

# Melling Gateway Strategic Case

Enabling a more resilient and accessible Hutt City

Strategic Assessment and Funding Application to proceed to programme development



Version 1.01

12 November 2014

## Approval

PREPARED BY:	ORGANISATION	REVIEWED BY MANAGEMENT GROUP:	ENDORSED BY:	ENDORSED BY P&I / COUNCIL COMMITTEES:
David Jeffrey, Simon Whiteley and Will Skeggs of GHD Ltd  14 October 2014	<b>New Zealand            Transport Agency</b>	[INSERT NAMES]  [JOB TITLE]  [DATE]	[INSERT NAME]  PROPOSAL SPONSOR  [DATE]	[INSERT NAME]  P&I CASE MANAGER  [DATE]
	<b>Greater            Wellington            Regional Council</b>	[INSERT NAMES]  [JOB TITLE]  [DATE]	[INSERT NAME]  [JOB TITLE]  [DATE]	[INSERT NAME]  [JOB TITLE]  [DATE]
	<b>Hutt City Council</b>	[INSERT NAMES]  [JOB TITLE]  [DATE]	[INSERT NAME]  [JOB TITLE]  [DATE]	[INSERT NAME]  [JOB TITLE]  [DATE]

## Revision Status

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Final report (v1.00)	14.10.2014	Updated report incorporating stakeholder feedback
Final report (v1.01)	12.11.2014	Updated report following 5.11.2014 Management Meeting

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# Executive Summary

## Introduction

This 'Melling Gateway' strategic case outlines the context and case for a co-ordinated investment programme to improve the resilience, accessibility and safety of Hutt City and the wider Greater Wellington region in the Melling Bridge area.

The cornerstone investment is the replacement of the Melling Bridge, which is required to alleviate a major flooding problem with catastrophic consequences. If the bridge is replaced then it will enable further transport and urban development improvements in the area.

The package of investments will:

1. Increase flood plain resilience of the Hutt River valley.
2. Improve connectivity between Hutt City centre and its adjacent transport corridors and the Hutt River.
3. Improve State Highway 2 and local road network reliability and multi-modal transport choices.
4. Improve road safety for customers using State Highway 2 and the local road network.

## Purpose

The purpose of this document is to provide the senior management and governance bodies of the New Zealand Transport Agency (Transport Agency), Greater Wellington Regional Council (GWRC) and Hutt City Council (HCC) with a high degree of confidence that a co-ordinated investment in the Melling Gateway will align with their strategic priorities and respond to serious and urgent problems in an effective manner.

Specifically, this document aims to provide the senior management and governance of the three agencies with an early opportunity to determine if the proposed investment warrants moving to the development of a programme investment business case.

## Stakeholders

The document identifies key stakeholders in addition to NZ Transport Agency, GWRC and HCC that have an interest in the investment outcomes. These include the Treasury's National Infrastructure Unit, landowners and businesses in Hutt City, Iwi, Transpower, Kiwirail, Wellington Water and community groups.

## Context

Early residents such as the Ngai Tara people called the Hutt River Te Awakairangi, 'the watercourse of greatest value'. Flooding impeded Lower Hutt's early development, and the great earthquake of 1855 sent a tsunami up the river. Three years later, a severe flood drowned nine people at Taita. Another big flood in 1893 prompted the building of stop banks.

Once the river was contained through the construction of stop banks and channel modifications, Hutt City began to grow. It is now home to over 100,000 people, along with industrial, retail and commercial buildings and infrastructure.

The Melling Bridge spans the Hutt River and is the main access point from SH2 into Hutt City. Flooding of the Hutt River is a recurring problem with twelve major flood events from 1855 to 2005, as listed in Appendix C. Minor flooding of Block Road (a key link in the road network near the bridge) occurs two to three times a year.

## **The Problem**

In 2001, GWRC, HCC and Upper Hutt City Council, agreed in consultation with the community on a 500 year (440) flood protection standard for the urban areas of Hutt Valley. A five hundred year flood is defined as a severe flood event, which has a 20% chance of occurring within the next 100 years. Recent investigations have shown that the flood capacity of the existing bridge to be approximately a one in sixty five year flood event. This causes a major constriction of the floodway putting Hutt CBD at high risk of flooding, as the Melling Bridge has an insufficient span and height to allow water to pass underneath.

The physical damage to Hutt City CBD of such a flood potentially results in loss of life and is estimated to exceed \$1 billion. The potential social, economic and environmental costs may double that estimate. For this reason the design standard agreed to by Hutt and Upper Hutt Cities and Greater Wellington, following extensive consultation with the community, was for a 500 year return period event including an allowance for climate change which may double that estimate.

From a transport perspective, Melling Bridge and the adjacent intersection with State Highway 2 (SH2) operates at capacity in peak periods. The bridge is narrow with only three traffic lanes and does not provide a safe, segregated path for cyclists. The bridge is owed by HCC and has an estimated remaining structural life of 90 years. While the bridge's future needs to be considered as part of wider approach to improving the connectivity of Hutt City with its transport corridors and the river, HCC could not justify replacing the bridge for those purposes alone. The flooding issue is the catalyst for the bridge replacement.

## **Case for a new Melling Bridge and associated transport and urban design improvements**

GWRC has been progressively improving flood protection in the Hutt River corridor upstream and downstream from the Melling section. The council now wish to progress stop bank improvements on the Melling section so as to complete the overall flood protection strategy for the Hutt City Centre within the next 15 years. In planning the Melling phase of the work, GWRC has confirmed that the Melling Bridge is a flood hazard and, through the development of a Programme Case, will confirm whether the right solution is to replace the bridge as this will determine the level of flood protection to be provided through stop banks improvements.

HCC has a programme of urban design improvements called the "Making Places" project. The implementation of some aspects of Making Places ie the Promenade is dependent on the scale and timing of stop bank improvements and Melling Bridge replacement. If the bridge is not replaced the council may need to consider whether a duplicate cycle/footbridge closer to the CBD is economically justifiable.

The NZ Transport Agency and HCC are planning to improve the reliability and safety of the intersection between Melling Bridge and SH2. A network optimisation investment is proposed which will bring substantial improvements in the short to medium term (0-10 years) using existing infrastructure.

In the longer term (5-15 years) the NZ Transport Agency may decide to build a grade separated junction at Melling which will bring further benefits. If and when the Transport Agency decides to proceed with this grade separated junction it will need to know whether to design it in conjunction with a new bridge or with the existing bridge. A new bridge at Melling would enable a superior transport solution to be provided but it would also be more costly than retaining the existing bridge.

## **Benefits of a coordinated investment programme**

NZ Transport Agency, HCC and GWRC all need a degree of certainty about if and when the Melling Bridge is to be replaced, so that other complimentary investment activities can be planned coherently

and cost effectively. This will avoid wasted expenditure over the next 20 years and maximise the returns from the investment in the short, medium and long terms.

Once implemented, the optimised investment programme will contribute to Hutt City being a safe, resilient, prosperous, attractive and thriving place to live, work and play. Achieving this will require the three organisations to work together and with the community in order to implement a co-ordinated programme.

Overall the programme of investment has been assessed to achieve a high strategic fit and high effectiveness ranking against both NZ Transport Agency’s Investment and Revenue Strategy and the strategic policies of GWRC and HCC. The early indication is that the optimal time to replace the Melling Bridge would be in 10 years’ time to coincide with the completion of the stop bank improvements.

### Indicative investment programme and assessment profile

The indicative investment required over the next 20 year period is:

**Table 1: Indicative investment programme 2014-2034**

Activity		Timescale	Estimated Investment
<b>Flood plain protection</b>	Flood protection including raised stop banks and deeper channels	5-15 years	\$30-190m
<b>Urban design and development</b>	‘Making Places’ reconfigured streets, paths, tracks and open spaces	5-20 years	\$15-20m
<b>Transport network optimisation</b>	Optimised configuration and operation of network intersections	0-10 years	\$7-8m
<b>Large scale transport infrastructure improvements</b>	Grade separated SH2 intersection at Melling	5-15 years	\$50-70m

Melling Bridge replacement (\$20m) (5-10 years)

### Conclusions

There is a compelling case for investment in the current infrastructure at the Melling Gateway to improve the resilience, accessibility and safety of Hutt City.

The magnitude and consequences of the flooding risk from the Hutt River in the Melling area would be of national significance and the risk is too great for central and local government to ignore. It is not practicable to manage this risk by ‘retreating’ residents and businesses from the flood zone. However, the flood risk can be substantially mitigated by raising stop banks along the Hutt River and replacing the existing bridge with one that has a higher and longer span.

Alternatively, the current bridge could be retained, but this would mean the improvements in flood protection would be of a lower standard to that already implemented upstream and downstream of Melling.

While the future of the Melling Bridge needs to be considered as part of wider approach to investing in improvements to the connectivity and safety of Hutt City with its transport corridors and the river, the case for replacing the bridge for transport and urban design purposes alone is relatively weak.

The flooding issue is thus the main driver for the bridge replacement, however replacing the bridge also would bring transport and urban design benefits.

If the Melling Bridge is not replaced, the effectiveness of the investment programme would be much reduced because the level of flood protection would be well below the level that has been strategically agreed for the Hutt River valley.

The early indication is that the optimal time to replace the Melling Bridge, as part of an integrated investment programme, may be in around 10 years' time to coincide with the completion of the stop bank improvements. However, the bridge replacement will provide some immediate protection even without the completion of the stopbanks. A decision is needed on whether to proceed with the integrated investment programme and, in particular, whether and when the Melling Bridge will be replaced, to enable the three agencies to coordinate and develop appropriate plans. There is therefore some urgency in proceeding to prepare a Programme Case as this will determine the scale and timing of the optimal investment programme, and also identify the sources of funding for the programme.

## **Recommendations**

1. Approval be sought from the senior management of GWRC, NZ Transport Agency and HCC to progress with the development of a programme business case for the Melling Bridge replacement and associated stopbank, transport and urban design improvements. The primary purpose of the programme business case will be to:
  - Confirm the case for change and the need for investment through the collection and analysis of demonstrable evidence;
  - Identify the key investment activities that will support the programme outcomes and how these will be funded; and
  - Seek approval of the governing bodies to develop subsequent project based business cases for the different activities within the investment programme.
2. Approval be sought from the senior management of NZ Transport Agency and HCC to prepare a detailed business case for the short to medium term project to optimise the configuration and operation of the Melling Intersection using existing infrastructure. This business case should be progressed as soon as possible, and need not be delayed until the programme case has been developed for the longer term investment programme involving new infrastructure.

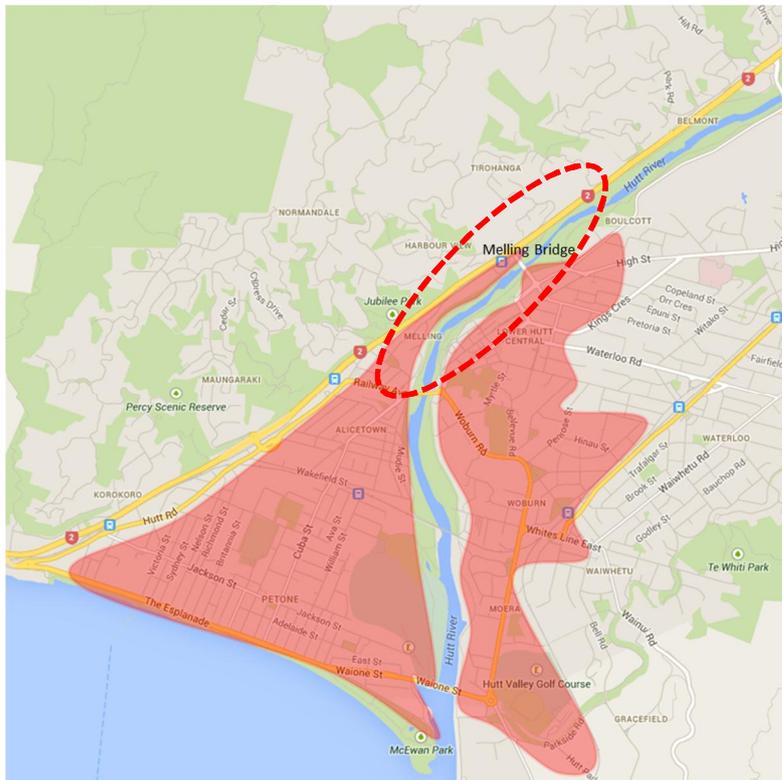
# PART A – THE STRATEGIC CASE

## 1 Introduction

This strategic assessment outlines the context and case for change in relation to a proposed co-ordinated investment programme to improve the resilience and accessibility of Hutt City at Melling Bridge in the Lower Hutt Valley area. An investment programme is being considered collaboratively through a cross-agency group, comprising representatives from the New Zealand Transport Agency (NZ Transport Agency), Greater Wellington Regional Council (GWRC) and Hutt City Council (HCC).

The area that will benefit from the proposed Melling Gateway investment is shown in Figure 1 below.<sup>1</sup> 'Melling Gateway' is the proposed co-ordinated investment programme to improve the road network and river protection in the area bounded by the dotted lines in Figure 1.

**Figure 1: Melling Gateway programme area**



*NB: The area shaded in red is the zone at risk of extensive damage from a 1 in 440 year flood breach at the stopbanks either side of Melling Bridge.*

The investment programme will improve the resilience and accessibility of Hutt City and the wider Greater Wellington region through:

1. Increased flood plain resilience of the Hutt River.
2. Improved connectivity between the city centre and its adjacent transport corridors and the Hutt River.
3. Improved State Highway 2 and local road network reliability and multi-modal transport choices.

<sup>1</sup> A brief history of the area is included in Appendix C.

4. Improved road safety for customers using State Highway 2 and the local road network.

The purpose of this strategic assessment is to seek approval to progress the programme business case for investment in the Melling Gateway in accordance with Treasury and NZ Transport Agency guidance on business cases. To do so, this document:

- Outlines the strategic context and fit for the proposed investment;
- Identifies the key problem, causes and consequences; and
- Identifies the benefits of investing.

The next deliverable will be the programme business case, that will set out analysis and evidence to confirm (or otherwise) the case for change and also identify the preferred programme / activity mix and sequencing.

Once the programme business case has been approved by the governing bodies, separate more detailed business cases for each project within the programme will be developed in the future as the programme is progressively implemented by the agencies concerned in the years ahead.

## 2 Strategic Assessment - Outlining the Need for Investment

### 2.1 Defining the Problem

A facilitated problems workshop was held on 9 July 2014 with key stakeholders to gain a better understanding of current issues and business needs. The stakeholder panel attendees, comprising of senior management from the three key agencies, NZ Transport Agency, GWRC and HCC, included:

- Kesh Keshaboina - Principal Transport Planner, HNO, NZ Transport Agency
- Michael Siazon - Senior Project Manager, HNO, NZ Transport Agency
- Daya Atapattu - Team Leader, FMP Implementation, GWRC
- Graeme Campbell - Manager Flood Protection, GWRC,
- Steve Kamo - Project Engineer, FMP Implementation, GWRC
- Ron Muir - Divisional Manager Road & Traffic , HCC
- Paki Maaka - Urban Design Manager, HCC
- Gary Craig - Making Places, HCC

The above panel identified and agreed on the following key problems as part of the Investment Logic Map produced. In brackets are the relative weighting assigned to the problems in terms of the importance of addressing the problem.

- **Problem one:** A constrained river corridor is increasing the flood risk and the potential economic and social impacts (30%)
- **Problem two:** Hutt River and transport capacity constraints at Melling Bridge and the immediate vicinity result in exacerbated flood risk and inefficient multi modal network performance (50%)<sup>2</sup>
- **Problem three:** The disconnect between the city, river corridor and transport has undermined the status of the access from SH2 as the main gateway to the city centre (20%)

The Investment Logic Map, produced as part of the workshop, is attached as Appendix A.

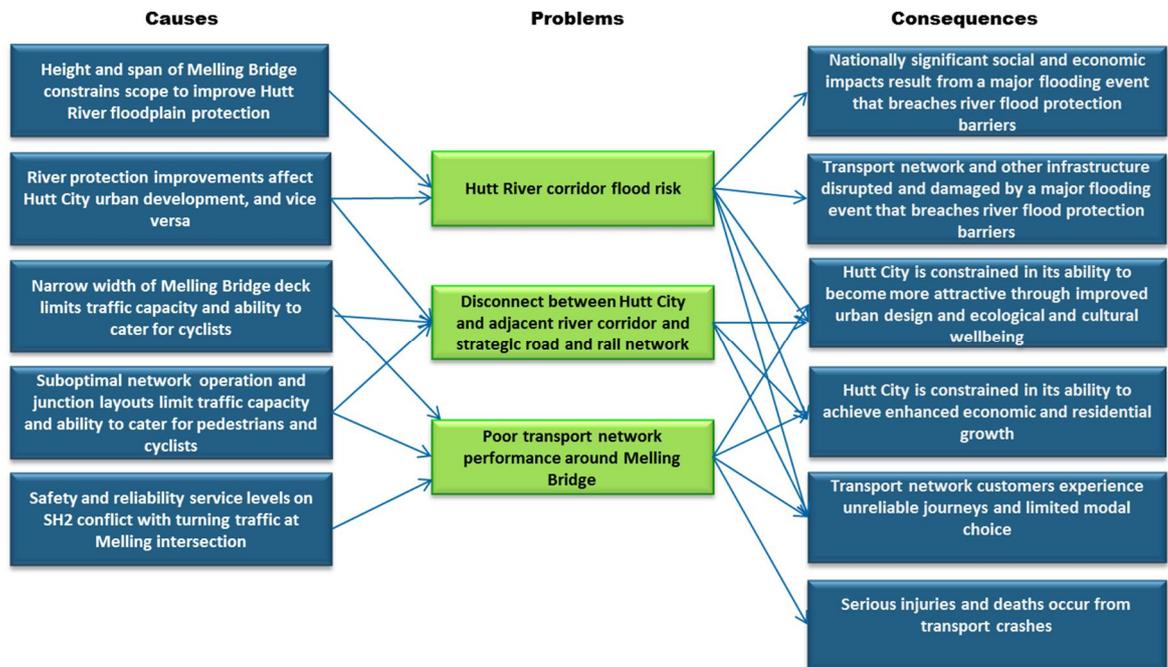
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<sup>2</sup> NB: A workshop was held on 9 September 2014 where all stakeholders agreed that the earlier agreed wording of problem two in the Investment Logic Map (featured in Appendix A) should be updated to include the words "Hutt River and transport" at the beginning of its description.

## 2.2 Causes and consequences of the problems identified

The following diagram shows the causes and consequences of the identified problems. The arrows demonstrate that the causes result in several problems which in turn have a number of consequences. The interrelated nature of the problems and consequences supports this proposal for the key stakeholders to work together in a co-ordinated programme.

**Figure 2: Causes and consequences of the problems identified**



Failure of NZ Transport Agency, GWRC and HCC to coordinate their investment activities and agree on the timing and funding of the investment programme would result in the following threats and loss of opportunities:

- The HRFMP recommended flood protection standard cannot be provided to the Hutt City Centre until the bridge is replaced. A major flood event (i.e. an event with a 20% chance of occurring within the next 100 years) is likely to result in estimated tangible damages to the Lower Hutt community in excess of \$1 billion. As the capacity of the existing bridge is only a 65 year event, there is potential for failure during a medium scale event >100 year.
- Negative impacts on HCC's *Making Places* project short and long-term efforts to improve the liveability of the Hutt City CBD through improved connectivity of the CBD with the adjacent transport corridors and integration with the Hutt River.
- Negative impacts on NZ Transport Agency/HCC short, medium and long-term efforts to improve the reliability and safety of the State Highway 2 and the adjoining local transport network.

The magnitude and consequences of this flooding problem are too great for New Zealand to ignore. It is not practical from an economic or social perspective to resolve the issue by retreating residents and businesses from the flood zone. The existing flood risk can be substantially mitigated by the completion of the stop bank improvements along the Hutt River and the replacement of the Melling Bridge.

From a transport perspective Melling Bridge and the adjacent intersection with State Highway 2 (SH2) is at capacity in peak periods. The Bridge does not provide a safe, segregated path for cyclists, and its future needs to be considered as part of wider approach to improving the connectivity of Hutt City with its transport corridors and the river.

### 2.3 The Benefits of Investment and Key Performance Indicators

The potential benefits of successfully investing to address these were identified as part of the facilitated benefits workshop held on 7 August 2014. In this workshop the stakeholder panel identified and agreed the following potential benefits for the proposal, including the relative weighting in brackets which indicates the relative importance of fully realising the benefit:

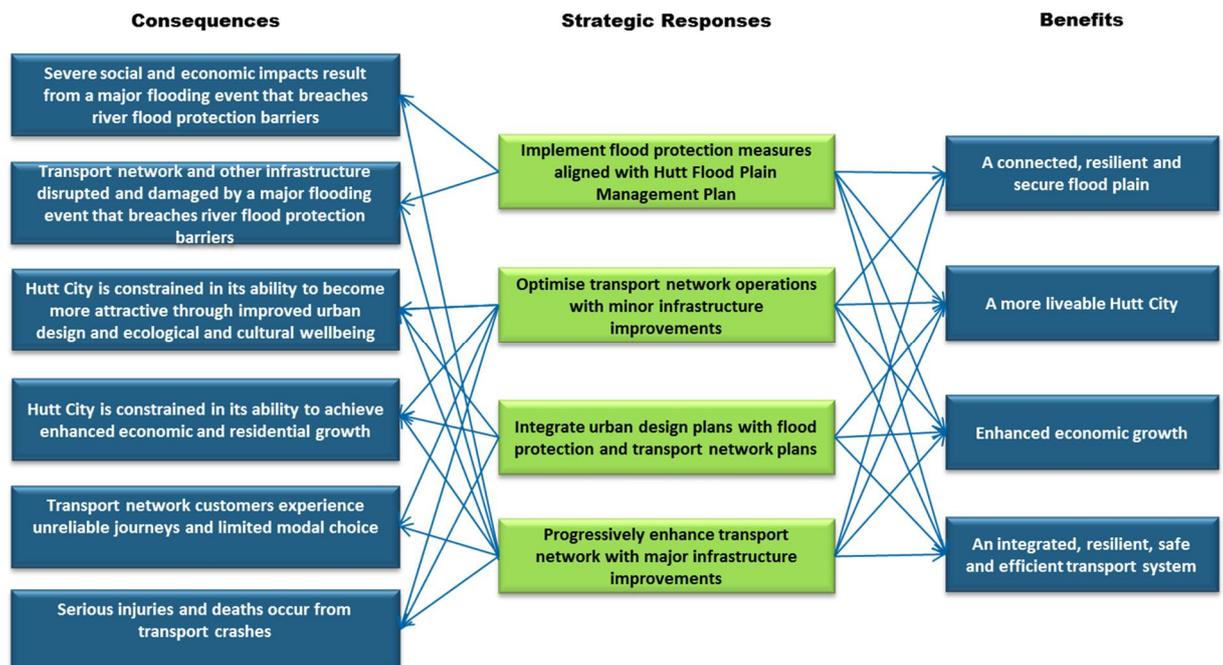
- **Benefit one:** A connected, resilient and secure floodplain (50%)
- **Benefit two:** An integrated, resilient, safe and efficient transport network (35%)
- **Benefit three:** A more liveable Hutt City (10%)
- **Benefit four:** Enhanced economic growth (5%).

In the second workshop key performance indicators were also established and potential measures and targets were identified. These are summarised in the Benefits Management Plan attached as Appendix B. It is intended that developing the programme business case will further refine the KPIs and measures.

### 2.4 Alignment of Strategic Responses

Four strategic responses have been developed to address the consequences of the identified problems in order to deliver the desired benefits, as shown in Figure 3.

**Figure 3: Strategic responses and resulting benefits**



The three agencies have developed separate investment activities to progress these strategic responses:

- Flood protection work along the Hutt River between Ewen Bridge up to the Kennedy Good Bridge which will require the removal of the 'pinch point' at Melling by raising the height of Melling Bridge and extending its span
- "Making Places" involves improvements to infrastructure on both sides of the Hutt River between Melling (train) Station to Daly Street. Service utilities to be either extended, upgraded or relocated within or near the final river corridor
- Network improvements to optimise the network at the SH2 Melling Link and Block Road intersections, local road junction improvements on the western and eastern side of the Hutt River
- In the longer term the construction of a grade separated junction at Melling.

The Melling Bridge spans the Hutt River and is the main access point from State Highway 2 into Lower Hutt. The Bridge is a constraint on river flow capacity and road network capacity. Further it does not provide a separate safe path for cyclists.

Greater Wellington Regional Council have been progressively improving flood protection in the Hutt River corridor and have further stop bank developments to complete in the next ten years. The stop banks alone however will not prevent flooding on either the east or west side of the Hutt River, and a new bridge is necessary to provide the required level of flood protection.

Hutt City Council own the Melling Bridge asset and have a programme of urban design improvements called "Making Places" that has some elements such as the Promenade development that is dependent on the timing of a Melling Bridge replacement.

The Transport Agency and Hutt City are planning to improve the reliability, efficiency and safety of the intersection between Melling Bridge and State Highway 2 and the surrounding local road network. This involves a 'One Network' approach.

The three agencies are now firmly of the view that the four investment activities need to be coordinated going forward because the activities are inter-dependent. The Melling Bridge replacement is the cornerstone project within this programme and is currently unfunded. The indicative investment required over the next 20 year period is set out below.

**Table 2: Indicative Investment Programme 2014-2034**

Activity		Timescale	Estimated investment	
<b>Flood plain protection</b>	Flood protection including raised stop banks and deeper channels	Melling Bridge replacement (\$20m)	5-15 years	\$30-190m
<b>Urban design and development</b>	'Making Places' reconfigured streets, paths, tracks and open spaces		5-20 years	\$15-20m
<b>Transport network optimisation</b>	Optimised configuration and operation of network intersections		0-5 years	\$7-8m
<b>Large scale transport Infrastructure Improvements</b>	Grade separated SH2 intersection at Melling		5-15 years	\$50-70m

The timing and certainty of funding for the Melling Bridge replacement is a key component of this programme. The flood protection benefits of a Melling Bridge with greater flow capacity will not be realised until the stop bank programme is completed along the Hutt River.

NZ Transport Agency, Hutt City Council and Greater Wellington Regional Council all need the certainty of about whether Melling Bridge is to be replaced, so that other complimentary projects can be planned and to avoid short term waste of expenditure. Certainty that Melling Bridge will be replaced will allow the agency to assess benefits of the options for the intersection improvements.

The early indication is that the Melling Bridge should be replaced in 10 years' time to coincide with the completion of the stop bank improvements.

This whole investment programme will contribute to Hutt City being a safe, resilient, prosperous, attractive and thriving place to live, work and play. Bringing about this outcome will require the three agencies to work together and with the community to implement a co-ordinated programme.

## 2.5 Evidence Base

The evidence supporting the causes of the problems identified during the Investment Logic Mapping workshop is briefly outlined below, along with further recognition of any gaps in evidence that will require further analysis during the next phase of programme case development.

### 2.5.1 Hutt River corridor flooding issues and the need for increased floodplain protection

The Hutt River corridor has a known history of minor and major flooding dating back to Lower Hutt's early development during the 1800s, where damage and multiple flood-related fatalities occurred, through to the frequent threats to stop banks experienced in more recent times.<sup>3</sup> During the 1800s it was realised that flood protection measures were crucial to minimising

<sup>3</sup> Further information can be found in a timeline of known major flood events in the Hutt Valley attached in Appendix C.

damage to the community and consequently stop bank development began. Further flood protection works occurred during the 1900s, though largely on an ad-hoc basis in reaction to flooding threats and damage incurred.

**Figure 3: Firth Centre (north of Melling Railway Station) during Hutt River flood of 1994**



In 2001 Greater Wellington Regional Council (GWRC) created the Hutt River Floodplain Management Plan (HRFMP)<sup>4</sup>, which established policy and a base programme for the long term development and operation of the Hutt River flood protection system. The HRFMP established a minimum standard of design for flood protection measures, requiring the provision of a high level of security during flood events with a 1 in 440 chance of occurring in each and every year (a 2,300 cumec flood), or in other words a flood event with a ~20% chance of occurring within the next 100 years. This standard was justified amongst others options for lesser and greater levels of protection using a risk-based approach that considered environmental and social effects, effectiveness of limiting flood damage, and cost in development and maintenance over time.

The HRFMP also required newly constructed or reconstructed stop banks pass a higher 2,800 cumec flood standard, a standard seen as necessary for some floodplain areas (e.g. highly developed areas) to maintain high security level flood protection measures equivalent in nature to that of the standard 2,300 cumec flood protected areas. This higher design standard for such stop banks was justified through:<sup>5</sup>

- The potential impacts of climate change.
- Uncertainties about flood protection behaviour.
- Eliminating additional future physical and environmental disruption by improving a section only once.

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<sup>4</sup> Wellington Regional Council (2001). *Hutt River Floodplain Management Plan*.

<sup>5</sup> Chapter 3 of the HRFMP provides further explanation of the adopted design standard and its rationale.

- From a community perspective it would be incongruous for the more intensely developed floodplain, below Kennedy Good Bridge, to have a lower standard than above the bridge.

Since the HRFMP in 2001, the likelihood of the 1 in 440 year flood event occurring has increased as the impacts of climate change, such as more frequent and heavier rain and rising sea levels, have become more evident in recent years.<sup>6</sup> Protecting all areas of the river corridor from flooding to the standards prescribed under the HRFMP is therefore increasingly of importance.

Applied to the current situation, the Hutt City CBD and Melling Bridge are located on a narrow section of the river corridor where flood protection measures could be designed to cater for 2,300 cumec flow standard with a high level of security, but cannot be designed to pass 2,800 cumec flow with the same level of high security. Such a design would require a wider river corridor with a new replacement bridge.<sup>7</sup>

#### **2.5.1.1 Height and Span of Melling Bridge constrains scope to improve river floodplain protection**

Currently, almost all areas of the river corridor have prescribed levels of flood protection except for around the Melling Bridge. As outlined in the HRFMP and the 2013 CBD Section Scoping Report<sup>8</sup>, the existing bridge height and width of the bridge design do not allow for the flood protection standards to be met due to the way it constrains flood-level flow, which also affects the security of other parts of the river corridor. Interim flood protection measures on and around the bridge have been identified to improve the flood-level flow in the area, however they will not achieve the required level of protection of 2,800 cumecs. Consequently, in order for full flood protection measures to be met, the Melling Bridge needs to be replaced to the appropriate flood protection specifications.

The GWRC hydraulic modelling in Figure 4 predicts the flood breach that would likely occur to stop banks either side of the Melling Bridge during a 1 in 440 year flood event under the existing protection measures and bridge design. This could also happen with improved stopbanks with the existing bridge. Note that it is likely either, rather than both, of the stop banks are likely to breach in such a flood event.

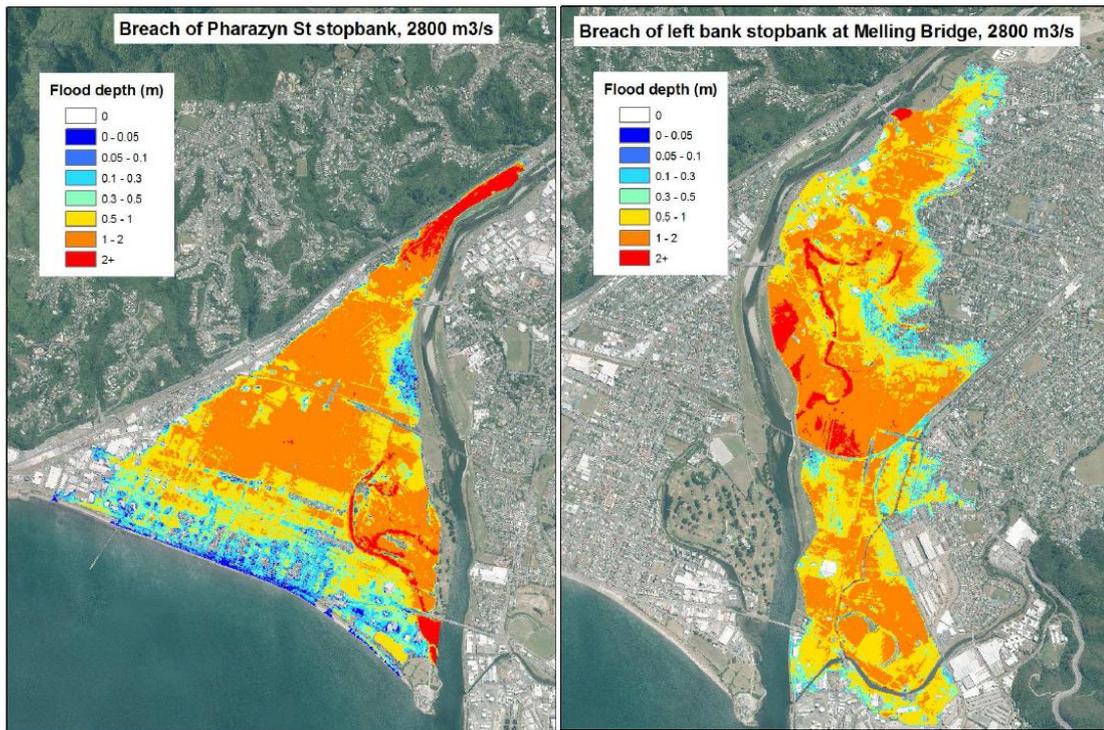
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<sup>6</sup> Greater Wellington Regional Council (2014). *Hutt River City Centre Upgrade Project: River Corridor Options Report* (Edition 2).

<sup>7</sup> Greater Wellington Regional Council (2014). *Hutt River City Centre Upgrade Project: River Corridor Options Report* (Edition 2).

<sup>8</sup> Greater Wellington Regional Council (2013). *Hutt River Floodplain Management Plan: City Centre Section Scoping Report*.

**Figure 4: Hydraulic model of stop bank breach either side of Melling during a 1 in 440 year flood event**



Under the scenarios above GWRC anticipate the following number of properties to be affected and the following amount of consequential physical damage to occur.

**Table 3: Predicted properties affected and damage to tangible items should either Melling stop-bank breach during a 1 in 440 year flood event**

Corridor breach	Property types affected				Estimated tangible damages <sup>9</sup>
	Commercial	Residential	Schools	Industrial	
West bank at Melling Bridge (Pharazyn St)	462	2,111	4	91	\$1.1 billion
Breach of east stopbank at Melling Bridge (left stopbank)	126	3,115	5	596	\$1.06 billion

As Figure 4 and Table 3 demonstrate, should the Hutt CBD/Melling Bridge section of the river corridor not be protected to manage a 2,800 cumec flood, then severe damage to property could occur. The tangible damage predictions do not, however, include the potential for loss of life, flood damage response efforts or the non-tangible impacts of the flood event (such as social and environmental losses), which GWRC anticipate could be of an equivalent level to that of the tangible damages. A breach of this magnitude will also likely have a wider impact to the region in terms of the migration of people from Hutt Valley, particularly considering the CBD and other large residential areas in Wellington are already populated near capacity. The recent Christchurch earthquakes provide a good example of how the tangible and non-tangible losses from a natural disaster can run far beyond expectations.

<sup>9</sup> NB: Tangible damages include direct costs, i.e. damage to property and other assets, and indirect costs such as loss of production.

The evidence supporting the extent of the damages incurred by not replacing Melling Bridge to appropriate specifications during a 1 in 440 year flood event could be more accurately estimated through further analysis to examine the associated non-tangible losses. Additionally, a gap in the evidence remains as to whether immediately implementing the interim flood measures around the Melling Bridge will produce an acceptable benefit-cost ratio during its lifetime prior to any major flood protection projects being undertaken.

There is also potential for the stopbanks to fail during a range of floods exceeding the current capacity but still less than 2,800 cumecs.

### 2.5.2 Flood protection improvements affect Hutt City urban development, and vice versa

Both HCC and GWRC have a shared interest in developing the same CBD/Melling section of the Hutt River. HCC has prioritised the revitalisation of the Hutt CBD and river integration through the *Making Places* project in order to promote Hutt City's liveability, economic development and employment growth.<sup>10</sup> At the same time GWRC wish to improve the level of flood protection in the area to the agreed level of security already provided in upstream and down stream along the river corridor. Both stakeholders have indicated a willingness to work with one another and some initial integrated concepts have been designed. The proposed integrated Making Places/Flood Protection works would have impacts on Daly Street/ Rutherford Street access.

More specifically, the *Making Places* project will affect stop bank design and development, landscaping and vegetation along the CBD section of the river corridor.<sup>11</sup> As well as providing flood protection measures (e.g. stop banks), GWRC also have an interest in the ecological and biodiversity impacts of development along the Hutt River. Interconnected to this is HCC's interest in adequately protecting any current and future investments in the area from the risk of flooding.

Given the above, either party cannot proceed with individual development unless they are to impact the viability of each other's investments, nor can they progress individual development without duplicating costs (e.g. landscaping, stop bank development etc.). As mentioned, the Melling Bridge replacement is pivotal to the GWRC flood protection efforts along the Hutt River corridor. Melling Bridge is also of great interest to HCC through its ownership, its influence on the local road network and it affecting the attractiveness of entering the Hutt City CBD.<sup>12</sup>

### 2.5.3 Transport-related causes of identified problems

Multiple overlapping causes drive the transportation problem identified during the Investment Logic Mapping workshops. Evidence supporting the existence of each cause is briefly discussed below, along with identification of any gaps in its basis.

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<sup>10</sup> Derkek Kemp Prosperous Places Pty Ltd (2009). *Hutt CBD Economic and Employment Report*.

<sup>11</sup> Hutt City Council (2009). *Hutt CBD Making Places*.

<sup>12</sup> Works Consultancy Services (1994). *Approaches to the Hutt City: A strategy for accentuating main entrance routes*.

### 2.5.3.1 Reliability and Safety service levels on SH2 conflict with turning traffic at Melling intersection

Previous GHD and Beca transport studies commissioned by NZ Transport Agency provide the following strong evidence to support the reliability and safety issues surrounding the SH2/Melling intersection.<sup>13</sup>

#### Reliability

Previous network deficiency assessments<sup>14</sup>, with consideration to traffic surveys and modelling, have identified the following as key drivers of the unreliability experienced at the SH2/Melling area:

- SH2 at Melling and on the surrounding network is characterised by conflicting movements between high-speed, high-volume state highway traffic and local access traffic coming to, from, or across the state highway.
- During peak periods and in the weekend SH2 at Melling experiences severe congestion. This congestion results in vehicle queues which exceed the storage capacity right-turn bays and block the state highway and local road network.
- From the Melling Bridge approach, the right turn onto SH2 is also heavy. With the two heavy conflicting right turn movements there is not enough capacity to efficiently operate the traffic signals. As a result, the Melling Bridge approach right turn also experiences significant congestion and queuing. At times the Melling Bridge right turn queue can extend back to the Melling Link/Rutherford Street roundabout in turn impacting the local road network.

While there is strong evidence linking the safety and reliability issues to the nature of the SH2/Melling intersection, wider Melling network operation and layout inefficiencies are also contributing factors.

#### Safety

Previous network deficiency assessments have identified that the presence of traffic signals in the 100 km/h environment creates significant safety and crash risk, particularly for stationary vehicles which are queued waiting to turn right onto the Melling Bridge from SH2. The heavy right turn flowing into the northbound high-speed lanes effectively blocks one of the two through-lanes and significantly affects SH2 traffic. The dangers of the intersection area highlighted by NZ Transport Agency Crash Analysis System (CAS) data, showing that of the intersections in the Melling area, the SH2/Melling Link intersection had the highest number of reported crashes over the 2009 to 2013 period, with over 50% of these being rear-end/obstruction type crashes.

In comparison to other national State Highway signalised intersections of similar volumes, the 2010 Beca study showed SH2/Melling intersection crash statistics to be significantly higher than the comparison intersections. Furthermore, in the 2013 GHD study compared the Melling/SH2 CAS intersection crash rate of 4.6 injury crashes/year to the NZ Transport Agency Economic Evaluation Manual 'generic high speed intersection' crash rate of 1.1 injury crashes/year, concluding the difference is likely due to excessive queuing and the presence of traffic signals in the high speed environment.

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<sup>13</sup> GHD (2013). *Melling Optimisation Study Final Project Feasibility Report*. Beca (2010) and *SH2 Melling to Haywards Upgrade Investigations Scoping Options Report*.

<sup>14</sup> GHD (2013). *Melling Optimisation Study: Final Project Feasibility Report*.

### **2.5.3.2 Sub-optimal network operation and junction layouts limit traffic capacity and ability to cater for pedestrians and cyclists**

The GHD and Beca transport assessments have favoured a grade-separated Melling interchange as the preferred long-term solution for improving the reliability and safety issues of the Melling/SH2 network, however several optimisation options have also been identified that reduce congestion and enhance the network's operation and layout using existing infrastructure. These optimisation options are expected to defer the necessity of such long term options as a significantly more expensive grade-separated interchange for up to ten years. However, a gap in the evidence remains as to whether immediately implementing the preferred optimisation will produce an acceptable benefit-cost ratio during its lifetime prior to any potential major infrastructure project (including a Melling Bridge replacement). If a new bridge is needed and programmed within a 10 year period, then the NZ Transport Agency will need to re-think its strategy, re-design and stage the improvements for the intersection to address congestion. Furthermore, the existing transportation assessment for Melling optimisation options could also be recalibrated to confirm compatibility with an earlier Melling Bridge replacement.

Previous transport investigations have also identified that existing cycling and pedestrian accessibility in the SH2/Melling network is suboptimal. In particular, the Beca 2010 study of local pedestrians/rail users found:

- Rail users surveyed indicated a desire for improved access to the station from SH2, western suburbs and Melling Bridge approaches.
- Grade-separating the Melling Interchange will affect the ability to provide access to the Melling Rail Station from the Melling Bridge and result in longer vehicular trips.

### **2.5.3.3 Narrow width of Melling Bridge deck limits traffic capacity and ability to cater for cyclists**

Currently the Melling Bridge connects SH2 on the western side of the Hutt River and with the Hutt City CBD on the eastern side. The Melling Bridge originally had a two lane capacity (one lane each direction), which was subsequently remarked to provide two lanes towards SH2 and one lane into the Hutt CBD. There is no space to implement dedicated cycle facilities without reducing the bridge to two lanes.

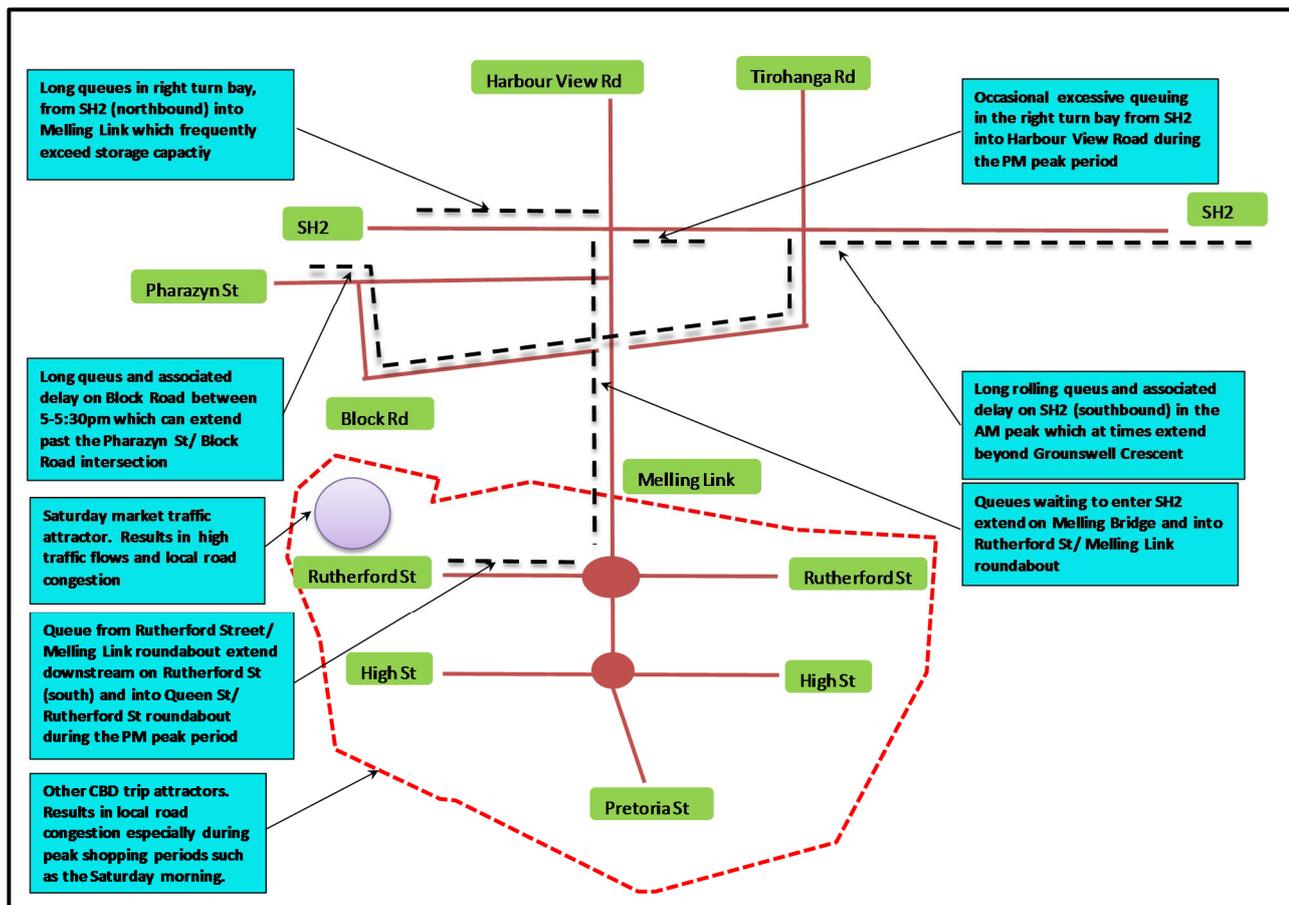
Previous transport investigations of the Melling area recognise through traffic surveying and traffic modelling that future traffic growth will require additional capacity for bridge movements.<sup>15</sup> It should, however, be recognised that with a short-term Melling network optimisation investment it is expected that bridge congestion would be improved to acceptable levels for at least the next ten years.

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<sup>15</sup> GHD (2013). *Melling Optimisation Study Final Project Feasibility Report*. Beca (2010) and *SH2 Melling to Haywards Upgrade Investigations Scoping Options Report*.

## 2.5.4 Summary of Transport related issues

Figure 5: Summary of Melling transport network deficiencies



## 2.5.5 Summary of gaps in evidence

The following additional analysis has been identified as being beneficial to improving the strength of the evidence base and assisting with next phase of programme case development:

- Analysis of the non-tangible damages associated with a flood breach to the stop banks either side of Melling Bridge.
- Benefit-cost analysis of interim flood improvement options on the CBD section of the river corridor prior to major flood protection improvements.
- Benefit-cost analysis of interim transportation network optimisation prior to major transportation infrastructure improvements.
- Adapted assessment of the interim transportation network optimisation options to confirm compatibility with an early or later Melling Bridge replacement.
- Assessment of impacts on Daly Street/Rutherford Street from Flood Protection/Making Places works

## 3 Strategic Context

The activities proposed within the Melling Gateway Strategic case fit closely with the strategic priorities of the three stakeholder organisations, New Zealand Transport Agency, Greater Wellington Regional Council and Hutt City Council. There is also a close fit with the Central Government resilience goals.

### 3.1 Organisational Overview and Objectives

#### 3.1.1 Central Government

The National Infrastructure Plan (9 July 2011) has as a resilience goal that national infrastructure networks are able to deal with significant disruption and changing circumstances such as those resulting from climate change. It recognises that both physical and system resilience are crucial and means acknowledging the value of adaptability and redundancy in the network to improve business confidence. It also points to the need to identify and manage cross-sectorial dependencies.

#### 3.1.2 New Zealand Transport Agency



The NZ Transport Agency is responsible for giving effect to the Government Policy Statement, which sets out the Government's strategic direction for investment in the land transport network. This role extends from planning and funding activities, supporting public transport, building the networks that connect communities, to ensuring the people and vehicles that use the system are safe to do so.

The Land Transport Management Act (LTMA) 2003 requires the NZ Transport Agency to assess all potential projects against the GPS, the relevant Regional Land Transport Strategy and the New Zealand Transport Strategy's five current key strategic priorities listed below:

1. Improving customer service and reduce compliance costs.
2. Planning for and delivering Roads of National Significance.
3. Improving the road safety system.
4. Improving the efficiency of freight movement.
5. Improving the effectiveness of public transport.

### 3.1.3 Greater Wellington Regional Council



Greater Wellington Regional Council (GWRC) is responsible for regulating the use of the region's natural resources. They do this through regional policies, plans and resource consents, helping the community to restore ecosystems (such as streams and wetlands) and helping businesses become more environmentally sustainable. The GWRC vision for the region is:

*"A prosperous community safe from the consequences of flooding with rivers and streams in a natural state providing ecological diversity and recreational opportunities."*

GWRC's specific activities include:

- Providing drinking water to the region
- Monitoring and reporting on the state of the environment
- Managing environmental threats like pest plants and animals
- Protecting the region from flooding
- Providing a 24-hour pollution response service and support environmental education programmes in schools

Greater Wellington's Flood Protection group works with communities to manage flood risk from the region's rivers and streams. The approach is to understand the processes affecting a river/stream and its floodplain within a wider catchment, and to provide a co-ordinated response through floodplain management plans (in partnership with the community) to reduce the impact of flooding.

Greater Wellington works with communities to manage flood risk from the region's rivers and streams. We develop floodplain management plans, provide a free advice and consultation service, maintain and build flood protection works, work with the community to improve the environment and recreational opportunities and provide flood warnings.

Greater Wellington is committed to achieving Quality For Life by ensuring the environment is protected while meeting the economic, cultural and social needs of the community.

### 3.1.4 Hutt City Council



Hutt City's vision is a city that is a great place to live, work and play. This means:

#### **People are proud to live here**

Hutt City is compact, vibrant and diverse, offering the best of city living while being safe, friendly and easy to get around. There is quality education and healthcare, with a choice of housing options from apartments to family homes on the hillsides, in the valleys or near the coast.

#### **Working or investing here is a smart choice**

Our vibrant economy offers a range of job opportunities close to home. We've built on our traditional industries, created export opportunities, and cemented our reputation as a science centre. This is a place of new ideas, creativity and innovation, bringing together the best of the arts, industry and science.

#### **There's always something for the family to explore**

Experience our culture and heritage, visit our museums and libraries, or enjoy our cafes, restaurants and boutique stores. Head outdoors to a park or beach, walk along the river, take the boat out, hit the hills or a mountain bike trail, or enjoy a game of golf.

#### **What is the Hutt CBD Making Places Project?**

'Making Places' follows from the 'Vision CBD 2030' project. Making places is about taking the ideas for the future of Hutt City's CBD found within the visioning work into an overall design framework to unlock the CBD's potential. This framework includes a detailed set of actions for the CBD's future transformation toward 2030.

This long term design framework has the overall aim to create a CBD that is economically vibrant, artistically and culturally rich, and people friendly. The CBD must offer an exceptional quality of life within a sustainable context.

The framework covers the CBD in detail including northern, southern, central, river edge, Westfield, Civic areas (as defined within Vision 2030), and the Residential areas which are peripheral to the central city. The framework also takes into account the wider context that influences the central area.

### 3.2 Partners and Key Stakeholders

Stakeholder	Relationship to the proposal	Degree of influence	Current Interest	Stakeholder management strategy
New Zealand Transport Agency	Key internal stakeholder responsible for key activities in the programme	High	High	Part of Governance Group for the programme business case
Greater Wellington Regional Council	Key internal stakeholder responsible for key activities in the programme	High	High	Part of Governance Group for the programme business case
Hutt City Council	Key internal stakeholder responsible for key activities in the programme	High	High	Part of Governance Group for the programme business case
National Infrastructure Unit – The Treasury	Key interest in alleviating potential threat.	Medium	Low	Present Strategic Case to The Treasury.
Landowners in Hutt City	Potential impact from programme	Medium	Medium	Engage during option assessment for all activities
Businesses in Hutt City	Potential impact from programme	Medium	Medium	Engage during option assessment for all activities
Iwi	Interest in protecting the river and historical sites.	Medium	Medium	Engage during option assessment for all activities
Transpower	Substation within flood zone	Medium	Medium	Engage regarding the flood risk to the substation supplying the Hutt City
Kiwirail	Rail lines within flood zone.	Medium	Medium	Engage in design and options for Melling bridge and flood risk.
Capacity	Opportunity to align storm water, wastewater and water supply asset improvements with this programme	Medium	Medium	Engage in programme business case

Other community groups to be engaged with during the consultation phase of the Programme Business Case:

Wellington Region Accessibility Group	Lower Hutt Chamber of Commerce	Forest and Bird	Central Community Committee
Friends of Hutt River	Department of Conservation	Fish and Game NZ	Western Community Committee
Wellington Electricity	Ambulance	Flood Park Markets	Hutt River Trail Operations Committee
Wellington Rural Fire Department			

The strategy is to engage with interested parties at an early stage to gauge their views on the total programme and ensure they are part of a transparent and open process. The process will involve pre-consultation sometime over the next few months and full consultation sometime next year with full information on the 3 main activities: flood protection, Making Places and Melling Bridge.

## 4 Anticipated Strategic Fit & Effectiveness

### 4.1 Assessment Profile

An assessment of the anticipated Strategic Fit and Effectiveness has been undertaken in accordance with the NZ Transport Agency Investment and Revenue Strategy, and against HCC and GWRC strategies.

**Table 4: Melling Gateway indicative assessment profiles**

Assessment Type	Flood protection Improvements	Optimisation of transport network	Integrated urban development	Enhanced transport Infrastructure	Overall assessment
<b>STRATEGIC FIT</b>	<b>HIGH</b>	<b>HIGH</b>	<b>HIGH</b>	<b>HIGH</b>	<b>HIGH</b>
	<ul style="list-style-type: none"> <li>Melling flood protection improvements are a key element of the Hutt River Floodplain Management Plan (HRFMP)</li> <li>Replacing the Melling Bridge will enable the benefits to be realised from current and planned flood protection measures upstream and downstream from Melling</li> </ul>	<ul style="list-style-type: none"> <li>Investment in optimising the network will make a significant contribution to regional economic growth and productivity, through improving journey time reliability and easing urban congestion</li> <li>The investment will also significantly reduce crash risk at the high risk urban Melling intersection</li> </ul>	<ul style="list-style-type: none"> <li>Improving the connection of CBD to the adjacent transport routes and the Hutt River is the priority of Making Places project and the 2030 CBD Vision</li> <li>This investment will enable the Hutt City to become a “great place to live, work and play”.</li> </ul>	<ul style="list-style-type: none"> <li>Investment in enhanced transport infrastructure at the Melling Intersection will further improve the reliability and safety of SH2</li> <li>This investment will also provide improved multimodal transport connections between Hutt CBD and its adjacent strategic transport routes</li> </ul>	<ul style="list-style-type: none"> <li>The four investment activities are complementary and together will strengthen accessibility and resilience of Hutt City and the wider Wellington region</li> </ul>

Assessment Type	Flood protection improvements	Optimisation of transport network	Integrated urban development	Enhanced transport infrastructure	Overall assessment
<b>EFFECTIVENESS</b>	<b>HIGH</b>	<b>HIGH</b>	<b>HIGH</b>	<b>HIGH</b>	<b>HIGH</b>
	<ul style="list-style-type: none"> <li>The flood protection improvements will increase the flood return period of 50 years currently, to a flood return period of 500 years when the investment programme has been completed</li> <li>The investment in the Melling section will enable the benefits of previous investments in the sections upstream and downstream of Melling to be fully realised</li> </ul>	<ul style="list-style-type: none"> <li>Network optimisation will significantly improve levels of service for freight and general traffic, while also improving conditions for cyclists and pedestrians</li> <li>The proposed improvements are designed using a 'one network' approach to form an overall solution to severe congestion and safety problems currently being experienced</li> </ul>	<ul style="list-style-type: none"> <li>Integration of SH2 and local road improvements will significantly improve connections between the CBD and its adjacent transport corridors</li> <li>Integration of the CBD's urban form with the river's flood protection measures will significantly improve the liveability and attractiveness of Hutt City CBD</li> </ul>	<ul style="list-style-type: none"> <li>Investment in a grade separated intersection at Melling will significantly improve journey times and safety on SH2, by removing conflicts with local traffic at the Melling Intersection</li> <li>Investment in a new bridge at Melling will be able to significantly improve integration of land transport, urban design and flood protection at the gateway to Hutt City</li> </ul>	<ul style="list-style-type: none"> <li>The four investment activities are complementary and their benefits will be maximised if the tranches of investment are carefully coordinated</li> </ul>

## PART B – PLANNING THE PROGRAMME BUSINESS CASE

Part B serves two purposes; it sets out the requirements for funding to further develop the business case through a Programme Business Case (PBC) in sufficient detail to facilitate an investment decision and also be sufficient to be used as the initial Project Plan.

### 5 Programme Business Case Scoping

Sponsor: NZ Transport Agency, Greater Wellington Regional Council and Hutt City Council.

Reporting: Management Board and respective agencies.

The indicative investment required over the next 20 year period is:

**Table 5: Indicative Investment Programme 2014-2034**

Activity		Timescale	Estimated investment	
Flood plain protection	Flood protection including raised stop banks and deeper channels	Melling Bridge replacement (\$20m)	5-15 years	\$30-190m
Urban design and development	'Making Places' reconfigured streets, paths, tracks and open spaces		5-20 years	\$15-20m
Transport network optimisation	Optimised configuration and operation of network intersections		0-5 years	\$7-8m
Large scale transport infrastructure improvements	Grade separated SH2 intersection at Melling		5-15 years	\$50-70m

#### 5.1 Right Sizing the Capacity and Capability of the Team

##### Draft Programme Business Case Dates

**Table 6: Draft programme business case dates**

Activity	Relevant date
Start date for developing the Programme Business case	1 November 2014
Start date for the PBC review:	1 February 2015
Date for final approval decision	1 April 2015

Final approval is to progress to consultation and detailed design.

## Programme Business Case Team

The programme business case will be developed through a working group project team consisting of representatives from the three partner organisations working collaboratively together.

*Figure 6: Key stakeholders for Melling Gateway*



As identified in the Strategic Assessment, the investment contains four activities:

- Flood plain protection – implementation timescale 5-15 years
- Urban design and development – implementation timescale 5-20 years
- Transport network optimisation – implementation timescale 0-5 years
- Large scale transport infrastructure improvements – implementation timescale 5-15 years.

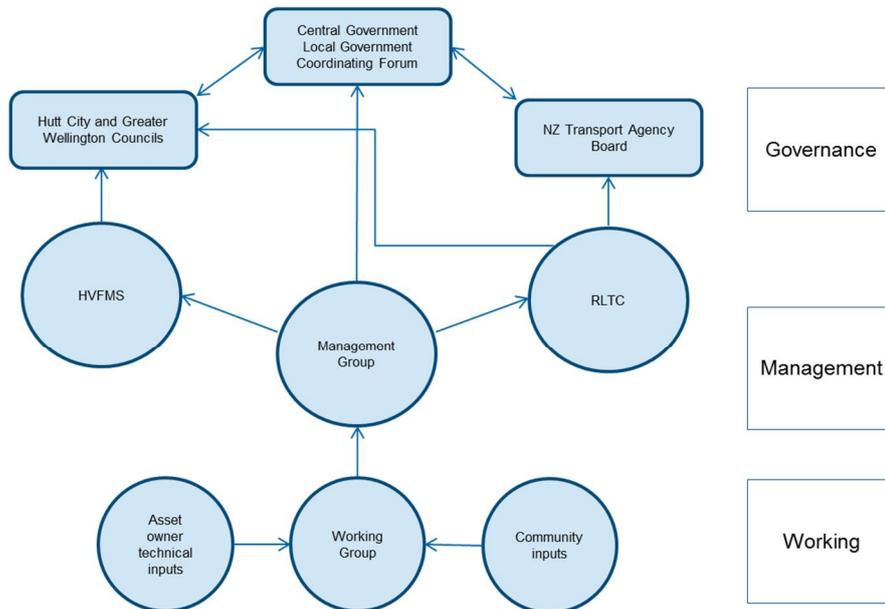
Inter-dependencies between the programmes mean that pursuing them independently would result in abortive work and the loss of many of the potential benefits. For example:

- Pressing ahead with the interim project to optimise the Melling Interchange could result in abortive work if the Melling Bridge is subsequently replaced
- The decision on whether, and when to replace Melling Bridge will impact on the scale and timing of the flood protection programme
- The scale and timing of the flood protection programme will in turn determine the shape and timing for urban design and redevelopment programme.

The case for a coordinated approach is a strong one, but will require different governance and differing funding arrangements from the routine investment programmes which the three agencies carry out.

The proposed governance structure for the Programme Business Case is as follows.

**Figure 7: Possible revised governance structure for programme business case**



It would be necessary to discuss whether the Management Group should report to RLTC and others through the HVFMS. The HVFMS is represented by GW, HCC, UHCC and Iwi.

## 5.2 Right Sizing the Effort

### 5.2.1 Estimated Cost to Develop the Programme Business Case

A total amount of \$200,000 (indicative) has been budgeted for the development of the programme business case. It is proposed that the split of funding be agreed between the stakeholders. The Strategic Assessment has articulated the problem and the benefits in Part A of this document. The following work is required for the programme business case stage.

**Table 7: Analysis required for the programme business case stage**

Analysis
Feasibility and design options of Melling Bridge replacement and grade separated junction
Benefit cost and transport assessment for transport optimisation to align with a future bridge replacement
Benefit cost study of short term flood protection around Melling Bridge
Development of the combined Programme Business Case
Economic analysis of wider consequences of flood protection failure (loss of life etc.)
Assessment of costs and benefits of combined programme.

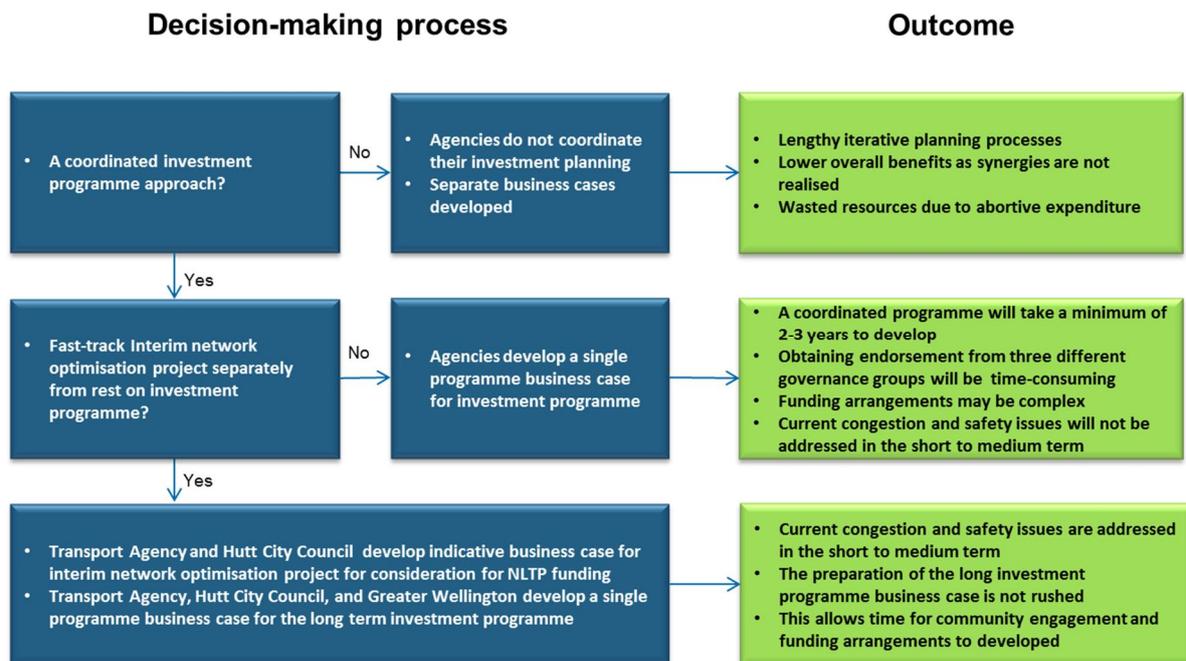
### 5.2.2 The Recommended Preferred Way Forward

The programme business case will develop all the options for potential projects and sequencing to achieve the optimum balance of cost versus risk, to achieve maximum effectiveness and efficiency for all the stakeholders.

There may be a case for proceeding at an early stage transport network optimisation as a free standing project, provided it can be demonstrated:

- This will not preclude or constrain consideration of investment options for the longer term investment programmes.
- The network optimisation improvements are ‘future proofed’ so that they will fit as far as possible with later large scale transport improvements.
- Any abortive work carried out on the network optimisation improvements can be justified by additional benefits from implementation of network optimisation at an early date prior to the larger scale improvements.

Figure 8: Options for next stage of business case development



The approach taken would also be dependent on the timing for Melling Bridge replacement.

### 5.3 Risk Management

The primary risk that the programme business case faces is that the key stakeholders (NZ Transport Agency, GWRC and HCC) act independently and proceed with projects in a disjointed way. This could result in loss of reputation and will ultimately cost more than a co-ordinated multi-agency programme.

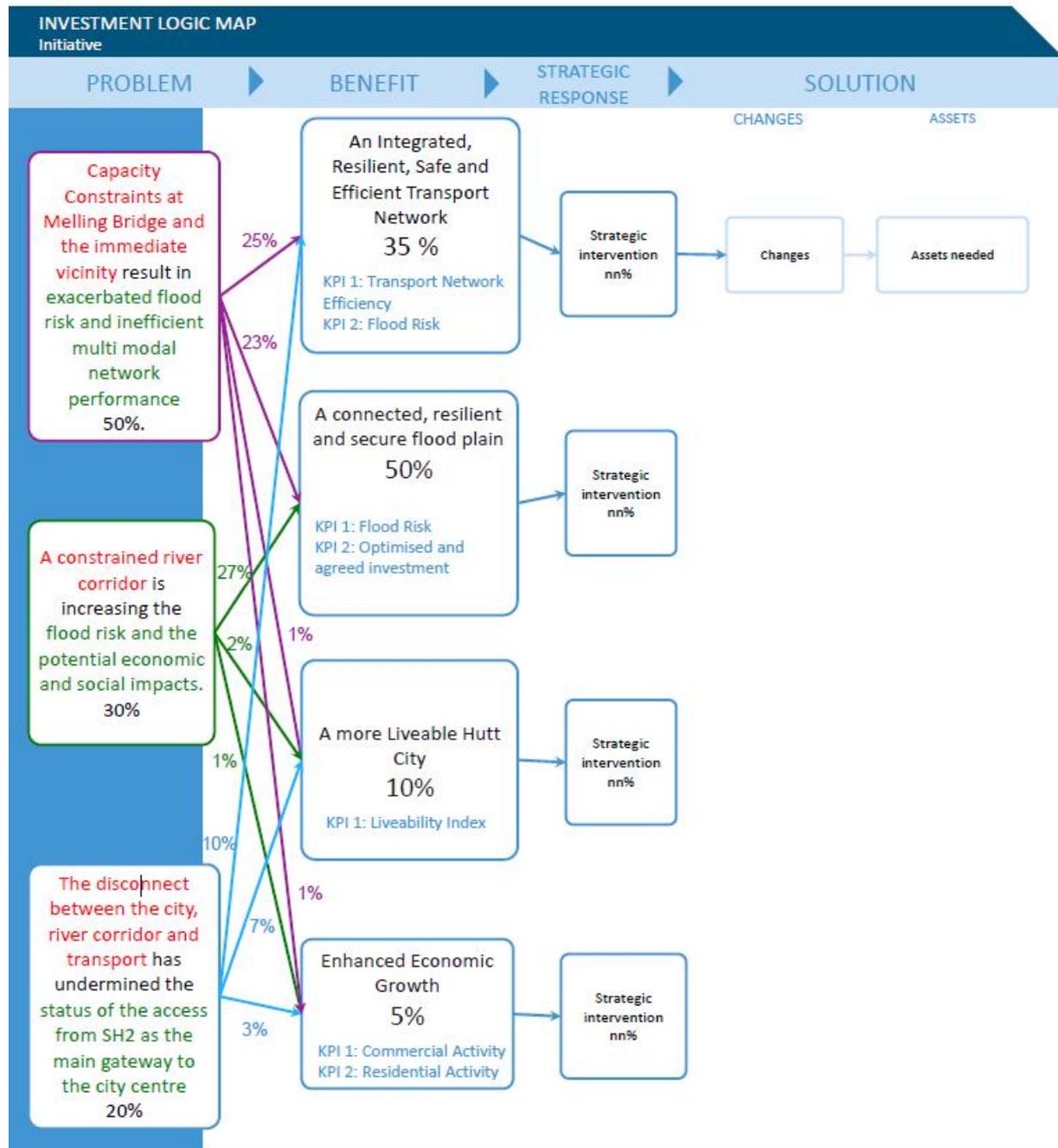
The development of the programme business case may also raise expectations of immediate action. The likely timeframe for this programme is over twenty years, but short term actions need to have the certainty of a commitment to the longer term actions.

Risks will be monitored and actions agreed through the joint Management Board.

# Appendix A - Investment Logic Map

## Intervention name; "Accessing a more resilient Hutt City"

Sub title; "Improving the resilience of the Melling Bridge"



Investor: GWRC / HCC / NZTA  
Facilitator: Mark Edwards  
Accredited Facilitator: No

Version no: <0.1>  
Initial Workshop: <09/07/2014>  
Last modified by: <mark edwards 10/07/2014 >  
Template version: 5.0



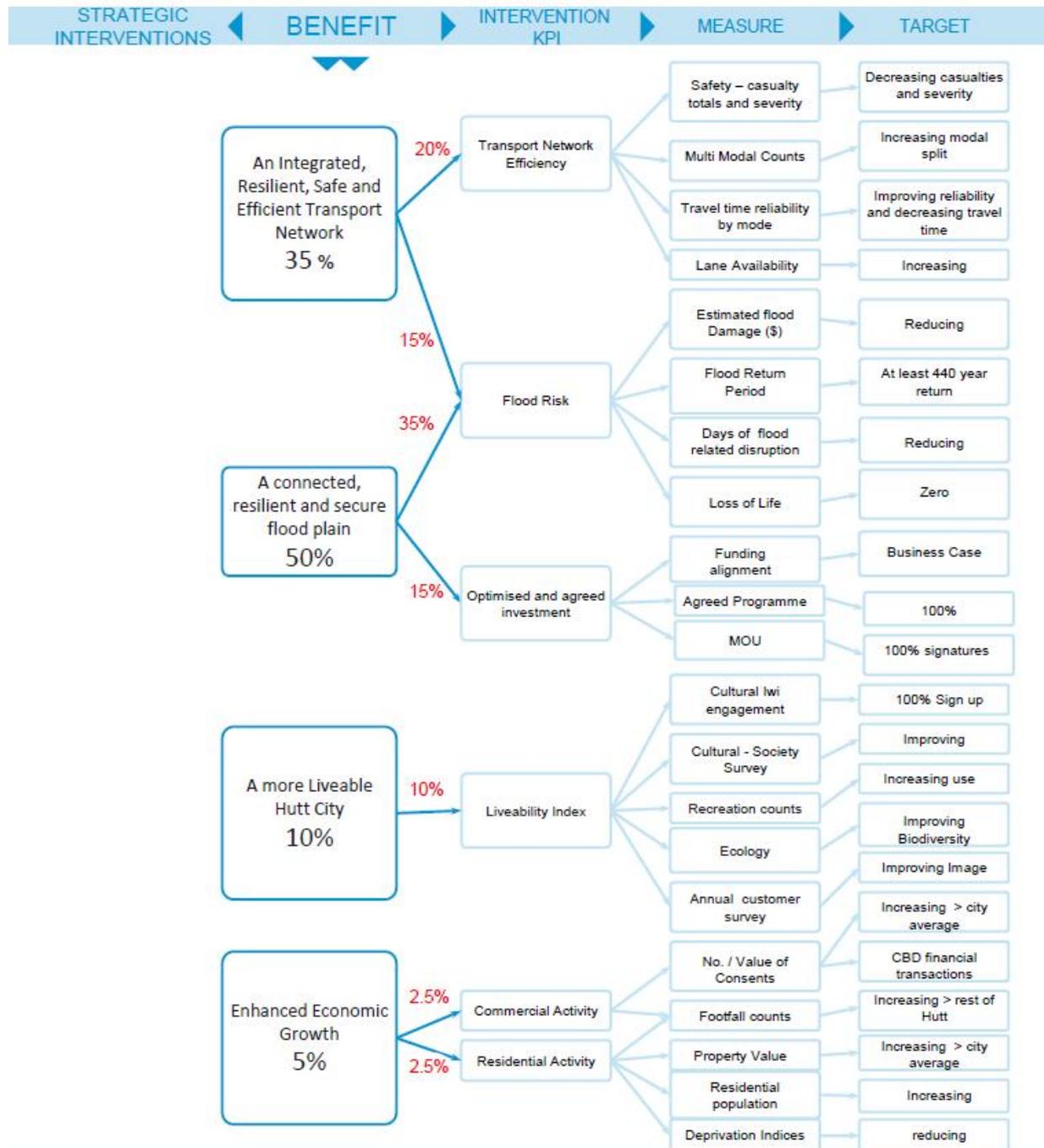
# Appendix B – Benefits Map

Benefit Management Plan  
Benefit Map

Intervention name; “Accessing a more resilient Hutt City”

Investor: Stakeholders GWRC / HCC / NZTA  
Facilitator: Mark Edwards  
Initial Workshop: 07/08/2014  
Version no: 0.1  
Last modified by: Mark Edwards

Sub title; “Improving the resilience of the Melling Bridge”



Template version: 4.0



## Appendix C – Supporting Evidence

### History of the Hutt River Area

Early residents such as the Ngai Tara people called the Hutt River Te Awakairangi, 'the watercourse of greatest value'. Flooding impeded Lower Hutt's early development, and the great earthquake of 1855 sent a tsunami up the river. Three years later, a severe flood drowned nine people at Taita. Another big flood in 1893 prompted the building of stop banks.

Once the river was contained through the construction of stop banks and channel modifications, Hutt City began to grow. It is now home to over 100,000 people, along with industrial, retail and commercial buildings and infrastructure.

The Melling Bridge spans the Hutt River and is the main access point from SH2 into Hutt City. Flooding of the Hutt River is a recurring problem with twelve major flood events from 1855 to 2005, as listed in Appendix C. Minor flooding of Block Road (a key link in the road network near the bridge) occurs two to three times a year.

**Table 8: Timeline of Known Major Hutt Valley Floods**

Year	Description
1855	The river rises higher than ever seen before, destroying the third Hutt bridge.
1858	Nine people die in Taita after a massive flood bursts the river's banks.
1878	Two big floods sweep the valley, inundating the entire floodplain.
1893	A large flood swamps some Petone properties to more than a metre.
1898	The largest recorded flood covers the valley floor, rising 90cm in 30 minutes. A second flood prompts building of first major stopbanks.
1931	A flood threatens Lower Hutt city as the river rises 5.2m. Manor Park Bridge and Haywards suspension bridge swept away.
1939	A devastating deluge covers hundreds of acres. The entire valley from Silverstream to the Upper Hutt basin is flooded wall-to-wall.
1976	Flooding isolates Petone and leads to further reviews of the flood protection system.
1998	Two floods within a week of each other cause extensive riverbank damage but no breaches recorded.
2000	Like 1998, two floods strike within a week of each other - again the system copes well.
2004	The Waiwhetu Stream floods causing an estimated \$200m in damage.
2005	Water floods 10 Lower Hutt homes and causes severe erosion on golf courses.

Source: <http://www.stuff.co.nz/dominion-post/news/hutt-valley/7872436/Plan-now-for-future-floods-urge-scientists>  
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## Appendix D – Detailed Transport Assessment Profile Analysis (for network optimisation)

### Strategic Fit

This strategic fit assessment considers how the opportunity to improve SH2 at Melling and associated local roads aligns with the NZ Transport Agency's strategic investment direction. For the purposes of the Strategic Fit assessment the intersection improvements are in the activity class '*New and improved infrastructure for state highways*' and NZ Transport Agency work category 324: Road Improvements.

This work category provides for:

- Improvements to or upgrading of existing roads within the existing or widened road reserve; and
- Deviations onto a new road reserve, where the original road is closed, including any associated new road structures.

To be assessed as **High** under the activity class '*New and improved infrastructure for state highways*' the project must meet one or more of the following criteria:

- Be a Road of National Significance (RoNS);
- Offer a nationally significant contribution to economic growth and productivity for national strategic state highways identified by the State Highway Classification System through significant improvements in one or more of:
  - Journey time reliability;
  - Easing of severe congestion in major urban centres;
  - More efficient freight supply chains; and / or
  - A secure and resilient transport network.
- Have the potential to significantly reduce the actual crash risk involving deaths and serious injuries in accordance with Safer Journeys strategy:
  - On a high-risk rural road;
  - At a high-risk urban intersection;
  - On a high-risk motorcycle route; and / or
  - A Safe System demonstration project.

Table 9 on the following page outlines the intersection improvements strategic fit assessment.

**Table 9: Strategic Fit Assessment – High Criteria**

Criteria	Assessment	Reference
Roads of National Significance (RONS)	Based on the current RONS, the section of SH2 at Melling does not fall under this category.	List of Road of National Significance (RONS) <a href="http://www.NZ.TransportAgency.govt.nz/network/rons/index.html#rons">http://www.NZ.TransportAgency.govt.nz/network/rons/index.html#rons</a>
Potential contribution to nationally significant economic growth and productivity on national strategic state highways	<p>The Hutt Corridor Plan states that <i>“The strategic transport network through the Hutt Valley has come under significant pressure due to increasing demands over past decades, and this is expected to continue with further increases in freight volumes and new land development over coming decades. There are particular sections of the network experiencing some serious pressures and issues as a result”</i>.</p> <p>One of the key areas of the corridor under pressure is Melling which is identified in the Hutt Corridor Plan as a ‘Strategic Road Network Project’ with safety and congestion issues the key drivers.</p> <p>The section of SH2 at Melling is classified as a national strategic state highway in the criteria and thresholds for the classification tables 1 and 2 which will form part of the State Highway Network Strategy.</p> <p>Contribution to significant improvements in <b>one or more</b> of:</p> <ul style="list-style-type: none"> <li>• Journey time reliability – <b>YES</b></li> </ul> <p>Intersection improvements and redirected Melling Link right turn to SH2 northbound traffic will allow SH2 to operate more efficiently reducing the stop delay and congestion improving trip reliability.</p> <ul style="list-style-type: none"> <li>• Easing of severe congestion in major urban areas – <b>PARTIAL</b></li> </ul> <p>The project will ease severe congestion on SH2 and Melling link; however, as this is not in a ‘major urban area’ there is only a partial yes.</p> <ul style="list-style-type: none"> <li>• Relieving capacity constraints – <b>YES</b></li> </ul> <p>Signalising the intersections of Melling Link at Rutherford Street and at High Street will allow a coordinated flow of traffic off SH2 into the HCC CBD facilitated by a widened bridge abutment on the southern side of Melling Bridge. Additionally, Block Road widening is proposed to facilitate increased traffic volumes re-directed from Melling Bridge.</p> <ul style="list-style-type: none"> <li>• More efficient freight supply chains – <b>YES</b></li> </ul> <p>Improvements to the operation of SH2 at Melling intersection through re-directing traffic around Block Road will allow signal co-ordination to facilitate the movements of both SH2 northbound right turn onto Melling Bridge and northbound right turn onto SH2 to operate concurrently.</p> <ul style="list-style-type: none"> <li>• A secure and resilient transport network – <b>YES</b></li> </ul> <p>The addition of a flood wall on Block Road aims to provide improved flood resilience during regular low-level flood events.</p>	<p>Greater Wellington Regional Council – Hutt Corridor Plan 2011 <a href="http://www.gw.govt.nz/assets/Transport/Regional-transport/Hutt-Corridor/HuttCorridorPlan2011.PDF">http://www.gw.govt.nz/assets/Transport/Regional-transport/Hutt-Corridor/HuttCorridorPlan2011.PDF</a></p> <p>NZ Transport Agency state highway classification criteria and thresholds tables 1 and 2 (Which will form the State Highway Network Strategy, currently in development): <a href="http://www.NZ.TransportAgency.govt.nz/planning/process/doc/criteria-and-thresholds.pdf">http://www.NZ.TransportAgency.govt.nz/planning/process/doc/criteria-and-thresholds.pdf</a></p>
Potential reduction in actual crash risk in accordance with Safer	<p>The National Road Safety Committee’s (NRSC), Safer Journeys road safety strategy 2010–2020 recognises that to achieve a safe system we need to achieve:</p> <ul style="list-style-type: none"> <li>• Safe roads and roadsides that are predictable, forgiving of mistakes, and encourage safe user</li> </ul>	Safer Journeys – road safety strategy 2010–2020 <a href="http://www.saferjourneys.govt.nz/">http://www.saferjourneys.govt.nz/</a>

Criteria	Assessment	Reference
Journeys strategy	<p>behaviour;</p> <ul style="list-style-type: none"> <li>• Safe speeds that suit the function and level of safety of the road, with road users understanding and complying with speed limits and driving to the conditions;</li> <li>• Safe vehicles – that prevent crashes and protect road users, including pedestrians and cyclists, in the event of a crash; and</li> <li>• Safe road use, ensuring road users are competent, alert, unimpaired, comply with road rules, choose safer vehicles, take steps to improve safety and demand safety improvements.</li> </ul> <p>Of the above system approaches, intersection improvements on SH2 at Melling support and encourage safe roads. The current SH2 / Melling Link intersection is a high-risk urban intersection. By improving intersection efficiency and reduced congestion, exposure for traffic connecting to the local road network from high speed state highway traffic is reduced. This has the potential to significantly reduce the crash risk on SH2 where there is a high record of rear-end crashes. Over 50% of crashes at on SH2 are rear end / obstruction type crashes. This is followed by overtaking / lane change crashes and crossing / turning crashes. Improving the existing congestion experienced on SH2 at Melling and the surrounding network is expected to improve the safety and operation of SH2 at Melling.</p>	NZ Transport Agency Crash Analysis System (CAS)

The overall assessment rating for 'Strategic Fit' is **High**.

In addition to this assessment it is considered this programme offers the potential for significant contribution to LTMA, GPS and Hutt Corridor Plan objectives as discussed in the following section.

## Fit with local, regional and national plans and policy

Table 10 summarises the potential of this investment to contribute to plan and policy objectives:

- Land Transport Management Act 2003 (LTMA);
- Government Policy Statement 2012/13 – 2021/22 (GPS); and the
- Hutt Corridor Plan (2011) by Greater Wellington Regional Council

**Table 10 Summary of key policy objectives**

Source	Key objectives	Potential contribution
LTMA	<p><b>Assists economic development</b></p> <p>In the One Network Road Classification (ONRC), SH2 at Melling has the highest classification: <i>'National High Volume'</i>. This classifies SH2 at Melling as a road as making a large contribution to the social and economic wellbeing of New Zealand by connecting major population centres, major ports or international airports with high volumes of heavy commercial vehicles or general traffic. Improvements to the operation of SH2 and surrounding local road network are expected to have a positive impact on the efficiency of SH2 thereby assisting economic development.</p>	✓
	<p><b>Assists safety and personal security</b></p> <p>Investigation into the NZ Transport Agency Crash Analysis System (CAS) indicated that over 50% of crashes at the SH2 / Melling Link intersection are rear end / obstruction type crashes. This is followed by overtaking / lane change crashes and crossing / turning crashes. Improvements to SH2 at Melling are predicted to reduce congestion and lane blocking from the over-capacity SH2 northbound right turn lane improving efficiency through this section of SH2 contributing to an expected reduction in crashes.</p>	✓
	<p><b>Improves access and mobility</b></p> <p>The package of improvements will improve access and mobility for a number of modes of transport. Intersection improvements and re-directed traffic is expected to reduce congestion for general traffic on SH2 and the surrounding local road network. Additionally, signalling the Melling Link / Rutherford Street and Melling Link / High Street intersection will provide safer crossing locations for pedestrians and improve safety for cyclists over the current roundabout layouts.</p>	✓
	<p><b>Protects and promotes public health</b></p> <p>Improved facilities for pedestrians and cyclists on the local road network will help promote more active modes of transport.</p>	✓
	<p><b>Ensures environmental sustainability</b></p> <p>A key objective for the SH2 at Melling intersection improvements is to utilise and maximise use of existing network infrastructure through optimising existing layouts and providing improved pedestrian and cycle facilities where possible.</p>	✓
GPS 2012	<p>Improvements in the provision of infrastructure and services that enhance transport efficiency and lower the cost of transportation through:</p>	
	<p><b>Improvements in journey time reliability</b></p> <p>Intersection improvements and redirected Melling Link right turn to SH2 northbound traffic will allow SH2 to operate more efficiently reducing the stop delay and congestion improving trip reliability along SH2.</p>	✓
	<p><b>Easing of severe congestion</b></p> <p>Intersection improvements and re-directed traffic are expected to reduce congestion for traffic on SH2 and the surrounding local road network through more efficient operation of the SH2/Melling Link intersection.</p>	✓
	<p><b>More efficient freight supply chains</b></p> <p>By improving the operation and efficiency of SH2/Melling Link and SH2/Block Road intersections on SH2, reduced congestion and improved journey time reliability</p>	✓

Source	Key objectives	Potential contribution
	during peak periods will provide for a more efficient freight route along SH2 in the vicinity of Melling.	
	<b>Better use of existing transport capacity</b> The underlying principle applied during development of the preferred option was to maximise use of existing transport capacity. Separating the two heavy right turn movements at SH2/Melling Link will provide more efficient operation while using predominantly existing transport infrastructure. Where additional infrastructure is provided this is intended to tie in with a long term grade separated solution for SH2 at Melling.	✓
	<b>Better access to markets, employment and areas contributing to economic growth</b> Through improving the operation of the heavily congested and over capacity northbound right turn from SH2 onto Melling Link there will improve access to the Hutt CBD, a central economic area in the Hutt Valley, during peak periods.	✓
	<b>Reductions in deaths and serious injuries as a result of road crashes</b> Fortunately in the SH2 at Melling vicinity there have been no recorded fatalities in the 5-year period investigated. However, there were a noticeable number of rear-end/obstruction type crashes on SH2. With improvements to the operation of the SH2 northbound right turn it is predicted there will be a reduced queue length reducing over-flow into the SH2 northbound through lane. This has the potential to reduce the likelihood of serious injuries from having stationary vehicles queued in a high speed environment on SH2.	✓
	<b>More transport choices, particularly for those with limited access to a car</b> The intersection improvements package of works incorporates signalling two roundabouts in the Hutt CBD network providing improved pedestrian facilities and cycle safety over roundabouts.	✓
	<b>A secure and resilient transport network</b> The better performance of SH2 at Melling will have a positive impact on the resilience of the nationally strategic SH2 corridor through the Hutt Valley. With the addition of a flood wall on Block Road, there is also more flood resilience for Block Road reduction the likelihood of closure during flood events.	✓
	<b>Reductions in adverse environmental effects from land transport</b> Reducing severe congestion experienced on SH2 at Melling during peak periods has the potential to decrease vehicle emissions. Traffic also spends less time in stop-start congested conditions combined with an expected reduction in network travel times through the area.	✓
	<b>Contributions to positive health outcomes</b> Improved facilities for pedestrians and cyclists on the local road network will help promote more active modes of transport.	✓
HCP 2011	Identifies a Melling package as a key strategic road network project	✓

### Effectiveness

The effectiveness assessment looks to determine how effectively the proposed solution achieves the potential outcomes identified in the strategic fit assessment. In particular, the effectiveness assessment looks to see how the LTMA's purpose and objectives are achieved.

Table 11 below outlines the effectiveness assessment for the intersection improvements package of works.

**Table 11: Effectiveness Assessment**

Rating	Criteria	Assessment	Achieved
Low	Evidence is provided to demonstrate that the activity or combination of activities delivers on <i>each</i> of:		
	The potential impact or outcome identified in the 'strategic fit' assessment	Traffic network modelling using Paramics tested the preferred option and predicted improved network journey times by relieving capacity constraints on SH2 at Melling. With SH2 a key freight route in the Wellington regions this supports improving the efficiency of freight supply chains as well.	✓
	An agreed level of service	<p>The NZ Transport Agency 'One Network Road Classification' (ONRC) classifies roads into categories based on their function in the national network and defines the fit for purpose customer levels of service (CLoS) outcomes. In the ONRC, SH2 at Melling has the highest classification: <i>'National High Volume'</i>. These are roads that make the largest contribution to the social and economic wellbeing of New Zealand by connecting major population centres, major ports or international airports and have high volumes of heavy commercial vehicles or general traffic.</p> <p>At Melling congestion is currently gridlocking the operation of SH2. Intersection improvements in combination with local road intersection upgrades are expected to noticeably improve the level of service for state highway traffic during the peak periods.</p> <p>The interim improvements package aims to improve level of service on SH2 while providing the flexibility for integration into a long term grade separated solution in the future.</p>	✓
	The purpose and objectives of the LTMA	Yes, Refer to Table 10	✓
	Has considered: <ul style="list-style-type: none"> <li>• All relevant problems, issues and opportunities</li> <li>• All appropriate alternatives and options</li> <li>• Opportunities for collaboration</li> <li>• Any adverse effects or impacts</li> </ul>	<p>The section of SH2 at Melling has been thoroughly investigated with issues and constraints identified in prior studies considered as part of the intersection improvements investigation. Options investigated have covered grade separation of SH2 and the local road network as well as interim intersection improvements. Recognising the high cost and constraints associated with grade separation, the interim improvements has been designed with the intention that it can be integrated with a grade separated solution.</p> <p>With investigations into flood resilience improvements by GWRC and Hutt CBD town centre improvements by HCC, the opportunity to work collaboratively has been embraced with a working group established to identify cross-overs between projects and ensure compatibility between options investigated. Specifically, the SH2 at Melling intersection improvements solution incorporates the upgrade of three intersections in the HCC road network. These have been included on the agreement that the wider impacts on the local road network, identified during the traffic network modelling, will be investigated by HCC. This collaborative approach allows integration between the investigations to ensure solutions for the wider local road network address any potential impacts as a result of SH2 at Melling improvements. Furthermore, collaboration between NZ Transport Agency, HCC and GWRC has allowed transparency between each stakeholder's strategic objectives, goals and visions working in a 'one network' approach.</p>	✓
	Is an <b>affordable</b>	The economic assessment undertaken demonstrates that even	✓

Rating	Criteria	Assessment	Achieved
	solution with a funding plan	<p>with a conservative approach excluding weekend and accident cost benefits there is an economically viable solution. The RLTS (2012 – 2015), also includes SH2 at Melling as a committed project under investigation.</p> <p>From the preferred option developed for SH2 at Melling, the intersection improvements are valid for improvements to the local road network in addition to supporting the interests of SH2 through Melling.</p> <p>Between NZ Transport Agency and HCC there is agreement that the wider impacts on the local road network as a result of the SH2 at Melling intersection improvements will be investigated by HCC.</p>	
	Avoids duplication of activities	The intersection improvements solution is designed to be compatible with a future grade separated solution separating SH2 and the local road network to improve both safety and efficiency. This project combines interim flood resilience improvements on Block Road with local road and SH2 improvements.	✓
	The scale of the proposed solution is appropriate to the <b>potential</b> impact or outcome in the <b>strategic fit assessment</b>	Transportation issues on SH2 in the vicinity of Melling as well as on the local road network have long been a subject of discussion. The solution incorporates three intersection improvements on the local road network as well as SH2 improvements to provide a predicted improvement in journey times and reduction in congestion. The improvements provide for a collaborative effort to manage the traffic effectively while maximising use of the existing network within the constraints of the area.	✓
<b>Medium</b>	Evidence is provided to demonstrate that the activity or combination of activities delivers on <b>each</b> of:		
	All the low effectiveness criteria	Yes, refer to the low effectiveness assessment above.	✓
	Is part of a <b>NZ Transport Agency supported strategy, endorsed package, plan or macro scope</b>	The SH2 at Melling interim intersection improvements sits within the framework of a number of NZ Transport Agency strategies including the RLTP and State Highway 2 Hutt Corridor strategic study. Improvements to SH2 at Melling are considered important and it is acknowledged that there is public interest in seeing a solution that addresses the operational issues present. Interim improvements form part of a long term grade separated solution whilst maximising use of the existing network infrastructure.	✓
	Is <b>significantly effective</b> (delivers a measurable impact or outcome) in achieving the <b>potential</b> impact or outcome identified in the <b>'strategic fit' assessment</b>	The current operation of SH2 at Melling results in extensive congestion on both SH2 and the local road network due to capacity constraints. Investigations for the preferred option predict improved network journey times by relieving capacity constraints on SH2 at Melling. There is also a predicted significant reduction in congestion on SH2. With SH2 a key freight route in the Wellington regions this supports improving the efficiency of freight supply chains as well.	✓
	Provides a long term solution with <b>enduring benefits</b> appropriate to the scale of the solution	The improvements package incorporates upgrades to local road network intersections considered necessary to improve the level of service in the Hutt CBD while the wider package aims to provide a solution that provides immediate congestion relief while allowing for tie in to the long term grade separated solution. Hence, the intersection improvements package is considered part of the final solution for SH2 at Melling.	✓
	Provides a solution that	SH2 at Melling is considered a 'gateway' to the Hutt CBD for	✓

Rating	Criteria	Assessment	Achieved
	responds to land use strategies and implementation plans, where appropriate to the activity	both local and regional traffic. Improvements in the operation of SH2 at Melling and surrounding local road network support this vision for the Hutt CBD.	
	Provides a solution that makes a contribution to multiple <b>GPS impacts</b> , where appropriate to the activity	Yes, Refer to Table 10	✓
<b>High</b>	Evidence is provided to demonstrate that the activity or combination of activities delivers on <b>each</b> of:		
	Covers all of the low and medium effectiveness criteria	Yes, refer to the medium effectiveness assessment above.	✓
	Is a key component of an <b>NZ Transport Agency supported strategy, endorsed package, programme or plan</b>	The SH2 at Melling interim intersection improvements sits within the framework of a number of NZ Transport Agency strategies including the RLTP and State Highway 2 Hutt Corridor strategic study. Improvements to SH2 at Melling are considered important and it is acknowledged that there is public interest in seeing a solution that addresses the operational issues present. Interim improvements form part of a long term grade separated solution whilst maximising use of the existing network infrastructure.	✓
	Is part of a whole of network approach	The intersection improvements investigations have been undertaken in a 'one network' approach with contribution and input from NZ Transport Agency, GWRC and HCC. The improvements package incorporates both state highway and local road network improvements to form an overall solution to the severe congestion, safety and accessibility issues on SH2 at Melling.	✓
	Improves integration within and between transport modes, where appropriate to the activity	The option aims to improve general and freight traffic movements while catering for improvements to pedestrians and cyclists on the local road network. Facilities have been provided within the option to cater for conflicting transport modes such as a pedestrian crossing between the car park and train station and providing for cycle boxes as local road intersections.	✓
	Provides a solution that successfully integrates land transport, land use, other infrastructure and activities, where appropriate to the activity	As discussed in the medium assessment, SH2 at Melling is considered a 'gateway' to the Hutt CBD for both local and regional traffic. Improvements in the operation of SH2 at Melling and surrounding local road network support this vision for the Hutt CBD improving connectivity between the nationally strategic SH2 and the Hutt CBD while maximising use of existing transport capacity.	✓
	Supports networks from a national perspective, where appropriate to the	SH2 in the Wellington region is a nationally strategic route considered important making a large contribution to the social and economic wellbeing of New Zealand by connecting major population centres, major ports or international airports with high volumes of heavy commercial vehicles or general traffic.	✓

Rating	Criteria	Assessment	Achieved
	activity	Improvements to the operation of SH2 and surrounding local road network are expected to have a positive impact on the efficiency of SH2.	
	Provides a solution that significantly contributes to multiple GPS impacts, where appropriate to the activity	Yes, Refer to Table 10	✓
	Is <b>optimised</b> against multiple transport outcomes and objectives	The option has been developed and investigated in a collaborative approach with NZ Transport Agency, GWRC and HCC identifying common strategies, goals and visions. The overarching ideal being an optimised package of works that optimises use of existing infrastructure which provides an interim solution. This solution being compatible with a long term grade separated SH2 as well as incorporating both local and state highway improvements to produce a 'one network' solution.	✓

## Appendix E – Evidence Base Bibliography

### River corridor

Wellington Regional Council (2001). *Hutt River Floodplain Management Plan*.

Greater Wellington Regional Council (2013). *Hutt River Floodplain Management Plan: City Centre Section Scoping Report*.

Greater Wellington Regional Council (2014). *Hutt River City Centre Upgrade Project: River Corridor Options Report (Edition 2)*.

### Transport

Beca (2010). *SH2 Melling to Haywards Upgrade: Investigations Scoping Options Report*.

GHD (2013). *Melling Optimisation Study: Final Project Feasibility Report*.

### Urban design

Works Consultancy Services Ltd (1994). *Approaches to the Hutt City: A strategy for accentuating main entrance routes*.

Derkek Kemp Prosperous Places Pty Ltd (2009). *Hutt CBD Economic and Employment Report*.

Hutt City Council (2009). *Hutt CBD Making Places*.

## Appendix E – Further References

*Hutt City Council Cycling Strategy 2006*

*Hutt City Council Walking Strategy 2006*

Hutt City Council (2008). *Vision CBD 2030*.

*Procurement Strategy for Bus and Ferry Services 2008*

*Regional Cycling Plan 2008*

*Regional Walking Plan 2008*

*Hutt City Council Draft Urban Growth Strategy*

*Hutt City Council Environmental Sustainability Strategy 2009 – 2014*

*Hutt City Council Petone Vision*

*Regional Road Safety Plan 2009*

*Regional Travel Demand Management Plan 2009*

Greater Wellington Regional Council (2010). *Transport Procurement Strategy*.

*Safer Journeys 2010 – 2020*

*Wellington Regional Land Transport Strategy 2010 – 2040*

*Wellington Regional Rail Plan 2010 – 2035*

*Connecting New Zealand 2011 – A summary of the government’s policy direction for transport*

*Hutt Corridor Plan 2011*

*National Infrastructure Plan 2011*

*Regional Freight Plan 2011*

*Wellington Regional Public Transport Plan 2011 – 2021*

Greater Wellington Regional Council *Long-Term Plan 2012 – 2022*

*Hutt City Long Term Plan 2012 – 2022*

*Regional Land Transport Programme 2012 – 2015*

*Draft Hutt City strategic objectives into Road User Hierarchy principles (2013)*

*Hutt City Annual Plan 2013 – 2014*

*NZTA Statement of Intent 2013 – 2016*

Regional Policy Statement for the Wellington region 2013

*Government Policy Statement on Land Transport Funding 2012/13–2021/22 (July 2011)*

NZTA (December 2012). *SH2 Melling Intersections Optimisation Study: Update and Discussion on Way Forward Presentation*.

GHD (August 2013). *Draft Proof of Concept Report*.

GHD (September 2013). *SH2 at Melling Grade Separated Junction: Proof of Concept Design Presentation*.

Hutt Valley Flood Management Subcommittee (September 2013). *Hutt River: City Centre Upgrade Project Integrated Concept Design*.

GHD (January 2014). *Bridge concept options and potential implications*.

GHD (May 2014). *Melling Bridge Options - Preliminary Traffic Assessment*.

GHD (May 2014). *Melling Options Testing Presentation*.

GHD (July 2014). *Draft SH2 at Melling Intersection Improvements Report*.

GHD (July 2014). *Melling Interchange Interim Upgrade Draft Economics*.