Cross Valley Link

Evidence Base

Prepared for

New Zealand Transport Agency Waka Kotahi (NZTA)

Prepared by

Tonkin & Taylor Ltd

Beca Ltd

Commute Transportation Consultants Ltd

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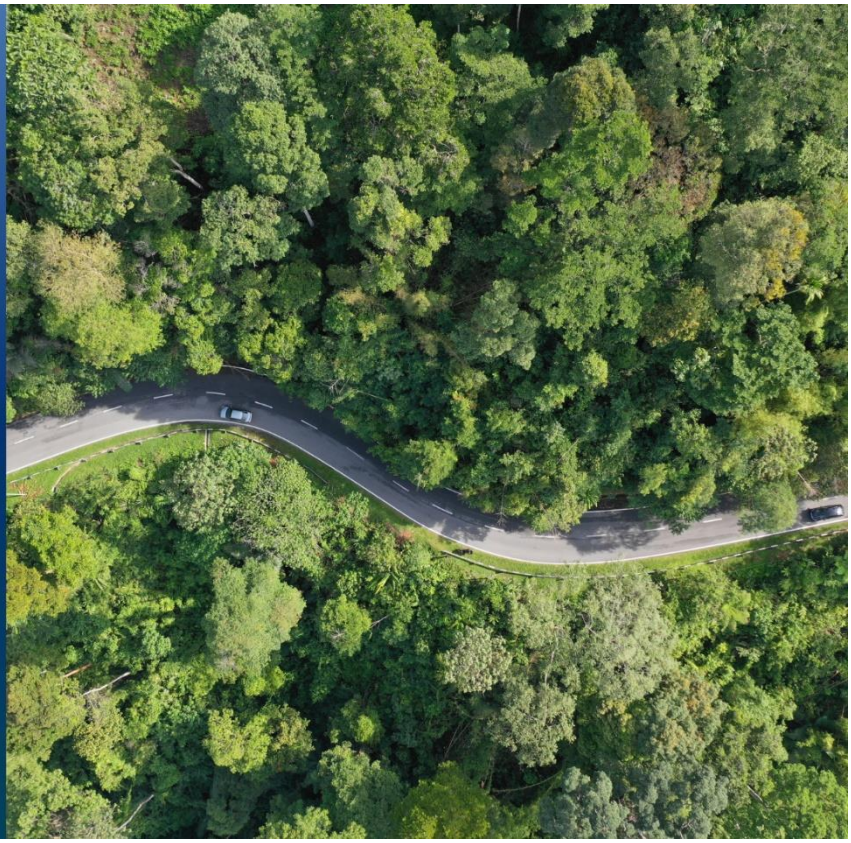

DOCUMENT CONTROL

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Revision Details

Provide a brief statement on what the updates are for each revision.

Revision	Details
0.1	Draft for internal review
0.2	Draft for IQA review

Contents

1 Executive Summary

The Petone to Grenada Link Road (P2G) is a proposed new highway that will connect the economic centres of North Wellington/Porirua and Lower Hutt. It will result in significantly reduced journey times between these cities, facilitating greater movement and increased economic activity, and will help reduce congestion on SH1 and SH2.

The Government Policy Statement on Land Transport (GPS) 2024-34 has identified the Petone to Grenada Link Road and the Cross Valley Link (CVL) as a Road of National Significance (RoNS). They are identified jointly as a RoNS to "unlock housing growth" and will contribute to the primary strategic priority of the GPS, which is to support economic growth and productivity. The National Land Transport Programme 2024-27 (NLTP) includes the P2G and CVL RoNS as a project that will unlock land for housing, improve resilience, and support economic growth.

This appendix provides the foundational evidence base for CVL, outlining the critical transport challenges in the corridor and demonstrating the need for investment. It supports the development of a robust case for change by assessing the key drivers of investment need and validating them against empirical data and strategic priorities.

This document:

- Establishes a clear understanding of the problems and their underlying causes and provides a robust evidence base to validate the need for investment; and
- Informs future option development and assessment by helping identify and evaluate solutions based on evidence.

The projects sit under a single overarching investment objective, with problem themes that are refined to understand the nuance and specific issues that each element is seeking to address.

The overarching investment objective is:

To create an efficient transport connection between southern Lower Hutt and North Wellington/Porirua to support economic growth and productivity, and housing development.

CVL Key Problem Statements

- Lack of Connectivity – There is currently poor east-west connectivity for all transport modes within the southern Lower Hutt area which limits economic development.
- Congestion – Historic land use patterns and the location and capacity of key transport corridors, combined with growth, is resulting in increasing levels of congestion in Lower Hutt
- Resilience Challenges – Southern Lower Hutt's transport network lacks resilience to major natural events, future sea level rise, and regular network disruptions, leading to economic and social consequences for Lower Hutt and the wider Wellington region.

This Evidence Base validates the need for investment, providing evidence to support further investigation and option development to determine the most effective transport solution for the corridor.

2 Introduction

2.1 Purpose and Scope

The Petone to Grenada Link Road (P2G) is a proposed new highway that will connect the economic centres of North Wellington/Porirua and Lower Hutt. It will result in significantly reduced journey times between these cities, facilitating greater movement and increased economic activity, and will help reduce congestion on SH1 and SH2.

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P2G and CVL are adjacent initiatives. P2G is proposed to provide an east-west corridor between the key urban areas of Lower Hutt (SH2) and North Wellington/Porirua (SH1). CVL is proposed to connect SH2 (and a future P2G corridor) with the Seaview/ Wainuiomata areas via a new/ upgraded corridor. Both projects have been investigated previously, P2G has been examined by NZTA and recent investigations into CVL have been progressed by Hutt City Council.

An Investment Case has been progressed for P2G which includes a Feasibility Study for CVL. The focus of the Feasibility Study has been to identify the alignment, form, and function that CVL needs to be to deliver on the project objective.

On completion of the Investment Case, a decision will be made whether to fund P2G, and hence progress to further design, route protection, and consenting.

This appendix provides the foundational evidence base for CVL, outlining the critical transport challenges in the corridor and demonstrating the need for investment. It supports the development of a robust case for change by assessing the key drivers of investment need and validating them against empirical data and strategic priorities.

This document:

- Establishes a clear understanding of the problems and their underlying causes and provides a robust evidence base to validate the need for investment; and
- Informs future option development and assessment by helping identify and evaluate solutions based on evidence.

2.2 Background to Cross Valley Link

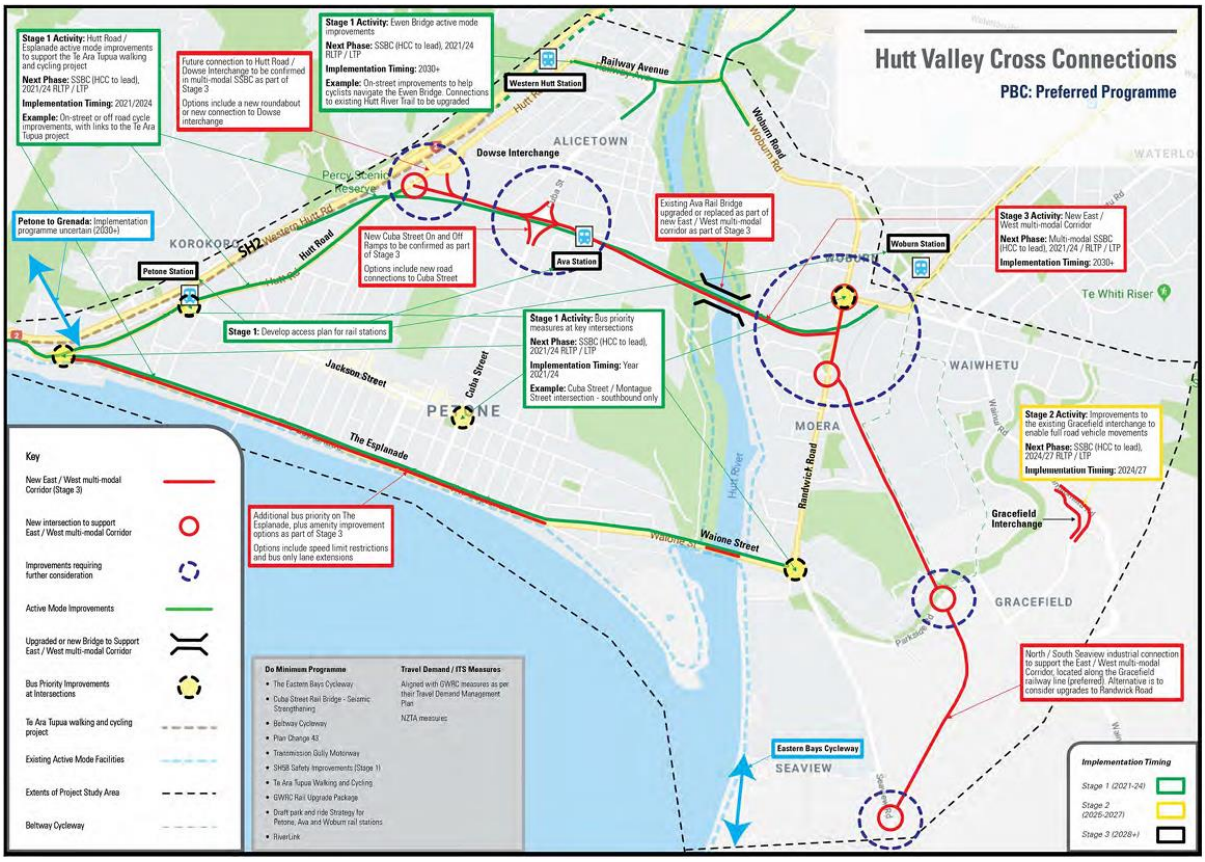
In 2020 Hutt City Council (HCC) published the Cross Valley Transport Connections Programme Business Case (PBC). The PBC aimed to address current transport challenges including congestion, resilience, and accessibility issues, by enhancing transport links between Seaview / Gracefield / Wainuiomata / Eastbourne areas to the east of Petone with State Highway 2 (SH2) to the west.

The PBC sought to support economic growth by improving freight efficiency, enabling better access to employment hubs, and promoting sustainable transport options.

This programme was driven by the need to support the long-term development of Lower Hutt's transport network while accommodating future growth. By addressing existing transport inefficiencies and planning for future demand, the PBC aimed to create a more resilient and connected urban transport system.

The CVC PBC recommended a suite of measures, including an east west link named the Cross Valley Link, that will facilitate access from the Seaview/Gracefield area through to SH2. The connection has also identified as supporting connection form Wainuiomata through to the SH2. The full programme of measures is shown below in Figure 2-1.

Figure 2-1: Cross Valley Connections PBC (2020)



3 Defining Objectives, Problems and Benefits

In 2025, as part of the initiation phase of the P2G Investment Case and the CVL feasibility study, NZTA reviewed the investment objectives, problems and benefits for P2G. This Strategic Review considered the work completed previously on P2G and any contextual changes to wider influences such as population growth, housing development, and resilience.

3.1 Investment Objective for P2G

The outcome of the Strategic Review was an overarching Investment Objective for P2G and two core problems – Lack of Connectivity and Congestion, with a secondary problem related to Resilience.

The investment objective for P2G was confirmed as:

To create an efficient transport connection between southern Lower Hutt and North Wellington/Porirua to support economic growth and productivity, and housing development.

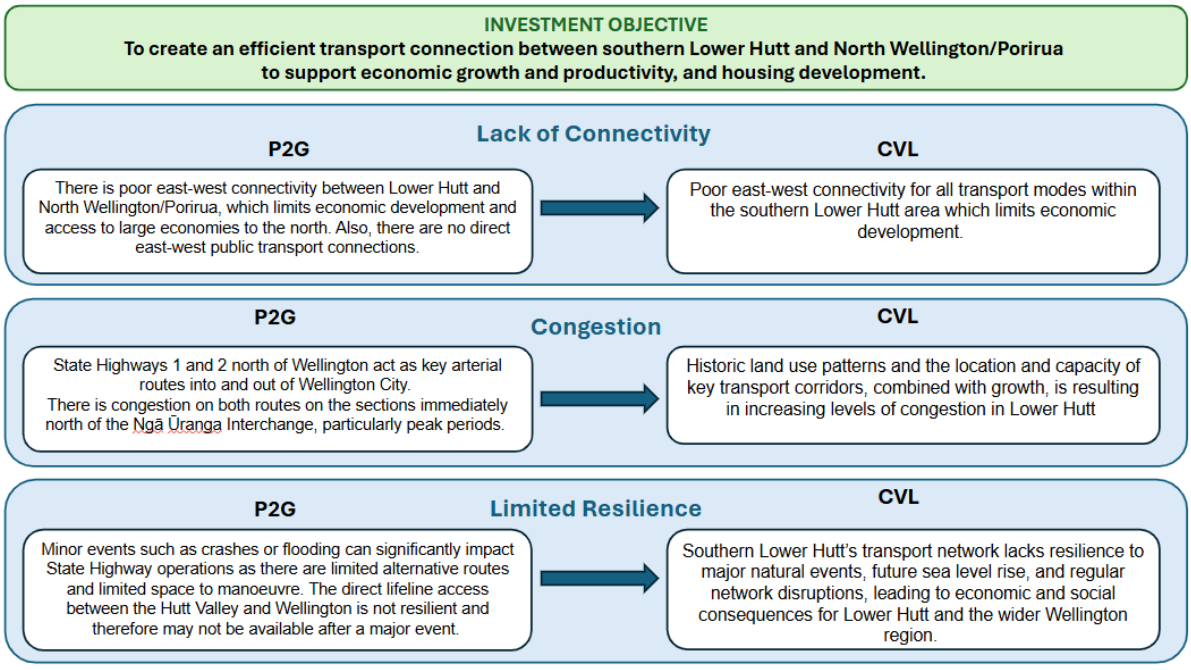
3.2 Interface with CVL

Although the primary focus was on P2G, the objective is well aligned with the broader goals of the Cross Valley Connections PBC—particularly the CVL—whose purpose of enhancing transport links is closely tied to supporting economic growth, productivity, and housing development.

At a thematic level, the problems of Lack of Connectivity, Congestion and Resilience are equally applicable to CVL. The specific nature of the problems for CVL have however been refined in this appendix to focus on evidence linked to CVL.

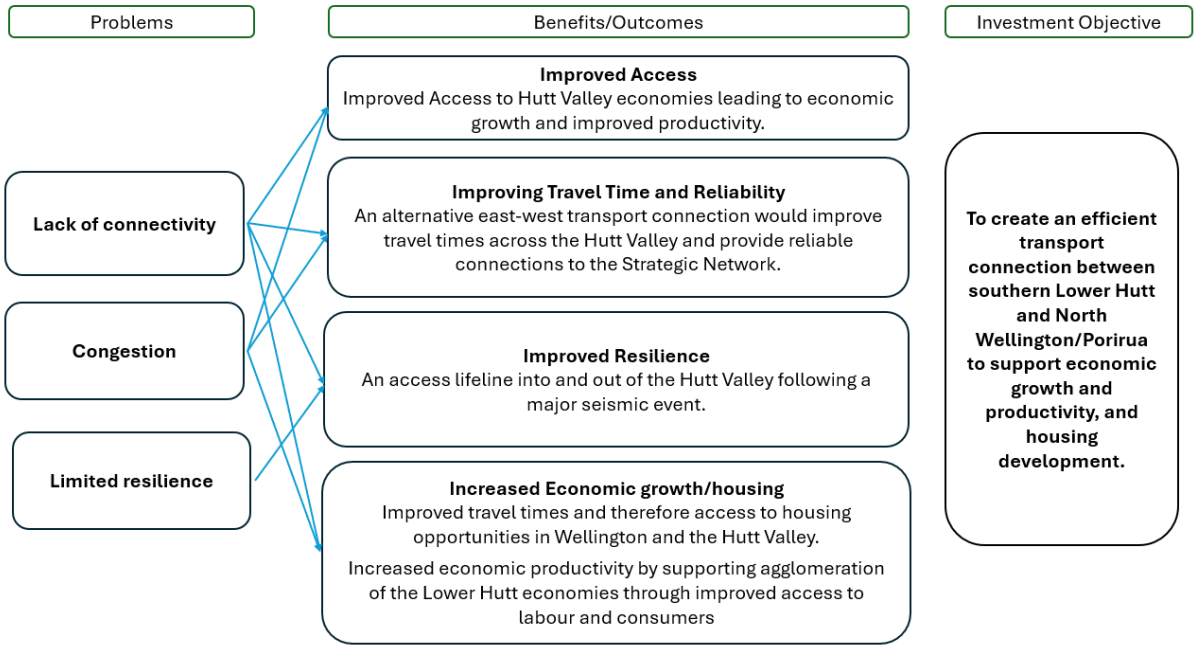
This is summarised in Figure 3-1 below, with this report focused on these problems.

Figure 3-1: Problems for CVL



An Investment Logic Map for the CVL project has been developed and is shown below in Figure 3-2.

Figure 3-2: Linkages between project objectives, problem statements, and benefits



3.3 Problems

3.3.1 Primary

Problem 1: *Lack of Connectivity*: There is currently poor east-west connectivity for all transport modes within the southern Lower Hutt area which limits economic development.

Problem 2: *Congestion*: Historic land use patterns and the location and capacity of key transport corridors, combined with growth, is resulting in increasing levels of congestion in Lower Hutt

3.3.2 Secondary

Problem 3: *Resilience*: Lower Hutt's transport network has limited resilience to major natural events, future sea level rise, and regular network disruptions, leading to economic and social consequences for Lower Hutt and the wider Wellington region.

Evidence to support each problem statement is presented in the following sections, identifying the underlying issues as well as a description of any opportunities identified.

4 Evidence Base for Problem Statements

4.1 Problem Statement 1 – Lack of Connectivity

Lack of connectivity: *There is currently poor east-west connectivity for all transport modes within the southern Lower Hutt area which limits economic development.*

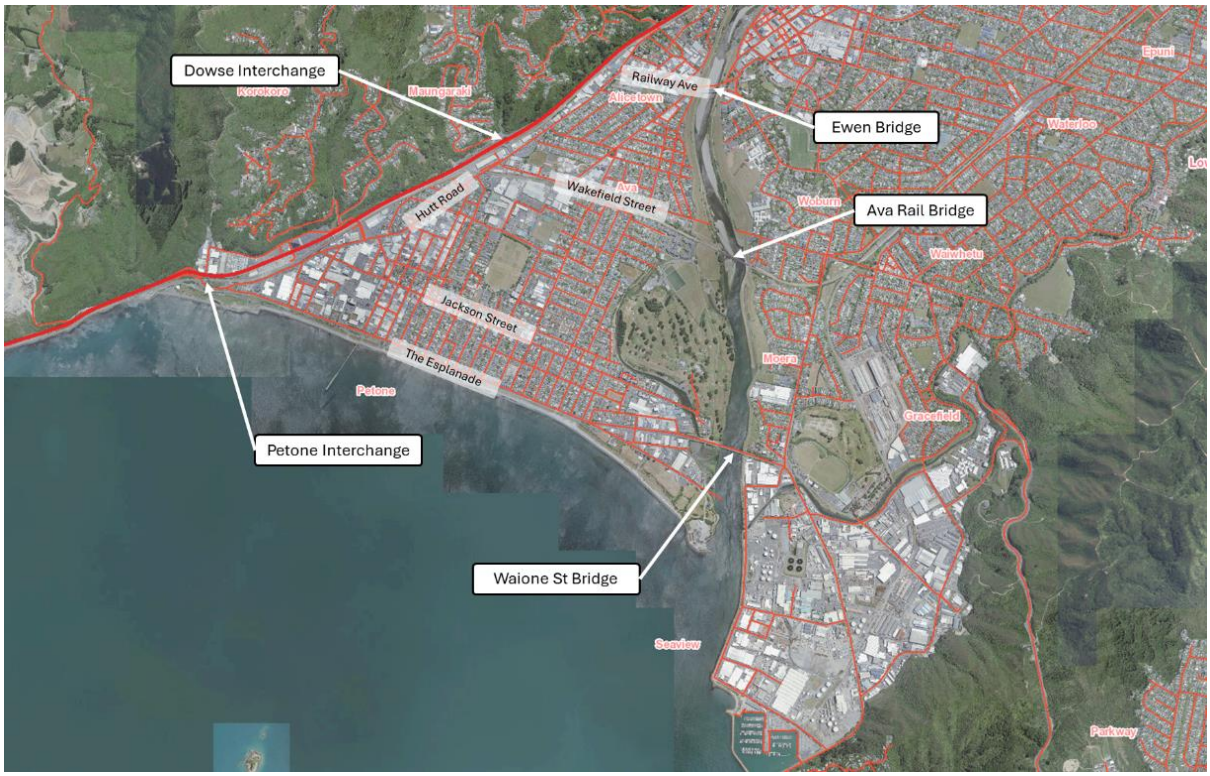
This problem affects general traffic, pedestrians, and cyclists, and will become increasingly critical as regional growth places greater demands on an already limited network. Currently, the lack of efficient, safe, and attractive transport links limits not only immediate mobility but also longer-term economic development, access to amenities, and integration with the broader Wellington transport network.

4.1.1 Existing Transport Connections

The southern Lower Hutt area faces significant infrastructure and design gaps that restrict efficient east-west connectivity. As shown in Figure 4-1 below, only two road links (Waione Street Bridge and Ewen Bridge) and a single rail link connect Petone to Seaview across the Hutt River, while connections to SH2 are limited to just two interchanges. The lack of alternative nearby routes increases reliance on these limited links, which in turn affects network resilience, traffic flow, and freight reliability.

Walking and cycling connections are also limited, with no continuous separated routes across the Hutt River and Hutt Valley Rail Line. Design limitations across these crossings reduce the attractiveness and safety of walking and cycling, increasing the reliance on private vehicles.

Figure 4-1: Existing Hutt Valley Connections



Crossing the Hutt River is a significant constraint, resulting from the geography of Lower Hutt. South of the Hutt CBD, travelling from Seaview, Gracefield or Wainuiomata to the State Highway network, all require crossing the Hutt River. These connections are discussed in the sections following.

Waione Street Bridge

There is frequently significant congestion at peak times along The Esplanade which impacts the operation of the Waione Street Bridge and subsequently increases travel times for general traffic and freight. The Waione Street Bridge is a critical connection but suffers from spatial conflicts due to only two traffic lanes, a narrow footpath and no dedicated cycle lanes. Cyclists must ride with general traffic or use this narrow footpath, presenting safety concerns and deterring active mode use.

Figure 4-2: Waione Street Bridge - looking West

Ava Rail Bridge

The Ava Rail Bridge has a very narrow footpath that generally only allows for one person to pass at a time and is largely unsuitable for cyclists. This rail bridge is planned[1] to be replaced as part of the rail network improvements, with a new pedestrian footbridge being co-funded by the Crown and Hutt City Council.

Ewen Bridge

The Ewen Bridge, located significantly further north (approximately 3km using Randwick Rd and Woburn Rd), provides a critical road connection as it serves a large catchment of Hutt Central and provides an alternative for freight from the Seaview industrial area to the Waione Street bridge. However, given the distance from the Seaview industrial area freight vehicles would need to take longer, less direct routes, adding time and cost to logistics operations.

This bridge is four lanes wide which provides greater vehicle capacity and has wider footpath facilities compared to Waione Bridge. The location of the bridge further north also means that it has a larger catchment – serving the Hutt City CBD in combination with the Melling Link.

[1] https://www.huttcity.govt.nz/people-and-communities/news/2025/government-funding-secured-for-ava-rail-footbridge-replacement

Figure 4-3: Ewen Bridge (Looking East)

4.1.2 Summary

Lower Hutt's limited east-west transport connections undermine strategic outcomes for the region.

Specifically, the location of the urban area adjacent to the Hutt River constrains options to travel across the river. This increases reliance on the existing corridors that cross the river. With limited options, these routes experience congestion in peak periods, and provide limited options for walking and cycling as an alternative transport option.

Further information on the levels of congestion experienced is provided in the following section.

4.2 Problem Statement 2 – Congestion

Congestion: *Historic land use patterns and the location and capacity of key transport corridors, combined with growth, is resulting in increasing levels of congestion in Lower Hutt .*

Unacceptable levels of congestion are emerging across key east-west corridors within the Petone study area due to historic land use patterns and the location of key transport corridors including State Highway connections, and growing travel demand. This is significantly impacting travel time reliability for both general traffic and freight. The compounding nature of these issues, if left unaddressed, will further hinder regional connectivity and economic development.

4.2.1 Land use

Lower Hutt has developed over time around the Hutt River, with residential and urban development occurring on either side of Hutt River. The Lower Hutt central business area is located north of the harbour, and the industrial/commercial areas are concentrated in Seaview/Gracefield. Figure 4-4 below shows the Lower Hutt District Plan zonings.

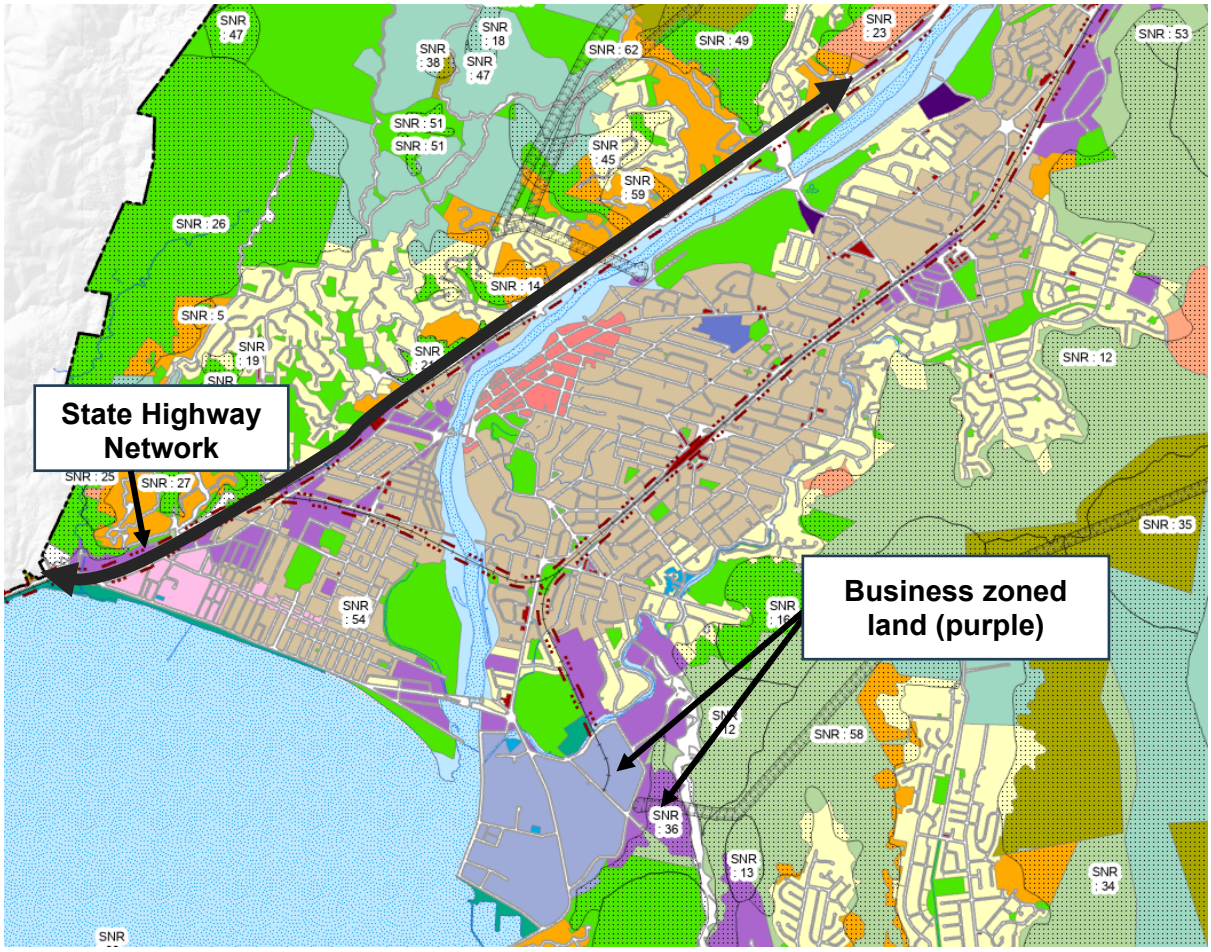


Figure 4-4: Existing Land Use - Lower Hutt District Plan

As can be seen, the location of the business zoned land is some distance from the strategic network – and requires crossing the Hutt River to access SH2 (and SH1). With the constrained options available, this results in congestion in peak periods and in the commuter periods freight is competing for space with the residential demands (shown in brown) – which also require crossing the river to access employment areas outside of Lower Hutt.

4.2.2 Travel Demand and Volumes

Travel time variability, and in particular its impacts on people and freight movement in and through the study area, have been documented in several strategic documents:

- Cross Valley Transport Connections Programme Business Case identified significant travel time variability as a persistent issue for all road users.
- The Hutt Urban Growth Strategy identified that heavy commercial vehicle traffic was creating congestion on The Esplanade, thereby limiting access and constraining industrial development in the Gracefield and Seaview areas.
- The WRTLP's Hutt Corridor Plan identified conflicting demands between freight and commuter, noting that improved east-west connectivity was a priority.
- Petone Esplanade Strategic Case recorded a congestion indicator of 4+ minutes of delay per kilometre – significantly higher than acceptable thresholds for urban travel.
- Lower Hutt Growth Strategy found that key road and rail infrastructure was operating at, or near capacity, particularly during peak travelling hour.

These documents collectively identify The Esplanade / Waione Street route as a consistent congestion hotspot, with poor travel time reliability and worsening performance indicators.

4.2.2.1 Waione Bridge

A key constraint on the network is the Esplanade and Waione Bridge corridor. Surveys[2] conducted in late 2021 identified this area as having the highest traffic volumes in Lower Hutt City, averaging around 33,000 vehicles per day—9.3% of which are heavy vehicles. Peak hour traffic ranges from 2,200 to 2,480 vehicles, contributing to declining travel speeds and reduced levels of service.

According to Austroads[3], typical arterial roads with limited intersections can carry between 1,200 and 1,400 vehicles per hour per lane. While this may apply to the surveyed location (between Waione Bridge and Seaview Roundabout), traffic volumes here still significantly exceeded standard mid-block capacity thresholds.

Data from the Wellington Analytics Unit (Figure 4-5) highlights a marked deterioration in travel times across Waione Bridge, correlating with consistently high traffic volumes throughout the day. This pattern suggests substantial freight and commercial activity, compared with typical commuter routes, where volumes generally decline during off-peak periods.

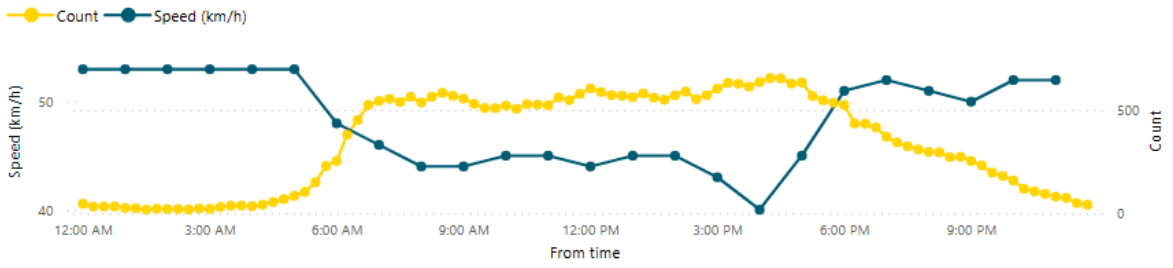


Figure 4-5: Speed and Volume on Waione Street (east of Waione Bridge) Nov 2021

[2] https://wellingtontransportanalytics.co.nz/traffic-count-dashboard - Site 573
[3] Austroads Guide to Traffic Management, Part 3

4.2.2.2 Travel Time Variability Analysis

To analyse travel time variability, average travel speeds at peak travelling times (as an indicator of variability) were analysed using Google Map travel speeds from May 2019. Travel speeds were assessed for typical weekdays at half hour intervals for the key routes within the study area. The travel times for these speeds were then compared against a 50km/h free flow situation.

For The Esplanade / Waione Street route, it was possible to compare the 2016 travel speeds identified in the Petone Esplanade Strategic Case with the travel speeds identified for 2019 and 2025 to assess any travel speed / variability changes that might have occurred in the interim. However, this was not possible for the other routes / roads analysed within the study area, as Google map data was not collected for these routes for development of the Petone Esplanade Strategic Case.

The Esplanade

Figure 4-6 below considers the westbound average travel speeds on The Esplanade / Waione Street route (between the Seaview Road / Parkside Road roundabout to the southern end of the Petone Overbridge on-ramp) for the AM peak periods in 2016, 2019 and 2025. Red indicates a deterioration in travel speed, while green indicates an improvement.

	2016					2019					2025				
Time	Mo	Tu	We	Th	Fr	Mo	Tu	We	Th	Fr	Mo	Tu	We	Th	Fr
5:00	51	44	51	51	51	51	51	51	51	51	45	45	45	45	45
5:30	44	39	44	44	44	51	51	51	44	51	45	45	45	45	45
6:00	35	35	39	39	39	51	44	44	35	44	39	39	39	39	39
6:30	35	30	35	35	35	39	35	35	35	35	34	34	34	34	34
7:00	25	25	25	22	25	18	16	18	16	18	27	23	23	27	30
7:30	22	18	20	18	20	15	13	14	14	15	19	17	15	17	23
8:00	22	18	18	20	20	14	13	14	13	16	17	15	14	15	23
8:30	25	22	20	20	30	15	13	16	14	20	19	15	14	15	27
9:00	30	25	25	30	39	25	20	22	16	25	27	17	19	19	30
9:30	39	35	39	39	44	35	30	35	30	35	30	23	27	27	30
10:00	44	44	44	44	44	39	35	39	35	35	30	30	34	30	30

Figure 4-6: Lowest average speeds (km/h) across The Esplanade over the AM peak (westbound)

Figure 4-6 above presents evidence of a progressive decline in travel speeds during the 2025 AM peak period. Average travel speeds decrease from 45 km/h at 6:00 AM to a minimum of 14 km/h at 8:00 AM, representing a variation of 31 km/h. From a travel time perspective, a 5 km journey along The Esplanade / Waione Street route, which would typically take approximately 6 minutes at a free-flow speed of 50 km/h, extends to approximately 20 minutes at 14 km/h, resulting in a peak-period travel time increase of 14 minutes.

A comparison with historical data highlights the worsening trend in travel speeds. The lowest recorded AM peak travel speeds were 18 km/h in 2016 and 13 km/h in 2019, with 2025 figures remaining similarly low. While the relative consistency between 2019 and 2025 may be influenced by increased remote working following the COVID-19 pandemic, an overall decline in travel speeds between 2016, 2019, and 2025 is evident.

As such, analysis of Google Maps travel speed data confirms a continued deterioration in westbound travel conditions along The Esplanade / Waione Street during the AM peak period, indicating increasing congestion and prolonged delays over time.

Figure 4-7 below considers the eastbound average speeds on The Esplanade / Waione Street route for the PM peak period for 2016, 2019 and 2025.

	2016					2019					2025				
Time	Mo	Tu	We	Th	Fr	Mo	Tu	We	Th	Fr	Mo	Tu	We	Th	Fr
15:00	40	40	36	40	36	30	26	26	26	23	27	23	23	19	17
15:30	40	36	36	36	30	30	26	26	26	20	23	19	23	23	17
16:00	36	30	30	30	30	26	23	23	23	20	19	19	19	19	15
16:30	36	30	26	30	26	23	23	20	23	23	19	19	19	19	17
17:00	36	30	26	30	30	23	20	20	23	23	19	19	19	19	17
17:30	30	30	30	36	30	23	20	23	23	26	19	19	23	23	19
18:00	30	30	36	30	36	30	26	30	30	30	27	23	23	23	23
18:30	36	36	36	36	36	36	30	36	30	36	30	27	30	30	30
19:00	45	40	36	40	45	40	40	40	36	40	34	34	34	34	34
19:30	45	45	40	45	45	45	40	40	40	40	34	34	34	34	34

Figure 4-7: Lowest average speeds (km/h) across The Esplanade in the PM peak (eastbound)

Figure 4-7 above illustrates the high variability in travel speeds during the PM peak period. In 2025, the lowest recorded travel speed was 15 km/h, which is 35 km/h lower than the free-flow speed of 50 km/h. However, it is noted that free-flow speeds are not achieved at any point during the PM peak. This decline in speed results in a travel time variation of approximately 13 minutes between free-flow conditions and the most congested period.

A historical comparison indicates a continued deterioration in travel speeds. In 2016, the lowest recorded speed was 26 km/h – 11 km/h higher than in 2025 – resulting in a travel time of approximately 11 minutes and a peak-period variation of 6 minutes.

Consistent with trends observed in the AM peak, a decline in travel speeds between 2016, 2019, and 2025 is evident during the PM peak. Analysis of travel speed data confirms that congestion along The Esplanade / Waione Street (eastbound) route has intensified over time, leading to increased travel delays.

Other Roads

The key observations from the Google Map travel speed and travel time variability analysis, for the other roads in the study area during 2019 and 2025, are as follows:

- Cuba and Victoria Streets - travel speeds in the southbound direction are generally at 50km/h free flow, with the only noticeable speed reduction being between 8:00am to 8:30am in 2019, but not in 2025. Northbound traffic showed more variation, with speeds reducing below free flow between 15:00pm and 17:00pm.
- Jackson Street - travel speeds were below 50km/h free flow throughout the weekday, with speeds more noticeably slower in the westbound direction (near the Jackson Street / Gear Street intersection) when compared to the eastbound direction
- Randwick Road - travel speeds showed no significant travel speed variability in either direction during the AM and PM peaks

4.2.3 Summary

Increasing traffic volumes and travel time variability on key routes / roads is likely to be impacting on freight and private vehicle movements on the key routes within the study area.

For freight movements, variable travel times, on The Esplanade / Waione Street route is problematic. Hutt City Council has consistently received feedback from heavy commercial vehicle operators advising that travel time variability on The Esplanade / Waione Street route and on Randwick Road was a major risk for their business or was constraining their development opportunities in the Seaview / Gracefield area.

Consultation undertaken to support development of the Seaview Links Project Feasibility Report in 2015 supported this feedback. This report included the following statement:

"Congestion on The Esplanade during both AM and PM peaks is a significant concern for businesses regarding development and investment in the Seaview / Gracefield area;

- *The port aims to have efficient cargo movement therefore congestion influences their business decisions.*
- *Port has a large amount of developable land in Seaview, but its growth will be influenced by congestion."*

Currently there are no economically feasible alternatives to the road network for the transportation of freight to and from the Seaview / Gracefield area. KiwiRail has previously ruled out re-opening the Gracefield Rail Line for moving freight due to[4]:

- The short travelling distance between Seaview / Gracefield and CentrePort, freight companies were unlikely to use the line as it was uneconomic from a commercial freight perspective
- Transporting extra freight on the Hutt Valley Rail Line would conflict with Hutt Valley commuter rail services using the Line, and commuter rail services would receive priority over freight trains, disadvantaging just-in-time deliveries.

The combined evidence suggests that congestion across the Petone study area is continuing to be of concern, with noticeable declines in travel speeds, increased delays, and impacts on both freight and commuter reliability. If these trends continue, there is likely that this congestion could begin to limit regional growth, affect economic productivity, and reduce the overall quality of life for residents and businesses in the area.

[4] Seaview Links Project Feasibility Report, 2015

4.3 Problem Statement 3 – Resilience

Resilience: *Southern Lower Hutt's transport network lacks resilience to major natural events, future sea level rise, and regular network disruptions, leading to economic and social consequences for Lower Hutt and the wider Wellington region.*

This problem statement relates to the resilience of the transport network in the Southern Lower Hutt area. The transport network in the area is vulnerable to natural hazard impacts such as flooding, sea level rise and earthquakes. The impacts of climate change, such as the increasing risk of hazards occurring, further puts the transport network at risk of failures and closures. As a result, resilience is a key challenge for the region as road closures have significant impacts on communities and freight movements to, from and through the area.

4.3.1 Defining Resilience

In 2018 NZTA developed a resilience framework which defines transport resilience as:

The transport system's ability to enable communities to withstand and absorb impacts of unplanned disruptive events, perform effectively during disruptions, and respond and recover functionality quickly. It requires minimising and managing the likelihood and consequences of small-scale and large-scale, frequent, and infrequent, sudden and slow-onset disruptive events, caused by natural or manmade hazards.

The Wellington Regional Land Transport Resilience PBC 2018 (Wellington Transport Resilience PBC) which was endorsed by the NZTA Board in July 2019 defines the resilience of the transport system as follows:

The ability of network infrastructure to deal with a range of significant disruptions and situations, from natural disasters to changing demographics or economic shocks. Resilience is defined, for the purpose of this study, as the combination of the loss of service of the transport system (from normal levels) and the time required for full recovery.

These definitions highlight two key types of resilience issues Low Impact High Probability (LIHP) and High Impact Low Probability (HILP) events. LIHP events relate to minor unplanned events on the road network, such as crashes or disruption caused by minor flooding, while HILP events relate to more catastrophic events such as severe flooding, sea level rise, earthquakes and earthquake associated hazards, such as, liquefaction, ground shaking and tsunamis.

4.3.2 Risk of Earthquake events

The study area lies within an area of the Wellington region that is exposed to a high level of seismicity. As shown in Figure 4-8, the study area is particularly vulnerable to a movement on the Wellington Fault line, which runs north-south along its western boundary. This fault line has a predicted recurrence interval of 1,100 years, and it has been estimated that a 7.5 magnitude earthquake on this fault line could see ground surface displacements of up to 5-metres horizontally and 1-metre vertically.

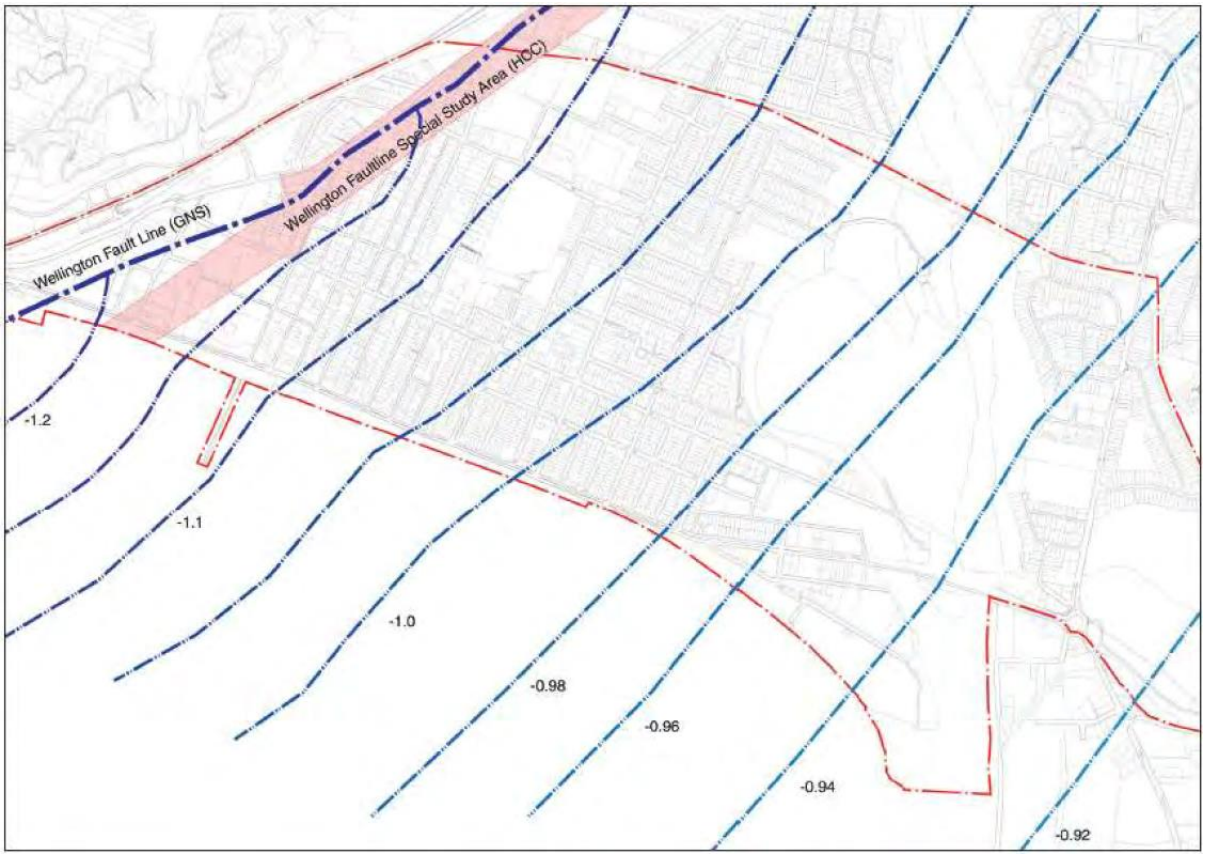


Figure 4-8: Location of the Wellington Fault Line and subduction zones within the study area

If an earthquake occurs within the study area, it could trigger a range of related hazards, as described below.

4.3.2.1 Ground Shaking

Figure 4-9 below sets out the areas within the study area that are likely to be subject to significant ground shaking as part of a HILP event. A significant portion of the study area will be subject to high ground shaking following a large HILP event.

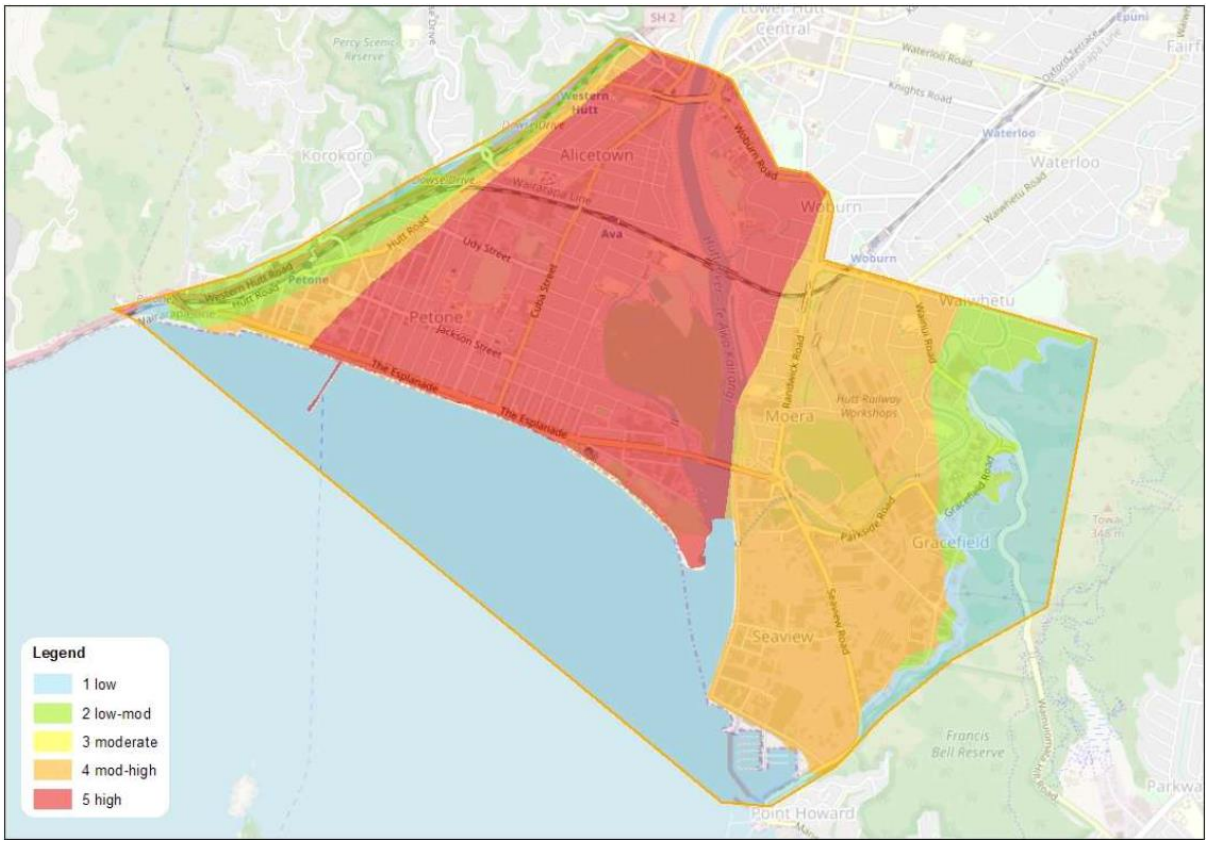


Figure 4-9: Ground shaking risk areas

4.3.2.2 Liquefaction

Figure 4-10 below sets out the areas of the study area that are vulnerable to liquefaction following a HILP event. Petone and Seaview are all located in high risk (red) liquefaction areas.

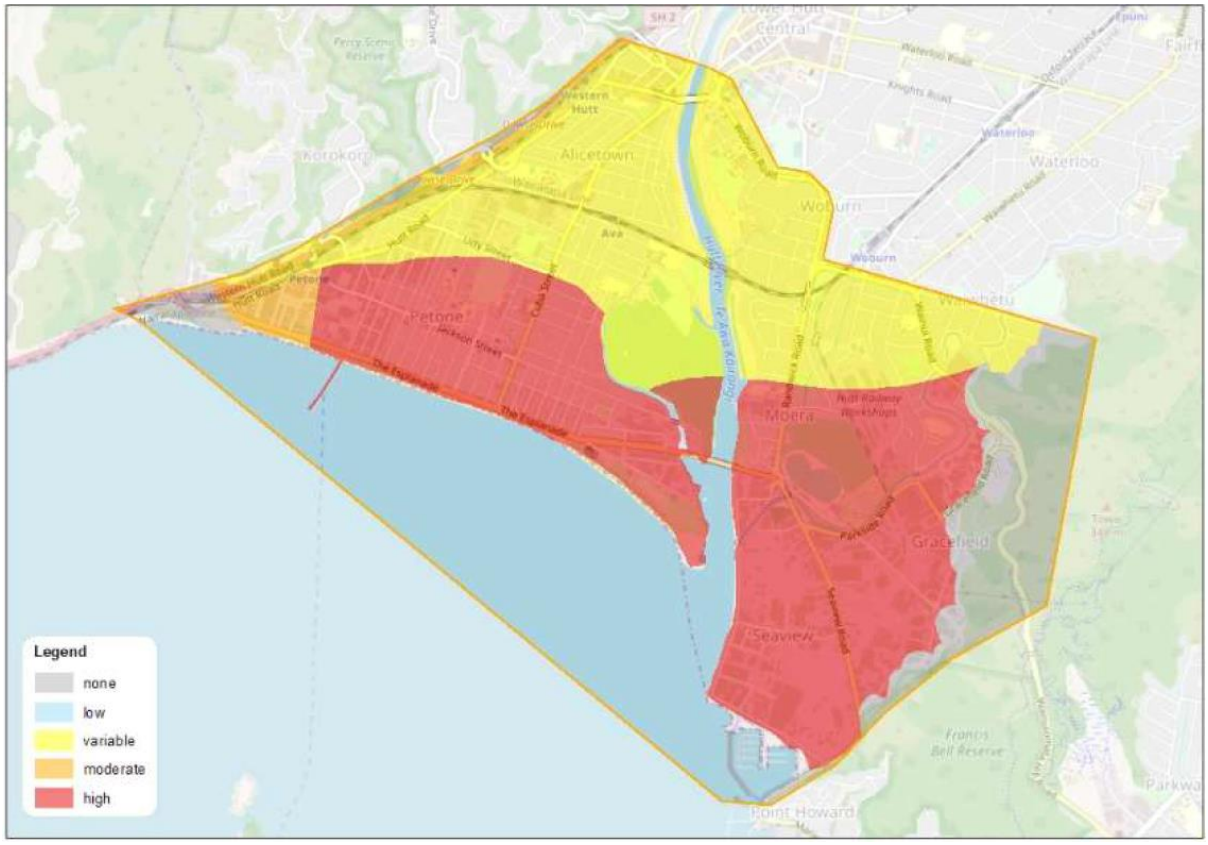


Figure 4-10: Liquefaction Risk Areas

4.3.2.3 Tsunami

The study area is at risk from the following tsunami types:

- Local - from earthquakes or landslides in the Cook Strait and Wellington Harbour
- Regional - generated from events in the Kermadec Trench
- Distant source - generated from events in the Pacific Ocean, particularly those in South America.

The vulnerability of the study area to a tsunami event depends on the source of the tsunami. Figure 4-11 below shows that most of the Project Study Area would be affected by a tsunami.

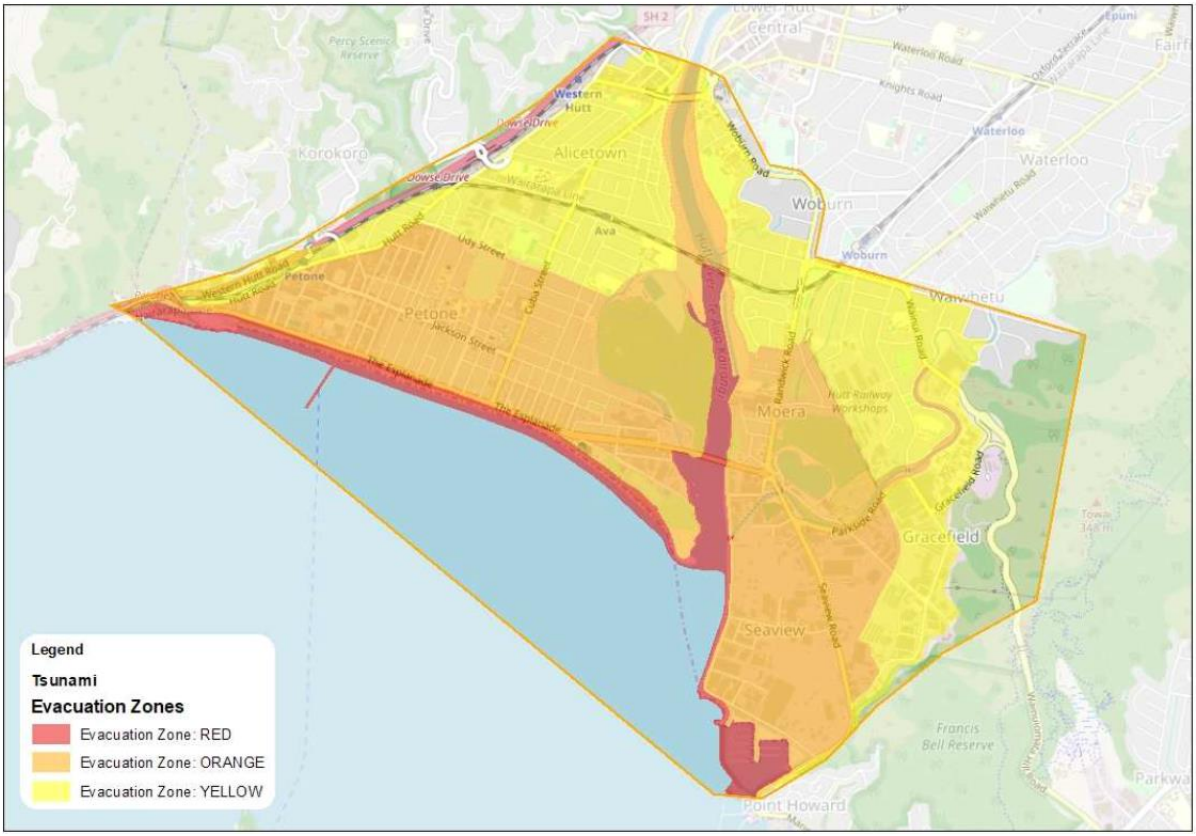


Figure 4-11: Tsunami Risk Areas

4.3.2.4 Criticality ratings following an earthquake HILP event

The Wellington Resilience PBC includes a Regional Resilience Risk Register (Risk Register) that identifies the sections of the Wellington region's transport system that are most at risk from HILP events. The Risk Register was based on an assessment of the importance of the relevant sections of the transport system, and its availability and disruption states. Through establishment of the Risk Register (which is a combination of the importance and disruption state assessments), the Cross Valley Transport Connections PBC was able to identify criticality ratings for the key sections of the Wellington region's transport system. For the study area, the relevant criticality ratings are set out in Figure 4-12 below.

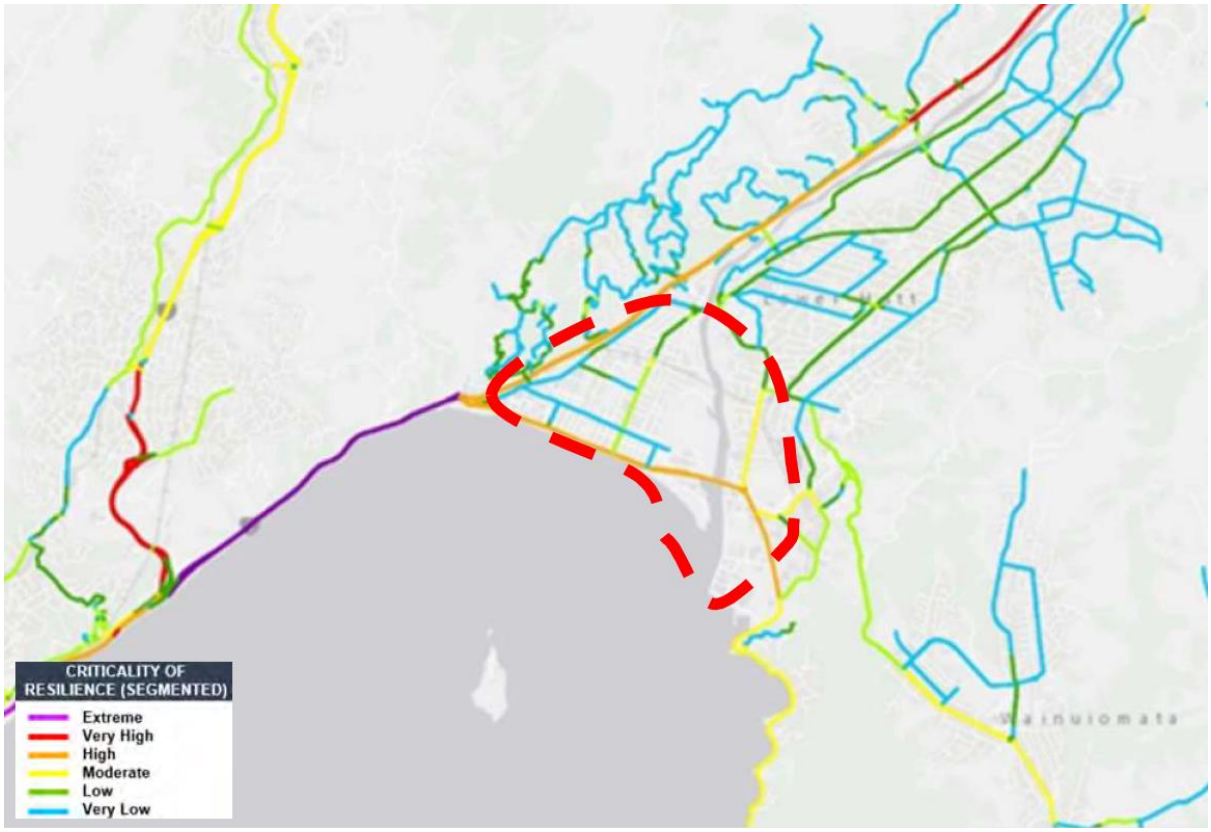


Figure 4-12: Criticality Ratings for the study area

Both The Esplanade / Waione Street route and Seaview Road have been identified as having a high criticality rating. Table 1 below describes the nature of the vulnerabilities of these two routes.

Table 1: Criticality Ratings

Network Segment	Vulnerability			Nature of vulnerability
	EQ	Tsu	Storm	
The Esplanade / Waione Street	Yes	Yes	No	Critical route to provide access to the Seaview fuel supply terminals and industrial area. Also provides access to eastern suburbs of Lower Hutt, Wainuiomata and Eastbourne. This waterfront route is vulnerable to closure in a ~M7.5 earthquake due to liquefaction/lateral spreading, tsunami, and storm surges in a major storm. This will take weeks to recover and possibly many months if the bridge collapses. The Waione Street bridge approaches are prone to collapse from lateral spreading. This corridor also carries the bulk water main into Wellington from the Hutt Valley and Wainuiomata water sources.

Network Segment	Vulnerability			Nature of vulnerability
	EQ	Tsu	Storm	
Seaview Road	Yes	Yes	No	Key route to access fuel supply terminals in Seaview. In a major ~M7.5 earthquake, likely to be affected by liquefaction and lateral spreading towards the Waiwhetū Stream and failure of the Seaview Road bridges. This will take many weeks to months to restore access.

As set out in Table 1 above, the outage times predicted for The Esplanade / Waione Street route and Seaview Road range from weeks to months. It is also noted (from Figure 4-12) that the section of SH2 between Petone to Ngauranga, including the Petone Overbridge, has been identified as having an extreme critical rating with a predicted outage period (for both road and rail) of between 6 and 12 months.

The Wellington Resilience PBC also considered the social consequences of a significant earthquake HILP event. It considered that most of the communities in the Wellington region were at high risk of social isolation following such an event – in particular Eastbourne and Wainuiomata. It is noted that both communities are reliant on the study areas transport system for access to and from Lower Hutt and the wider Wellington region.

4.3.2.5 Economic consequences of a major earthquake

The Wellington Lifelines PBC predicted that it would take decades for the Wellington region to recover to pre-quake levels-of-service following a major movement on the Wellington Fault line. To help put the economic consequences of such an outcome into context, the Wellington Lifelines PBC made the following economic predictions / observations for the Wellington region and for New Zealand:

- Under the "do-nothing" scenario, the expected economic loss to the national GDP is likely to be in the order of $16B over a five-year period. It is noted that this estimate excluded recovery costs and building repairs, which have been estimated to be in the order of $16B in a separate report by GNS Science[5]
- A loss of one to two per cent from the national GDP per year, which is equivalent to a net present value of $30-$40B.
- Modelling undertaken by Deloitte NZ, for similar earthquakes to those which occurred in Christchurch in 2010 and 2011, but instead occurring in Wellington, showed that national GDP was likely to reduce by up to $29B by 2030[6].

Although specific economic modelling hasn't been undertaken for an HILP event that damages the study area's transport system, the economic consequences predicted for the Wellington region by the Wellington Lifelines PBC suggests that the economic losses from a severely damaged system within the study area is also likely to be significant.

It is also noted from a short-term recovery perspective, access to, through and from the study area will be critical, and access to the regional fuel supply facilities located in Gracefield / Seaview. Connectivity will also be important for accessing the potable water (e.g. Gear Island Water Treatment Plant) and wastewater (e.g. Seaview Wastewater Treatment Plant) facilities located within the study area.

[5] GNS Science, estimated earthquake and tsunami risks from large earthquakes affecting the Wellington Region, 2014. It is noted that this estimate is based on a combined 7.5 magnitude and tsunami HILP event. It is also noted that the $16B estimate is in 2014 dollars

[6] https://www.nzherald.co.nz/nz/kaikoura-quake-wake-up-call-for-wellington/CFARN2MSO5SV52F6F77YSLLKZ4/

4.3.3 Flood Risks

Petone 2040 identifies that there are three water courses that are likely to create flood hazards for Petone (and the northern sections of the Project Study Area), including the Hutt River, Korokoro Stream and Waiwhetū Stream. All three rivers / streams have a history of flooding in the study area and subsequently disrupting its transport system. Figure 4-13 below shows the extent of 2300 m3/s flood risk (i.e. the 1:440-year flood event) from the Hutt River for the Petone area.

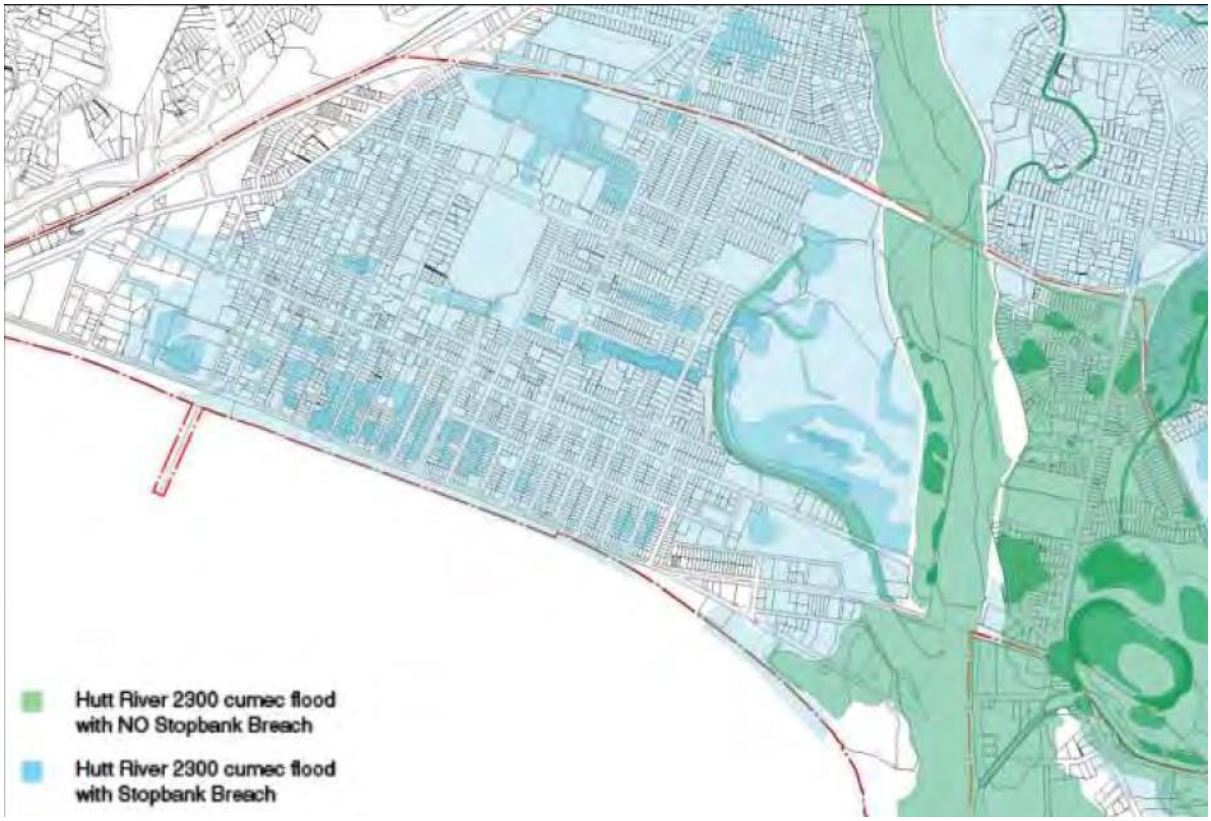


Figure 4-13: Hutt River 1:440 Year Flood Risk Extents

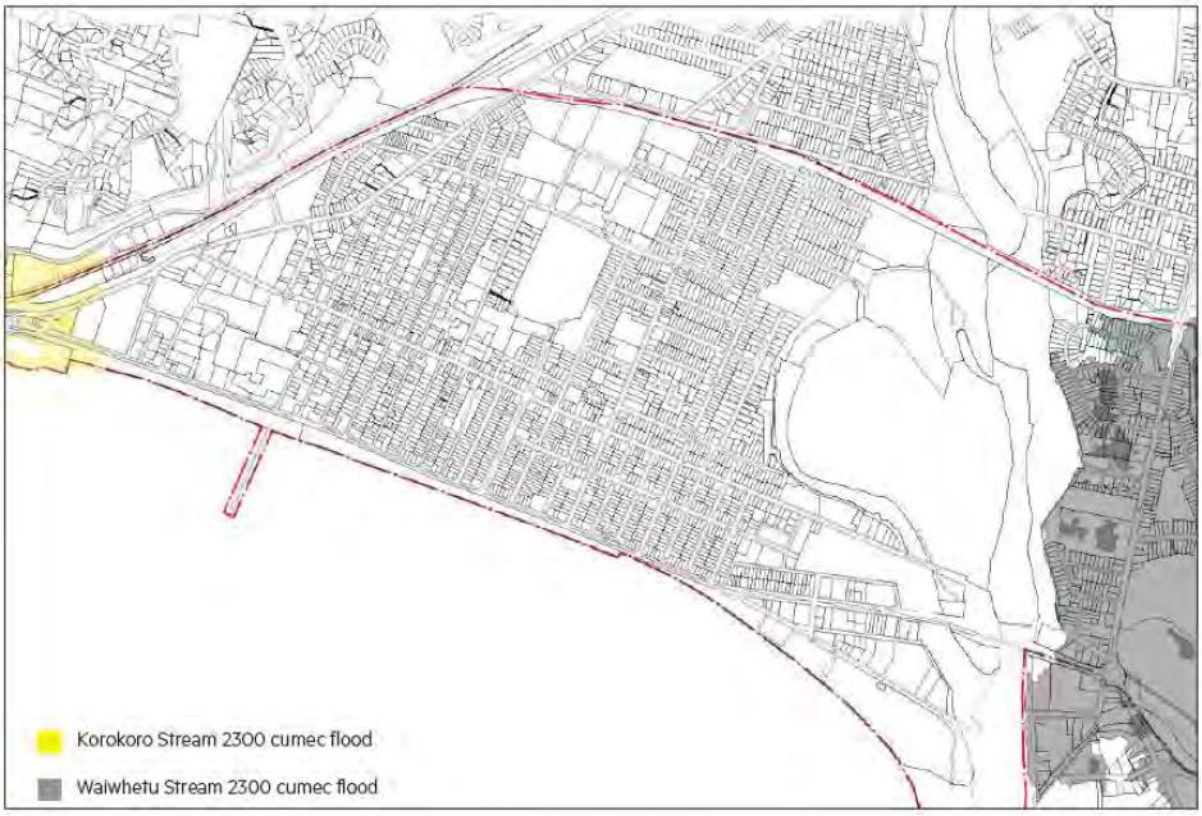


Figure 4-14: Korokoro Stream / Waiwhetū Stream 1:440 Year Flood Risk

Figure 4-14 above, shows the impacts on the transport system should flooding occur in the Petone West area and in the Seaview / Gracefield area because of the Korokoro Stream and Waiwhetū Stream flooding.

Should these areas flood a key resilience risk to the transport system is the flood capacity of the local bridges. The Hutt River Floodplain Management Plan highlights the flood capacity of the existing transport system. Table 2 shows the flood capacity for the bridge that cross the Hutt River in the study area.

Table 2: Flood Capacity of the Hutt River Bridges[7]

Bridge	Flood Capacity		
	1,900m^3/s	2,300m^3/s	2,800m^3/s
Ewen Bridge	Yes	Yes	No
Ava Rail Bridge	Yes	No	No
Waione Street Bridge	Yes	Yes	Yes

The Ava Rail bridge has been identified as being the most “at-risk” bridge from a 1:440 flood event (i.e. a 2,300 m^3/s flood) followed by the Ewen Bridge.

[7] https://www.gw.govt.nz/assets/Documents/2021/11/FP-Hutt-River-FMP-v2.pdf

4.3.4 Long Term Sea Level Rise

As indicated above in Figure 4-15 below, long term sea level rise is likely to have a widespread impact on the study area. Particularly vulnerable locations include the Petone West, Petone South, Seaview and Alicetown areas where sea level rise is predicted to be as much as 300cm. In terms of the transport system, the study area's most vulnerable sections are The Esplanade (west), and the road and rail network in and around The Esplanade / Hutt Road roundabout. GWRC's 2019 assessment of coastal vulnerability to climate change and sea level rise also identified that the Seaview and Petone areas were amongst the most vulnerable to the effects of sea level rise in the Wellington region[8].

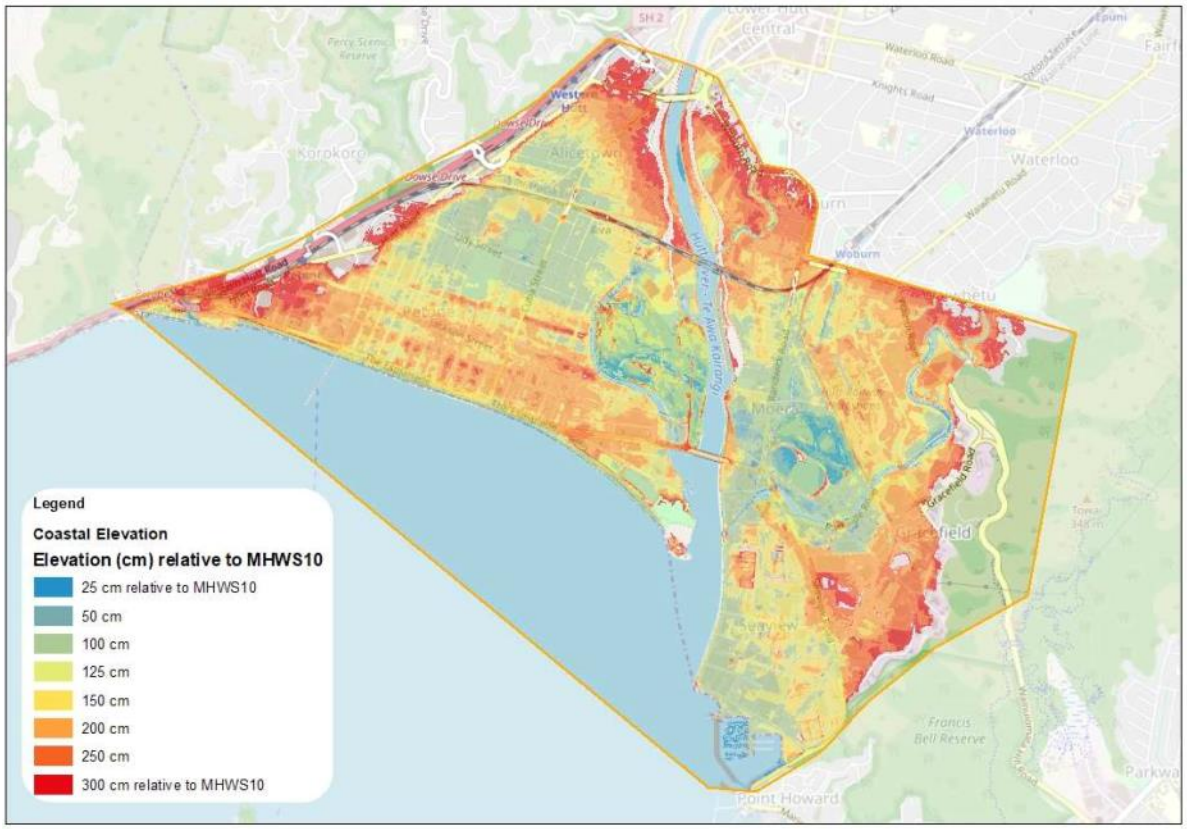


Figure 4-15: Predicted Sea Level Rise

[8] https://www.scribd.com/document/420897103/Preparing-Coastal-Communities-for-Climate-Change#from_embed

4.3.5 Combined Hazard Map Overlay

Petone 2040 includes a combined hazard overlay map for Petone and the northern areas of the study area. This map, shown in Figure 4-16 below, identifies three natural hazard risk zones, ranking them high, medium and low. It identified Petone West (including the Petone Overbridge area), Petone Foreshore and Seaview / Gracefield areas to be the most at risk from natural hazards. It is noted that large parts of central Petone have been afforded a medium or low risk.

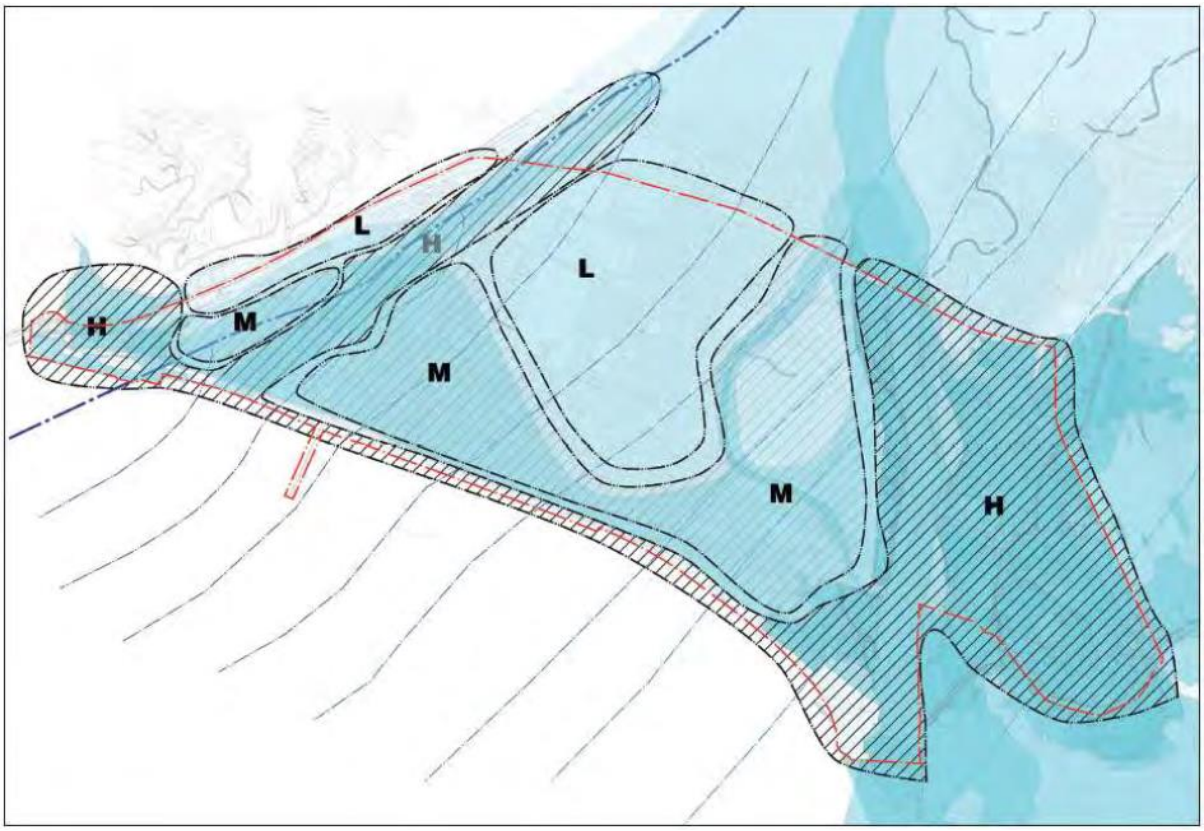


Figure 4-16: Petone Combined Hazard Map

5 Summary

There is sufficient evidence to demonstrate that the lack of connectivity, worsening congestion and resilience risks on key roads are a key problem for the transport system within the Southern Lower Hutt area. The key routes most affected are those providing east-west connectivity or connectivity to SH2. While the key routes with the greatest resilience risk are those closest to streams, rivers and the ocean.

Lack of connectivity

The design of the road network, combined with high traffic volumes, influences the way people move around the transport network. For general traffic and freight, there are limited opportunities to cross the Hutt River and connect to SH2 from Petone. To the east, there are only two road links over the Hutt River connecting Petone to Seaview, while to the west there are only two interchanges connecting the local road network to SH2.

For active modes, there are limited opportunities to cross the Hutt River and Hutt Valley Rail Line, which is likely to result in people choosing to drive rather than to walk or cycle.

Congestion

All routes analysed in the study area, had varying travel time variability problems, with this problem being most evident on The Esplanade / Waione Street route. On this route travel times can vary up to 14 minutes in the AM morning peak, and up to 13 minutes in the PM peak (when compared to the 50km/h free flow situation). Furthermore, the evidence suggests that travel time variability has deteriorated since 2016 – it now takes five minutes longer to travel in the AM Peak compared to 2016. It is also evident that the AM and PM peak periods are now spreading, with the AM peak extending past 10am, and PM peak starting prior to 3.00pm.

Travel time variability has consistently been recognised as a problem for freight movements through the study area. In particular, variability problems, and the need to address these problems on The Esplanade / Waione Street route and on Randwick Road has been a consistent theme identified in key regional and HCC strategic transport documents over the past 10 to 20 years. Freight operators have also consistently expressed concern that high traffic volumes during peak travelling times impacted negatively on their businesses, and that poor overall east-west connectivity was limiting the economic development potential of the Seaview / Gracefield area.

Resilience

The transport system within the study area is vulnerable to HILP events, particularly a major earthquake on the Wellington Fault. Such an event could render key routes such as The Esplanade, Waione Street, and Seaview Road unusable for weeks or months, isolating communities such as Eastbourne and Wainuiomata.

These routes have been identified as critical and at high risk of liquefaction, lateral spreading, tsunami, and flooding. Lifeline utilities, including bulk water supply and access to regional fuel depots, also rely on this network for emergency response and recovery. If compromised, the consequences could include long-term water shortages and disruption to recovery efforts. Additional risks from stop bank breaches, stream flooding, and long-term sea level rise, particularly in areas like Petone and Seaview, further compound the area's vulnerability.

Based on the available evidence, it is clear the study area faces significant resilience risks that could seriously disrupt the transport system and associated lifelines highlighting a strong need for proactive mitigation and investment.

This report has been prepared for the exclusive use of our client Waka Kotahi - NZ Transport Agency, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Report prepared by:

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Name here
Title here

Report reviewed by:

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Name here
Title here

Authorised for Tonkin & Taylor Ltd by:

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Name here
Title here