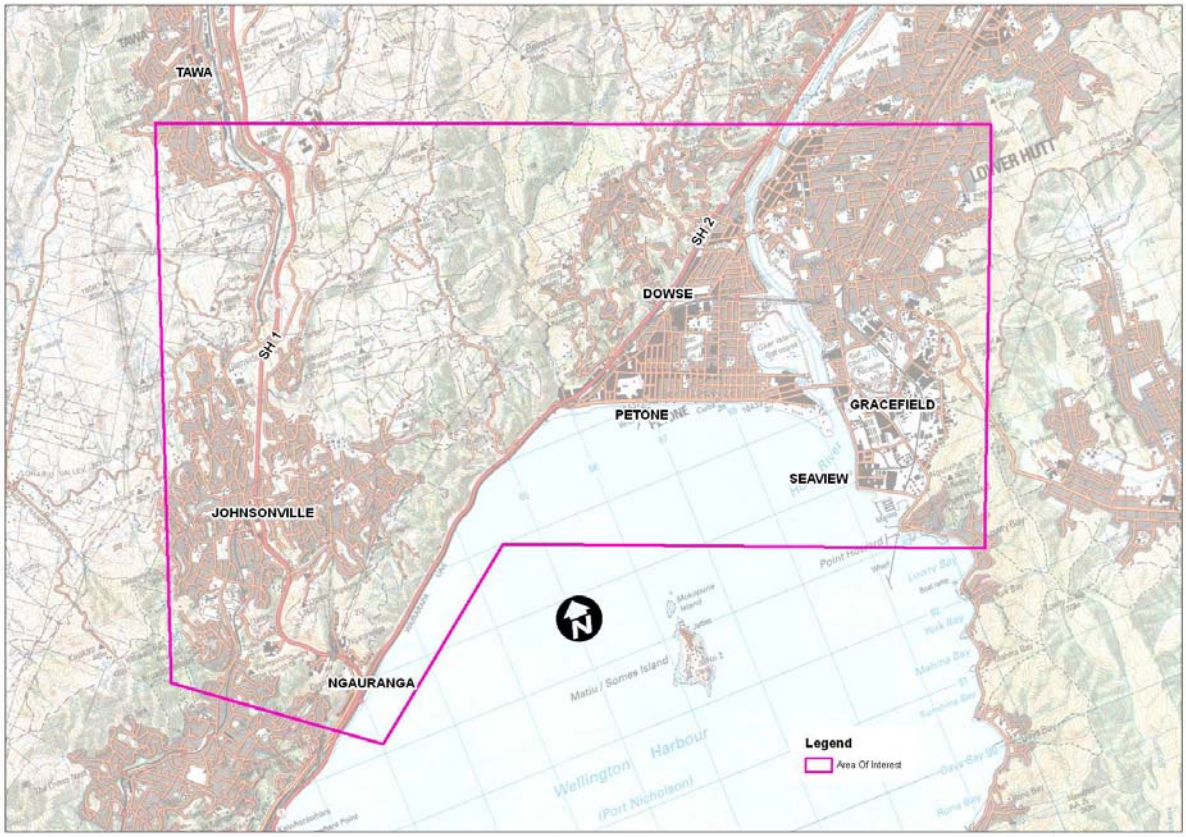
The preferred long term transport plan must satisfy the NZTA's statutory responsibilities under the Land Transport Management Act 2008 (LTMA), give effect to the Government Policy Statement (GPS) on land transport funding, and take account of the Wellington Regional Land Transport Strategy (RLTS) and its plans.

The development of the Ngauranga Triangle Strategy Study has resulted from specific actions identified in the Hutt Corridor Plan (2003) and the Western Corridor Plan (2006) for Transit NZ (now New Zealand Transport Agency), HCC and WCC relating to the investigation of projects with the study area.

In particular, both the Western Corridor Plan and the Hutt Corridor Plan have signalled the intent of providing a link road from SH1, north of Johnsonville, to SH2 in the vicinity of Petone. The Hutt Corridor Plan signals the need to link the Seaview-Gracefield industrial area efficiently to SH2, while the Regional Cycle Plan signals a desire to complete the off- road cycle facility between Petone and Ngauranga. This study seeks to confirm the merits of these proposals or otherwise.

2. Background

The Ngauranga Triangle Strategic Study area is one of the most critical parts of the greater Wellington region's transport network and is vital to its economic performance. The highways and rail system within the study area connect the region's fastest growing district, the Kapiti Coast, to the region's dominant employment hub in central Wellington. The Hutt Valley is the region's second largest population base and contains its primary industrial hub at Seaview-Gracefield, and this too is connected to Wellington City through the study area.



- **Figure 1.1: Ngauranga Triangle Strategic Study Area**

Journey-to-work data from the 2006 Census and measured traffic volumes show that there is significant travel between northern Wellington (Johnsonville, Churton Park, Newlands etc), Tawa, Porirua and the Hutt Valley (including Seaview-Gracefield). For example, travel for commuting purposes from the 2006 Census data shows that 53% of employed residents of Porirua work in Wellington City and Lower Hutt, whilst in Lower and Upper Hutt around 31% of employed residents work in Wellington City. The current road and rail networks do not provide direct routes for travel between the Hutt Valley and SH1, north of Ngauranga Gorge.

The greater Wellington region is experiencing ongoing economic and population growth, which has exceeded Statistics New Zealand's medium projections in recent years. By 2026, regional population is expected to be 54,200 greater than the 2006 population, an increase of approximately 12 %.

In a report commissioned by Grow Wellington, the estimated total regional Gross Domestic Product (GDP) was $22.2 billion in 2008. This is the largest regional GDP per capita in New Zealand. In the 2006 Census the greater Wellington region had the greatest proportion of persons in the four highest income groups of any region. This means the Wellington regional economy is more dependent on higher value activities than other

regions in New Zealand. Tertiary sector[1] activities such as services, Government and finance are examples of such higher value activities. Growth in regional GDP during 2008 was 2.6 % per annum.

In the greater Wellington region, traffic growth is closely correlated with economic growth and in particular heavy vehicle volumes grow faster than economic growth. For example, the 2.6 % per annum growth in regional GDP experienced in 2008 was shown to deliver a growth in heavy vehicle volumes in excess of 3.9 % per annum. The Wellington Transport Strategy Model (WTSM) is forecasting an underlying growth in heavy vehicle numbers in the greater Wellington region of 4.25 % per annum from 2006 to 2026, based on medium growth projections. Given that recent growth has exceeded Statistics New Zealand's projections, this could lead to even higher numbers of heavy vehicles on the network if that trend continued.

As this transport plan has been developed for a 20-year time horizon, it is appropriate that growth forecasts are not overly influenced by the current recessionary times. Treasury forecasts developed in May 2009 for the 2009 budget anticipated a decline in national GDP for 2009 and 2010. Forecast GDP growth is 1.8 % in 2011, 2.9 % in 2012 and 4.0 % in 2013. Treasury's forecast indicates that the current recessionary period is a short-term phenomenon and in the near future, growth in national GDP can be expected to improve, growing strongly by 2012.

General traffic growth is a function of car ownership. Over the 2003 to 2007 period, Wellington regional light vehicle registrations increased by 2.6 % per annum and heavy vehicle registrations increased by 4.4 %. In summary, growth in regional travel demand is expected to outstrip population growth in the region into the future despite growing public transport use and higher fuel prices. This means that without increased road capacity in the Ngauranga Triangle Strategic Study Area, travel times can be expected to deteriorate over time.

The Local Authority study partners, HCC and WCC, who are jointly responsible for district planning within the study area, have identified development opportunities where careful integration of transport and urban form may produce improved outcomes, such as increased economic development, improved urban design and better integrated travel. These development opportunities include new development, significant regeneration or transformation of existing areas. Identified development opportunities in the study area are as follows:

Wellington City	■ Lincolnshire Farm ■ Johnsonville Town Centre
Hutt City	■ Petone and foreshore ■ Seaview-Gracefield (industrial and logistics hub).

Lincolnshire Farm is a residential and business park development of a large parcel of land located north of Grenada Village and west of Horokiwi. WCC, in conjunction with the developer, has undertaken a planning

1 The tertiary sector of economy (also known as the service sector or the service industry) is one of the three economic sectors, the others being the secondary sector (largely manufacturing) and the primary sector (extraction such as mining, agriculture and fishing).

exercise to provide a structure plan to guide the future development of the area. The Petone-Grenada Link Road concept is intrinsically built into this development plan.

Redevelopment of the Johnsonville Town Centre is more than the redevelopment of the existing mall, although the mall development is very much part of this proposal. The town centre development includes the development of areas across Johnsonville Road from the mall. This raises an issue of how land uses east of Johnsonville Road can be better integrated into the town centre development, requiring careful consideration of how Johnsonville Road might function. WCC has undertaken a planning exercise that has provided a framework for the future development of the wider town centre. This framework is the Northern Growth Management Framework.

The continuing growth of the Churton Park area is expected to see the construction of an additional 1,100 dwellings over the next 20 – 30 years. Accessibility to the suburb will be significantly improved by the proposed extension of Westchester Drive to Middleton Road. The potential provision of a new and more direct route between this area and the Hutt Valley will not only improve accessibility but also alleviate severe congestion in Ngauranga Gorge on SH1 by the removal of around 12,000 vehicles per day (vpd) north of Johnsonville, improving the potential for economic development.

Heavy volumes of traffic, including large numbers of heavy vehicles, create a barrier between the Petone foreshore and the lower Hutt Valley. HCC has developed a vision for the wider Petone area which seeks to create:

- A unique heritage place
- An economically and environmentally sustainable environment
- A real place for people
- An attractive and vibrant village culture.

The construction of an improved road link between SH2 and Seaview will enable the desired improved connections between the foreshore and Petone and would enable a considerable improvement in amenity in the area. The value of land adjacent to the foreshore would be significantly enhanced by this amenity improvement and this could contribute to a significant economic regeneration in the area.

The Seaview-Gracefield area is identified in the Wellington Regional Strategy (WRS) as the greater Wellington region's primary industrial area. Growing congestion on The Esplanade increases the costs to business in the region and reduces the attractiveness of the area for further development. Efficient access between this area and SH2 will be important for its future development. Further, as the region's primary industrial area, it is important that this area is efficiently connected to SH1 to enable improved servicing of the lower North Island.

The implications of proposals arising from this study could have a profound impact, not only on transport, but also social and economic activities in the region. The strategic road and rail networks in the region are linear in form and provide for north-south movement in both the SH1 and SH2 corridors. This study not only considers measures that may improve the efficiency of these north-south movements but also considers measures that allow improved movements outside this linear north-south pattern such as east-west movements between SH1

to SH2, and SH2 to Seaview. This may lead to new opportunities and facilitate more effective agglomeration[2] of activities resulting from land uses in the SH1 corridor interacting more effectively with those in the SH2 corridor and lower Hutt Valley.

Of particular significance is the Seaview-Gracefield area. This is the greater Wellington region's primary industrial and logistics centre. The Seaview-Gracefield area generates significant travel demands, particularly for heavy vehicles, to and from Wellington City, the Port, Wellington's northern suburbs, Kapiti and further north. This study is concerned with improving access to and from this area to facilitate increased productivity and economic development.

3. Form and Function of the Transport Network

The primary strategic roads and rail lines within the study area include SH1, SH2, The Esplanade, the North Island Main Trunk Railway (NIMT) Line, and the Wairarapa Railway Line. These key transport routes make up the strategic transport network in the study area and are described in more detail below.

SH1 out of Wellington is classified as a National State Highway in NZTA's National State Highway Strategy 2007 (NSHS). The Government has identified this road, between Wellington and Levin, as one of seven Roads of National Significance (RoNS) and is therefore one of the country's most important road sections in terms of assisting national economic development. SH1 and the NIMT connect Wellington to the lower North Island and beyond. In this respect SH1and the NIMT have an important economic function of linking the lower North Island centres to the greater Wellington region urban areas for tourist, business and social reasons; while also connecting the lower North Island to the Port of Wellington for the export of logs, wood products and other resources.

Within the study area SH1 is a multi-lane divided highway that alternates between motorway and expressway standards. This part of SH1 carries between 45,000 vpd at Tawa and 70,000 vpd at Ngauranga. Traffic includes significant volumes of heavy vehicles making up 3 to 5 % of the daily vehicle numbers on SH1 in the Ngauranga Gorge.

The NIMT runs parallel to SH1. The line is double tracked within the study area and has the dual function of providing for passenger rail services, and delivering rail based freight. The passenger rail services include regular suburban rail services to the Kapiti Coast and long distance connections to Palmerston North and Auckland.

SH2 from Wellington is classified as a Regional State Highway in NZTA's NSHS. The segment of SH2 within the study area operates as a four-lane divided expressway and carries 34,000 vpd at Dowse and 67,000 vpd at Ngauranga. Like SH1, this traffic includes significant volumes of heavy vehicles on SH2 north of Ngauranga, making up approximately 10 % of the daily traffic flow.

2 The phenomenon of economic activity congregating in or close to a single location, rather than being spread out uniformly over space.

The Wairarapa Line is adjacent to SH2, and is double tracked within the study area. This line has the dual function of providing for passenger rail services and delivering rail based freight to the Wairarapa. The passenger rail services include suburban rail services and long distance connections to the Wairarapa.

The Esplanade is classified as a Major District Distributor Road[3] in the Hutt City District Plan. The road serves as a major route for traffic wishing to gain access to SH2 from Petone, Gracefield and eastern parts of the Hutt Valley including Wainuiomata and the Eastern Bays. The Esplanade consists of a mixture of two-lane and one-lane sections with some on-street parking in each direction. During the morning (am) peak, a west-bound high occupancy vehicle and taxi lane operates. The Esplanade carries 32,000 vpd including large volumes of heavy vehicles travelling from Seaview and Gracefield (10 to 12 % of the daily traffic on The Esplanade).

SH1, SH2 and The Esplanade currently experience significant congestion at peak times leading to delay and travel time variability for drivers using these roads at these times because travel demand is close to capacity resulting in delays due to sheer volume of traffic on the link rather than a specific bottleneck. Forecast travel demand, using WTSM, indicates that congestion will worsen leading to increased delay, greater travel time variability and the lengthening of the peak periods if additional road capacity or new roads are not provided. This will add cost to business activities in the greater Wellington region making it less attractive to new businesses and reducing the potential for economic development.

Both the NIMT and Wairarapa lines have high ridership at peak times. There are approximately 4,100 passengers per day on the NIMT and 5,200 passengers per day on the Wairarapa line in the study area that travel southwards towards Wellington. It is expected that similar numbers of passengers would make the return trip. Capacity constraints outside the study area limit the possible improvement of levels of service on the rail network to a 15 minute frequency from Kapiti and Upper Hutt to Wellington at peak times. Higher peak period frequencies, without line improvements, would lead to a significant deterioration in service reliability. Increases in passenger rail service frequency would limit the opportunities for additional freight movements. Travel forecasts, using WTSM, indicate that passenger rail will experience increasing demand into the future within the study area.

4. Study Process

The study development process is shown in a flow diagram below (Figure 1.2). In summary the steps in the study process are as follows:

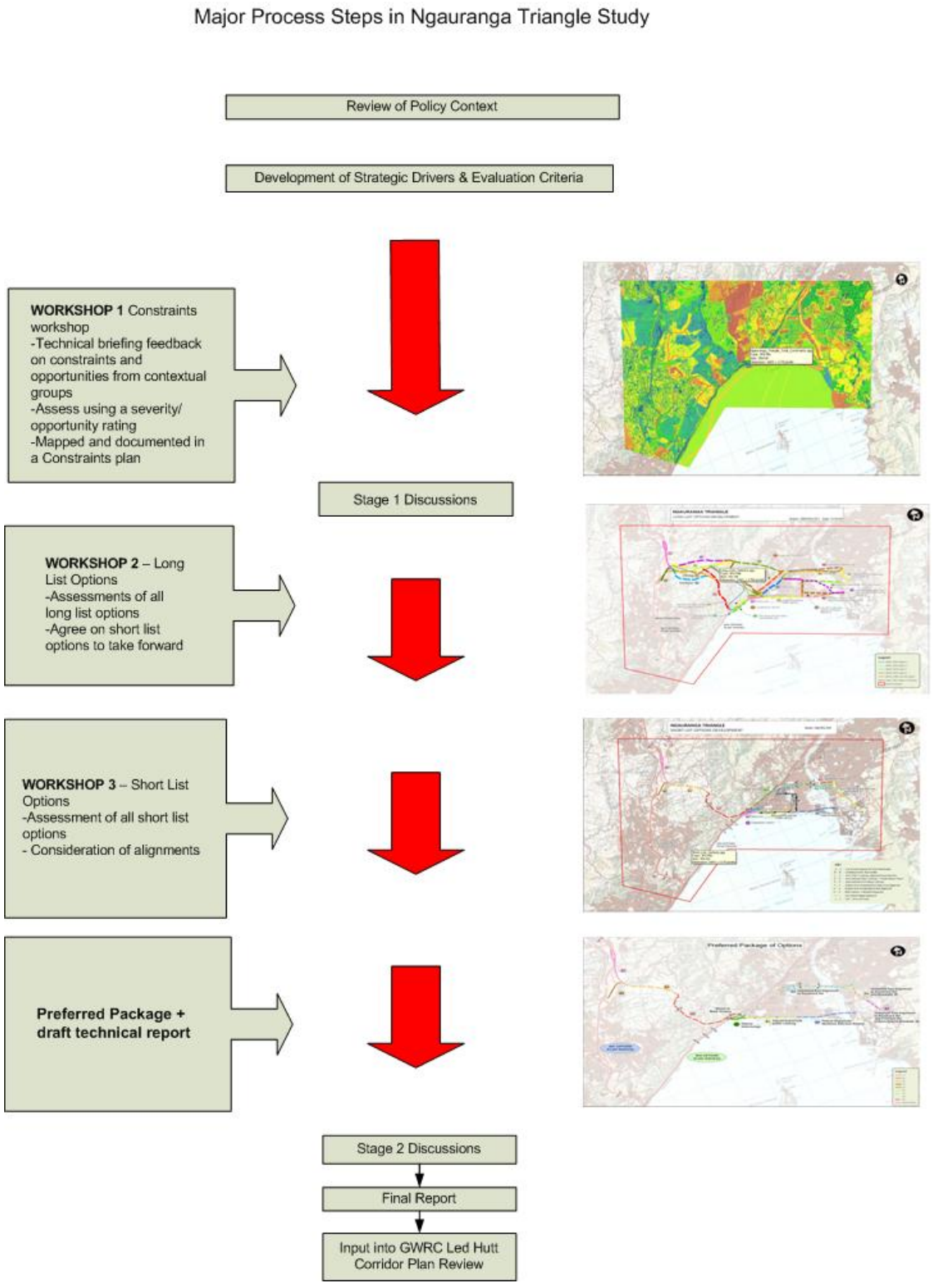
Policy Context Review	■ This was a review of the relevant legislation and national policy documents, regional and local policy documents and other relevant non-statutory planning documents to provide a context in which this study was undertaken.

[3] A Major District Distributor is the second level in the road hierarchy, below State Highways. This indicates that this is a local road with a key through traffic moving function.

Development of Strategic Drivers and Evaluation Criteria	■ The strategic drivers for the study were developed to give effect to the policy context of the study and the study's objectives. The evaluation criteria are a set of objectives and performance measures for the study's potential projects that reflect the study's strategic drivers within the specific context of the issues and opportunities identified in the study area.
Constraints Plan	■ This is the identification of constraints and opportunities that may impact on potential project options in the study area. This includes a broad range of matters such as regulatory requirements, heritage, areas of cultural significance, noise sensitivity, sensitive ecological environments, difficult geotechnical ground conditions and others. This step also included the identification, assessment and mapping of constraints and opportunities. A multi-party and multi-disciplinary workshop was undertaken to facilitate this phase.
Early Discussions ("Fireside Chats")	■ A series of meetings were held with representatives of identified key existing stakeholders. Meetings were held with these groups so that they could identify the issues important to them, possible community constraints and potential options and alternatives.
Long List Options	■ An extensive list of potential transportation measures that address the strategic drivers were developed for the study. This list was subject to a coarse evaluation with the purpose of removing those options that performed poorly against the wider study objectives, or were seriously compromised by the identified constraints. This analysis was presented to, and reviewed by, a workshop involving Study Governance Group[4] members. A short list of options was agreed for further evaluation as an outcome of the workshop.
Short List Options	■ A detailed assessment of the remaining options was undertaken including a strategic assessment of cost, project economics and consentability. This included the identification of a preferred suite of key projects and their form. This phase was concluded with a workshop involving Governance Group members who reviewed the analysis.
Technical Report	■ Further technical work was undertaken on the remaining options including the refinement of route alignments. This was summarised in the Study's Technical Report. This report provides an extended executive summary of the Technical Report and the following sections detail each of the stages set out above.

After further discussions with key stakeholders, the Technical Report will be finalised and will become a key input to the GWRC-led review of the Hutt Corridor Plan scheduled to begin in early 2010, and local planning considerations. Full public consultation, including hearings, on the projects that make up the proposed study strategy, will be undertaken as part of the Hutt Corridor Plan review.

[4] The Study Governance Group was made up of senior officers from NZTA, WCC, HCC and GWRC.



- **Figure 1.2: Ngauranga Triangle Strategic Study Process**

5. Policy Context Review

The first stage of the study was to review relevant legislation, national, regional and local policy and other relevant non-statutory documents to confirm the statutory context under which this study has been undertaken. The review assisted the development of evaluation criteria for the study which are consistent with existing policy. Further, this step helped identify potential projects put forward in relevant previous planning documents and studies that could help address identified issues in the study area over the short and long term.

Overall, it is recognised that the various policy documents and legislation support and encourage transport projects which:

- Integrate land use and transport planning
- Provide economic benefits for the area
- Improve the sustainability of the land transport system
- Improve the performance of land transport systems
- Limit the environmental impact of land transport systems on their surroundings
- Improve the safety, security and public health of the community
- Manage transport demand.

The recently released GPS highlights the importance of transportation to support economic development. The GPS states:

> *The government's priority is for land transport investment to support national economic growth and productivity.*

This means that proposals that facilitate economic development are an important outcome of this study. The GPS also identifies the section of SH1 in the study area as part of the Wellington-Levin corridor RoNS. From a Government perspective, this means that any proposals that improve the efficiency and reliability of SH1 will be of particular value.

6. Issue Identification

Following Stage One discussions and the constraints workshop, a number of issues were identified that relate to the current and future performance of the transport network within the study area. These issues, along with the key policy and planning documents, were used to inform the development of performance measures to support each of the objectives in the evaluation framework detailed below.

The "level of service" for the key roads is noted in the sections that follow. The definition of "level of service" is a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. In general there are six levels of service, designated from A to F, with a level of service A representing the best operating conditions (i.e. free flow) and level of service F the worst (i.e. forced break-down flow). For reference, the level of service ratings are explained in more detail in Table 1.1 below.

Table 1.1: Level of Service Definitions

Level of Service (LoS)	Description
A	A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience is excellent.
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of discomfort and convenience is a little less than with level of service A.
C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream The general level of comfort and convenience declines noticeably at this level.
D	Close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
E	Occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause break-down.
F	Is in the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow break-down occurs, and queuing and delays result.

Ngauranga to Tawa	■ Growing traffic volumes on SH1 leading to severe peak period congestion (LoS E) and travel time variability (NZTA travel time surveys indicate that peak travel times have stabilised which means increasing traffic demand will lead to a lengthening of the peak period) ■ The level of crashes in the vicinity of Tawa Interchange (3 serious from 2004 to 2008) ■ Placement/design of motorway access points creating congestion on Johnsonville Road ■ Commuter buses getting caught in congested general traffic in Ngauranga Gorge leading to service delays in peak times ■ Poor level of service for cyclists and pedestrians ■ Current inadequate level of service for passenger rail at peak and non-peak times

Ngauranga to Dowse	■ Growing traffic volumes on SH2 leading to severe peak period congestion (LoS E) and travel time variability, particularly on the on and off-ramps at peak times (NZTA travel time surveys indicate that peak travel times have stabilised which means increasing traffic demand will lead to a lengthening of the peak period) ■ High level of crashes in the vicinity of Petone Interchange, resulting in safety issues and disruption to traffic flows (crash statistics show there were 89 injury crashes between Petone and Ngauranga on SH2 from 2004-08 of which eight were serious and 81 were minor. The majority of crashes, including minor, are associated with Horokiwi/SH2 intersection and the Petone interchange) ■ Commuter buses getting caught in congested general traffic between Ngauranga and Petone leading to service delays in peak times ■ Poor level of service for cyclists and pedestrians ■ No direct link for pedestrians and cyclists crossing from the Petone foreshore to the Korokoro Valley and the Belmont Regional Park ■ Current inadequate level of service for passenger rail at peak and non-peak times.
SH1 to SH2	■ Poor connections/integration between the Western Corridor/SH1 and Hutt Corridor/SH2), leading to: - Lack of east – west social and economic integration - Poor freight connectivity of Seaview-Gracefield to lower North Island - Limited east – west passenger transport service opportunities
SH2 to Seaview-Gracefield	■ Growing traffic volumes on The Esplanade leading to serious peak period congestion (LoS E) and travel time variability, community severance, decreased Petone foreshore amenity values and limited economic development (NZTA travel time surveys indicate that peak travel times have stabilised which means increasing traffic demand will lead to a lengthening of the peak period) ■ Reducing quality of connectivity between the Seaview-Gracefield Industrial Area and SH2 as The Esplanade nears capacity ■ Poor level of service for cyclists and pedestrians ■ Aging infrastructure of Petone ramp bridges and Petone pedestrian bridge ■ Increasing freight volumes which operate throughout the day.

7. Strategic Drivers and Evaluation Criteria

The strategic drivers for the study were collectively developed with the Governance Group using the policy context review as a basis. In this way, all the issues associated with different parts of the study area could be taken into account.

These drivers have underpinned the development of the project strategy and evaluation criteria, which have consequently guided decisions on which options to reject or take to the next stage of development. These drivers have also informed the urban design objectives and principles developed as part of the urban design framework for this study. The drivers are defined below:

- Improve connectivity for passenger transport
- Improve connectivity for general traffic
- Improve connectivity for freight traffic
- Improve connectivity for safe walking and cycling (and other active modes)
- Improve the amenity of Petone and foreshore to enable development of this area incorporating integration with the foreshore
- Improve the network security, resilience, and quality of the transport network between Wellington City and the Hutt Valley and the SH1 RoNS corridor within the study area
- Provide for the integration between transport and land use.

A high level evaluation framework and associated performance measures were developed based on the project objectives and strategic drivers detailed above. These evaluation criteria allowed a transparent evaluation of individual projects to identify the extent to which they contributed towards the study objectives, complied with legislation, national, regional and local policy, and provided benefits to the community.

This evaluation framework is based on the following objectives:

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

The first five objectives are from the LTMA and are reflected in the RLTS. The last objective is a measure of the ability of projects, within a preferred strategy, to be implemented. A practical transportation plan for the Ngauranga Triangle area should concern itself with projects that can be implemented. This means a project should have some likelihood of gaining consent under the Resource Management Act 1991 (RMA).

As noted above, the GPS places particular importance on transportation infrastructure supporting economic development. In this study, economic development can be facilitated by:

- Improving the efficiency and reducing the cost of business related travel by reducing severe congestion and travel time variability
- Improving access to and from important economic activity centres such as the Seaview-Gracefield industrial hub and the Port
- Facilitating new development such as the Lincolnshire Farm area
- Supporting the renovation and economic regeneration of areas such as the Johnsonville town centre, Petone, the Petone foreshore
- Improving the efficiency and reliability of SH1 and SH2.

Each of the seven study objectives identified above have had a set of performance indicators developed for them that take into account the specific context of this study and the transportation issues and opportunities in the study area.

8. Constraints and Opportunities in the Study Area

Considering the size of the study area and variety of environments ranging from urban to rural areas, there are multiple constraints and opportunities. Key urban design considerations are outlined in the diagram below. These include identification of the key areas of employment and community activity areas, future development areas, important areas of open space and areas where amenity improvements are sought.

Study constraints are outlined below. These constraints relate to:

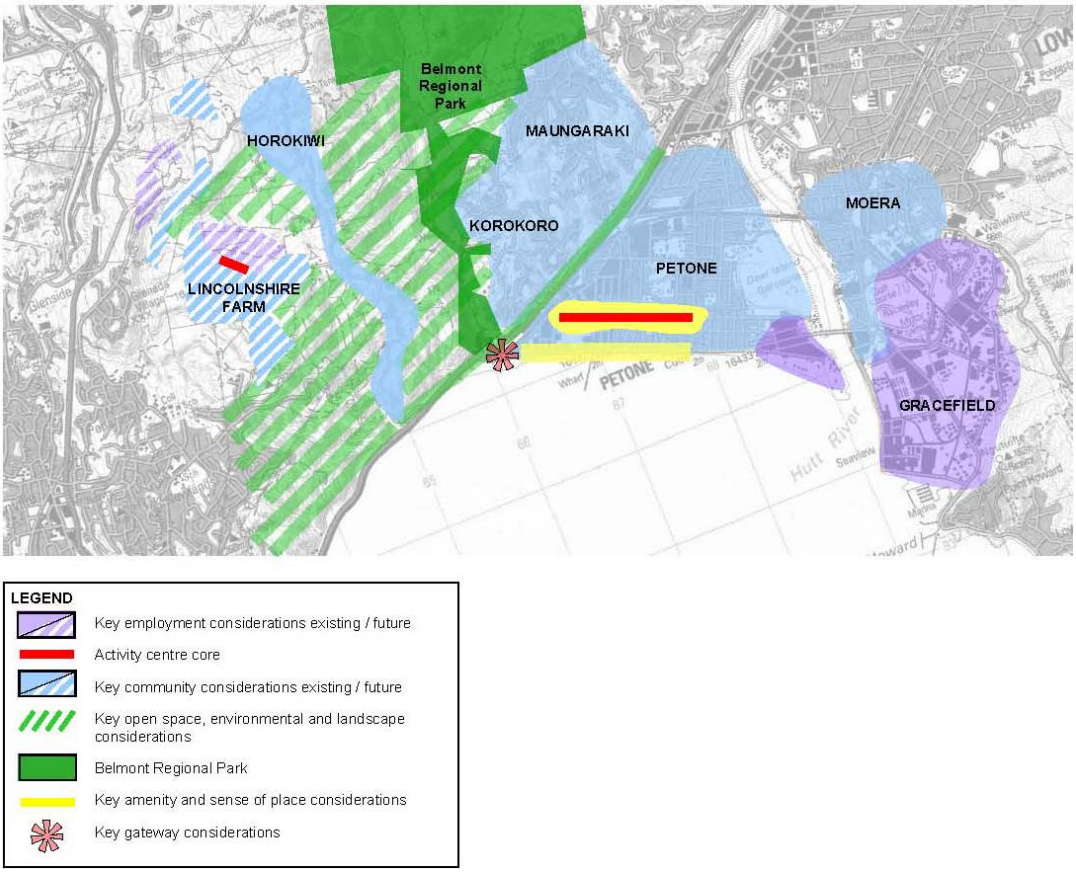
- Urban form
- Regional Parks and Department of Conservation Land
- Ecology
- Geotechnical conditions
- Hydrological science
- Landscape values
- Noise and air quality
- Contaminated land
- Climate change and sea level rise
- Community severance
- Iwi/Maori land and archaeological sites.

These constraints and opportunities are discussed in more detail in the Technical Report and for clarity, only those constraints related to the preferred strategy detailed below are shown in the map, over.

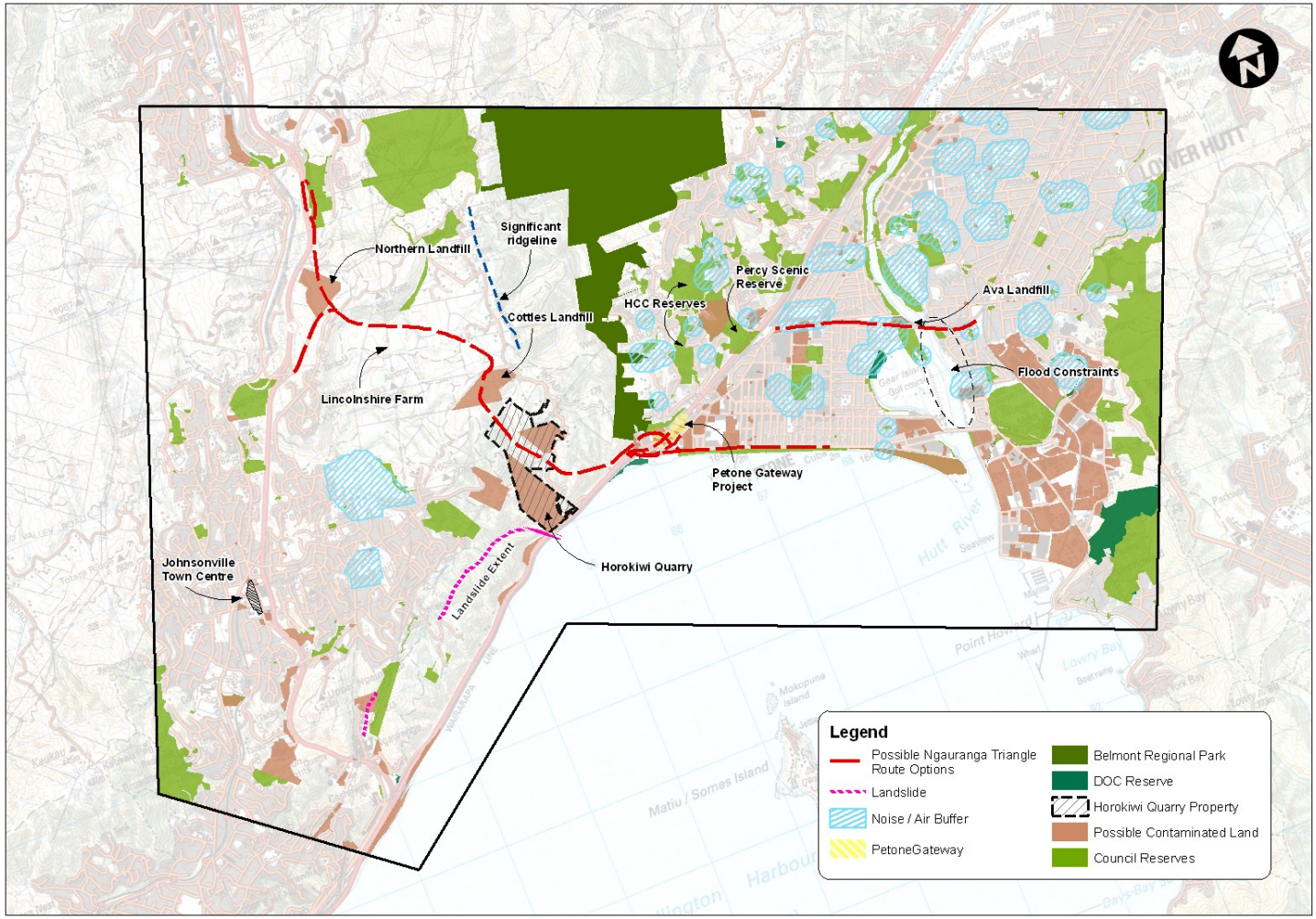
As this study is intended to consider the transportation needs of the Ngauranga Triangle Strategic Study area up to 30 years into the future, climate change and sea level rise are not considered to have a major impact on this study. Associated with the issue of climate change and sea level rise is the increased impact of storm surge.

The consensus of scientific thought indicates that sea level rise around New Zealand over the next 100 years is expected to be less than 1 metre[5]. This means that sea level rise and storm surge is unlikely to greatly impact on projects in the study area over the 30 year study period. However, it would be prudent that all major new infrastructure proposed in the preferred strategy be designed to accommodate sea level rise and increased storm surge over its design life.

[5] Coastal Hazards and Climate Change – A Guidance Manual for Local Government in New Zealand 2nd Edition July 2008. Ministry for the Environment



- **Figure 1.3: Urban Design Considerations**



- **Figure 1.4: Key Constraints**

9. The Preferred Strategy Components

This section sets out the proposed strategy components for the Ngauranga Triangle Strategic Study area. As this is a strategic study, more detailed investigations will be required to confirm the individual elements within the strategy as they are progressed. The study has carefully investigated transport solutions that include road, public transport, walking, cycling and freight needs.

In developing the preferred strategy the following key issues have been considered:

- Traffic, passenger and economic growth
- The effects of the wider transport network on the individual elements of the strategy
- The development opportunities identified above.

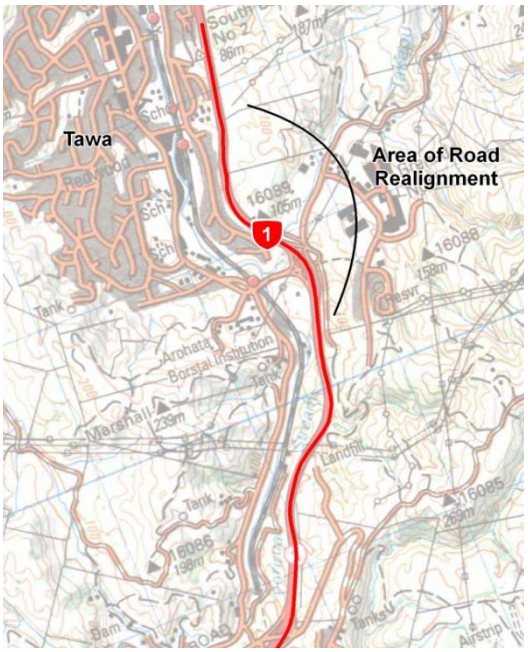
The components of the preferred strategy have been generally grouped according to the corridors to which they relate.

Ngauranga to Tawa

Tawa Interchange Improvements

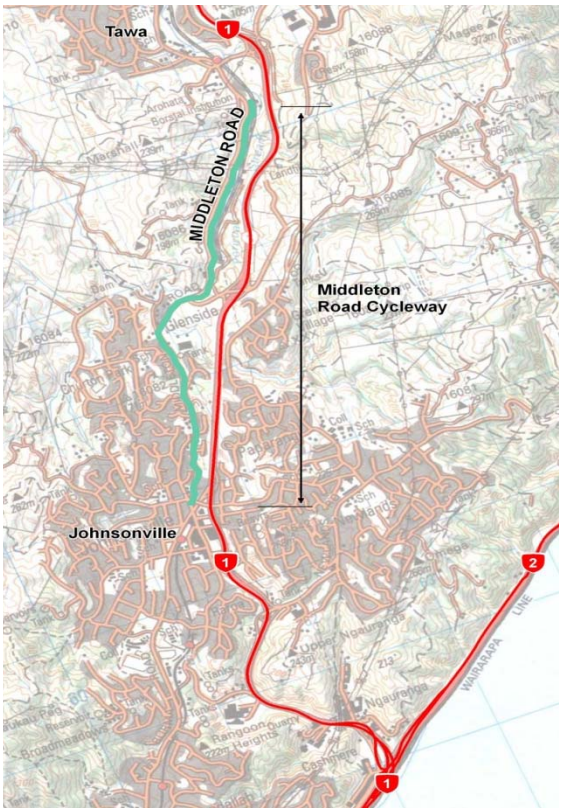
This project brings SH1 up to 100 km/h design standards and improves safety in the vicinity of Tawa Interchange which is an identified issue. This project is expected to cost $14 million and has an indicative benefit cost ratio (BCR)[6] of 1.8.

These improvements could proceed independently of the Petone-Grenada Link Road but it is proposed that this project be built in conjunction with the Petone-Grenada Link Road, as the link road will require alterations to the Tawa Interchange and building these together will result in less overall disruption to SH1 traffic.



[6] A BCR compares monetarised expressions of travel time savings, vehicle operating cost savings, crash savings, travel time reliability benefits and others with the project cost over time. A BCR greater than 1.0 indicates the project is worthwhile as benefits exceed costs. BCRs set out in this report are at a strategic level only and subject to further refinement during future project investigation phases.

Middleton Road Cycleway Improvements



North of Johnsonville, pedestrians and cyclists must leave SH1 and travel north or south using Middleton Road. The road between Johnsonville and Tawa is narrow in many places and sections of the road operate at 70 km/h. There is no continuous footpath for pedestrians on this road. Over the period 2004 – 2008, crashes involving cyclists amounted to one serious and two minor crashes and one of these was a collision between two cyclists. Estimates of current levels of cycling along this route total 150 cyclists per day in both directions.

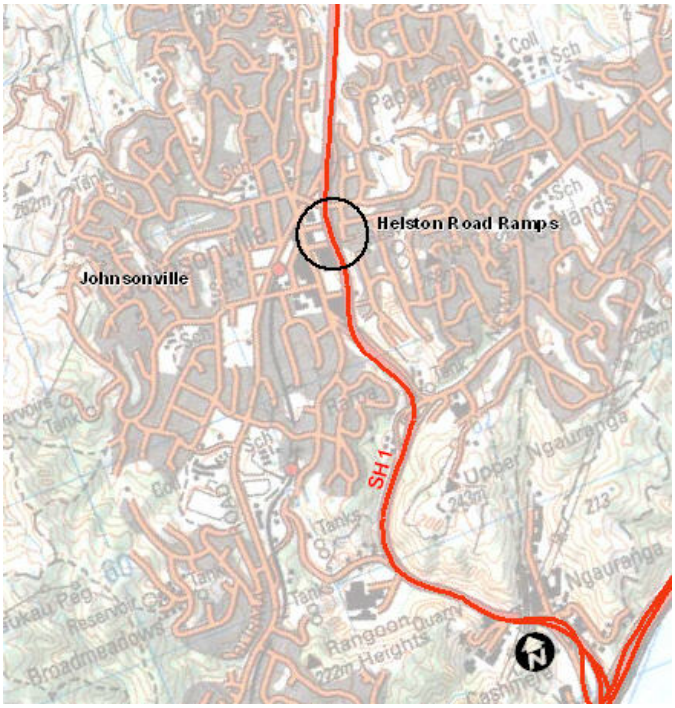
A purpose-built three metre wide facility to accommodate pedestrians and cyclists is expected to cost $5 million. The proposal will involve widening of existing footpaths towards the Johnsonville and Tawa ends of the project and providing a new cycleway by widening the road. Some parts of the cycleway, on the widened sections of road, would require retaining structures to be provided. It has been assumed that the cycleway will be provided on the open side of the gorge to avoid cutting into rock face on the opposite side.

As an estimate it is reasonable to expect that a new purpose-built cycling facility along Middleton Road would double the number of cyclists using this route to around 300 cyclists per day. Using the estimated cost of $5 million, the indicative BCR of the cycleway is 1.8.

This project is recommended to proceed as it will provide a cycle facility that will serve the existing demand on this road and further enhance cycling as a mode of travel in this area, whilst also providing a scheme that is economically justifiable.

Johnsonville Motorway Access Improvements

South facing Helston Road ramps were considered to alleviate congestion on Johnsonville Road, assist development at the Johnsonville Town Centre and provide improved access to Churton Park. Such ramps would significantly reduce traffic on Johnsonville Road and allow it to be redeveloped in a manner consistent with a shopping street while improving pedestrian permeability.



The reduction of traffic on Johnsonville Road would prevent the tail of a queue from the Johnsonville northbound off-ramp stretching back on to SH1 in the evening (pm) peak. This situation occurs at times and is considered a significant safety risk. Closure of the Johnsonville ramps is not recommended as it would increase traffic volumes on SH1 between Johnsonville and Helston Road and result in congestion and safety impacts.

Providing the Helston ramps is forecast to reduce Johnsonville Road traffic volumes by approximately 7,000 vpd in 2016 but at the same time increase traffic volumes on the "Johnsonville Bypass" (SH1 at Johnsonville) by approximately 10,500 vpd.

As the proposed Petone-Grenada Link Road is forecast to reduce traffic volumes by approximately 12,000 vpd on SH1, the installation of new Helston ramps cause the relief to SH1, north of Johnsonville, provided by a new Petone-Grenada link to be reduced.

The Helston ramps have an estimated cost of $11 million. The cost of these ramps reflects the constrained and difficult environment in which the ramps would be built and the BCR of the project is negative, because the benefits gained by relieving the Johnsonville off-ramp and Johnsonville Road are more than offset by the additional delay incurred by road users on SH1 north of Johnsonville.

The development of this project should be subject to further investigations, including more detailed traffic modelling, and discussions between the NZTA and WCC to thoroughly examine the full range of benefits and costs of this project. Only the direct transportation related benefits of the project have been taken into account at present, and the provision of the Helston ramps may generate significant economic and development benefits in the Johnsonville Road area and surrounds which are not accounted for in the standard NZTA BCR calculations. Further work should be undertaken by WCC to quantify the amenity and economic regeneration benefits that will accrue to the Johnsonville area by building the Helston ramps.

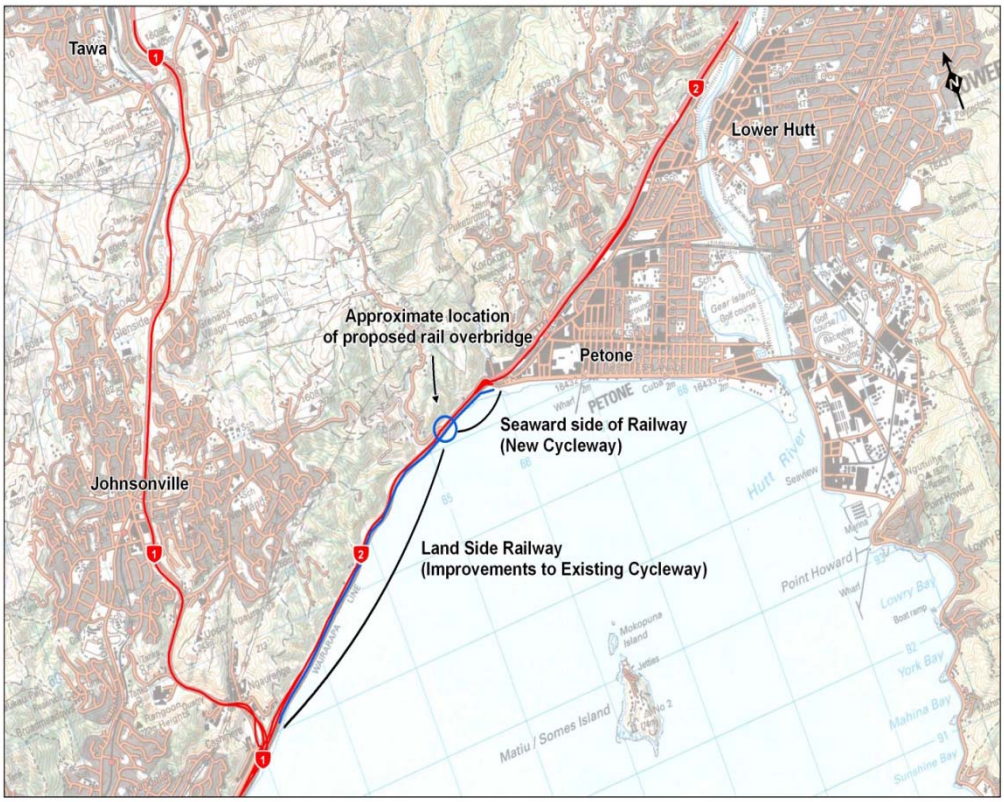
Ngauranga to Dowse

The proposed Petone – Grenada Link Road (refer below) will reduce traffic pressure on SH2 by an expected 12,000 vpd south of the Petone ramps in the forecast year of 2016, which leaves residual cycling and pedestrian issues to be solved between Ngauranga and Petone.

Complete the Off-Road Pedestrian/Cycle Facility on SH2

This project addresses the inadequate level of service to pedestrians and cyclists that currently exists, by completing the northern section of the pedestrian/cycle facility on SH2, between Horokiwi and Petone, following a route on the seaward side of the rail tracks north of the Horokiwi intersection.

As the railway lines are double tracked and at peak times, highly utilised from Petone to Ngauranga in this location, it is proposed that the project joins the new pedestrian/cycleway via a bridge over the rail tracks to the existing pedestrian/cycle facility adjacent to SH2. The proposed bridge will provide the best safety outcomes for pedestrians and cyclists and avoids potential disruption to daily rail movements that might be caused by an at-grade crossing. The provision of the proposed cycle/pedestrian facility, including the proposed bridge, will require the reclamation of approximately 400m of coastal land. Discussions have taken place with ONTRACK regarding an at-grade crossing of the rail tracks but it has strongly recommended against such a proposal.



This new section of pedestrian/cycleway can be thought of as the first stage of the "Great Harbour Way" concept and should be built to standards consistent with the vision for that concept (i.e. a 4m wide shared-use (cycle/pedestrian) facility). If measured demand on this new facility is sufficient it may provide further justification for completion of the "Great Harbour Way" between Horokiwi and Ngauranga.

The cost of improving the existing Ngauranga – Horokiwi section of the off-road cycleway within the constraints of the corridor and the completion of the northern section of this pedestrian/cycleway is expected

to have a total cost of $16 million. This includes a bridge structure from the existing facility over the rail tracks to the seaward side of the tracks, the required reclamation and track formation. The indicative BCR for this project is 1.3. This project is not physically tied to any other projects nor is its timing.

This project is proposed because it addresses:

- An incomplete off-road pedestrian/cycling facility parallel to SH2
- Growing congestion on SH2 by providing an alternative for travel.

In a small way, the completion of this cycleway assists locking in the benefits of the Petone-Grenada Link Road. The Petone-Grenada Link Road will remove traffic from SH2 and therefore reduce congestion on this road between Ngauranga and Petone. Completion of the cycleway will also provide a higher level of service for pedestrians and cyclists in this area, reducing the risk of pedestrians and cyclists switching to travel by car. A completed cycleway will provide a higher standard alternative to assist in absorbing future growth in the demand for travel in the corridor.

"Beach to Bush"

The construction of the Petone-Grenada Link Road will require the reconstruction and relocation of the existing Petone Interchange. This will release the Petone ramps overbridge from the existing interchange to provide a crossing over SH2 and the Wairarapa rail line providing a safe and convenient path for pedestrians and cyclists, connecting the Petone foreshore to the Korokoro Valley and the Belmont Regional Park – the "Beach to the Bush" concept. As this project largely re-uses existing infrastructure, it requires little funding.

An alternative to this proposal is to demolish the structures at the Petone Interchange so that a purpose-built "Beach to Bush" pedestrian and cycling facility could be built. This could be built with sufficient clearance to allow over dimensioned vehicles to travel north of Petone on SH2 which they cannot do at present due to the constraint at the overbridge.

The pedestrian and cycling demand served by the "Beach to Bush" project is approximately 90 per day based on surveys undertaken by Beca in 2007 as part of the Dowse to Petone improvements. Based on the level of use it would be difficult to produce a BCR that would support a purpose-built facility. In addition, over

dimensioned vehicles on SH2 would still be limited by the clearances provided by the Normandale Bridge 3 km north on SH2.

Traffic Management on SH2

This may include ramp signalling at Petone in the am peak and at Ngauranga in the pm peak to manage the amount of traffic allowed on to SH2 so that it operates more efficiently and improves the severe congestion encountered at these ramps at peak times.

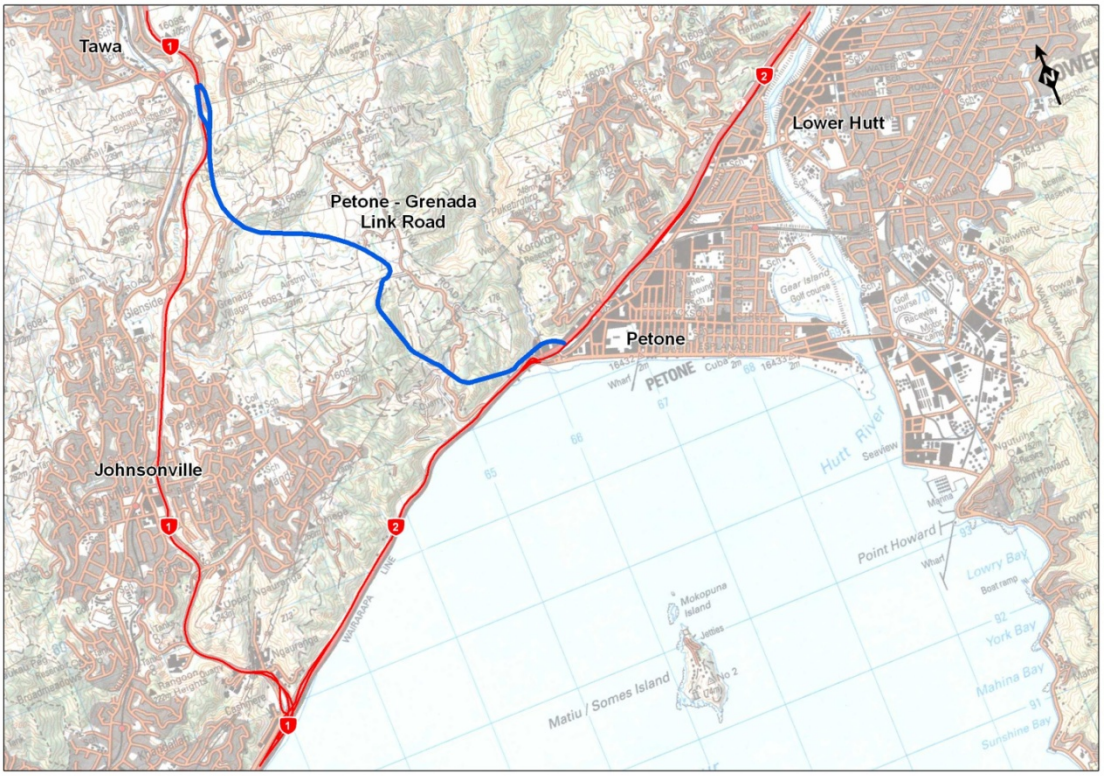
Ramp signalling involves the installation of traffic signals on the on-ramp that intermittently allows two vehicles per green phase to enter the mainline traffic stream. The frequency of the green phase is set to a level that provides optimal traffic conditions on the mainline flow.

Ramp signalling at Petone is expected to cost $850,000 and has a BCR of 1.7. Ramp signalling at Ngauranga has an expected cost of $700,000 and has an indicative BCR of 2.1. These projects lock in the benefits of the proposed Petone-Grenada Link Road and the Cross Valley Link by encouraging greater use of these roads rather than their alternatives. This is an application of travel demand management designed to sustain the benefits of these new roads. Further, these measures smooth the mainline traffic flow on SH2 at the respective peak times by managing the traffic stream entering the highway and therefore improve their efficiency.

SH1 to SH2 Link

Petone-Grenada Link

This is proposed to be a four-lane divided road with adequate shoulder width to allow for cyclist use, linking SH1 near Tawa to SH2 using a new Petone Interchange. It is designed to have a nominal operating speed of 70 km/h. The Petone-Grenada Road Link is expected to cost $250 million and has an indicative BCR of 1.3. This is a promising BCR for a project of this size. This project is integrally related to the development of Lincolnshire Farm.



The cost of the new Petone Interchange is included in the cost of this option. The reconstruction of this interchange is an essential part of linking the Petone-Grenada Link Road into SH2 and the Hutt City local road network. The aging structures that form the current interchange will require replacement within 20 years and this replacement will allow the alignment of SH2, which is currently substandard and the location of historic crash problems, to be improved to 100 km/h standards. The accommodation of the Petone-Grenada Link Road will allow the interchange to be relocated further north which will release a large parcel of land for potential community or economic development. It is expected that the Petone Interchange will be an elevated two lane roundabout similar to the roundabout at the new Dowse Interchange.

The Petone-Grenada Link Road is proposed because it addresses:

- Growing congestion (forecast to be at a severe level by 2016) on SH1 north of Ngauranga Interchange which is a RoNS
- Growing congestion (forecast to be at a severe level by 2016) on SH2 between Petone and Ngauranga and in particular at Petone and Ngauranga on-ramps
- Poor east-west connectivity between the SH1 and SH2 corridors (both by road and public transport) and road safety issues at Horokiwi.

The project supports development at:

- Lincolnshire Farm
- Johnsonville Town Centre
- Petone
- Ongoing development of the Seaview-Gracefield industrial area – which is recognised as the region's primary industrial hub and a regionally significant activity centre.

The project is particularly important as it serves a key direction of travel for freight that is currently not well provided for. This is travel in the direction of Seaview-Gracefield to northern Wellington and beyond. This project is important in fulfilling the GPS objective of encouraging economic development. The Petone-Grenada Link Road has an end-to-end journey distance of approximately 6 km compared to an equivalent journey using SH1 and SH2 of approximately 12.5 km representing a travel time saving of 8 minutes in peak periods and 3 minutes outside of peak periods.

The Petone-Grenada Link provides a new and direct connection between the region's primary industrial hub and the southern North Island via SH1 at Tawa. The link road provides significant relief to the existing State Highways, being SH1 and SH2. As SH1 is classified as a RoNS in the GPS, this is a key improvement especially as given the significant geographical constraints through the Johnsonville Bypass section of SH1. The construction of the Petone-Grenada Link is seen as a key way of reducing congestion on SH1 between Johnsonville and the Ngauranga merge and SH2. In the forecast year of 2016, traffic volumes on SH1 at Johnsonville are expected to reduce by 12,000 vpd and on SH2 south of the Petone ramps, by 12,000 vpd if the link road is built. The Petone-Grenada Link Road is expected to carry approximately 25,000 vpd.

The Petone-Grenada Link Road also provides some relief to SH58. In the forecast year of 2016, the traffic volumes on SH58 reduce by around 3,000 vpd with the link road in place to 12,000 vpd. Conversely, with Transmission Gully in place in 2016, traffic increases on SH58 by 2,000 vpd. The overall combined effect of the link road and Transmission Gully in 2016 is therefore roughly neutral, and with the overall volume of traffic at 15,000 vpd, this traffic volume is at a similar level to current traffic flows along SH58 and therefore no capacity upgrades to the road will be required. Further, when developed, the NZTA SH58 Strategic Study will address any safety issues identified on this route.

The Petone-Grenada Link Road will serve key regional freight movements particularly well and encourage economic development. This is because it offers direct benefits for freight travelling between the SH1 corridor and the SH2 corridor, providing travel time and travel distance savings. Approximately 2,500 heavy vpd are expected to use this route. The 9% grade on parts of the link would require additional testing, possibly using a micro-simulation modelling tool to establish any potential impact of slower moving HCVs. In addition, the Petone-Grenada Link Road reduces journey times on both the SH1 and SH2 corridors because of the relief it provides to those routes. By comparison, SH58 does not serve large numbers of freight vehicles because of a smaller demand and difficult alignment. Heavy vehicle usage of SH58 is approximately 500 vpd.

The construction of the Petone-Grenada Link Road is of primary importance for the greater Wellington region as it directly serves a large volume of heavy vehicles and provides relief to SH1 (a RoNS), and SH2. The removal

of east-west trips from the SH1-SH2 corridor frees up capacity on these links to be used by traffic travelling to and from Wellington City.

Presently, connections between the Ngauranga-Tawa and Ngauranga-Dowse corridor are provided by an interchange at Ngauranga and a signal controlled intersection at SH58. The construction of the Petone-Grenada Link Road increases the connectivity between the SH1 and SH2 corridors. Traffic modelling indicates that in 2016 traffic flows between these corridors will increase from 42,000 vpd to 51,000 vpd if the Petone-Grenada Link Road is built. This represents an increase of more than 20 % in traffic travelling between these corridors which will result in a significant increase in economic activity and social interaction between these corridors. This result indicates the important contribution that the Petone-Grenada Link Road potentially could make to economic development in the greater Wellington region.

The Petone-Grenada Link Road could also provide a safer and more convenient connection to Horokiwi Road. This would align with NZTA's consideration of closing the Horokiwi-SH2 intersection or reducing it to a 'left in-left out' junction, which would have safety benefits.

Another key contribution that the Petone-Grenada Link Road will make is that it provides an alternative route in the event of an incident on either SH1 or SH2. Currently, an incident that closes or severely restricts either SH1 or SH2 in the study area has a major impact on traffic movements on the network. A Petone-Grenada Link Road would significantly improve east-west strategic transport network resilience.

In the longer term, a possible link from Johnsonville north in the vicinity of Westchester Drive to the Petone-Grenada Link Road should be allowed for. Such a link is not yet justified by demand but would make the improved connectivity offered by the Petone-Grenada Link Road available to a larger catchment. Traffic modelling for the year 2016 indicates that the Johnsonville link would attract 10 % of the daily Petone-Grenada Link Road traffic but by 2026 this percentage would increase to near 15 %. In view of this it is recommended that the route designation for the road is pursued through the planning process.

The Petone-Grenada Link Road provides relief to both SH1 and SH2. Measures that lock in these benefits are important otherwise this relief will be eroded by persons switching from other forms of transport to use motor vehicles or eroded by ongoing traffic growth. Measures that discourage change in travel mode are the completion of the pedestrian and cycleway on SH2 and increased passenger rail frequency on both corridors (as addressed in the Regional Rail Plan). Ramp signalling of the Ngauranga on-ramp will also encourage greater use of the Petone-Grenada Link Road.

Bus Services on the Petone-Grenada Link Road

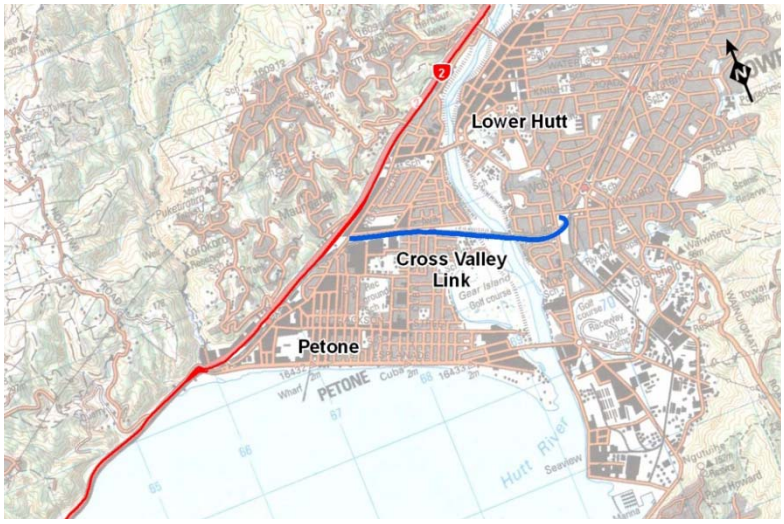
Bus services can be provided using Petone-Grenada Link Road. This will contribute to improving the public transport connectivity between the SH1 and SH2 corridors and assist sustaining the benefits of the Petone-Grenada Link Road. The bus services support:

- Improved east-west connectivity between SH1 and SH2; and
- The Lincolnshire Farm development.

Forecasts for 2016 indicate that over 1,500 persons per day might be expected to use buses between the catchments at either end of the Petone-Grenada Link Road. These estimates make no allowance for bus trips that might be generated in the Lincolnshire Farm development or might be generated in Horokiwi, which would be expected to further increase bus patronage. New bus services need to 'grow' their patronage. They are developed over time and should be integrated into the environment they serve. In this respect, trial services may need to start at a modest level and may even use mini buses until patronage levels build up in response to the service.

SH2 to Seaview-Gracefield

Cross Valley Link



This is a two-lane divided road with provision for cyclists that connects Seaview-Gracefield to SH2 at the new Dowse Interchange on SH2. The new Dowse Interchange has sufficient capacity to receive the traffic generated by the Cross Valley Link.

The Cross Valley Link follows Wakefield Street and then runs just west of the Hutt River adjacent to the Wairarapa Line to Randwick Road. The proposed road has a nominal operating speed of 70 km/h. The cost of this road is estimated at $76 million and has an indicative BCR of 0.5.

The Cross Valley Link is proposed because it addresses:

- Growing congestion on The Esplanade leading to increased delay and travel time variability
- Poor connectivity between the Seaview-Gracefield industrial area and SH2
- Enables improved amenity in Petone and the foreshore by reducing daily traffic volumes and community severance
- The additional traffic on The Esplanade delivered by the Petone-Grenada Link.

The Cross Valley Link supports:

- Petone Foreshore development
- Seaview-Gracefield industrial and logistics hub
- HCC Petone Vision document
- Connectivity to Wainuiomata.

The Cross Valley Link is forecast to attract 21,000 vpd in 2016. This will lead to a reduction in traffic on The Esplanade of approximately 10,000 vpd. This reduction in traffic will lead to a significant reduction in severance on The Esplanade and contribute to an improvement in amenity for this environment.

The volume of traffic attracted to the Cross Valley Link indicates that there will be substantial benefits to other parts of the Hutt City road network, in addition to The Esplanade, (such as the operation of Hutt Road), by constructing the Cross Valley Link. In effect, the Cross Valley Link provides significant east-west permeability for traffic and contributes to a more effective use of the new Dowse Interchange.

Currently the Cross Valley Link project has a BCR of 0.5. Only the direct transportation related benefits of the project have been taken into account at present. Further work is being undertaken by HCC to quantify the amenity and economic regeneration benefits that will accrue to the Petone foreshore and the Seaview-Gracefield area by building the Cross Valley Link and to recognise the economic disbenefits to Seaview-Gracefield of worsening congestion on The Esplanade if the Cross Valley Link is not built. A preliminary consideration of what might happen to land values in the foreshore area alone, suggests that such additional economic benefits would be considerable. In addition, the improvement of amenity in the area would be a large intangible benefit.

The Petone foreshore area could experience considerable benefits in the form of improved amenity if the Cross Valley Link was built. These benefits could be supported by appropriate traffic calming in the area, ramp signalling of Petone on-ramp on SH2 in the am peak and measures such as restrictions for heavy vehicles to access The Esplanade. This environment could facilitate enhanced community activity, in addition to economic activity. Such an environment could be designed to be attractive for walking, cycling and bus travel on The Esplanade as well as significantly increasing pedestrian permeability, opening up the foreshore to more recreational use. In addition, the “Beach to Bush” project and the SH2 pedestrian/cycleway completion would further enhance these activities.

As identified in the WRS, the Seaview-Gracefield area is the region’s primary industrial area. However, growing congestion on The Esplanade provides poor connectivity to SH2, those areas served by SH1 and the lower North Island. This poor connectivity adds to the cost of business undertaken in Seaview-Gracefield. An efficient Cross Valley Link would link this area of primary importance to the strategic transport network and allow these business activities to be more effective. This improved connectivity would not only assist the production and transportation of goods but would link employment to a greater labour pool. The building of the Cross Valley Link in conjunction with the Petone-Grenada Link Road would significantly improve Seaview-Gracefield’s connectivity to those areas served by SH1 such as northern Wellington, Tawa, Porirua and the lower North Island.

The Cross Valley Link would enable the populations of the Eastern Bays and Wainuiomata to be better integrated into the greater Wellington region. It would provide an efficient connection to SH2 and again, with the construction of the Petone-Grenada Link Road, would facilitate travel to those areas served by SH1 and further north.

Many of the benefits of the Cross Valley Link can be achieved by upgrading The Esplanade but the costs of this upgrade, to maintain and improve the level of service required for access to the region’s industrial hub at Seaview-Gracefield, are as expensive, if not more expensive, than building the Cross Valley Link. An estimate

of the cost of building a road on The Esplanade that would provide an equivalent level of service is $90 million with an indicative BCR of 0.5. The main elements including in this $90 million cost estimate include:

- Property costs - $10 million
- Design & construction supervision fees - $10 million
- Construction costs - $70 million (includes a new bridge at $7 million).

This would mean that to maintain reasonable access to the region's primary industrial hub, upgrading The Esplanade is unlikely to provide any savings in cost and the economic regeneration benefits for Petone and the foreshore would be forfeited as well as improved amenity. In the longer term, issues such as climate change and sea level rise would suggest that a Cross Valley Link would provide better security of access to the Seaview-Gracefield area than The Esplanade.

Small scale improvements maintaining the 50km/hr design speeds to the Esplanade but providing alldition traffic lanes were considered. However, these improvements provided little benefit in terms of reducing delays along the Esplanade.

The Petone-Grenada Link Road deposits additional traffic onto The Esplanade because of increased economic interaction and connectivity between the Hutt Valley and Wellington's northern suburbs. The traffic modelling indicates that although this leads to deterioration in the performance of The Esplanade, if the Cross Valley Link is not built, it is still more efficient and provides better overall access for travellers, particularly to Seaview-Gracefield, than not building the Petone-Grenada Link at all. This is demonstrated by an extra 3,000 vpd expected to use The Esplanade in 2016 when the Petone-Grenada Link Road is built. The modelling work undertaken to assess this impact shows that the increase in daily traffic will not significantly worsen current levels of congestion and delay.

Further, in the greater Wellington region recent travel time surveys undertaken by NZTA indicate that travel times and speeds are stabilising which leaves a response such as a lengthening peak period as the likely mechanism for absorbing increased traffic growth. This is likely to be also true for The Esplanade.

The proposed Cross Valley Link will lead to more traffic using Randwick Road. Forecasts for this road for 2016 are currently for traffic volumes of 21,000 vpd, including 4,000 vpd. In 2016 with the Cross Valley Link in place total daily flows increase to 23,000 vpd which includes 5,000 heavy vpd. This increase in traffic volumes will need to be managed to limit any adverse effect on the local community.

The construction of the Cross Valley Link will also impact on properties in Wakefield Street, and adjacent to the railway line on the eastern side of the river. Some property purchase may be necessary depending on the final alignment chosen, and detailed design. A new bridge over the Hutt River will also be necessary which will require cooperation with GWRC and ONTRACK with respect to flood protection and rail matters.

The Strategy Components

The elements discussed above are designed to operate as a complementary, but independent, suite of projects with a total cost of $360 million. The proposed strategy contains two large structural elements in the Petone-

Grenada and Cross Valley Link Roads and a series of smaller proposals. The effectiveness of these two link roads is interrelated but they are not absolutely dependent on each other. That is, the improved accessibility and network benefits are greatest with both roads in place but the Petone-Grenada Link Road on its own still brings overall net benefits to the network and to the Seaview-Gracefield area. The Petone-Grenada Link Road improves the connectivity of urban areas supported by SH1 to those supported by SH2. The Cross Valley Link extends that connectivity to the Seaview-Gracefield, Wainuiomata and Eastern Bays areas. The Petone-Grenada Link Road brings relief to both SH1 (an identified RoNS), and SH2. The Cross Valley Link does not provide relief to these strategic State Highways.

A number of the smaller projects, which are included in the preferred strategy, such as completion of the SH2 pedestrian and cycleway provide benefits to forms of travel other than the private car and freight movements. These measures also assist in locking in the benefits of the larger projects as does the ramp signalling proposals and increasing the passenger rail frequency on both the NIMT and Wairarapa Rail Lines (as addressed in the Regional Rail Plan).

A key outcome of this strategy will be the support of economic development in the region. This is an important outcome sought by both the WRS and the GPS. The strategy components will do this by providing relief to SH1 and SH2. Further, the strategy components will improve the connectivity of key areas of economic activity such as Seaview-Gracefield to the wider region and the lower North Island. This will increase this area's catchment of business, reduce the cost of business in the area and better connect the area to a wider labour pool.

The strategy has identified measures that actively integrate into key development areas. These areas include Lincolnshire Farm, Johnsonville Town Centre, Churton Park, Petone, Petone Foreshore, and Seaview-Gracefield.

The analysis of this strategy has been undertaken using medium growth forecasts. Sensitivity tests have been undertaken which include:

- High growth forecasts
- Transmission Gully is built
- Passenger rail frequency is improved from the current levels (but includes an extension of electrified services to Waikanae) to a 15 minute frequency at peak from Waikanae and Upper Hutt to Wellington.

These sensitivity tests do not change the conclusions of this study nor the make- up of the preferred strategy. The impacts on the BCRs for the key projects are marginal.

The Ngauranga Triangle Strategic Study area has evolved over decades where populations and economic activities have had relatively convenient north-south travel along the Ngauranga to Tawa and Ngauranga to Dowse corridors. In the lower Hutt Valley, over the same period of time, relatively good east-west permeability has been provided along The Esplanade with a connection to SH2 at Petone, whereas the connection to SH2 at Dowse has been supported by weak east-west permeability. The strategy will require ongoing consideration of integrating land uses with the transportation network and these projects.

The Petone-Grenada Link road is well supported by the Lincolnshire Farm Structure Plan and is the first step towards integrating the new transport network into the Ngauranga Triangle Strategic Study area. The Cross

Valley Link will fundamentally alter access into and within the Hutt Valley and these needs to be addressed by HCC in formulating their future planning for this area.

For future development of the strategy components, consideration of how the wider urban areas at either end of this Grenada-Gracefield corridor interrelate (in particular how Seaview-Gracefield businesses respond to a significantly improved connectivity to the wider region and the lower North Island), should be given in future studies and structure planning.

10. Study Issues Not Addressed in the Recommended Strategy

It is noted that a number of issues identified for the study have been unable to be addressed in the study's recommended strategy components. These include:

- Buses getting caught in congestion on both SH1 and SH2
- Inadequate levels of service for pedestrians and cyclists in Ngauranga Gorge on SH1
- Current inadequate Level of Service for passenger rail at peak and non-peak times.

Buses getting caught in congestion on both SH1 and SH2	■ Options were considered for buses on SH1 and SH2 including a separate bus lane facility. Analysis of these options showed that they were relatively expensive and had poor BCRs. In both cases, peak period bus numbers are low and would give the appearance that the lane is not justifiable given the number of passengers forecast (using WTSM) to use the facility. For example, in the case of a southbound bus lane in Ngauranga Gorge, the estimated cost was $34 million and the indicative BCR is 0.05. ■ This was expected given there are only 35 southbound buses in the am two hour peak whereas good practice would normally require at least 60 for a separate bus lane over the two hour peak period. The reallocation of road space to provide a bus lane results in disbenefits as insufficient road capacity exists to prevent unacceptable levels of service for general traffic. Another option was considered to allow heavy vehicles as well as buses into this lane, however this was only marginally better, achieving an indicative BCR of 0.08.
Inadequate levels of service for pedestrians and cyclists in Ngauranga Gorge on SH1	■ The needs of pedestrians and cyclists travelling north of Johnsonville can be addressed through the proposed cycle path on Middleton Road. However, the options for improvements in Ngauranga Gorge are few. There is an existing footpath but this is often narrow and substandard and only localised improvements could be contemplated.
Current inadequate level of service for passenger rail at peak and non-peak times	■ The issue regarding current inadequate level of service for passenger rail at peak and non-peak times is addressed outside of this study in the current regional rail upgrade programme and the Regional Rail Plan.

11. Implementation Plan

The proposed strategy contains a combination of large projects such as the Petone-Grenada Link Road and the Cross Valley Link, and smaller projects such as the completion of the SH2 pedestrian/cycleway and the Middleton Road cycleway. Large projects invariably have lengthy planning timeframes and require considerably more detailed work to be implemented.

Implementation of the proposed strategy components could proceed according to the following indicative programme:

Short Term (the next ten years)	■ NZTA to undertake full investigation, reporting, design, consent and construction of the SH2 pedestrian/cycleway completion ■ WCC to undertake full investigation, reporting, design, consent and construct a new Middleton Road cycle facility ■ WCC/NZTA/HCC to undertake full investigation and reporting, design and gain consents for the Petone-Grenada Link Road including the Tawa and Petone Interchanges ■ NZTA to investigate further traffic management projects (including possible ITS Expansion and SH2 Ngauranga on-ramp signalling) ■ HCC to undertake additional economic regeneration benefit analysis of the Cross Valley Link and supporting policy/planning frameworks ■ WCC/NZTA to further investigate Helston Ramps including further detailed traffic modelling and determination of the regeneration benefits that might accrue to Johnsonville Road ■ WCC/NZTA to commence construction of the Petone-Grenada Link Road and associated Tawa and Petone Interchanges ■ NZTA to commence construction of further traffic management projects such as ITS expansion and Petone on-ramp signalling NZTA to complete the Petone – Grenada Link Road and Petone Interchange, including the “Beach to Bush” connection ■ HCC to undertake full investigation and reporting, design and gain consents for the Cross Valley Link.
Long Term (beyond ten years)	■ HCC to construct the Cross Valley Link[7] ■ WCC/NZTA to evaluate the Johnsonville link to the Petone-Grenada Link Road ■ WCC to undertake refinement, consents, design and construct the Johnsonville link to the Petone-Grenada Link Road.

[7] If the additional work that HCC is undertaking further justifies this link road then consideration of bringing the Cross Valley Link forward should be given.

12. Next Steps

This report is a step in a larger regional strategic transport planning process. The findings of this report and the proposals it makes will be the subject of further stakeholder discussions and Council and NZTA Board consideration. At the conclusion of these tasks the study will be finalised and put forward as a significant technical input to the GWRC led Hutt Corridor Plan review where full public consultation and hearings will take place.