State Highway 58 strategic study

A long-term strategic plan for State Highway 58 to 2029

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

State Highway 58
Strategic Study

The State Highway 58 Strategic Study is a technical report, outlining potential long-term transport solutions for State highway 58. The public release of the document means it is now available as an input into the Hutt and Western Corridor Plan reviews, which are scheduled to be undertaken by Greater Wellington Regional Council over the coming year.

As a technical report, the study has not been presented to the NZTA Board for its support, endorsement or approval. Accordingly, publication of the report does not constitute any form of commitment by NZTA to the recommendations contained in this report.

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State Highway 58
Strategic Study

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Executive Summary

The NZTA has developed a long-term strategic plan along State Highway 58 (SH58) over the 20-year period 2009 to 2029. This SH58 Strategic Study relates to the entire 15.1 km length of SH58, from the junction with SH2 at Manor Park in the Hutt Valley, to the junction with SH1 at Paremata. SH58 is a regional highway that joins the Hutt Valley with Porirua and the Kapiti Coast. It provides for travel between these three areas whilst also providing access to local communities such as Whitby and Pauatahanui. SH58 is also used by heavy vehicle traffic travelling between the industrial port area of Gracefield/Seaview and destinations to the north via SH1.

The current highway predominantly provides a single two-way carriageway with roundabouts and priority controlled intersections. The width of the highway is constrained in many locations due to the terrain. Traffic volumes vary from 13,800 vehicles per day (vpd) west of SH2 to 9,200 vpd east of James Cook Drive at the end of the Pauatahinui Inlet, and to 16,700 vpd east of the Paremata Roundabout. The highway is predominantly rural from SH2 to Pauatahanui, with the urban density increasing from Pauatahanui to SH1 at Paremata.

Increasing traffic volumes will place some sections of the highway under pressure within the 20-year period, depending on whether or not Transmission Gully and Grenada to Gracefield projects are completed. The current strategy assumes the Grenada to Gracefield projects are constructed within the 10 year period and Transmission Gully soon after the ten year period.

The Grenada to Gracefield projects will result in a decrease in traffic volumes on SH58, as traffic transfers to the new east-west route. However, when Transmission Gully is constructed traffic volumes on SH58 increase again, but these will only be greater than existing volumes east of the new gully route as alterative routes will be available into Porirua.

Analysis of the crash data for the 5-year period from 2004 to 2008 indicates that there are currently an average of about 16 injury crashes and 52 total crashes per year and crash costs of about $5.3 million per annum along the SH58 Corridor study length. Accordingly, there is scope for improving the safety along this highway.

Based on the background information, the capacity analysis and the crash statistics, a long-term strategic plan has been developed for SH58. This can be summarised as follows:

- The strategy assumes the Grenada to Gracefield projects will proceed within 10 years and Transmission Gully will be complete soon after the 10 year period.
- Based on these assumptions, SH58 will be retained as a two-lane two-way highway with the current passing lanes.
- All intersections will be at-grade, with the exception of the intersections with SH2 and Transmission Gully, which will both be grade separated.
- The section between Manor Park and Moonshine Road will be managed as an 80 – 100km/h rural environment with a median barrier (and some provision for turning movements) considered in the long term.
- The section between Moonshine Road and Pauatahanui will also be managed as an 80-100km/h rural environment with minor safety upgrades in the short term. Long term, this section could become a peri-urban environment and roundabouts for safety will be considered at the Moonshine Road and Flightys Road / Murphys Road intersections in conjunction with reducing the speed limit.

- The section between Pauatahanui and Postgate Drive will be managed as a 70km/h peri-urban section and the section from Postgate Drive to Paremata will be managed as a 50km/h urban highway with controlled access in the short term. The long term status of SH58 from Transmission Gully to Paremata will be determined as part of the Transmission Gully project.
- Minor safety works will continue to be undertaken to address specific crash issues that arise during the study period.

1 Introduction

The New Zealand Transport Agency (NZTA) is a Crown entity providing an integrated approach to transport planning, funding and delivery.

The NZTA has the statutory objective to undertake its functions (which include managing New Zealand's State highway system) in a way that contributes to an affordable, integrated, safe, responsive and sustainable land transport system, pursuant to the Land Transport Management Act 2003 (the LTMA), as amended by the Land Transport Management Amendment Act 2004 and the Land Transport Management Amendment Act 2008.

Accordingly, the NZTA has developed a long-term strategic plan to address significant issues along State Highway 58 (SH58) over the 20-year period 2009 to 2029. This SH58 Strategic Study relates to the entire 15.1 km length of SH58, from the junction with SH2 at Manor Park in the Hutt Valley, to the junction with SH1 at Paremata. The study length is illustrated (in red) in ***Figure 1***.

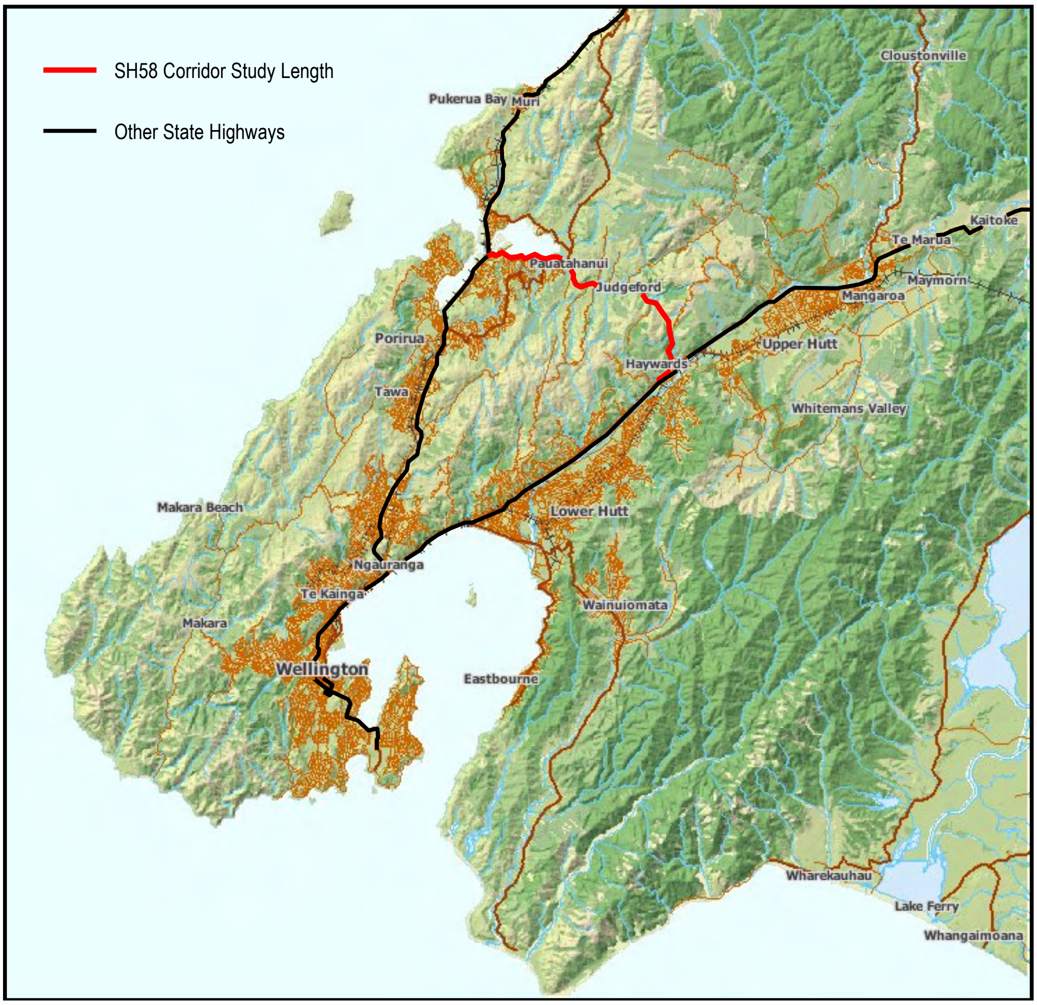


Figure 1: SH58 Corridor Study Length

(Map Source: Greater Wellington Regional Council Website)

1.1 Function of State Highway 58

SH58 is a regional highway that joins the Hutt Valley with Porirua and the Kapiti Coast. It provides for travel between these three areas whilst also providing access to local communities such as Whitby and Pauatahanui. SH58 is also used by heavy vehicle traffic travelling between the industrial port area of Gracefield/Seaview in the Hutt Valley and destinations to the north via SH1. Traffic volumes on SH58 vary from 13,800 vehicles per day (vpd) west of SH2 to 9,200 east of James Cook Drive at the end of the Pauatahanui Inlet, and to 16,700 east of the Paremata Roundabout on SH1. Heavy vehicle volumes vary along the route from 450vpd to 830vpd. This highway is also part of the Regional Strategic Cycling Network.

2 Strategic Context

2.1 Strategic Consistency

Under the enabling legislation the NZTA has five primary functions:

- Promoting an affordable, integrated, safe, responsive and sustainable land transport system.
- Managing the allocation of funding to transport activities.
- Planning, building, maintaining and operating the state highway network.
- Investigating and reviewing accidents and incidents involving accidents on land.
- Regulating and managing access to the land transport system.

Neither a specific mission nor strategic goals have yet been formulated for the newly established NZTA. Nevertheless five strategic priorities have been developed which represent the best prospects for the NZTA to advance the government's objectives for transport sector performance in the next three to five years. These are:

- Priority 1: Plan for and deliver corridors and roads of national significance
- Priority 2: Improve road safety
- Priority 3: Improve the efficiency of freight movements
- Priority 4: Improve the effectiveness of public transport
- Priority 5: Improve customer service and reduce compliance costs

The purpose of the land transport system is to move people and freight within New Zealand and to enable connections to the rest of the world. The New Zealand transport strategy 2008 outlines the objectives for the transport system as:

- ensuring environmental sustainability
- assisting economic development
- assisting safety and personal security
- improving access and mobility
- protecting and promoting public health.

The Government Policy Statement on Land Transport Funding (GPS) details the government's desired outcomes and funding priorities for the use of the National Land

Transport Fund. The GPS covers the impacts the government wishes to achieve from its investment in land transport, how it will achieve these impacts through funding certain activity classes, how much funding will be provided, and how this funding will be raised. The funding policies in the GPS reinforce the government's main priority of national economic growth and productivity.

This strategic plan for the SH58 Corridor is consistent with the New Zealand Transport Strategy, the GPS as well as NZTA's current Statement of Intent and National State Highway Strategy.

2.2 National State Highway Strategy

The National State Highway Strategy (NSHS) 2007 responded to the original New Zealand Transport Strategy (NZTS) as it related to the development of New Zealand's State highways. The NSHS set out how the former Transit would move towards and manage the State highway network as an integral part of a multi-modal transport system. It set out how the State highway network would support the Government's priority theme of economic transformation and the original NZTS objectives of improving access and mobility for all New Zealanders; ensuring the safety, security and health of New Zealanders; and improving the environmental sustainability of transport in New Zealand. In this way the NSHS provided a link between the NZTS and relevant legislation, the government funding allocated to State highways, and the detailed programme of works plans and policies.

The NSHS's proposed State highway 30-year concept is illustrated in ***Figure 2***. It should be noted that the NSHS has not yet been reviewed by the newly formed NZTA and therefore does not yet respond to recent changes in government strategy.

For Wellington, the NSHS states that:

> *'A range of strategies developed in partnership with the Wellington region's territorial local authorities and stakeholders is shaping an integrated highway concept. The Inner City Bypass will strengthen north-south links through the city. The Ngauranga to Wellington Airport Strategic Study will identify solutions to meet current and future land use, access and transport needs in and around the city. The Western Corridor Study, considering the links between Wellington and the Kapiti Coast, includes proposals for public transport, travel demand management and highway improvements such as the Transmission Gully Motorway and improved east-to-west connections. Strategic studies for SH2 and SH58 will provide a short-term programme of high priority projects within a longer-term strategic plan.'*

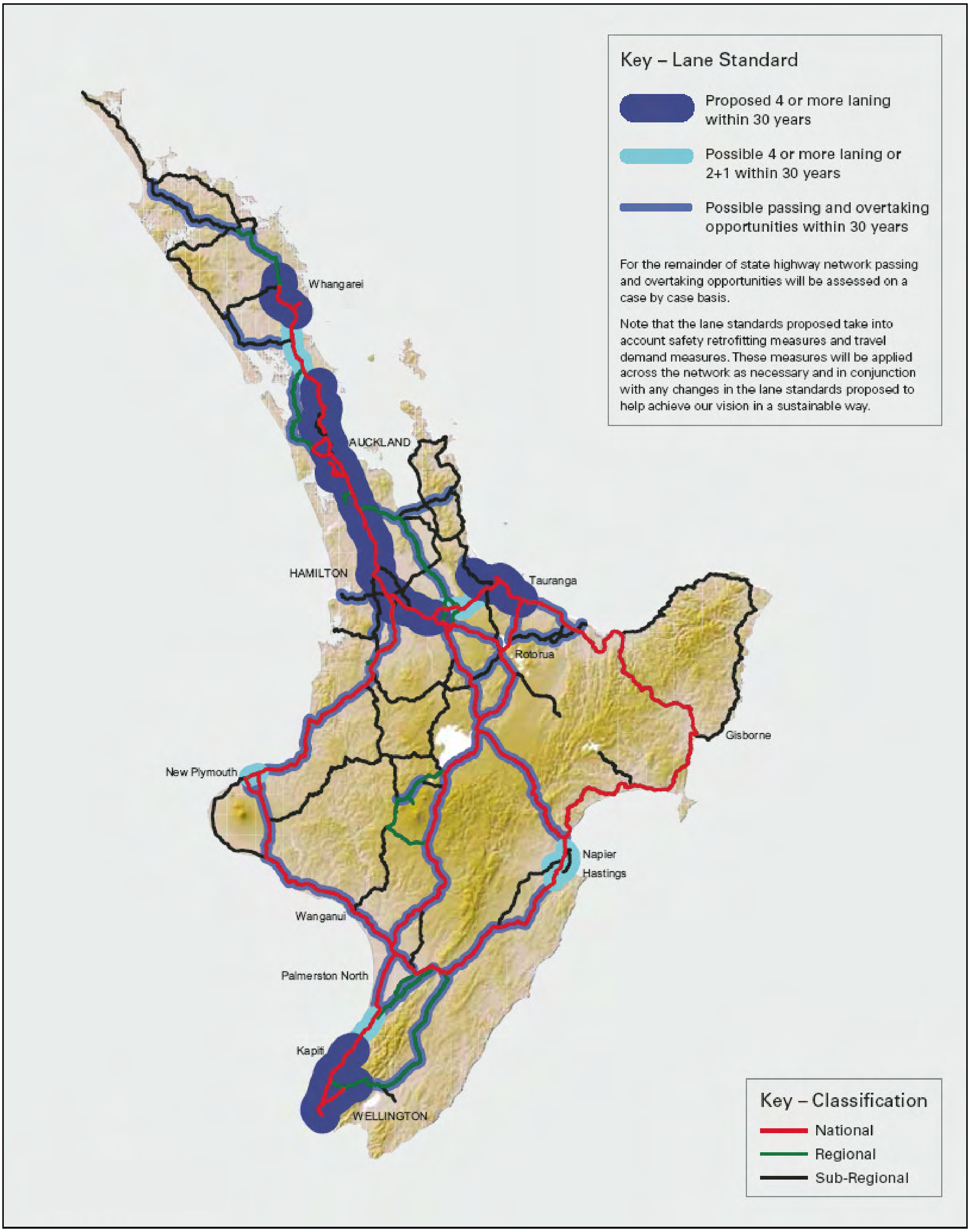


Figure 2: Proposed State Highway 30-year Concept

(Source: National State Highway Strategy, Figure 9)

2.3 Regional Planning Priorities

2.3.1 Wellington Regional Strategy

The Wellington Regional Strategy (WRS) has been jointly developed by the Greater Wellington Regional Council (Greater Wellington) and the territorial local authorities of the region. The WRS is intended to be a sustainable economic growth strategy, with an outlook to 2050. The WRS aims to make greater Wellington an 'internationally competitive' region – a region that offers the competitive package of a great lifestyle and job opportunities, supported by a strong economy. The WRS was adopted by Greater Wellington in 2007.

The three key focus areas of the WRS are:

- Investment in leadership and partnership,
- Investment in growing the regional economy, especially regional exports, *and*
- Investment in good regional 'form'.

The part of the WRS that is particularly relevant to the SH58 Strategic Study is the focus on 'investment in good regional form', within which the WRS lists two priority areas.

The first is 'a strong Wellington CBD and sub-regional centres'. The WRS notes that transport decisions may affect the ability of the Wellington CBD and sub-regional centres to be properly supported, but the converse point is equally true, that future development impacts on the operation and sustainability of the state highway network and the rest of the land transport system.

The second is 'change areas'. The WRS suggests that the region has the following eight 'change areas', which are said to be particularly important to the successful implementation of the strategy:

- Northern Waikanae edge,
- Pauatahanui,
- Grenada to Gracefield,
- Johnsonville to the airport – the growth spine,
- Paraparaumu town to Paraparaumu beach,
- Porirua to Linden,
- SH2 / SH58 Interchange to Upper Hutt City centre, *and*
- Waingawa, west of Masterton

Several of the 'change areas' will have direct and potentially significant impacts on the future demand for travel along SH58.

2.3.2 Wellington Regional Land Transport Strategy

The Wellington Regional Land Transport Strategy (RLTS) 2007 – 2016 was adopted in July 2007.

The RLTS records that its completion was delayed to allow for the completion of the Wellington Regional Strategy.

The vision of the Wellington Regional Land Transport Strategy 2007 - 2016 is:

> *'To deliver, through significant achievements in each period, an integrated land transport system that supports the region's people and prosperity in a way that is economically, environmentally and socially sustainable.'*

The RLTS seeks to address the following key issues and pressures faced by the region:

- Access to goods and services, employment and amenities,
- Transport related greenhouse gas emissions,
- Public transport capacity and mode share,
- Reliability of the transport network,
- Severe traffic congestion, particularly at peak times, *and*
- East-west connections between key transport corridors and regional centres.

The vision, objectives and outcomes of the draft RLTS are translated into the following action programmes for each transport mode:

- Road Safety Plan,
- Cycling Plan,
- Pedestrian Plan,
- Travel Demand Management (TDM) Strategy,
- Passenger Transport Plan, *and*
- Freight Plan.

In addition to these region-wide, mode-related action programmes, specific action plans are provided for each of the following four major transport corridors:

- Western Corridor – Otaki to Ngauranga Merge,
- Hutt Corridor – Upper Hutt to Ngauranga Merge,
- Wairarapa Corridor – Masterton to Upper Hutt, *and*
- Ngauranga to Wellington Airport Corridor.

The SH58 Corridor is referred to under both the Western Corridor Plan and the Hutt Corridor Plan in relation to the following projects:

- Design and construct SH2/SH58 grade separation
- Upgrade SH58 between Transmission Gully and SH2
- Review District Plan land use controls to align with the outcomes of the Wellington Regional Strategy, particularly in the vicinity of the junction of Transmission Gully and SH58
- Develop a corridor management plan for SH58 east of Pauatahanui consistent with the RLTS

2.4 Wellington Regional Land Transport Programme 2009-12

The Wellington Regional Land Transport Programme 2009-12 (RLTP) is a three year programme that contains all the land transport activities proposed to be undertaken throughout the region for the next 3 financial years (2009-12), indicative activities over the following 3 financial years, plus a 10 year financial forecast. The approved programme was released in June 2009.

The Regional Transport Committee adopted a prioritisaiton process to ensure the programme contributes to the region's desired outcomes. First-priority activities are required to maintain the existing level of service or are necessary to meet statutory obligations. Second-priority activities are relatively low cost studies, demand management activities and improvement works that are expected to help the region move quickly toward achieving RLTS outcomes. Third-priority activities are the high cost new works or services. Table 2.1 lists the proposed projects that are included in the Third-priority activities along the SH58 Corridor.

Table 2.1: 2009-12 RLTP and 10-Year Programme - Projects affecting SH58 Corridor

Project Name	Indicative Construction Timing
Proposed Large Projects:	
• SH2 / SH58 Grade-Separation construction	2009/10 to 2011/12
• SH58 Long-term Safety Upgrades	2013/14 to 2014/15
• Transmission Gully	2016+
• Grenada-Gracefield Western	2014/15+
• Grenada-Gracefield Eastern	2016/17+

+ Subject to consents being obtained and funding issues being resolved

2.5 Draft Wellington Regional ITS Strategy

The Wellington Regional ITS Strategy outlines how Intelligent Transport Systems (ITS) can contribute towards the objectives of the New Zealand Transport Strategy for the Wellington regional State highway network.

The strategy recommends expanding the current ITS infrastructure to cover the majority of the region over a 10 to 20 year timeframe.

In relation to the SH58 Corridor, the draft strategy suggests that ITS infrastructure be installed along the route, and at the intersections at either end within 5 years.

The ITS strategy also recommends that any improvement projects on the state highway network should include enabling works for ITS infrastructure where possible. This could include installing ducting, fibre pits, power supply upgrades or cabinets.

2.6 Towards Safer Highways

The NZTA Wellington Towards Safer Highways document identifies and documents existing road safety issues on the Wellington State Highway Network and provides an indicative prioritisation for future safety works programmes. This document is updated annually.

This document is used to identify safety issues on SH58 as they appear and assists in programming remedial measures to reduce the crash risk. Large capital works identified by this strategy are required to take the issues identified in the Towards Safer Highways document into consideration when developing the final design.

2.7 Summary of Strategic Context and Need for SH58 Strategic Study

The Wellington Regional Strategy (WRS) has direct and potentially significant implications for future demand for travel along SH58, as well as along other state highway corridors within the region, that are only partially addressed in the RLTS. While the RLTP details projects that have already been programmed, it does not contain the longer term strategic direction for the corridor.

This Strategic Study is being undertaken to determine the long term safety and efficiency trends on the SH58 corridor and to help identify, manage and/or mitigate the adverse impacts that could develop over the 20-year life of this strategy.

This Strategic Study for SH58 takes account of the overarching documents detailed above, and describes a long-term strategy that will enable SH58 to contribute to an affordable, integrated, safe, responsive and sustainable transport system, without undermining the known regional planning priorities.

3 Corridor Management – Background and Issues

The SH58 Corridor provides the major arterial route that joins Porirua and Kapiti Coast with the Hutt Valley. In hierarchical terms, as defined in the National State Highway Strategy, it operates as a regional route. The following sub-sections provide background information and describe the identified existing and future issues within the SH58 Corridor study length that influences the strategic plan for the corridor.

3.1 Existing Route Characteristics

The SH58 Corridor is 15.1km in length. It contains noticeable variation in both carriageway standards and traffic volume throughout the length. SH58 is predominantly declared a limited access road (LAR between RP 0/0.44 and RP 0/13.86) and provides a single two-way carriageway with roundabouts and priority controlled intersections. The width of the highway is constrained in many locations due to the terrain. Traffic volumes vary from 13,800 vehicles per day (vpd) west of SH2 to 9,200 vpd east of James Cook Drive at the end of the Pauatahinui Inlet, and to 16,700 vpd east of the Paremata Roundabout. The existing characteristics of the individual highway sections within the corridor study length are described in the following sub-sections.

3.1.1 Manor Park to Moonshine Road (RP 0/0.00 – 0/6.28)

The existing characteristics of the "Haywards Hill" section of SH58 are as follows:

- A single carriageway, two-lane, two-way, 100 km/h highway section, with one passing lane in the westbound direction and two passing lanes in the eastbound direction. The eastbound and westbound lanes are separated by a wire rope median barrier from approximately RP 0/1.5 to 0/2.3 and double yellow no overtaking lines for the remainder of the section.
- The SH2/58 intersection is currently traffic signal controlled with left turn slip lanes. The SH58 intersection with Hebden Crescent is located immediately west of the traffic signals and this priority controlled intersection allows all turning movements.

- This section has at-grade T-intersections with McDougall Grove, Hugh Duncan Street, Kaitawa Street, Old Haywards Road, Mt Cecil Road, Harris Road and Moonshine Road. The Old Haywards Road and Harris Road intersections are uncontrolled, while the remainder are priority controlled intersections with conventional intersection layouts (i.e. none of the intersections have 'seagull' T-intersection layouts).
- Haywards Hill has moderately tight horizontal curves in both directions. The curves can be described as below:

  For eastbound traffic:
  - RP 0/0.930 - horizontal curve with 75km/h advisory speed
  - RP 0/2.160 - horizontal curve with 65km/h advisory speed
  - RP 0/3.860 - horizontal curve with 75km/h advisory speed
  - RP 0/4.392 - horizontal curve with 85km/h advisory speed

  For westbound traffic:
  - RP 0/0.490 - horizontal curve with 75km/h advisory speed
  - RP 0/1.870 - horizontal curve with 75km/h advisory speed
  - RP 0/3.430 - horizontal curve with 75km/h advisory speed

- This section of SH58 has an upward gradient of 7% travelling from Manor Park towards Haywards Summit and a downward gradient of about 5% from Haywards Summit to Moonshine Road.
- The only recorded annual average daily traffic (AADT) volume along this section of SH58 in 2007 was 13,847 vpd west of SH2 (Haywards counts site). The historical traffic growth rate is 2.1% per annum, relative to the recorded 2007 AADT volumes.
- Hutt City Council and Porirua City Council records indicate that recorded 7-day average daily traffic (ADT) volumes on the local roads that intersect with the Haywards Hill section of SH58 are as follows:
  - Hebden Crescent, 498 vpd (September 2002)
  - McDougall Grove, 149 vpd (March 2005)
  - Hugh Duncan Street, no counts available
  - Kaitawa Street, no counts available
  - Old Haywards Road, no counts available
  - Mt Cecil Road, no counts available
  - Harris Roa, 36 vpd (August 2007)
  - Moonshine Road, 598 vpd (June 2007)

- The land use along this section is predominantly rural with a small amount of residential and industrial at the eastern end in the form of the Haywards electricity substation and the Dry Creek Quarry.

3.1.2 Moonshine Road to Pauatahanui (RP 0/6.28 – 0/10.00)

The existing characteristics of this section of SH58 are as follows:

- A single carriageway, two-lane, two-way, 100km/h highway section.
- SH58 has at-grade T-intersections with Mulhern Road, Belmont Road, Bradey Road, at-grade cross-intersection at Murphys/Flightys Road and a roundabout at Paremata Haywards Road (Pauatahanui Roundabout). All the T- and cross-intersections except for Mulhern Road are priority controlled intersections with conventional intersection

layouts (i.e. none of the intersections have 'seagull' T-intersection layouts). The T-intersection with Mulhern Road is uncontrolled.

- The section is moderately windy with some tight horizontal curves. The curves can be described as below:

  For eastbound traffic:

  - RP 0/7.022 – horizontal curve with 85km/h advisory speed

  For westbound traffic:

  - RP 0/6.604 – horizontal curve with 85km/h advisory speed

- The section between Moonshine Road and Pauatahanui is flat.
- The only recorded annual average daily traffic (AADT) volume along this section of SH58 in 2007 was 13,980 vpd east of Pauatahanui (RP 0/9.14) which is consistent with the traffic volumes east of Moonshine Road. The historical traffic growth rate at the count site is 2.0% per annum, relative to the recorded 2007 AADT volumes.
- Porirua City Council records indicate that the recorded 7-day ADT volumes on the local roads that intersect with SH58 are as follows:
  - Mulhern Road, 219 vpd (June 2007)
  - Murphys Road, 272 vpd (June 2007)
  - Flightys Road, 357 vpd (June 2007)
  - Belmont Road, 123 vpd (July 2007)
  - Bradey Road, 124 vpd (June 2007)
  - Paremata Haywards Road, no counts available

- The rural land continues along this section although there are also more frequent lifestyle blocks and industrial activities with direct access onto the highway. The Judgeford Golf Course is also located within this section.

3.1.3 Pauatahanui to Paremata (RP 0/10.00 – 0/15.10)

The existing characteristics of this section of SH58 are as follows:

- A single carriageway, two-lane, two-way highway section with 80 km/h speed limit between Pauatahanui Roundabout and north of Postgate Drive and 50km/h speed limit from north of Postgate Drive to Paremata.
- SH58 currently has at-grade T-intersections at Joseph Banks Drive, James Cook Drive, Spinnaker Drive, Postgate Drive, Oak Avenue, an at-grade cross-intersection at Seaview/Bayview Road and a roundabout at Paremata Crescent/SH1.
- All the T- and cross-intersections are priority controlled intersections with conventional intersection layouts.
- The section is moderately windy as it traverses the edge of the estuary with some tight horizontal curves. The curves can be described as below:

  For eastbound traffic:

  - RP 0/11.400 – horizontal curve with 55km/h advisory speed
  - RP 0/11.729 – horizontal curve with 45km/h advisory speed
  - RP 0/12.516 – horizontal curve with 35km/h advisory speed

  - RP 0/13.002 – horizontal curve with 35km/h advisory speed
  - RP 0/13.847 – horizontal curve with 35km/h advisory speed
  - RP 0/14.170 – horizontal curve with 35km/h advisory speed

  For westbound traffic:

  - RP 0/11.348 – horizontal curve with 45km/h advisory speed
  - RP 0/11.765 – horizontal curve with 45km/h advisory speed
  - RP 0/12.215 – horizontal curve with 35km/h advisory speed
  - RP 0/12.514 – horizontal curve with 45km/h advisory speed
  - RP 0/12.650 – horizontal curve with 35km/h advisory speed
  - RP 0/14.050 – horizontal curve with 35km/h advisory speed

- Majority of the section between Pauatahanui and Paremata is flat except for the section between Bay View Road and SH1 which has an upward gradient of 5% for about 300m and then a downward gradient of about 4.4% for 300m when travelling towards SH1.
- The traffic volumes between Pauatahanui Roundabout and SH1 increase dramatically from east to west. The recorded AADTs in 2007 increase from 9,236 vpd west of James Cook Drive to 16,703 vpd east of the Paremata Roundabout. The weighted average of the historical traffic growth rates at the count sites between Pauatahanui and Paremata is 1.8% per annum, relative to the 2007 AADT volumes.
- Porirua City Council records indicate that recorded 7-day ADT volumes on the local roads that intersect with SH58 are as follows:
  - Joseph Bank Drive, 1,719 vpd (June 2006)
  - James Cook Drive, 4,184 vpd (February 2007)
  - Spinnaker Drive, 2,919 vpd (May 2007)
  - Postgate Drive, 6,612 vpd(February 2009)
  - Oak Avenue, 1,743 vpd (July 2004)
  - Seaview Road, no counts available
  - Bayview Road, no counts available
  - Paremata Crescent, 3,654 vpd (June 2008)

- From Pauatahanui to Postgate Drive the highway traverses the edge of the Pauatahanui Inlet with cliffs on the other side of the road and therefore there is little in the way of land use adjoining the highway. However, residential properties line the majority of the route on both sides of the highway west of Postgate Drive.

3.2 Traffic Volumes and Highway Capacity

Recent 7-day traffic counts at each of the count sites along the study length have been analysed and factored to reflect the published 2007 AADT volumes to determine typical weekday commuter peak traffic volumes along the study length.

The forecast traffic volumes were determined primarily though the Greater Wellington Transport Strategy EMME2 model and the NZTA SATURN model. A full description of how the forecast traffic volumes were determined is included in Appendix A.

The timing of those large projects which are included in the RLTP have also been taken into account in the determination of the forecast traffic volumes. Two future years have been investigated, 2019 and 2029, and the following projects are assumed to be included in these scenarios over and above the current network:

2019 SH2/SH58 Interchange and the Grenada to Gracefield projects

2029 The above projects plus Transmission Gully

The detailed traffic analysis spreadsheets are presented in Appendix C.

Figure 3 to ***Figure 14*** show the variations in the traffic volumes and the highway capacity along the study length, for the typical weekday commuter peaks in 2009 and the predicted weekday peaks in 2019 and 2029 in both the eastbound and westbound directions. The individual figures are as follows:

- Figure 3: SH58 Eastbound Traffic Volumes – 2009 Weekday AM Peak
- Figure 4: SH58 Eastbound Traffic Volumes – 2009 Weekday PM Peak
- Figure 5: SH58 Westbound Traffic Volumes – 2009 Weekday AM Peak
- Figure 6: SH58 Westbound Traffic Volumes – 2009 Weekday PM Peak
- Figure 7: SH58 Eastbound Traffic Volumes – Predicted 2019 Weekday AM Peak
- Figure 8: SH58 Eastbound Traffic Volumes – Predicted 2019 Weekday PM Peak
- Figure 9: SH58 Westbound Traffic Volumes – Predicted 2019 Weekday AM Peak
- Figure 10: SH58 Westbound Traffic Volumes – Predicted 2019 Weekday PM Peak
- Figure 11: SH58 Eastbound Traffic Volumes – Predicted 2029 Weekday AM Peak
- Figure 12: SH58 Eastbound Traffic Volumes – Predicted 2029 Weekday PM Peak
- Figure 13: SH58 Westbound Traffic Volumes – Predicted 2029 Weekday AM Peak
- Figure 14: SH58 Westbound Traffic Volumes – Predicted 2029 Weekday PM Peak

The details of the current traffic volumes, predicted future traffic demands and current and future levels of service (LOS) for the individual highway sections within the corridor study length are described in the following sub-sections.

Level of Service (LOS) is an index of the operational performance of traffic on a given traffic lane, accommodating various traffic volumes under different combinations of operating conditions. Table 2.1 below outlines the Austroads' Guide to Traffic Engineering Practice - Roadway Capacity definitions of LOS.

Table 3.1: Austroads' LOS description

Level of Service	Austroads' Description
A	General free flow conditions with operating speeds usually about 90% of the free flow travel speed for the particular class of arterial. Vehicles are unimpeded in manoeuvring in the traffic stream and stopped delay at intersections is minimal.
B	Relatively unimpeded operation with average travel speeds about 70% of the free flow speed for the particular arterial class. Manoeuvring in the traffic stream is only slightly restricted and stopped delays are low.
C	Stable operating conditions but with manoeuvring becoming more restricted and motorist experiencing appreciable tension in driving, longer queues and/or adverse signal coordination may contribute to lower average travel speeds of about 50% of the free flow speed for the arterial class.
D	Conditions border on a range in which small increases in flow can significantly increase intersection delay and reduce travel speed. Travel speeds are about 40% of the free flow speed.
E	Conditions are characterised by significant intersection delays and travel speeds of 33% of free flow speed or lower. Contributing factors may be: adverse signal progression, closely spaced signals, extensive queuing at critical intersections (ie. saturated intersection conditions).
F	Traffic flow at this level is very low speed – below 25% to 33% of the free flow speed for the arterial class. Signalised intersections would be severely congested (over-saturated) with extensive queuing and delay.

The link Level of Service calculations are based on a range of variables. These include:

- Environment (i.e. rural or urban)
- Lane widths
- Shoulder widths
- Terrain
- Percent of heavy vehicles
- Directional distribution
- Passing opportunities

In the graphs below, the upper limit of LOS E has been chosen to reflect the capacity of the highway. Ideally, highway upgrades should occur prior to the traffic volumes in peak periods meeting this capacity figure; however, that this often does not happen. The primary reason for this is affordability. The NZTA National State Highway Strategy states:

> *"…in some areas the demand will continue to exceed the capacity of the network. It is recognised at a national level that we can't afford to build our way out of congestion, and state highways will not be able to meet peak demand in all instances. So, we must learn to act smarter to fulfil New Zealand's transportation needs. A combination of road building, smart land use planning and measures that manage travel demand is needed."*

Whilst this strategy promotes infrastructure upgrades prior to traffic volumes exceeding the capacity of high way sections, it is noted that there are many other factors need to be taken into account in the prioritisation and timing of land transport funding. These are outlined in the NZTA Planning Policy Manual and include the state highway category, scale and frequency of traffic delays, the extent and nature of economic, environmental and social effects, cost effectiveness and consistency with the RLTS. Accordingly, each project will be considered by the NZTA on a case by case basis.

In addition to the above, it is noted that the WTSM and SATURN models include growth information from Statistics New Zealand which is based on historical trends and therefore may not accurately reflect the probable level of future growth in specific areas. However, the total growth over the region is likely to be correct and it is not the purpose of this study to re-examine these growth projections. Nevertheless, this study does recognise that there is a need to monitor the growth around the region to ensure that the State Highway network is being developed in accordance with the actual demand. To this end, it is proposed to monitor this area and update this strategy if necessary. Further discussion on the monitoring strategy is contained in Section 6.

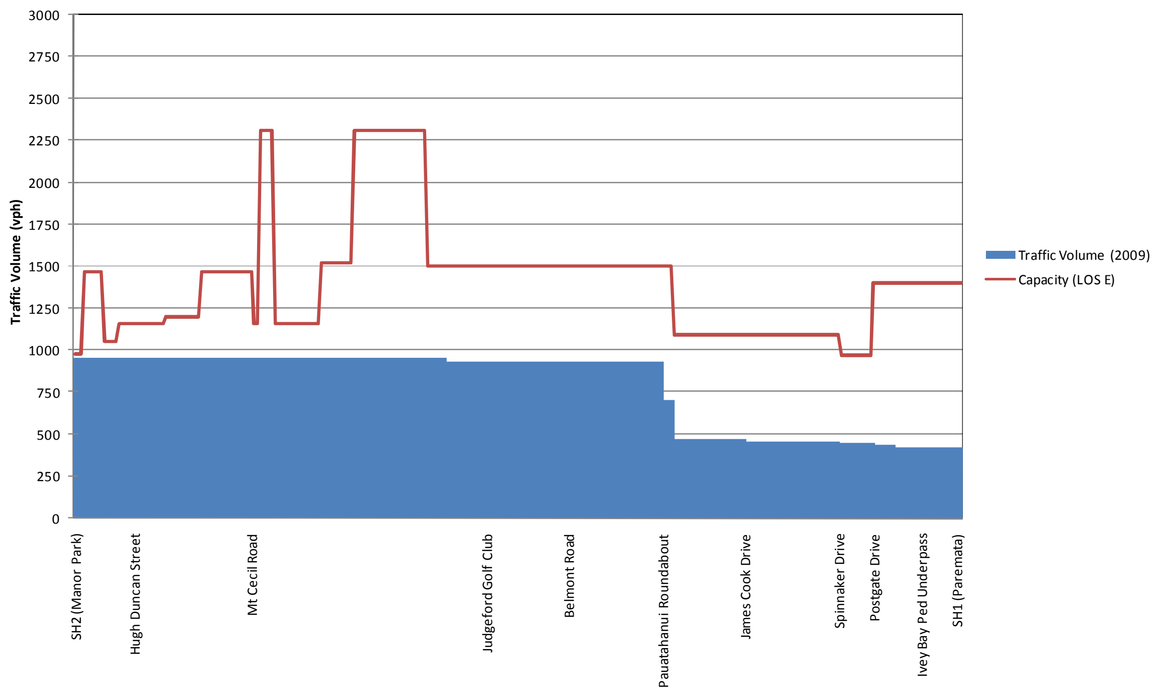


Figure 3: SH58 Eastbound Traffic Volumes – 2009 Weekday AM Peak

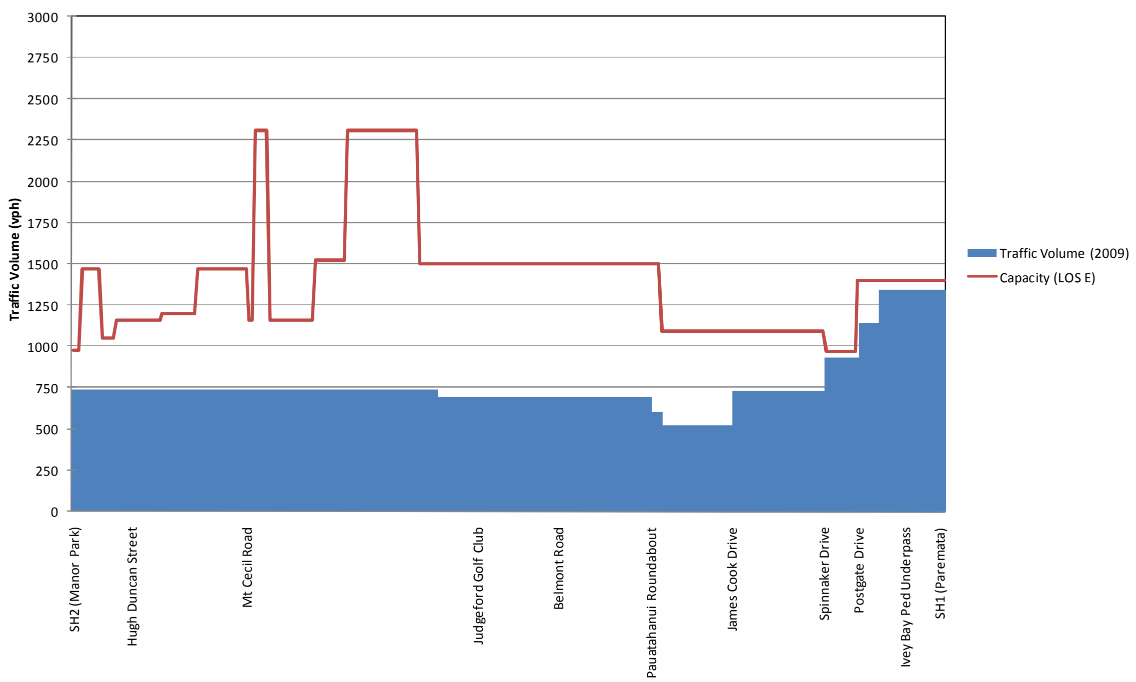


Figure 4: SH58 Eastbound Traffic Volumes – 2009 Weekday PM Peak

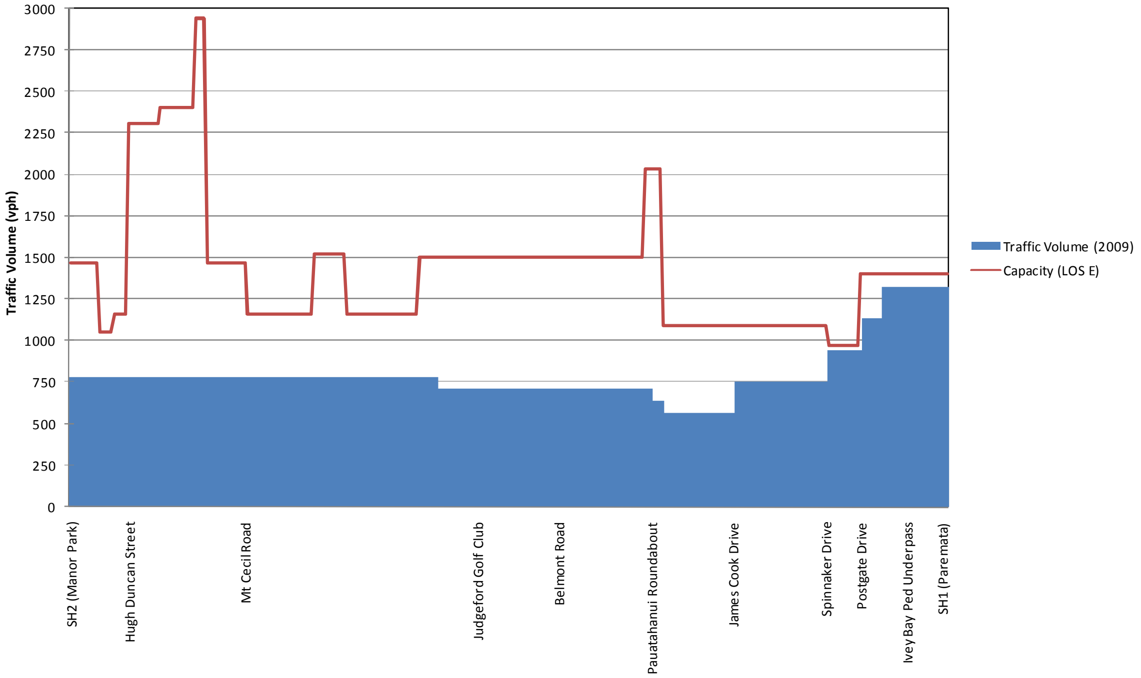


Figure 5: SH58 Westbound Traffic Volumes – 2009 Weekday AM Peak

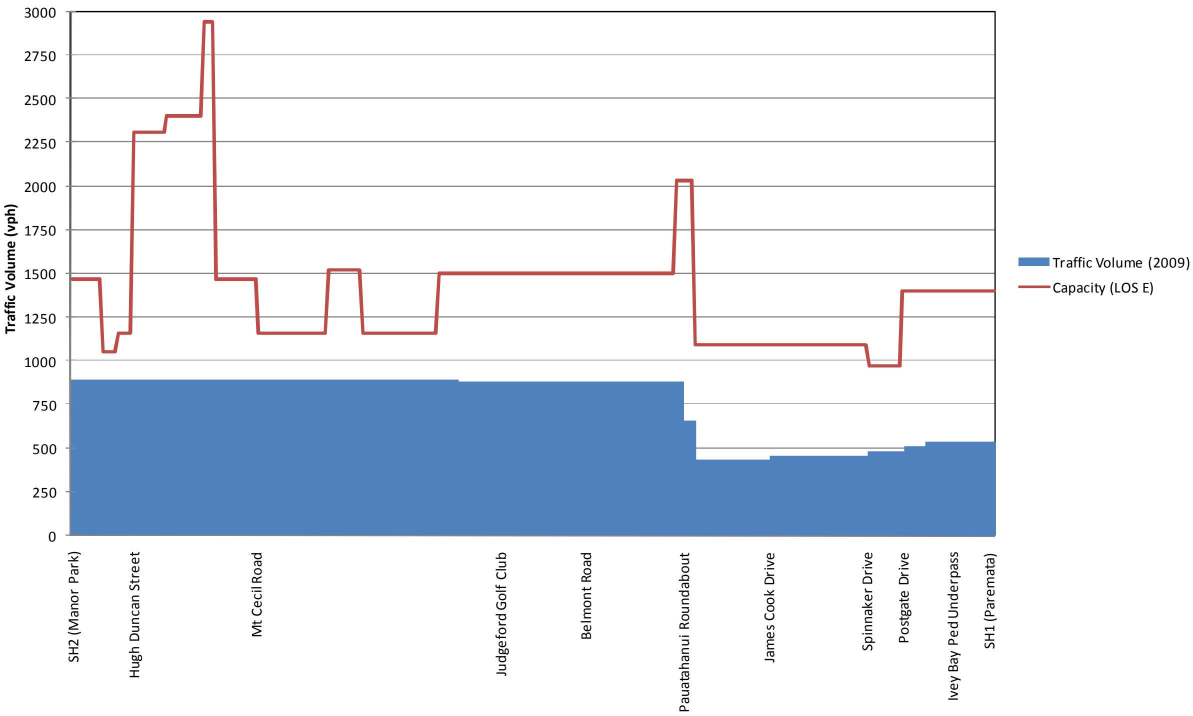


Figure 6: SH58 Westbound Traffic Volumes – 2009 Weekday PM Peak

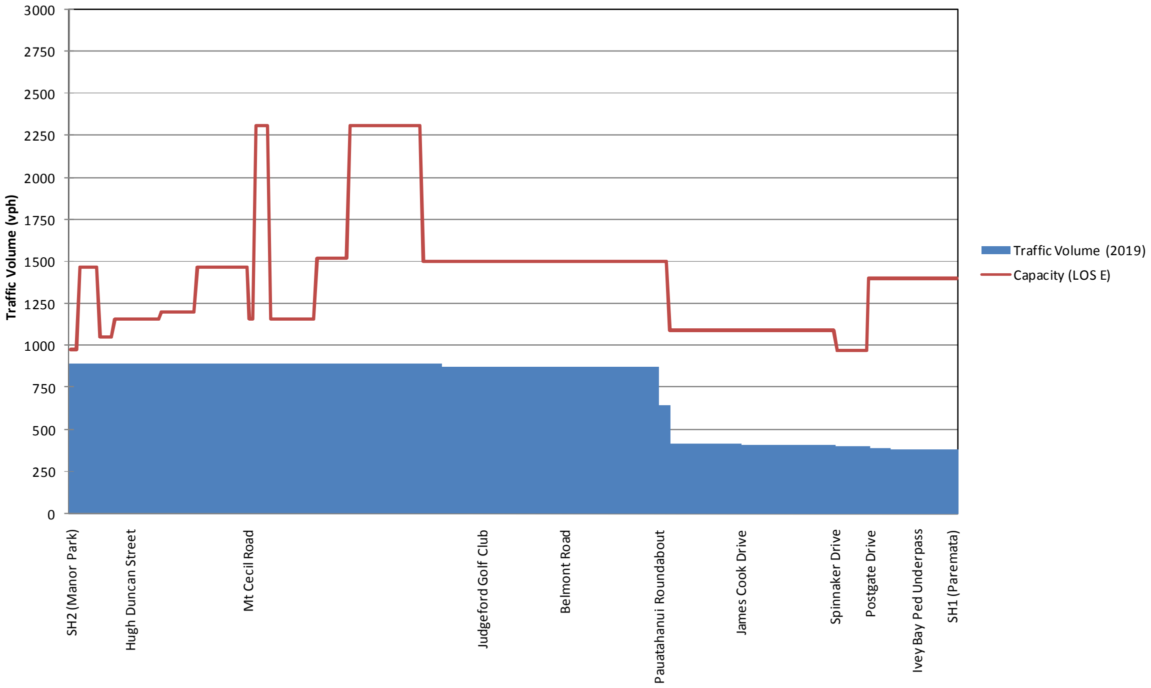


Figure 7: SH58 Eastbound Traffic Volumes – Predicted 2019 Weekday AM Peak

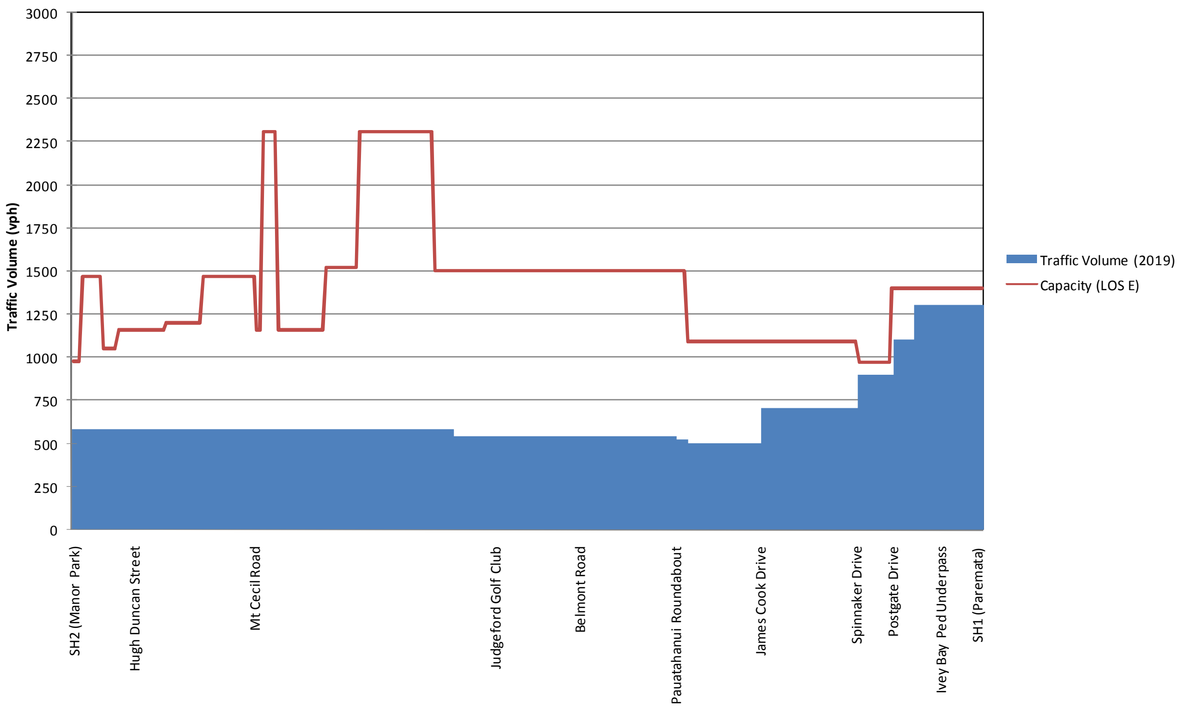


Figure 8: SH58 Eastbound Traffic Volumes – Predicted 2019 Weekday PM Peak

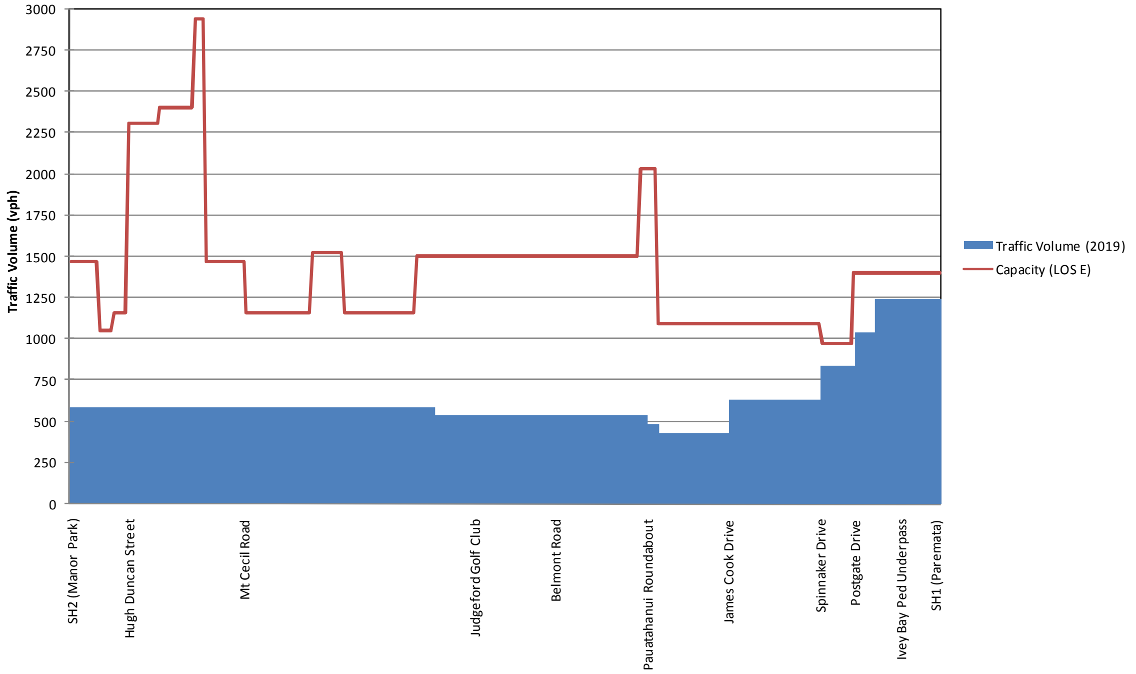


Figure 9: SH58 Westbound Traffic Volumes – Predicted 2019 Weekday AM Peak

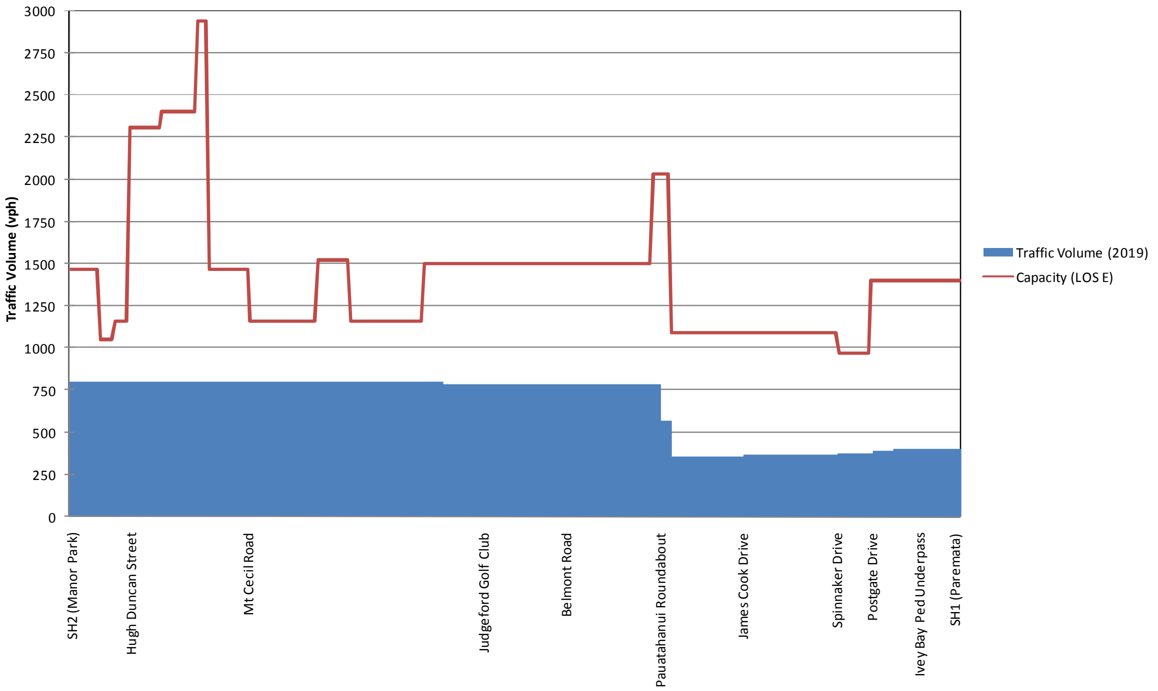


Figure 10: SH58 Westbound Traffic Volumes – Predicted 2019 Weekday PM Peak

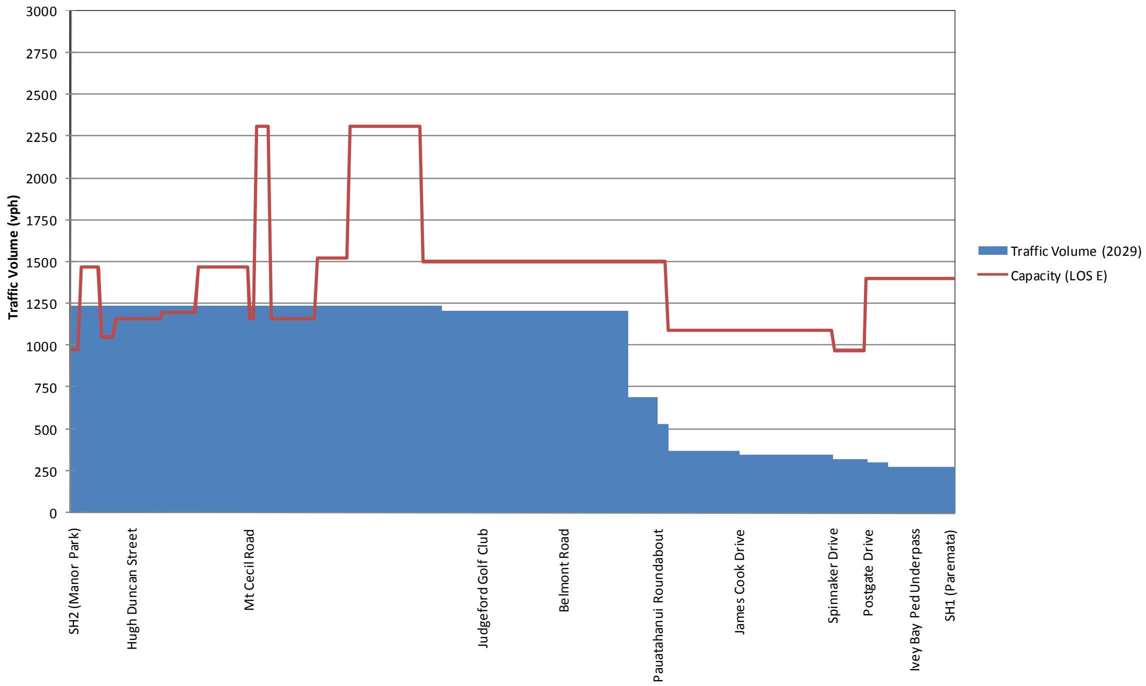


Figure 11: SH58 Eastbound Traffic Volumes – Predicted 2029 Weekday AM Peak

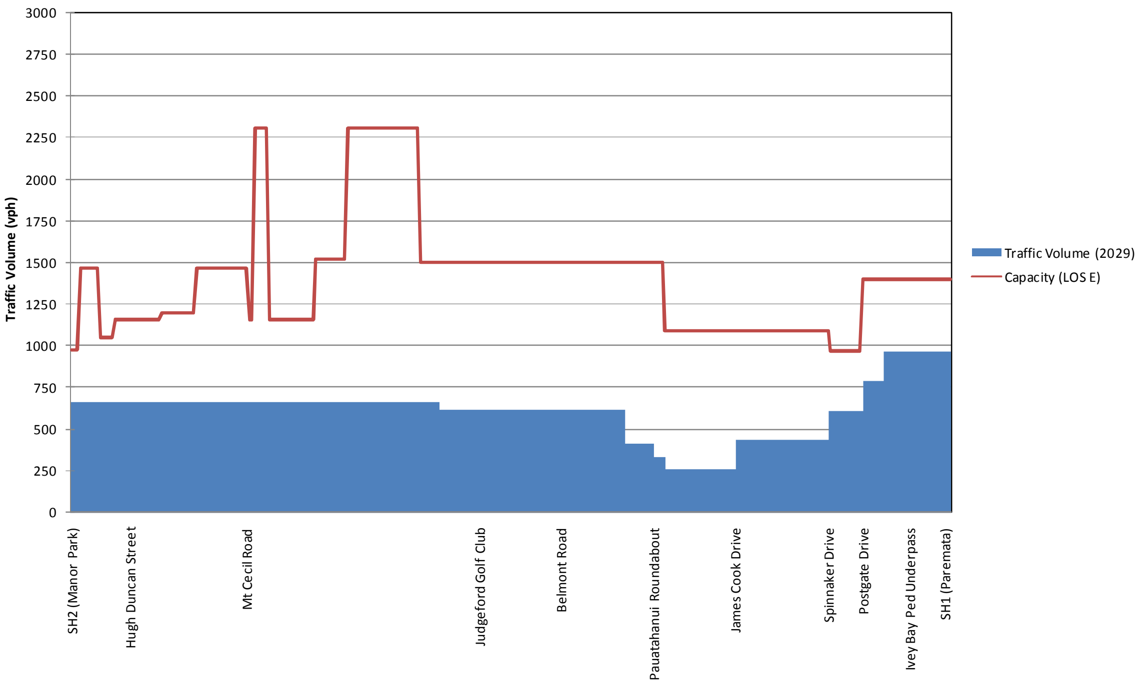


Figure 12: SH58 Eastbound Traffic Volumes – Predicted 2029 Weekday PM Peak

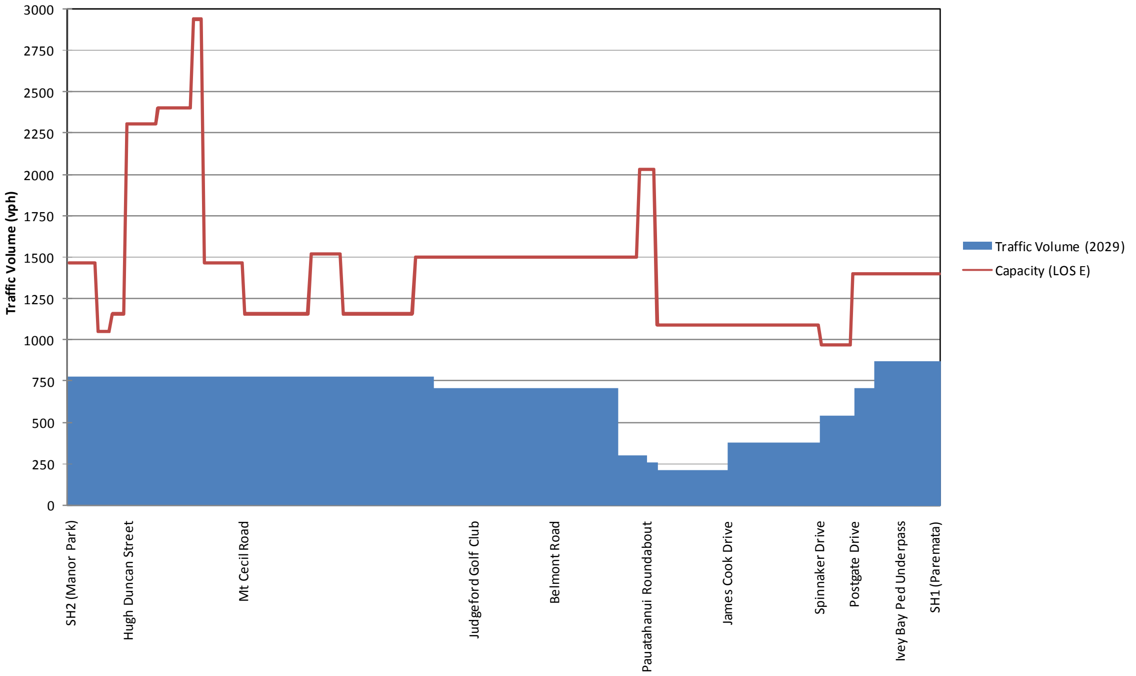


Figure 13: SH58 Westbound Traffic Volumes – Predicted 2029 Weekday AM Peak

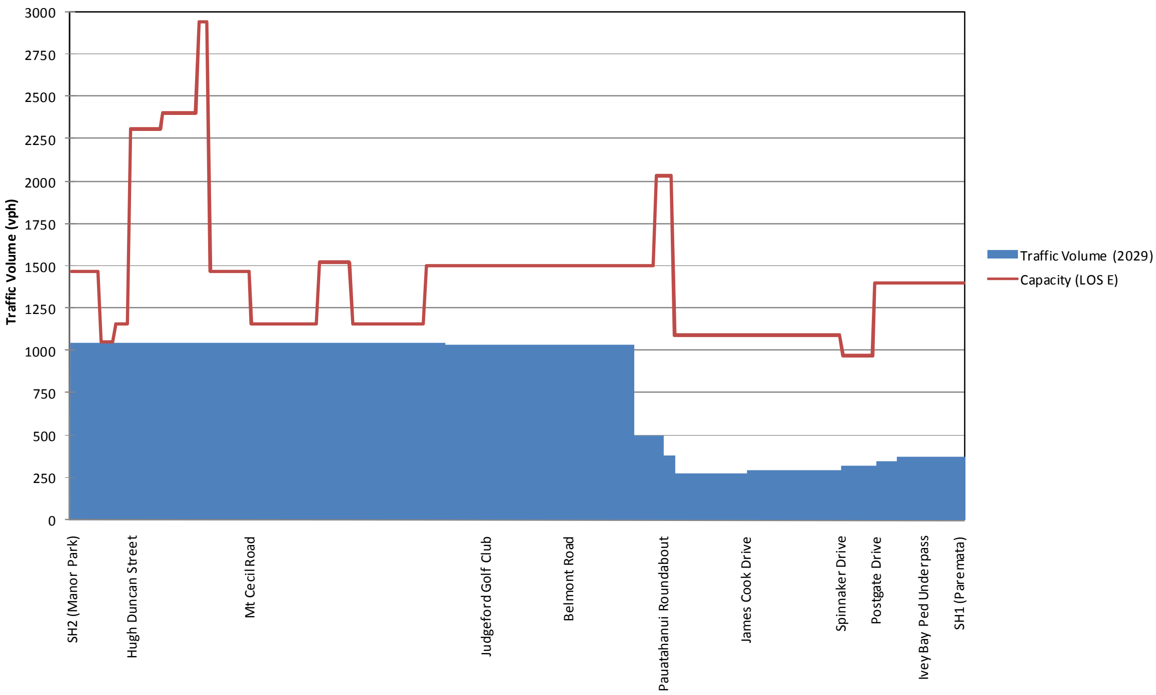


Figure 14: SH58 Westbound Traffic Volumes – Predicted 2029 Weekday PM Peak

3.2.1 Manor Park to Moonshine Road

The section of SH58 between Manor Park and Moonshine Road is currently operating below its capacity, with traffic volumes of 950 vehicles per hour (vph) eastbound and 800 westbound in the weekday morning commuter peak and 750 vph eastbound and 900 vph westbound in the weekday evening commuter peak. This section of SH58 is currently operating at LOS E during the weekday commuter peak periods, except for the sections with passing lanes which operate at LOS D.

Predicted future traffic demands and highway operating characteristics are as follows:

- In 2019, once the Grenada to Gracefield projects are completed, traffic volumes will have reduced in both directions and in both time periods as some traffic transfers to the new east-west route. This reduction, which is in the order of 50 to 200vph, results in improvements to the level of service experienced along this corridor.
- The introduction of Transmission Gully results in 2029 traffic volumes increasing again due to the attractiveness of the new highway. In the AM peak westbound and the PM peak eastbound traffic volumes are predicted to be equal to or less than those currently experienced, but in the AM peak eastbound and the PM peak westbound traffic volumes will be greater than 2009 flows. In the AM peak eastbound, the traffic volumes of approximately 1,250vph will mean that some sections of the route will be operating at capacity. However, in all other situations LOS D or E can be expected.

3.2.2 Moonshine Road to Pauatahanui

The section of SH58 between Moonshine Road and Pauatahanui is currently operating below its capacity (operating at LOS D or E), with traffic volumes of approximately 950 vph eastbound and 700 vph westbound in the weekday morning commuter peak and 700 vph eastbound and 900 vph westbound in the weekday evening commuter peak.

Predicted future traffic demands and highway operating characteristics are as follows:

- Traffic volumes in 2019 show similar characteristics to the eastern section of SH58, with lower traffic volumes due to the introduction of the Grenada to Gracefield projects.
- By 2029, the commissioning of Transmission Gully sees volumes again increasing. However, this section of SH58 has slightly better capacity which results in this section of highway operating at LOS D or well within LOS E.

3.2.3 Pauatahanui to Paremata

The section of SH58 between Pauatahanui and Paremata is currently approaching its capacity, with maximum traffic volumes of approximately 1,350 vph westbound and 400 vph eastbound in the weekday morning commuter peak and 1,350 vph eastbound and 600 vph westbound in the weekday evening commuter peak. This section of SH58 is currently operating at LOS D or E during the weekday commuter peak period.

Predicted future traffic demands and highway operating characteristics are as follows:

- In 2019, once the Grenada to Gracefield projects are completed, traffic volumes reduce slightly but the level of service remains within the same band.
- By 2029, traffic volumes decrease significantly with the introduction of Transmission Gully as drivers travelling to/from Porirua and other destinations on the western coast would use different links to the new highway, including the Kenepuru Link which will be provided with Transmission Gully. The reduced traffic volumes would

result in Level of Service D east of Postgate Drive and between Postgate Drive and SH1 the urban section would be operating at Level of Service C.

One of the other influencing factors for this section is the impact of Greys Road, as this carries a significant amount of traffic between SH58 east of Pauatahanui and SH1 around the northern side of the Pauatahanui inlet. The traffic volumes forecast on SH58 do not include an allowance for any major changes on Greys Road. However, Porirua City Council are considering undertaking traffic calming measures on this link, which may result in additional traffic using this section of SH58. NZTA and Porirua City Council will continue to have ongoing discussions in regards to any work undertaken on these links and the possible impact that any works will have on both roads.

3.3 Historic Highway Safety Performance

The NZTA Crash Analysis System (CAS) crash database has been interrogated to identify and analyse crashes and crash trends that have occurred along the SH58 Corridor length.

The reported crashes along SH58 are summarised in the following sub-sections.

Section 0 outlines the projects that are proposed to mitigate a number of the crash problems that are reported in this strategy. In addition NZTA's network managers also continuously review crash data and work to solve emerging crash trends through implementation of minor safety improvements and identification of larger capital projects.

3.3.1 Overall Crash Figures

Analysis of the crash data for the 5-year period from 2004 to 2008 indicates that there are currently an average of about 16 injury crashes, 52 total crashes and crash costs of about $5.3 million per annum along the SH58 Corridor.

These annual crash numbers and costs illustrate that there is scope for achieving one of the objectives of the Land Transport Management Act (2003), to improve safety and personal security, along the SH58 Corridor length.

A detailed analysis of crash trends and costs for intersections and mid-block sections is provided in ***Appendix D***. However, a number of observations can be made in regards to the 5-year crash history over the entire SH58 length.

Over half of all crashes on this stretch of SH2 were loss-of-control or head-on crashes on bends. This reflects the winding nature of much of the route and the often narrow carriageway.

Less than 30% of crashes occurred at intersections, with the remainder occurring along mid-block sections.

Around a third of all crashes occurred during dark or twilight conditions, and just over a third occurred during wet or icy conditions. These are not inconsistent with national statistics; however a couple of sections do have dark or wet crash rates which are deemed to be high.

Approximately 30% of all crashes included poor handling and 28% included poor observation as factors in the crash. 24% of all crashes involved inappropriate speed.

3.3.2 Intersection Crashes

During the 5-year period from 2004 to 2008, there have been a total of 95 reported intersection crashes along the SH58 Corridor length, comprising:

- five serious injury crashes,
- 23 minor injury crashes, *and*
- 67 non-injury crashes.

The reported crashes and total crash costs at the individual intersections along the SH58 Corridor length are illustrated in ***Figure 15*** and ***Figure 16*** below respectively.

Figure 15 shows that the intersection injury crash rates on SH58 near SH2/SH58 interchange and between Spinnaker Drive and Paremata are higher than the other sections of the highway. ***Figure 15*** also illustrates the crash rate west of Pauatahanui roundabout is generally higher than the crash rate east of the roundabout.

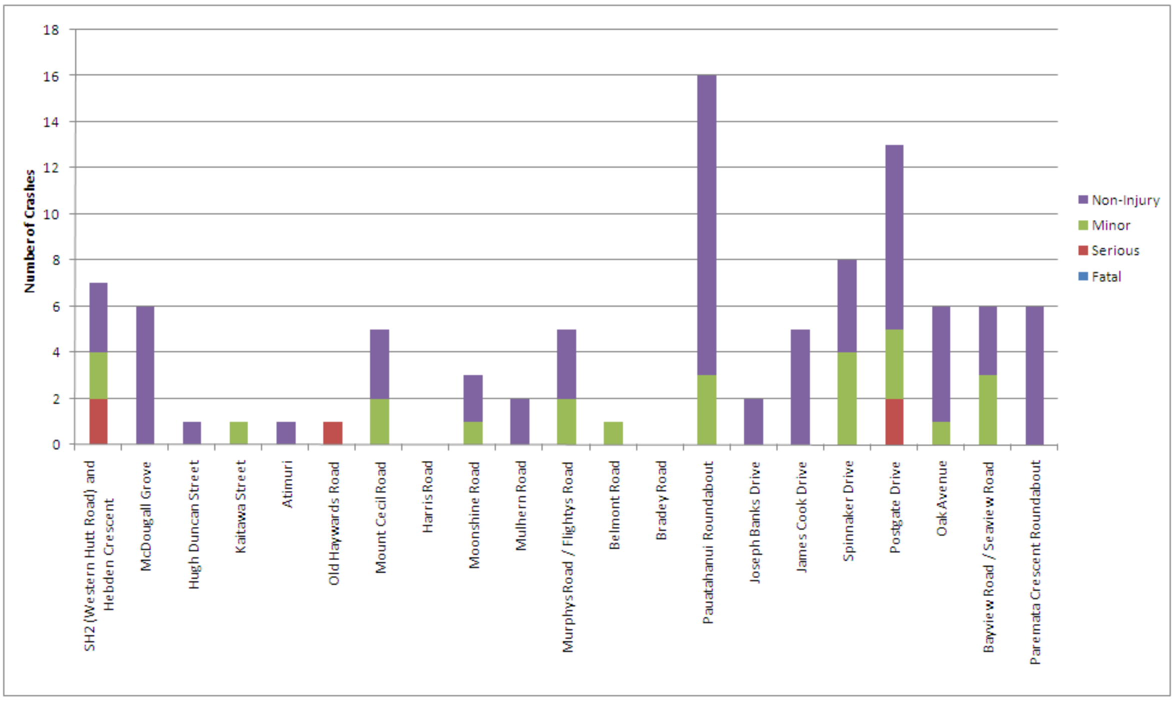


Figure 15: SH58 Corridor Intersections - All Crashes (2004-2008)

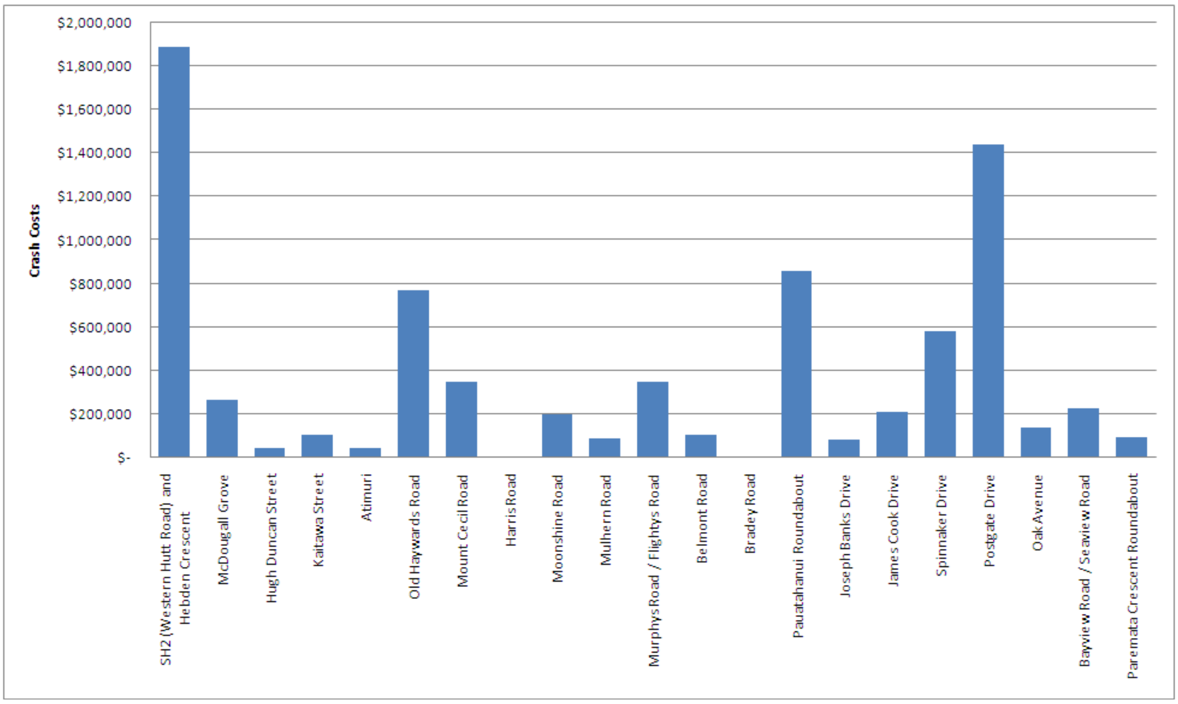


Figure 16: SH58 Corridor Intersections - Crash Costs (2004-2008)

3.3.3 Mid-Block Crashes

During the 5-year period from 2004 to 2008, there have been a total of 166 reported mid-block crashes along the SH58 Corridor length, comprising:

- one fatal crash (one fatality),
- eight serious injury crashes,
- 42 minor injury crashes, and
- 115 non-injury crashes.

The reported injury crashes, total crashes, total crash costs and injury crash rates for the mid-block sections along the SH58 Corridor length are illustrated in ***Figure 17***, ***Figure 18***, ***Figure 19*** and ***Figure 20*** below respectively.

In addition to showing the injury crash rates for the individual mid-block sections along the SH58 Corridor length, ***Figure 20*** also illustrates the typical injury crash rates (calculated in accordance with NZTA's (formerly LTNZ's) *'Economic Evaluation Manual, Appendix A6.5*) for the following mid-block highway section types:

- 2-Lane Rural Highway (with 3.5m lanes, 1.0m shoulders, though rolling/mountainous terrain and occasional passing lanes).
- 2-Lane Rural Highway (with 3.25m lanes, 2.0m shoulders).
- 2-Lane Rural Highway (with 2.75m lanes, 0.5m shoulders) , *and*
- 2-Lane Urban Arterial Highway, with Other Roadside Land-use.

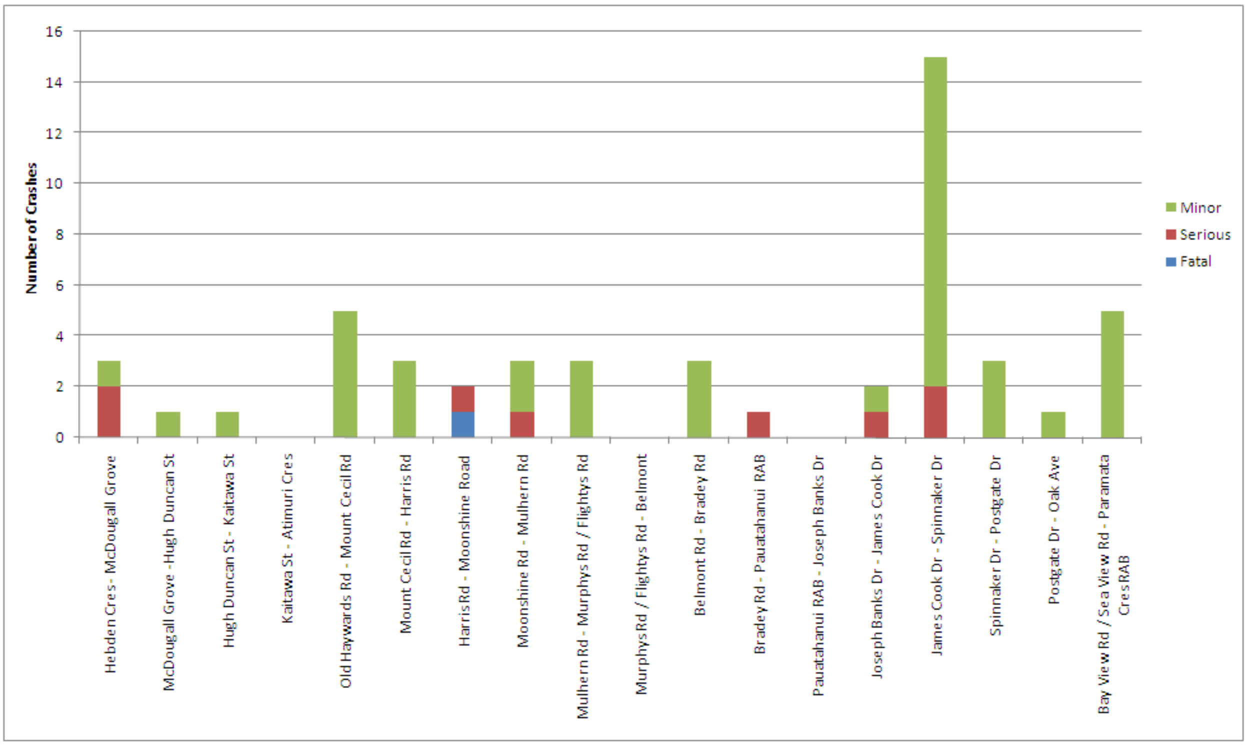


Figure 17: SH58 Corridor Mid-Block Sections - Injury Crashes (2004-2008)

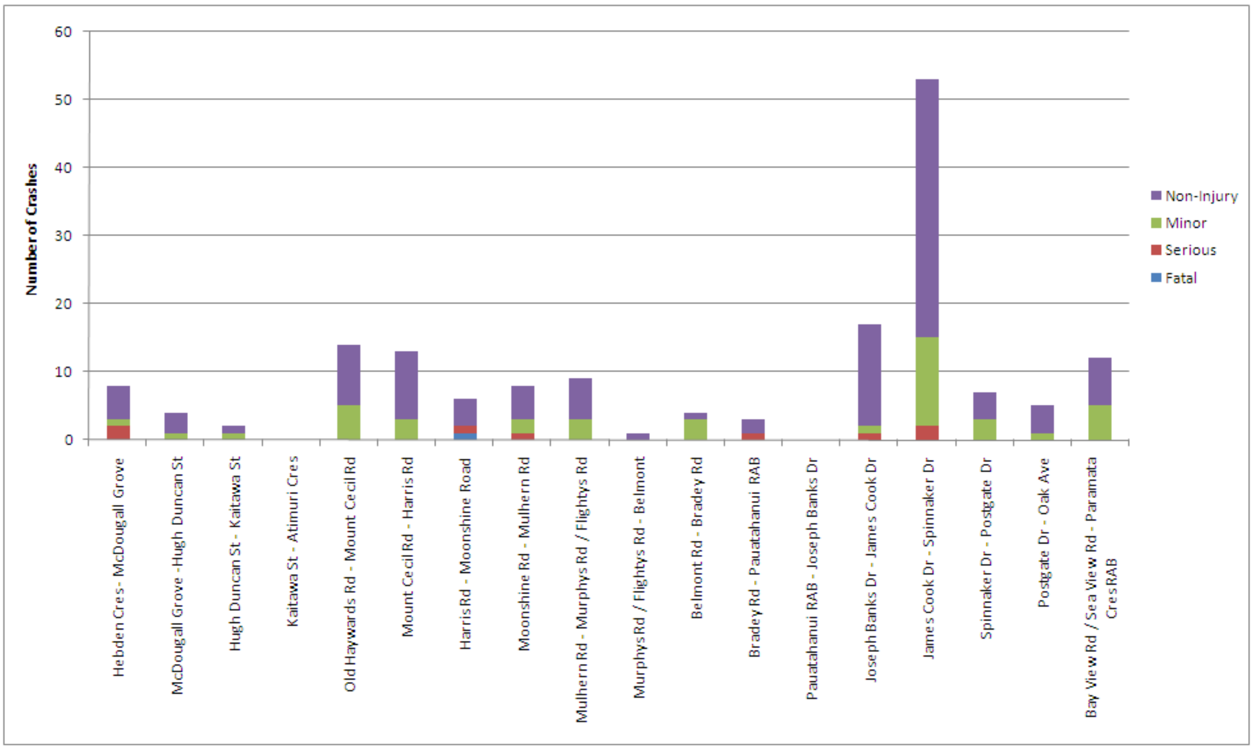


Figure 18: SH58 Corridor Mid-Block Sections - All Crashes (2004-2008)

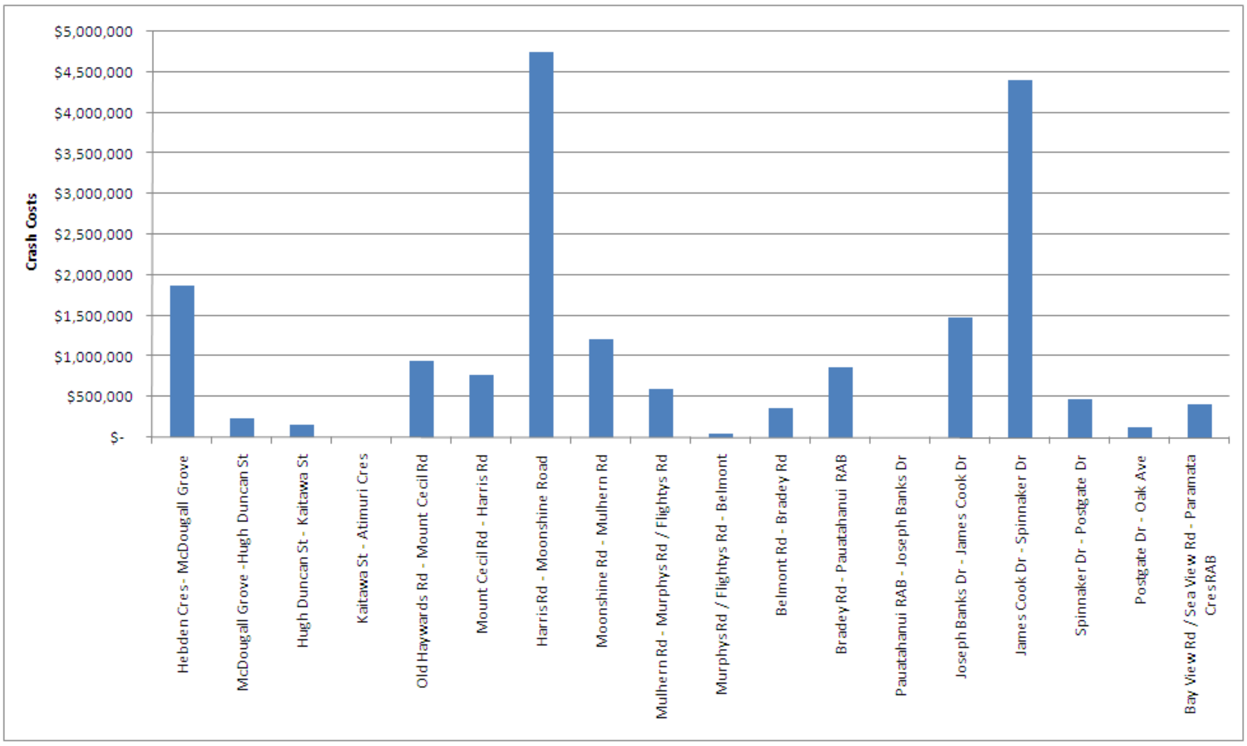


Figure 19: SH58 Corridor Mid-Block Sections - Crash Costs (2004-2008)

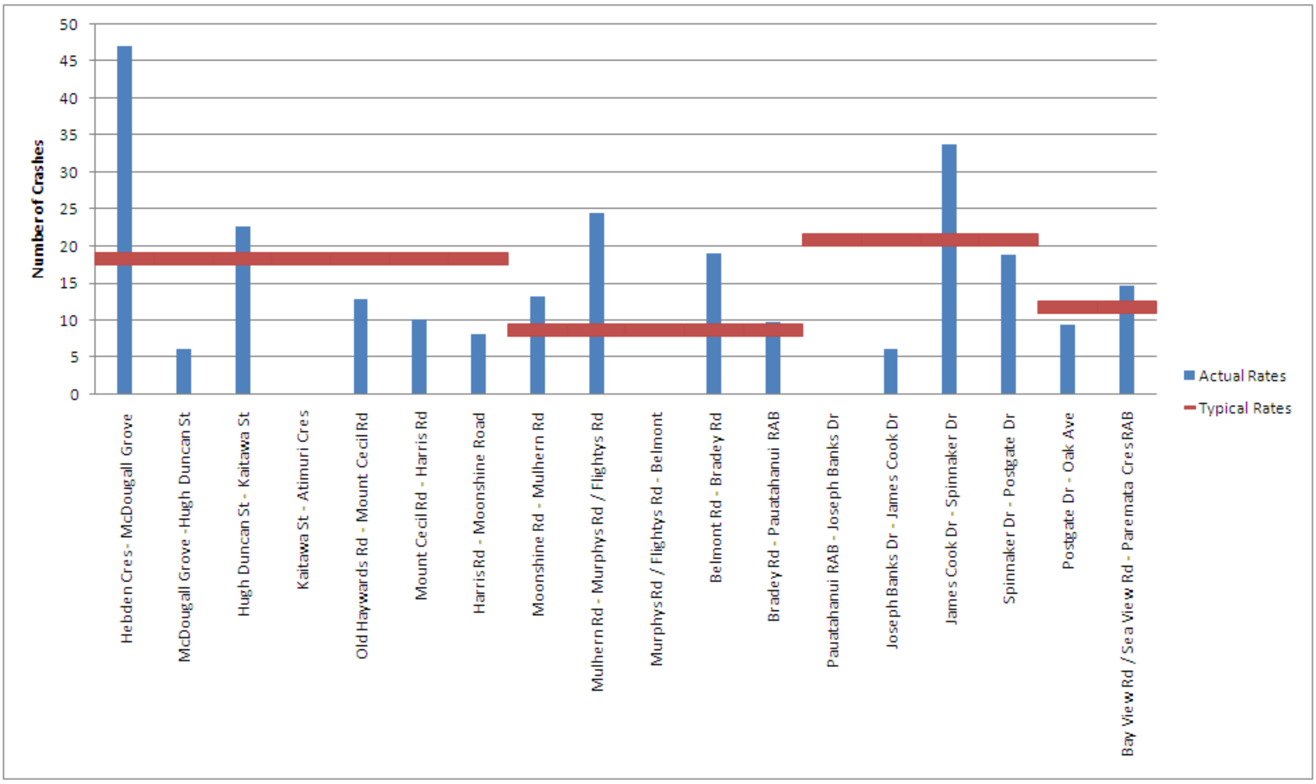


Figure 20: SH58 Corridor Mid-Block Sections – Injury Crash Rates (per 10^8 veh-km)

Discussion in regards to the safety issues raised in this section and how they are proposed to be addressed by improvements is presented later in the report.

3.4 Route Security

SH58 is subject to a number of different hazard events including extreme weather events (including ice and snow), flooding, spring tides, landslides, and earthquakes.

Flood events can impact on the highway at various locations causing localised impacts. Historically these have occurred around the Pauatahanui Stream and at Duck Creek, amongst others. Spring tides within the Pauatahanui Inlet can also result in the highway needing to be closed.

Landslides can be triggered by high rainfall events or earthquakes. The rolling and mountainous nature of the majority of the route means that landslides and slope failures can result in debris landing on or even blocking the highway.

The Wellington area is highly seismic and subject to occasional intense earthquakes. Earthquake related events can include landslides, soil liquefaction, tsunamis as well as infrastructure collapse due to seismic forces. These events could result in the highway needing to be closed.

The alternative routes for when SH58 is closed include using SH1 and SH2 via Ngauranga, Akatarawa Road (from Upper Hutt to Waikanae) or SH2, 3 and 57 via Palmerston North. However, in times of seismic event these routes may also be closed as they also are at risk of geological hazard. The Petone to Grenada link, once constructed, would also provide another viable alternative route.

4 SH58 Corridor Strategic Plan

An internal Transit New Zealand multi-division charette was held to determine the direction of the SH58 Corridor strategic plan. The charette considered the background information and issues and defined the broad strategic plan for the SH58 Corridor.

Consultation has been undertaken with Upper Hutt City Council, Hutt City Council, Porirua City Council, Kapiti Coast District Council and Greater Wellington Regional Council. Information obtained during this consultation, along with specific suggestions that have been received previously from the Councils and the findings of previous studies, have been considered in the development of the final strategic plan.

4.1 Discussion on the Strategic Plan

In general, the long-term SH58 Corridor strategic plan can be summarised as follows:

- The strategy assumes the Grenada to Gracefield projects and Transmission Gully will proceed within 10 years.
- Based on these assumptions, SH58 will be retained as a two-lane two-way highway with the current passing lanes.
- All intersections will be at-grade, with the exception of the intersections with SH2 and Transmission Gully which will be grade separated.

- The section between Manor Park and Moonshine Road will be managed as an 80 – 100km/h rural environment with consideration being given to carriageway widening and a median barrier (with some provision for turning movements) in the long term.
- The section between Moonshine Road and Pauatahanui will also be managed as an 80-100km/h rural environment with minor safety upgrades in the short term. Long term, this section could become a peri-urban environment and roundabouts for safety will be considered at the Moonshine Road and Flightys Road / Murphys Road intersections in conjunction with reducing the speed limit.
- In the short term, the section between Pauatahanui and Postgate Drive will be managed as a 70km/h peri-urban section and the section from Postgate Drive to Paremata will be managed as a 50km/h urban highway with controlled access. The long term status of SH58 from Transmission Gully to Paremata will be determined as part of the Transmission Gully project.
- Minor safety works will continue to be undertaken to address specific crash issues that arise during the study period.

The rationale for the form and programme of the proposed improvement works within the strategic plan are discussed for the individual highway sections in the following sub-sections. The details of the proposed short term (within 5 years), medium term (5 to 10 years) and long term (10 to 20 years) implementation plans for the strategic plan are provided in ***Section 4.2*** below, with a map of the proposed improvements attached in ***Appendix E***.

4.1.1 Manor Park to Moonshine Road

The section of SH58 between Manor Park and Moonshine Road is currently operating below capacity. In 2019, and assuming the Grenada to Gracefield projects are constructed, traffic volumes will decrease in comparison to the current situation. However, by 2029 and the completion of Transmission Gully, the traffic volumes will again increase but will remain well below the theoretical capacity in all time periods, except eastbound in the AM peak, and therefore some capacity improvements will need to be considered at this location.

The SH2/SH58 intersection is a capacity issue that is programmed to be addressed. A grade separated interchange is currently proposed at this location to replace the traffic signals. This will comprise ramps from SH2 to an elevated roundabout structure which will connect into SH58, Hebden Crescent, McDougall Grove and Manor Park Road. This interchange is currently programmed for construction from 2010/11.

In addition to the interchange, a couple of capacity improvements are proposed to ensure that this route continues to operate efficiently. The narrow road width which, in some locations, is reducing the theoretical capacity of the route will be increased to provide wider shoulders. This will also assist in improving the safety of those narrow sections. Furthermore, the two westbound lanes proposed as part of the SH2/58 interchange will be extended to join into the current Haywards Hill passing lane to provide two continuous lanes to the summit

The section from Manor Park to Moonshine Road has a relatively low crash rate overall. However, the curves around the Dry Creek Quarry and the Hayward substation have crash rates higher than expected. Due to the curvilinear nature of the highway and the potential for cross-centreline and head-on crashes, some long term improvements are proposed to extend the existing Wire Rope Median Barrier to Hugh Duncan Drive in the east and to Moonshine Road in the west. Turning movements would be rationalised to upgraded facilities at Haywards Substation, Mt Cecil Road and Harris Road. Realignments for safety at the Hayward substation will be considered as part of the median barrier extension, while the curves at Dry Creek Quarry will be addressed as part of the SH2/SH58 Grade Separated Interchange works.

4.1.2 Moonshine Road to Pauatahanui

The Moonshine Road to Pauatahanui section of the route is currently operating well below capacity and is not expected to reach capacity for at least 20 years.

However, the mid block crash rates on this section are higher than the typical rates for this type of highway, in part due to the higher level of access which this section affords. Accordingly, the short term strategy is to undertake minor safety improvements such as seal widening and intersection upgrades to address specific crash issues.

The long term strategy for this section of SH58 is to give consideration to constructing roundabouts at key intersections to appropriately manage turning movements and driver speeds. Depending on future crash trends and the level of turning movements, rural roundabouts will be considered at Moonshine Road and Murphys Road / Flightys Road in addition to the existing roundabout at Pauatahanui. This section will continue to be monitored in relation to the level of access and the number of turning movements. Should these significantly increase, a flush median between the roundabouts will be considered in conjunction with reducing the speed limit.

The Transmission Gully route crosses SH58 between Bradey Road and the Pauatahanui Roundabout. As part of the Transmission Gully project, a roundabout is proposed at this location to connect SH58 to the Transmission Gully on- and off-ramps.

4.1.3 Pauatahanui to Paremata

Some sections of SH58 between the Pauatahanui roundabout and the Paremata roundabout on SH1 are currently approaching capacity. However, the forecast traffic volumes assuming increased development but also the Grenada to Gracefield projects and Transmission Gully are well within the capacity of the highway. Nevertheless, the longer term strategy for this section is being investigated as part of the Transmission Gully project.

While the mid-block crash rates are not inconsistent with what could be expected for this type of highway, there has been a significant number of crashes occurring at many of the intersections along this route.

The constrained environment through which this highway traverses means that large scale improvements for capacity and safety would come at considerable expense. Accordingly, the short to medium term strategy seeks to make best use of the existing highway. This will primarily involve rationalising turning movements at the Spinnaker Drive intersection and installation of a roundabout at the Postgate Drive intersection to improve safety. These improvements will result in a safer and more efficient stretch of highway.

4.2 Details of the Strategic Plan

The proposed implementation plan for the SH58 Corridor is presented in Table 4.1 and Figure 21 to Figure 23 below.

The rationale for the form and programme of the proposed improvement works within the strategic plan are discussed in ***Section 4.1*** (and sub-sections) above.

Table 4.1: SH58 Corridor –Implementation Plan

Improvement Works	Indicative Timing for Construction
Proposed Large Projects	
• SH2 / SH58 Grade Separated Interchange	2010/11 – 2015/16
Proposed Small and Medium Projects:	
• Extension of uphill passing lane	0-5 years
• Haywards to Moonshine Seal Widening	10-15 years
• Hayward Substation Curves Realignment	10-15 years
• Haywards Summit to Moonshine Road Median Barrier	15-20 years
• Moonshine Road Roundabout	15-20 years
• Moonshine to Pauatahanui Minor Safety Improvements	0-5 years
• Flightys Road / Murphys Road Roundabout	15-20 years
• Postgate Drive Roundabout	2010
• Spinnaker Drive intersection treatment	2010/11

It is recommended that the investigation stages of the above projects be undertaken as early as possible to more accurately determine the appropriate construction timing.

In addition to the proposed projects above, minor safety works will be undertaken throughout the strategy period to continuously improve the safety of road users on this highway.

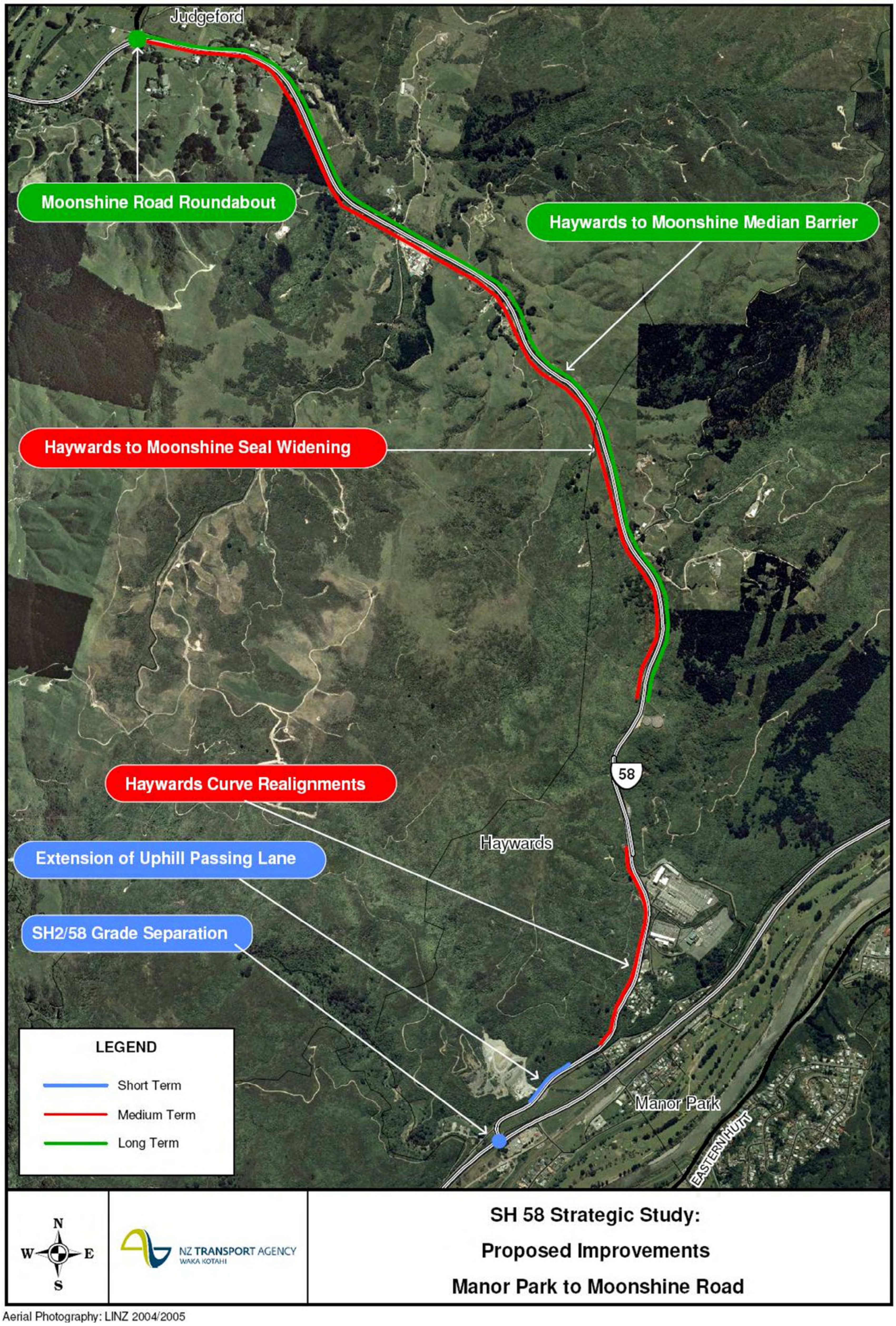


Figure 21: Proposed Improvements – Manor Park to Moonshine Road

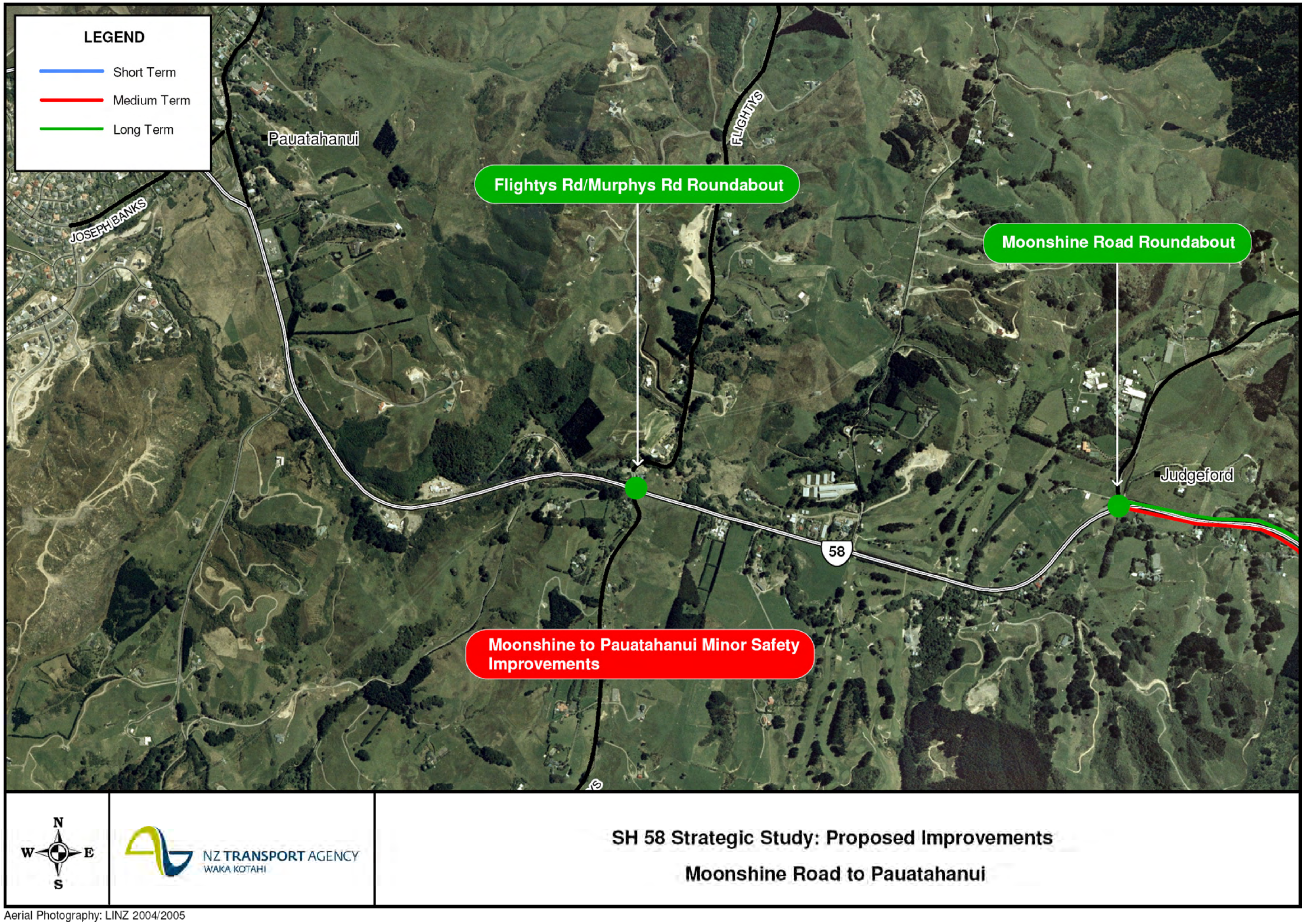
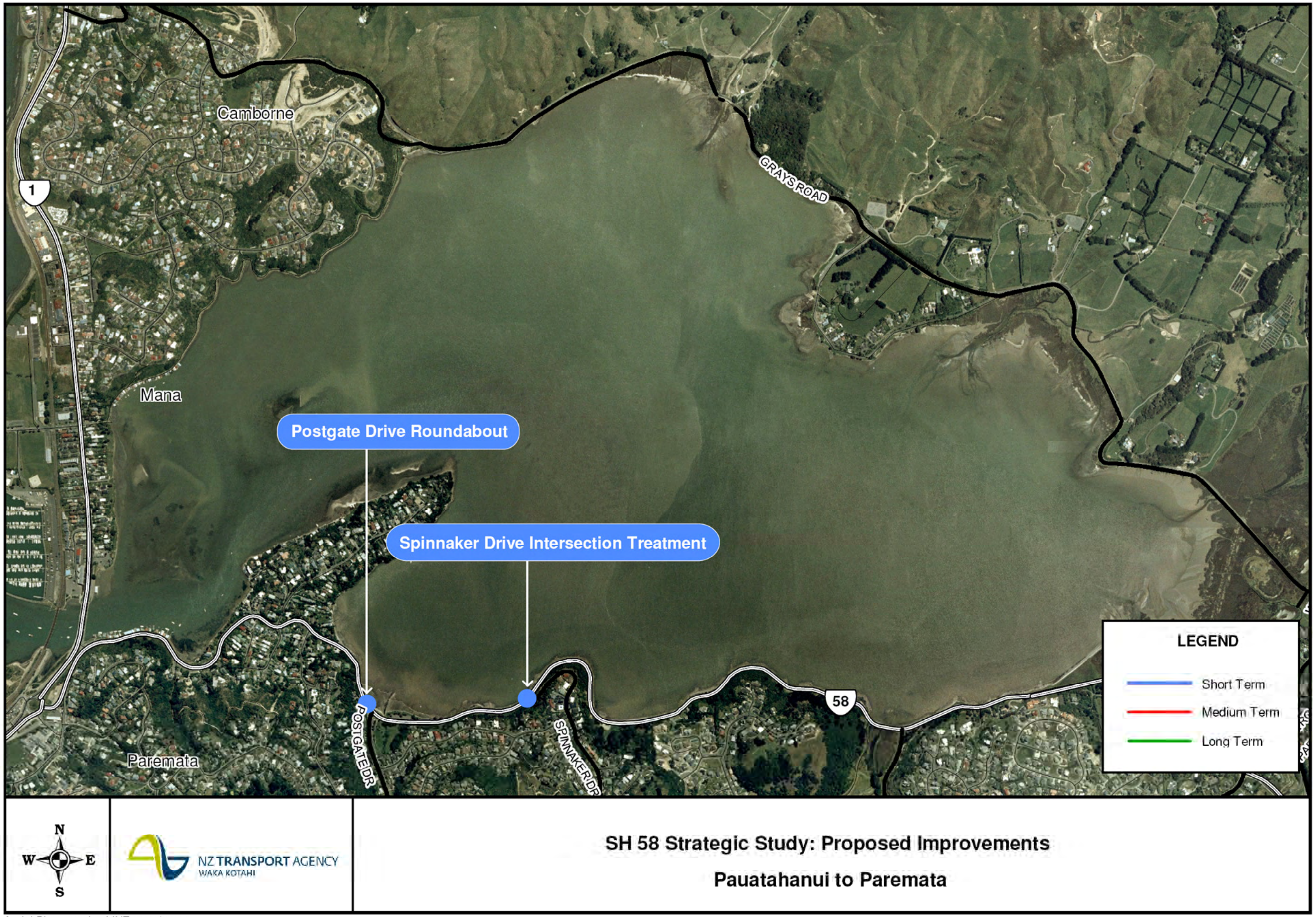


Figure 22: Proposed Improvements –Moonshine Road to Pauatahanui



Aerial Photography: LINZ 2004/2005

Figure 23: Proposed Improvements –Pauatahanui to Paremata

5 SH58 Corridor Improvements - Project Feasibility

Project Feasibility Reports (PFRs) have been undertaken for each of the proposed future improvement works within the SH58 Corridor strategic plan.

The indicative cost and the NZTA "Funding Assessment Profile" for each of the proposed improvement works are summarised in Table 5.1 below.

Table 5.1: SH58 Corridor – Project Feasibility for Proposed Works

Improvement Works	Indicative Cost I Investigate $ <5M $$ 5-20M $$$ 20-100M $$$$ 100+M	Funding Assessment Profile* Strategic Fit	 Effectiveness	 Economic Efficiency
Proposed Large Projects:				
• SH2 / SH58 Grade Separated Interchange	$$$	H	M	M
Proposed Small and Medium Projects:				
• Extension of uphill passing lane	$	M	M	L
• Haywards to Moonshine Seal Widening	$$	M	M	L
• Hayward Substation Curves Realignment	$	M	M	M
• Haywards Summit to Moonshine Road Median Barrier (including turn around facilities)	$$	M	M	L
• Moonshine Road Roundabout	$	M	M	L
• Flightys Road / Murphys Road Roundabout	$	M	M	L
• Postgate Drive Roundabout	$	M	M	H
• Spinnaker Drive intersection treatment	$	M	M	H

*Where a funding assessment profile for a project has not been approved by NZTA, the generic funding profile from the draft amendment to NZTA's Planning Programming and Funding Manual (dated 3 June 2009) has been used.

6 Monitoring

It is acknowledged that there are a number of assumptions in this strategy which have helped determine the types and timings of projects to be undertaken. If one or more of these assumptions do not eventuate then the strategy may need to be revisited to ensure the recommendations are still appropriate and robust.

In order to ensure that these reviews are undertaken, a monitoring strategy is proposed with a number of trigger points that will initiate consideration of whether the strategy needs to be reviewed. For the SH58 Strategic Study, these trigger points are as follows:

- Once the 2011 update of the Wellington Transport Strategy Model has been undertaken, which will include updated growth information around the region;
- Once construction timelines have been confirmed for the Grenada to Gracefield projects and Transmission Gully;
- Once the Wellington Regional Land Transport Strategy has been updated; and
- If significant changes in traffic volumes are experienced on the State Highway or intersecting local roads in comparison to the forecast traffic volumes used in this strategy. This is particularly important if significant changes are made to Greys Road and need to be revisited once the Grenada to Gracefield projects and Transmission Gully are constructed.

NZ TRANSPORT AGENCY
WAKA KOTAHI

Appendix A: Traffic Analysis File Note

This appendix includes a file note outlining how the forecast traffic volumes were determined for both the SH2 and SH58 corridors.

NZ Transport Agency

SH2 and SH58 Strategic Studies - Traffic Growth Assumptions

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Rev. No.	Date	Description	Prepared By	Reviewed By	Approved By
-	30/10/09	Draft for Comment	Phil Peet		
A	3/11/09	For GW Comment	Phil Peet	David Wanty	
B	4/11/09	Final	Phil Peet		Phil Peet
C	21/12/09	Final – SH58 Updated	Phil Peet		Phil Peet

1 Introduction

This document outlines how the forecast traffic volumes in the SH2 and SH58 Strategic Studies were determined.

When the SH2 Strategic Study was first prepared, neither the Wellington Transport Strategy Model (WTSM) or the SATURN model were developed sufficiently to enable traffic forecasts from these to be used to predict future traffic volumes on SH2 or SH58. Accordingly, the future demands on these routes were predicted by determining the historical traffic growth from NZTA count sites along the study lengths, then reducing these slightly to account for additional uptake in public transport and implementation of travel demand management measures in future years.

With the recent push to complete the strategic studies, this approach was retained. However, Greater Wellington, in reviewing the documents, requested that the future demand be based on WTSM forecasts, as this takes account of the changing land use, population and employment projections, public transport, fuel price and the capacity of the transport network.

MWH therefore requested WTSM model outputs from Greater Wellington to assist in the development of the strategy. Subsequently, SATURN model outputs were also obtained. It is important to note that no new trip matrices or networks were created as part of this project. Instead, the most appropriate existing matrices and networks were used to forecast traffic volumes,

2 WTSM Model Outputs

Four different model outputs were obtained from Greater Wellington; these were:

- 2006 Base. The committed projects in this run included the Inner City Bypass.
- 2016 Committed projects only (i.e. 2006 network above plus Dowse to Petone). This assumed the GW medium growth option (equivalent to around 1.8% p.a.), a 20% increase in public transport fares (from 2006) and a 20% increase in fuel price (from 2006).
- 2016 Committed projects plus Petone to Grenada and Transmission Gully. This also assumed medium growth, a 20% increase in public transport fares (from 2006) and a 20% increase in fuel price (from 2006).
- 2026 Committed projects plus Petone to Grenada and Transmission Gully. This assumed medium growth, a 20% increase in public transport fares (from 2006) and a 20% increase in fuel price (from 2006).

It is noted that the 20% increase in PT fares and fuel prices has not been altered between the 2016 and 2026 model runs. This means that no further increases in public transport fares or fuel prices have been assumed in this ten year period. It should also be noted that there are no network changes in any of these scenarios to SH1 through Ngauranga Gorge, SH2 Petone-Ngauranga or SH1 Ngauranga to Aotea Quay.

The outputs of these scenarios were provided by means of pdf network plans for the AM, IP and PM periods with traffic volumes adjacent to the links. These outputs are available on request, but a summary of the traffic volumes are presented in Attachment 1.

The model outputs show that there are a number of locations were traffic volumes are forecast to decrease over time. While some of these are due to network changes (e.g. Dowse to Petone and Grenada to Gracefield), at many locations, network changes cannot explain the decrease. This is especially true for the period 2016 to 2026. Static traffic volumes could be explained by the network being at capacity, such as a bottle neck at Ngauranga Interchange. As mentioned above, the tidal flow lanes proposed between Ngauranga and Aotea have not been included in the modelling runs that we received. GW's comments on this subject are as follows:

> *In terms of the tidal flow lane south of Ngauranga, we have modelled the impact of this, but not to any level of detail. For example, the strategic model does not model merge delay (although we are working on this). The merge is represented by a reduction in lane capacity upstream and downstream of the bottleneck. We have added the extra lane south, and this has shown to move traffic from the Old Hutt Road to SH1, thus allowing a bus lane on the Old Hutt Road. The Ngauranga-Airport work that was undertaken did not show significant increases in traffic upstream when the merge was removed - however this is probably more due to the limitations of the model with regards to merges modelling, which is typically why a traffic model would be used*.

However, this does not explain the reduction in traffic volumes in future years. Other variables which could result in reduced traffic volumes are demographic forecasts in the Hutt Valley, fuel price assumptions and public transport improvements. These are discussed in turn below.

In the medium growth scenario adopted, the population in the Hutt Valley is expected to grow by around 3% from 2006 to 2016, households will grow by a faster rate due to the ongoing trend of fewer people per household, but employment is expected to increase by 15%. This additional employment keeps some trips internal to the area meaning fewer trips on SH2.

The assumed 20% increase in fuel price will have a significant impact on the traffic volumes. According to Greater Wellington, they believe this could reduce the demand on the state highway corridor by around 6-8%.

The proposed improvements to public transport also draw trips away from the state highway network. Between 2006 and 2016 base networks, although road volumes remain constant, southbound public transport trips increase by about 9%.

Nevertheless, while these assumptions may be valid, we still felt uncomfortable with a decrease in traffic volumes on State Highway 2. Accordingly, we requested model runs from the SATURN model which was recently expanded to model the effect of likely SH2 interchange upgrades at Melling and Kennedy Good.

3 SATURN Model Outputs

The SATURN model is based on WTSM trip matrices and therefore the GW strategic assumptions will still be inherent in any outputs. However, SATURN enables better modelling of the localised network, specifically in regards to network improvements and hence outputs should be more accurate. Furthermore, the scenarios in terms of which projects are included in the future years are more aligned in the SATURN runs than in the WTSM runs.

Another key point of difference is the fuel price assumptions in future years; while the WTSM outputs assume a 20% increase in fuel price between 2006 and 2016 and no further increase between 2016 and 2026, the SATURN model assumes a 10% increase in the first ten year periods and an additional 10% increase in the second ten year period.

SKM provided us with a number of different network scenarios to assist us in requesting model outputs. These are included in Attachment 2, The network options basically vary in respect to the timing of Melling, KGB, Grenada to Gracefield, Transmission Gully and the SH58 roundabouts. SKM also gave us the option of applying a different trip matrix on a specified network.

The previous process used to forecast travel demand was based on historic traffic growth and did not take into account the capacity of the highway. This enabled us to then determine what improvements would be required and when they should be implemented to assist in meeting this demand. Using modelling outputs has meant that capacity restrictions do have an impact on traffic volumes and hence some network improvements need to be assumed for future years, especially outside of the study area, to ensure that future traffic volumes are realistic. To this end, the Regional Land Transport Programme 2009-12 has been used to determine the timing of future projects. This may be seen to be predetermining the outcome of the strategic studies, particularly for those projects wholly contained within the corridors under investigation, such as the 2/58, Melling and KGB interchanges. However, these particular projects are at locations which are known to be significant capacity restrictions and the capacity analysis undertaken as part of the studies proves that they will be required at, or before, the time that they are programmed.

The assumptions, based on the RLTP, are therefore as follows:

- 2009 Current Network excluding Dowse-Petone
- 2019 Dowse-Petone
  SH2/58 Interchange
  Melling Interchange
  Kennedy Good Interchange
  Grenada to Gracefield projects
  Ngauranga to Aotea Tidal Flow
- 2029 Transmission Gully

Accordingly, we requested the following model outputs:

- 2006 Base. Does not include the Dowse-Petone interchange but does include the Inner City Bypass.
- 2016 Trip Matrix on 2026 Test 58 Network. This includes projects such as Melling, KGB, 2/58, Ngauranga to Aotea and Grenada to Gracefield projects.
- 2026 Trip Matrix on 2026 Test 66 Network. This includes all projects above plus Transmission Gully and the SH58 roundabouts.

The model outputs for a number of other scenarios were also received; however the above three were determined to most closely replicate the likely timing of future projects. The outputs of all scenarios as received from SKM are shown in Attachment 3.

Although both models are based on the same trip matrices, the SATURN outputs do show significant differences in relation to the forecast traffic volumes when compared to WTSM. In summary, this is likely to be primarily due to the projects assumed in the model runs and the fuel price increase assumed. SATURN is also likely to be more accurate than WTSM in regards to the network impacts due to both the model type and model processes. In addition, WTSM outputs two-hour flows whereas SATURN outputs peak hour flows which may mean that some peak effects could be reported differently.

We consider that the SATURN outputs give a more realistic indication of the likely changes in traffic flows in the coming years.

4 Methodology for Forecasting Traffic Volumes

Both transport models use 2006 as a base year and have 2016 and 2026 as future years. However, the SH2 and SH58 Strategy documents have 2009 as the base year with 2019 and 2029 for future years. Traffic volumes for the 2009 base year have been determined using recent TMS count data then escalating based on historic traffic growth rates if required. As this is the most accurate information in relation to the traffic volumes that are currently occurring on the highways, we have continued to use this data rather than the 2006 base network model outputs.

By adopting the 'actual' traffic volumes for 2009, and needing 2019 and 2029 as future years, using the 2016 and 2026 traffic model outputs would not give accurate forecast information. Accordingly, we have instead calculated the percentage growth between the SATURN model traffic volume outputs and applied this to the 2009 'actual' traffic flows. This then provides us with a much better indicator of flows in the studies' future years. To clarify:

- To calculate the 2019 flows we determined the percentage growth between the 2006 Base and 2016 SATURN outputs and applied this percentage increase to the 2009 'actual' flows.
- To calculate the 2029 flows we determined the percentage growth between the 2016 and 2026 SATURN outputs and applied this percentage increase to the 2019 calculated flows.

This gave us future flows for both SH58 and SH2 from Ngauranga to Silverstream. However, as the SATURN model does not extend north past Silverstream, some additional calculation of future traffic volumes was needed for the section of SH2 between Silverstream and Maoribank.

One option for this section was to use the WTSM outputs to calculate the percentage growth; however, as already shown, we believe this may underestimate the future traffic volumes. We therefore wanted a way to encapsulate the increased traffic flows that were likely to occur.

To do this, the percentage growth between future years was plotted for both the SATURN model outputs and the WTSM outputs. There were some significant differences around the Dowse to Melling section, primarily because of the differing assumptions in relation to the Dowse-Petone and Grenada to Gracefield projects. However, between Melling and Silverstream, the percentage growth from 2006 to 2016 as shown by the SATURN model was shown as being greater than that output from the WTSM model. For each direction and period, this difference in growth was averaged and the absolute percentage difference was added onto the WTSM growth percentage. For example, in the northbound PM peak, the average percentage growth between Melling and Silverstream from 2006 to 2016 in the WTSM outputs is -1%, but for the SATURN model it is 3%. Therefore, 4 percentage points were then added to the growth rates output from WTSM for each section north of Silverstream, so that, for example, the 10% growth between Moonshine Road and Gibbons Street was escalated to 14%. As this process is best shown graphically, graphs are provided in Attachment 4.

5 Traffic Volumes used in Strategic Studies

Attachment 5 contains the spreadsheets which show both the 2009 'actual' flows, the flows from the SATURN models, growth percentages used, and the 2019 and 2029 future flows which are input into the spreadsheet and graphs shown in Appendix A of the Strategic Studies.

A final reality check was undertaken of the graphs of demand versus capacity (Section 3.2 and Appendix A of the Strategic Studies) using the traffic forecasts using the above methodology and altered capacity values to take account of network changes. All graphs appear to show sensible outputs.

Attachment 1: Summary of WTSM outputs

State Highway 2 - Note Volume is for 2 hour period

2006 Base		2006 AM				2006 PM			
		Southbound		Northbound		Southbound		Northbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
Ngauranga Gorge	SH2	4750	N/A	3070	N/A	3770	N/A	5450	N/A
SH2	Petone Interchange	7980	N/A	5570	N/A	6420	N/A	7840	N/A
Petone Interchange	Korokoro Road	4910	N/A	2150	N/A	3660	N/A	4070	N/A
Korokoro Road	Dowse Drive	4820	N/A	2280	N/A	3030	N/A	4300	N/A
Dowse Drive	Melling	4420	N/A	2330	N/A	2960	N/A	3970	N/A
Melling	Block Road	3320	N/A	1220	N/A	1450	N/A	2820	N/A
Block Road	Grounsell Crescent	4100	N/A	1530	N/A	1880	N/A	4090	N/A
Grounsell Crescent	Fairway Drive	3570	N/A	1540	N/A	1830	N/A	3680	N/A
Fairway Drive	SH2/SH58	3450	N/A	2040	N/A	2330	N/A	3150	N/A
SH2/SH58	Fergusson Drive	3500	N/A	2180	N/A	2520	N/A	3370	N/A
Fergusson Drive	Moonshine Road	2550	N/A	1830	N/A	2130	N/A	2410	N/A
Moonshine Road	Whakatiti Street	2130	N/A	1580	N/A	1940	N/A	2040	N/A
Whakatiti Street	Gibbons Street	1640	N/A	1300	N/A	1640	N/A	1570	N/A
Gibbons Street	Totara Park Road	1750	N/A	1170	N/A	1380	N/A	1590	N/A
Totara Park Road	Fergusson Drive	1210	N/A	950	N/A	1100	N/A	1110	N/A
Fergusson Drive	Akatarawa Road	2170	N/A	1500	N/A	1780	N/A	2190	N/A
Akatarawa Road	Norana Road	840	N/A	880	N/A	880	N/A	760	N/A
Norana Road		860	N/A	950	N/A	930	N/A	800	N/A

2016 Committed		AM				PM			
Growth compared to 2006 Base		Southbound		Northbound		Southbound		Northbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
Ngauranga Gorge	SH2	4740	0%	3400	11%	4050	7%	5330	-2%
SH2	Petone Interchange	8090	1%	6330	14%	7090	10%	7990	2%
Petone Interchange	Korokoro Road	5570	13%	4110	91%	4290	17%	5740	41%
Korokoro Road	Dowse Drive	5570	16%	3750	64%	4290	42%	5760	34%
Dowse Drive	Melling	4170	-6%	2410	3%	2930	-1%	4160	5%
Melling	Block Road	3160	-5%	1250	2%	1450	0%	3150	12%
Block Road	Grounsell Crescent	4070	-1%	1620	6%	1970	5%	4070	0%
Grounsell Crescent	Fairway Drive	3550	-1%	1630	6%	1900	4%	3630	-1%
Fairway Drive	SH2/SH58	3470	1%	2070	1%	2330	0%	3200	2%
SH2/SH58	Fergusson Drive	3360	-4%	2270	4%	2580	2%	3300	-2%
Fergusson Drive	Moonshine Road	2550	0%	1700	-7%	2310	8%	2210	-8%
Moonshine Road	Whakatiti Street	2180	2%	1810	15%	2160	11%	2240	10%
Whakatiti Street	Gibbons Street	1710	4%	1330	2%	1880	15%	1590	1%
Gibbons Street	Totara Park Road	1860	6%	1230	5%	1510	9%	1700	7%
Totara Park Road	Fergusson Drive	1330	10%	990	4%	1270	15%	1230	11%
Fergusson Drive	Akatarawa Road	2350	8%	1630	9%	2000	12%	2390	9%
Akatarawa Road	Norana Road	870	4%	980	11%	1080	23%	890	17%
Norana Road		900	5%	1050	11%	1150	24%	940	18%

2016 Committed plus TG and G-G		AM				PM			
Growth compared to 2006 Base		Southbound		Northbound		Southbound		Northbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
Ngauranga Gorge	SH2	5480	15%	3370	10%	4140	10%	5910	8%
SH2	Petone Interchange	7580	-5%	4360	-22%	5170	-19%	7440	-5%
Petone Interchange	Korokoro Road	7040	43%	4810	124%	5250	43%	7550	86%
Korokoro Road	Dowse Drive	7040	46%	4320	89%	5250	73%	6970	62%
Dowse Drive	Melling	5260	19%	2650	14%	3310	12%	4900	23%
Melling	Block Road	3730	12%	1280	5%	1670	15%	3630	29%
Block Road	Grounsell Crescent	4340	6%	1640	7%	1920	2%	4770	17%
Grounsell Crescent	Fairway Drive	3770	6%	1620	5%	1820	-1%	4290	17%
Fairway Drive	SH2/SH58	3480	1%	1960	-4%	2080	-11%	3400	8%
SH2/SH58	Fergusson Drive	3630	4%	2520	16%	2700	7%	3580	6%
Fergusson Drive	Moonshine Road	2570	1%	1800	-2%	2340	10%	2360	-2%
Moonshine Road	Whakatiti Street	2240	5%	1910	21%	2200	13%	2380	17%
Whakatiti Street	Gibbons Street	1740	6%	1390	7%	1900	16%	1670	6%
Gibbons Street	Totara Park Road	1870	7%	1260	8%	1570	14%	1750	10%
Totara Park Road	Fergusson Drive	1320	9%	1020	7%	1330	21%	1260	14%
Fergusson Drive	Akatarawa Road	2360	9%	1640	9%	2010	13%	2410	10%
Akatarawa Road	Norana Road	900	7%	1000	14%	1090	24%	910	20%
Norana Road		930	8%	1070	13%	1160	25%	960	20%

2026 Committed plus TG and G-G		AM				PM			
Growth compared to 2016 + TG & G-G		Southbound		Northbound		Southbound		Northbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
Ngauranga Gorge	SH2	5310	-3%	3800	13%	4530	9%	5660	-4%
SH2	Petone Interchange	7570	0%	4940	13%	5720	11%	7470	0%
Petone Interchange	Korokoro Road	6940	-1%	5530	15%	5780	10%	7700	2%
Korokoro Road	Dowse Drive	6940	-1%	5000	16%	5780	10%	7050	1%
Dowse Drive	Melling	5120	-3%	3050	15%	3650	10%	4720	-4%
Melling	Block Road	3470	-7%	1510	18%	1860	11%	3290	-9%
Block Road	Grounsell Crescent	4110	-5%	1950	19%	2130	11%	4640	-3%
Grounsell Crescent	Fairway Drive	3560	-6%	1910	18%	2040	12%	4190	-2%
Fairway Drive	SH2/SH58	3370	-3%	2340	19%	2270	9%	3460	2%
SH2/SH58	Fergusson Drive	3480	-4%	3030	20%	3030	12%	3600	1%
Fergusson Drive	Moonshine Road	2580	0%	2140	19%	2600	11%	2450	4%
Moonshine Road	Whakatiti Street	2200	-2%	2260	18%	2410	10%	2490	5%
Whakatiti Street	Gibbons Street	1720	-1%	1740	25%	2140	13%	1780	7%
Gibbons Street	Totara Park Road	1850	-1%	1580	25%	1870	19%	1850	6%
Totara Park Road	Fergusson Drive	1330	1%	1340	31%	1640	23%	1380	10%
Fergusson Drive	Akatarawa Road	2420	3%	2080	27%	2430	21%	2590	7%
Akatarawa Road	Norana Road	1050	17%	1390	39%	1460	34%	1100	21%
Norana Road		1130	22%	1480	38%	1560	34%	1170	22%

State Highway 58 - Note Volume is for 2 hour period

2006 Base		AM				PM			
		Westbound		Eastbound		Westbound		Eastbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
SH2/SH58	Old Haywards Hill Road	1540	N/A	1630	N/A	1600	N/A	1620	N/A
Old Haywards Hill Road	TG Interchange	1450	N/A	1590	N/A	1510	N/A	1540	N/A
TG Interchange	Pauatahanui Roundabout	1450	N/A	1590	N/A	1510	N/A	1540	N/A
Pauatahanui Roundabout	Joesph Banks Drive	1180	N/A	1140	N/A	1040	N/A	1250	N/A
Joesph Banks Drive	James Cook Drive	1060	N/A	860	N/A	820	N/A	1070	N/A
James Cook Drive	Spinnaker Drive	1610	N/A	1040	N/A	1190	N/A	1620	N/A
Spinnaker Drive	Postgate Drive	1530	N/A	1120	N/A	900	N/A	1630	N/A
Postgate Drive	Ivey Bay Ped Underpass	1670	N/A	1100	N/A	1040	N/A	1790	N/A
Ivey Bay Ped Underpass	SH1 to SH58 off ramp	1490	N/A	1140	N/A	830	N/A	2020	N/A
SH1 to SH58 off ramp	Paremata Roundabout	1490	N/A	810	N/A	830	N/A	1440	N/A

2016 Committed		AM				PM			
Growth compared to 2006 Base		Westbound		Eastbound		Westbound		Eastbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
SH2/SH58	Old Haywards Hill Road	1450	-6%	1770	9%	1660	4%	1510	-7%
Old Haywards Hill Road	TG Interchange	1340	-8%	1700	7%	1540	2%	1430	-7%
TG Interchange	Pauatahanui Roundabout	1340	-8%	1700	7%	1540	2%	1430	-7%
Pauatahanui Roundabout	Joesph Banks Drive	1150	-3%	1250	10%	1100	6%	1260	1%
Joesph Banks Drive	James Cook Drive	1010	-5%	920	7%	820	0%	1060	-1%
James Cook Drive	Spinnaker Drive	1620	1%	1130	9%	1230	3%	1650	2%
Spinnaker Drive	Postgate Drive	1540	1%	1190	6%	910	1%	1630	0%
Postgate Drive	Ivey Bay Ped Underpass	1690	1%	1210	10%	1060	2%	1800	1%
Ivey Bay Ped Underpass	SH1 to SH58 off ramp	1500	1%	1260	11%	840	1%	1950	-3%
SH1 to SH58 off ramp	Paremata Roundabout	1500	1%	890	10%	840	1%	1380	-4%

2016 Committed plus TG and G-G		AM				PM			
Growth compared to 2006 Base		Westbound		Eastbound		Westbound		Eastbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
SH2/SH58	Old Haywards Hill Road	1310	-15%	1700	4%	1760	10%	1320	-19%
Old Haywards Hill Road	TG Interchange	1200	-17%	1630	3%	1630	8%	1240	-19%
TG Interchange	Pauatahanui Roundabout	560	-61%	900	-43%	840	-44%	750	-51%
Pauatahanui Roundabout	Joesph Banks Drive	360	-69%	640	-44%	550	-47%	550	-56%
Joesph Banks Drive	James Cook Drive	230	-78%	360	-58%	290	-65%	370	-65%
James Cook Drive	Spinnaker Drive	560	-65%	540	-48%	520	-56%	740	-54%
Spinnaker Drive	Postgate Drive	480	-69%	610	-46%	400	-56%	680	-58%
Postgate Drive	Ivey Bay Ped Underpass	580	-65%	690	-37%	490	-53%	830	-54%
Ivey Bay Ped Underpass	SH1 to SH58 off ramp	420	-72%	790	-31%	310	-63%	1160	-43%
SH1 to SH58 off ramp	Paremata Roundabout	420	-72%	540	-33%	310	-63%	750	-48%

2026 Committed plus TG and G-G		AM				PM			
Growth compared to 2016 + TG & G-G		Westbound		Eastbound		Westbound		Eastbound	
		Volume	Growth	Volume	Growth	Volume	Growth	Volume	Growth
SH2/SH58	Old Haywards Hill Road	1330	2%	1900	12%	1960	11%	1330	1%
Old Haywards Hill Road	TG Interchange	1190	-1%	1820	12%	1810	11%	1250	1%
TG Interchange	Pauatahanui Roundabout	590	5%	950	6%	880	5%	760	1%
Pauatahanui Roundabout	Joesph Banks Drive	380	6%	690	8%	590	7%	550	0%
Joesph Banks Drive	James Cook Drive	240	4%	380	6%	300	3%	370	0%
James Cook Drive	Spinnaker Drive	590	5%	580	7%	560	8%	750	1%
Spinnaker Drive	Postgate Drive	510	6%	660	8%	430	8%	700	3%
Postgate Drive	Ivey Bay Ped Underpass	620	7%	770	12%	530	8%	850	2%
Ivey Bay Ped Underpass	SH1 to SH58 off ramp	440	5%	880	11%	330	6%	1170	1%
SH1 to SH58 off ramp	Paremata Roundabout	440	5%	580	7%	330	6%	740	-1%

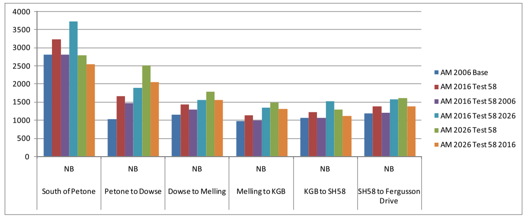
Attachment 2: SATURN Networks

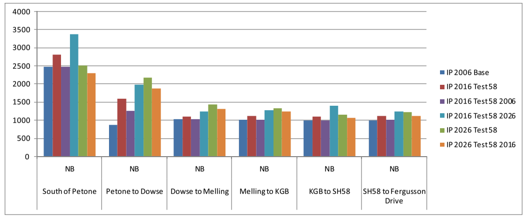
MELLING DM	2006	2016	2026
Terrace tunnel, inner city bypass, Kapiti WLR and a number of other schemes which are in the buffer are and so are coded simplistically and have limited effect on the simulation area;	✗	✓	✓
Dowse interchange;	✗	✓	✓
SH2/58 upgrade;	✗	✓	✓
Melling interchange upgrade;	✗	✗	✓
Kennedy Good bridge upgrade;	✗	✗	✗
Additional network representation around Mark Avenue / Westchester Drive;	✗	✓	✓
Takapu Valley Road;	✗	✓	✓
MacKay's Crossing;	✗	✓	✓
Bing Lucas Drive;	✗	✓	✓
Petone interchange; and	✗	✓	✓
SH1 widening south of Ngauranga.	✗	✓	✓
Grenada to Petone link (based on outcome of Ngauranga Triangle Strategy study)	✗	✗	✗
Cross Valley link (based on outcome of Ngauranga Triangle Strategy study)	✗	✗	✗
Helston south facing ramps	✗	✗	✗
Transmission Gully	✗	✗	✓
SH58 roundabouts (seven locations)	✗	✗	✓

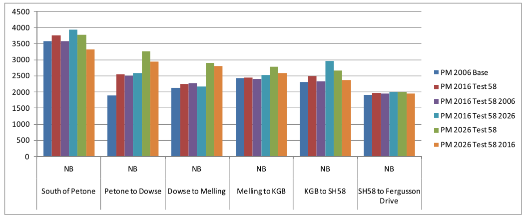
	DM=Test 58			With TG=Test 66		
TG	2006	2016	2026	2006	2016	2026
Terrace tunnel, inner city bypass, Kapiti WLR and a number of other schemes which are in the buffer are and so are coded simplistically and have limited effect on the simulation area;	✗	✓	✓	✗	✓	✓
Dowse interchange;	✗	✓	✓	✗	✓	✓
SH2/58 upgrade;	✗	✓	✓	✗	✓	✓
Melling interchange upgrade;	✗	✗	✓	✗	✗	✓
Kennedy Good bridge upgrade;	✗	✗	✓	✗	✗	✓
Additional network representation around Mark Avenue / Westchester Drive;	✗	✓	✓	✗	✓	✓
Takapu Valley Road;	✗	✓	✓	✗	✓	✓
MacKay's Crossing;	✗	✓	✓	✗	✓	✓
Bing Lucas Drive;	✗	✓	✓	✗	✓	✓
Petone interchange; and	✗	✓	✓	✗	✓	✓
SH1 widening south of Ngauranga.	✗	✓	✓	✗	✓	✓
Grenada to Petone link (based on outcome of Ngauranga Triangle Strategy study)	✗	✗	✓	✗	✗	✓
Cross Valley link (based on outcome of Ngauranga Triangle Strategy study)	✗	✗	✓	✗	✗	✓
Helston south facing ramps	✗	✗	✗	✗	✗	✗
Transmission Gully	✗	✗	✗	✗	✓	✓
SH58 roundabouts (seven locations)	✗	✗	✗	✗	✓	✓

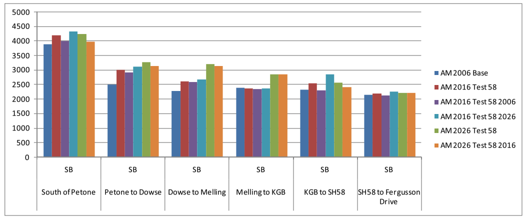
Attachment 3: SATURN Outputs

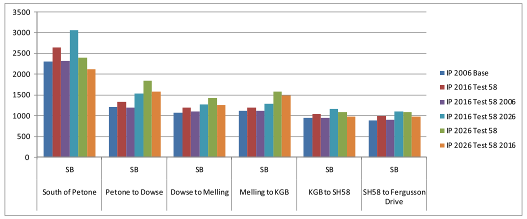
				5	26	110	131	47	152	68	89	12	33	117	138	54	159	75	96	19	40	124	145	61	166	82	103
				Actual flow (PCUs/hr)																							
				AM	AM	AM	AM	AM	AM	AM	AM	IP	IP	IP	IP	IP	IP	IP	IP	PM	PM	PM	PM	PM	PM	PM	PM
SH		Link	Direction	2006 Base	2016 Test 58	2016 Test 58 2006	2016 Test 58 2026	2026 Test 58	2026 Test 58 2016	2016 Test 66	2026 Test 66	2006 Base	2016 Test 58	16 Test 58 20	16 Test 58 20	2026 Test 58	2026 Test 58 2016	2016 Test 66	2026 Test 66	2006 Base	2016 Test 58	2016 Test 58 2006	2016 Test 58 2026	2026 Test 58	2026 Test 58 2016	2016 Test 66	2026 Test 66
8	2	South of Petone	NB	2819	3249	2828	3736	2797	2563	3143	2764	2482	2824	2481	3377	2523	2310	2792	2521	3595	3767	3596	3948	3794	3322	3755	3778
9	2	Petone to Dowse	NB	1043	1681	1474	1908	2529	2068	1612	2420	886	1596	1272	1991	2181	1885	1574	2154	1906	2559	2522	2588	3269	2957	2544	3297
12	2	Dowse to Melling	NB	1163	1438	1304	1571	1806	1568	1389	1755	1036	1103	1046	1247	1439	1322	1094	1434	2146	2267	2289	2184	2908	2813	2254	2725
13	2	Melling to KGB	NB	980	1147	1010	1354	1504	1322	1106	1482	1031	1123	1027	1280	1344	1242	1119	1344	2446	2449	2427	2538	2791	2592	2486	2720
14	2	KGB to SH58	NB	1072	1233	1078	1534	1297	1127	1241	1278	998	1112	1001	1405	1172	1073	1135	1187	2311	2506	2340	2980	2669	2381	2560	2629
15	2	SH58 to Fergusson Drive	NB	1201	1395	1223	1584	1627	1391	1403	1644	1004	1126	1023	1244	1228	1131	1141	1236	1932	1984	1970	1996	2003	1961	2009	2009
17	2	South of Petone	SB	3891	4209	4005	4342	4243	3992	4217	4224	2316	2647	2327	3064	2407	2128	2598	2404	3220	3700	3225	4082	3334	2992	3615	3421
18	2	Petone to Dowse	SB	2507	3011	2934	3136	3291	3141	3010	3264	1226	1339	1201	1543	1847	1590	1303	1812	1637	2000	1672	2382	2559	2047	1915	2687
21	2	Dowse to Melling	SB	2299	2626	2596	2683	3225	3157	2630	3202	1083	1196	1109	1281	1439	1260	1170	1421	1419	1569	1424	1705	1886	1629	1513	1855
22	2	Melling to KGB	SB	2408	2389	2353	2386	2874	2868	2394	2875	1127	1200	1127	1297	1586	1493	1196	1576	1291	1362	1276	1450	1449	1417	1321	1366
23	2	KGB to SH58	SB	2334	2544	2323	2870	2571	2421	2618	2556	951	1053	952	1173	1101	987	1064	1108	1255	1420	1273	1717	1619	1334	1423	1563
24	2	SH58 to Fergusson Drive	SB	2154	2212	2143	2266	2221	2219	2263	2273	901	996	906	1109	1096	985	1010	1106	1280	1442	1289	1673	1677	1436	1452	1677
26	58	Joseph Banks Drive to PHR	EB	658	813	648	1220	729	580	502	516	243	285	243	362	241	213	163	163	590	708	595	919	581	567	288	293
29	58	PHR to TG	EB	979	1188	982	1561	1182	930	696	724	358	411	364	516	351	310	237	237	694	721	694	995	580	540	414	417
30	58	West of SH2	EB	936	1131	940	1505	1121	876	1238	1210	380	433	386	535	373	333	478	431	716	742	716	998	607	564	795	641
31	58	SH1 to Oak Ave	EB	516	624	506	1014	560	465	331	336	531	566	532	616	535	518	375	389	1048	1111	1047	1301	1034	1015	688	754
33	58	Joseph Banks Drive to PHR	WB	543	598	526	710	466	418	212	208	276	309	269	498	276	248	173	173	591	706	588	1330	592	484	377	371
36	58	PHR to TG	WB	757	802	745	927	630	576	336	323	402	441	391	705	385	344	265	259	974	1126	969	1794	1103	890	577	551
37	58	West of SH2	WB	714	761	702	883	592	537	841	713	381	421	371	683	366	324	480	433	885	1024	878	1667	999	792	1128	1037
38	58	SH1 to Oak Ave	WB	1266	1282	1258	1410	1209	1188	833	838	470	488	464	612	461	448	297	309	534	515	526	905	433	399	374	369
41		Grenada to Petone	EB	0	0	0	0	1569	1020	0	1530	0	0	0	0	1027	694	0	996	0	0	0	0	1088	604	0	1085
42		Petone to Grenada	WB	0	0	0	0	853	506	0	778	0	0	0	0	913	597	0	871	0	0	0	0	1434	899	0	1462

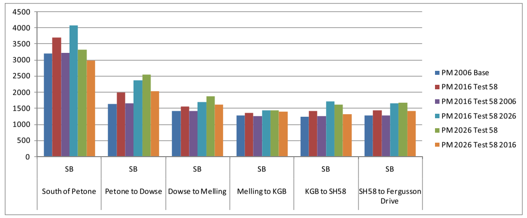


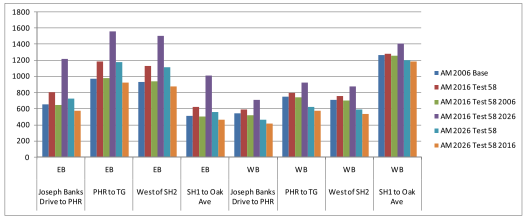


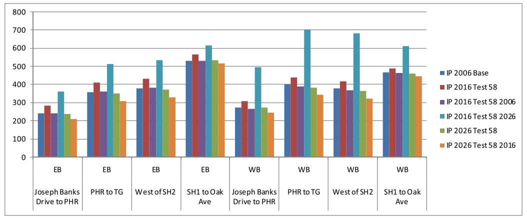


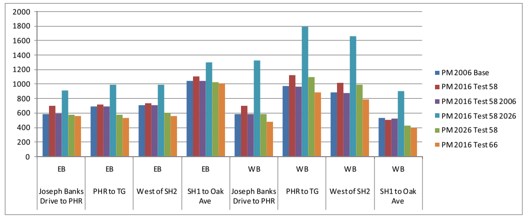










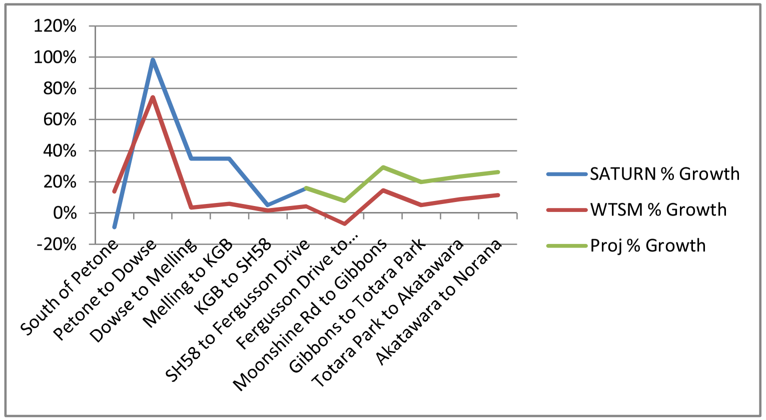


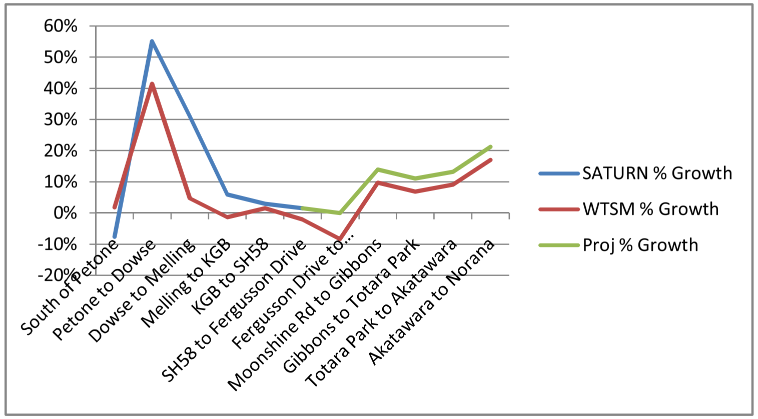
Attachment 4: Growth Rate Graphs

2006-2016

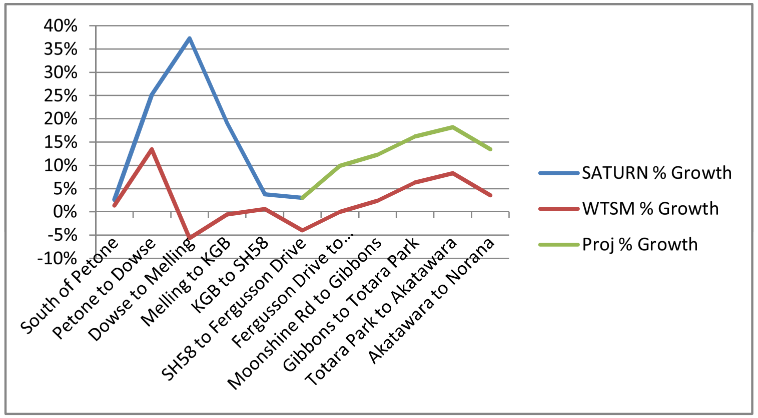
AM | PM

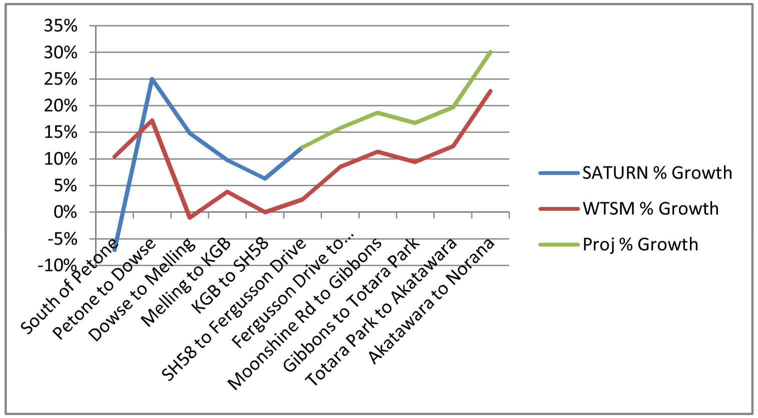
SH2 NBD



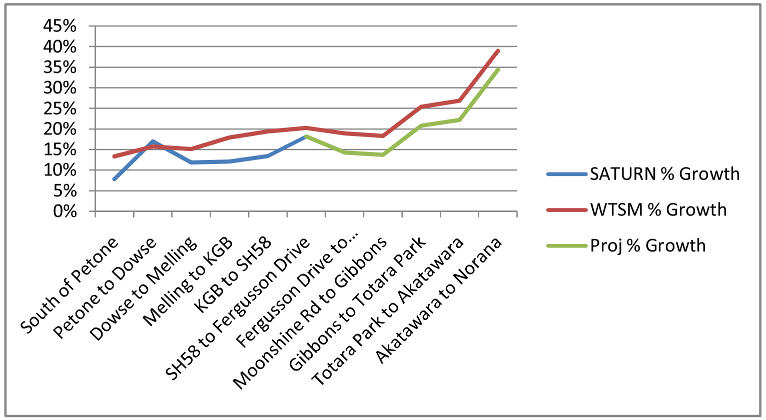
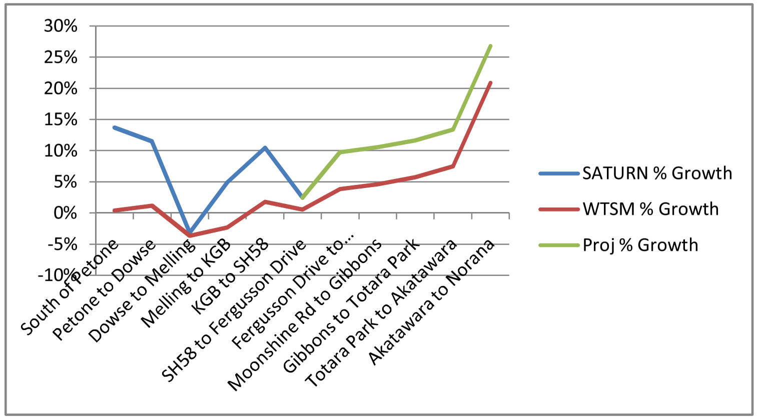
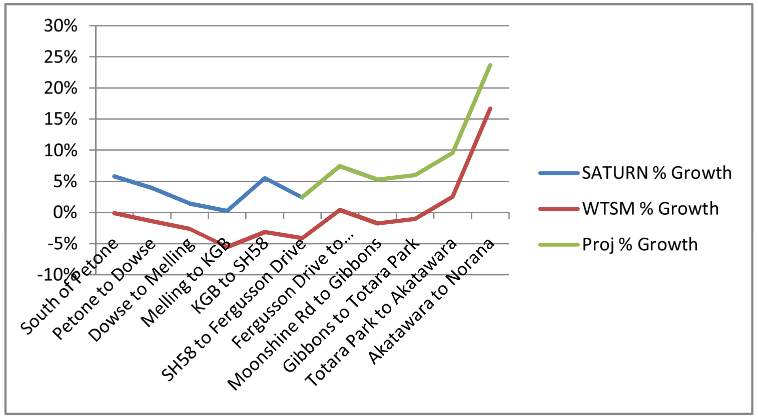
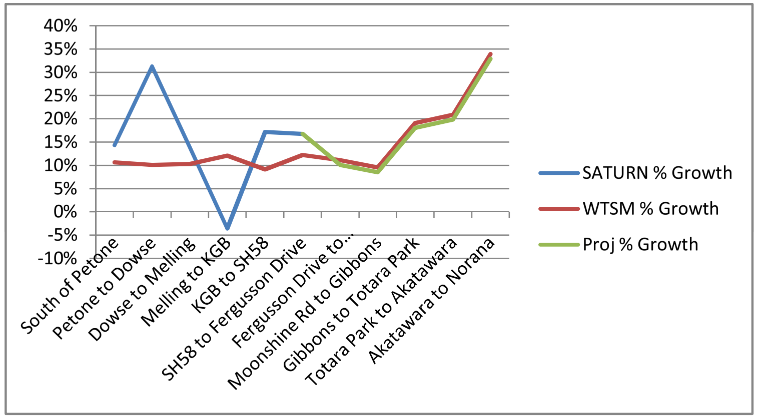


SH2 SBD





2016-2026

		AM	PM
SH2	NBD		
SH2	SBD		

Attachment 5: Growth Spreadsheets

Running Dist	RS	RP	Location	2009 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2009 Avg Weekday PM (17:00-18:00) Sbd	Nbd	2006 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2006 Avg Weekday PM (17:00-18:00) Sbd	Nbd	2016 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2016 Avg Weekday PM (17:00-18:00) Sbd	Nbd	Growth Rate AM (07:00-08:00) Sbd	Nbd	Growth Rate PM (17:00-18:00) Sbd	Nbd	2019 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2019 Avg Weekday PM (17:00-18:00) Sbd	Nbd
948.2	946		2.2 Norana to Akatawara	**724**	**230**	**391**	**806**	-	-	-	-	-	-	-	-	14%	26%	30%	21%	**822**	**290**	**509**	**977**
949.0	946		3.0 Akatawara to Totara Park	**1108**	**304**	**581**	**1274**	-	-	-	-	-	-	-	-	18%	23%	20%	13%	**1310**	**375**	**695**	**1443**
951.5	946		5.5 Totara Park to Gibbons	**1353**	**373**	**608**	**1460**	-	-	-	-	-	-	-	-	16%	20%	17%	11%	**1573**	**447**	**710**	**1621**
954.5	946		8.5 Whakatiki to Moonshine	**1797**	**718**	**952**	**1823**	-	-	-	-	-	-	-	-	12%	29%	19%	14%	**2018**	**929**	**1130**	**2077**
956.9	946		10.9 Moonshine Hill to Silverstream	**1905**	**743**	**922**	**1864**	-	-	-	-	-	-	-	-	10%	8%	16%	0%	**2094**	**800**	**1067**	**1864**
961.6	946		15.6 Silverstream to SH58	**2290**	**993**	**1133**	**2171**	2154	1201	1280	1932	2219	1391	1436	1961	3%	16%	12%	2%	**2359**	**1151**	**1271**	**2204**
962.4	962		0.5 SH58 to KGB	**2614**	**1167**	**1304**	**2332**	2334	1072	1255	2311	2421	1127	1334	2381	4%	5%	6%	3%	**2712**	**1227**	**1386**	**2402**
969.0	962		7.1 KGB to Melling	**1714**	**1003**	**1116**	**2480**	2408	980	1291	2446	2868	1322	1417	2592	19%	35%	10%	6%	**2041**	**1353**	**1225**	**2628**
971.0	962		9.1 Melling to Dowse	**2073**	**1028**	**1455**	**2004**	2299	1163	1419	2146	3157	1568	1629	2813	37%	35%	15%	31%	**2847**	**1387**	**1670**	**2627**
972.4	962		10.5 Dowse to Korokoro	**2315**	**1070**	**1411**	**2137**	2507	1043	1637	1906	3141	2068	2047	2957	25%	98%	25%	55%	**2900**	**2122**	**1764**	**3316**
973.6	962		11.7 Korokoro to Petone	**2590**	**1048**	**1400**	**2286**	2507	1043	1637	1906	3141	2068	2047	2957	25%	98%	25%	55%	**2900**	**2122**	**1764**	**3316**
977.5	962		15.6 Petone to Ngauranga	**3480**	**2633**	**2752**	**3597**	3891	2819	3220	3595	3992	2563	2992	3322	3%	-9%	-7%	-8%	**3571**	**2394**	**2557**	**3324**
				Extrapolated from TMS				SATURN 2006 Base				SATURN: 2016 Trips on 2026 Test 58 Network								**2009 figures plus growth rate**			

From attached graphs
From SATURN models

Running Dist	RS	RP	Location	2019 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2019 Avg Weekday PM (17:00-18:00) Sbd	Nbd	2016 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2016 Avg Weekday PM (17:00-18:00) Sbd	Nbd	2026 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2026Avg Weekday PM (17:00-18:00) Sbd	Nbd	Growth Rate AM (07:00-08:00) Sbd	Nbd	Growth Rate PM (17:00-18:00) Sbd	Nbd	2029 Avg Weekday AM (07:00-08:00) Sbd	Nbd	2029 Avg Weekday PM (17:00-18:00) Sbd	Nbd
948.2	946		2.2 Norana to Akatawara	**822**	**290**	**509**	**977**	-	-	-	-	-	-	-	-	24%	34%	33%	27%	**1017**	**390**	**676**	**1239**
949.0	946		3.0 Akatawara to Totara Park	**1310**	**375**	**695**	**1443**	-	-	-	-	-	-	-	-	10%	22%	20%	13%	**1436**	**459**	**834**	**1636**
951.5	946		5.5 Totara Park to Gibbons	**1573**	**447**	**710**	**1621**	-	-	-	-	-	-	-	-	6%	21%	18%	12%	**1666**	**540**	**838**	**1810**
954.5	946		8.5 Whakatiki to Moonshine	**2018**	**929**	**1130**	**2077**	-	-	-	-	-	-	-	-	5%	14%	9%	11%	**2124**	**1056**	**1226**	**2296**
956.9	946		10.9 Moonshine Hill to Silverstream	**2094**	**800**	**1067**	**1864**	-	-	-	-	-	-	-	-	7%	14%	10%	10%	**2250**	**915**	**1175**	**2046**
961.6	946		15.6 Silverstream to SH58	**2359**	**1151**	**1271**	**2204**	2219	1391	1436	1961	2273	1644	1677	2009	2%	18%	17%	2%	**2417**	**1360**	**1484**	**2258**
962.4	962		0.5 SH58 to KGB	**2712**	**1227**	**1386**	**2402**	2421	1127	1334	2381	2556	1278	1563	2629	6%	13%	17%	10%	**2862**	**1392**	**1624**	**2653**
969.0	962		7.1 KGB to Melling	**2041**	**1353**	**1225**	**2628**	2868	1322	1417	2592	2875	1482	1366	2720	0%	12%	-4%	5%	**2047**	**1516**	**1181**	**2758**
971.0	962		9.1 Melling to Dowse	**2847**	**1387**	**1670**	**2627**	3157	1568	1629	2813	3202	1755	1855	2725	1%	12%	14%	-3%	**2888**	**1552**	**1903**	**2545**
972.4	962		10.5 Dowse to Korokoro	**2900**	**2122**	**1764**	**3316**	3141	2068	2047	2957	3264	2420	2687	3297	4%	17%	31%	11%	**3014**	**2483**	**2316**	**3696**
973.6	962		11.7 Korokoro to Petone	**2900**	**2122**	**1764**	**3316**	3141	2068	2047	2957	3264	2420	2687	3297	4%	17%	31%	11%	**3014**	**2483**	**2316**	**3696**
977.5	962		15.6 Petone to Ngauranga	**3571**	**2394**	**2557**	**3324**	3992	2563	2992	3322	4224	2764	3421	3778	6%	8%	14%	14%	**3778**	**2582**	**2924**	**3780**
				2009 figures plus growth rate				SATURN: 2016 Trips on 2026 Test 58 Network				SATURN: 2026 Trips on 2026 Test 66 Network								**2019 figures plus growth rate**			

From attached graphs
From SATURN models

			AM							PM						
			SATURN			WTSM			Forecast	SATURN			WTSM			Forecast
SH	Link	Direction	2006 Base	2016 Test 58 2026	SATURN %	2006 Base	2016 Committe	WTSM % G	Proj % Growth	2006 Base	2016 Test 58 2026	SATURN %	2006 Base	2016 Committe	WTSM % G	Proj % Growth
2	**South of Petone**	**NB**	2819	2563	**-9%**	5570	6330	**14%**		3595	3322	**-8%**	7840	7990	**2%**	
2	**Petone to Dowse**	**NB**	1043	2068	**98%**	2150	3750	**74%**		1906	2957	**55%**	4070	5760	**42%**	
2	**Dowse to Melling**	**NB**	1163	1568	**35%**	2330	2410	**3%**		2146	2813	**31%**	3970	4160	**5%**	
2	**Melling to KGB**	**NB**	980	1322	**35%**	1540	1630	**6%**		2446	2592	**6%**	3680	3630	**-1%**	
2	**KGB to SH58**	**NB**	1072	1127	**5%**	2040	2070	**1%**		2311	2381	**3%**	3150	3200	**2%**	
2	**SH58 to Fergusson Drive**	**NB**	1201	1391	**16%**	2180	2270	**4%**	**16%**	1932	1961	**2%**	3370	3300	**-2%**	**2%**
2	**Fergusson Drive to Moonshine Rd**	**NB**				1830	1700	**-7%**	**8%**				2410	2210	**-8%**	**0%**
2	**Moonshine Rd to Gibbons**	**NB**				1580	1810	**15%**	**29%**				2040	2240	**10%**	**14%**
2	**Gibbons to Totara Park**	**NB**				1170	1230	**5%**	**20%**				1590	1700	**7%**	**11%**
2	**Totara Park to Akatawara**	**NB**				1500	1630	**9%**	**23%**				2190	2390	**9%**	**13%**
2	**Akatawara to Norana**	**NB**				880	980	**11%**	**26%**				760	890	**17%**	**21%**

			AM							PM						
			SATURN			WTSM			Forecast	SATURN			WTSM			Forecast
SH	Link	Direction	2006 Base	2016 Test 58 2026	SATURN %	2006 Base	2016 Committe	WTSM % G	Proj % Growth	2006 Base	2016 Test 58 2026	SATURN %	2006 Base	2016 Committe	WTSM % G	Proj % Growth
2	**South of Petone**	**SB**	3891	3992	**3%**	7980	8090	**1%**		3220	2992	**-7%**	6420	7090	**10%**	
2	**Petone to Dowse**	**SB**	2507	3141	**25%**	4910	5570	**13%**		1637	2047	**25%**	3660	4290	**17%**	
2	**Dowse to Melling**	**SB**	2299	3157	**37%**	4420	4170	**-6%**		1419	1629	**15%**	2960	2930	**-1%**	
2	**Melling to KGB**	**SB**	2408	2868	**19%**	3570	3550	**-1%**		1291	1417	**10%**	1830	1900	**4%**	
2	**KGB to SH58**	**SB**	2334	2421	**4%**	3450	3470	**1%**		1255	1334	**6%**	2330	2330	**0%**	
2	**SH58 to Fergusson Drive**	**SB**	2154	2219	**3%**	3500	3360	**-4%**	**3%**	1280	1436	**12%**	2520	2580	**2%**	**12%**
2	**Fergusson Drive to Moonshine Rd**	**SB**				2550	2550	**0%**	**10%**				2130	2310	**8%**	**16%**
2	**Moonshine Rd to Gibbons**	**SB**				2130	2180	**2%**	**12%**				1940	2160	**11%**	**19%**
2	**Gibbons to Totara Park**	**SB**				1750	1860	**6%**	**16%**				1380	1510	**9%**	**17%**
2	**Totara Park to Akatawara**	**SB**				2170	2350	**8%**	**18%**				1780	2000	**12%**	**20%**
2	**Akatawara to Norana**	**SB**				840	870	**4%**	**14%**				880	1080	**23%**	**30%**

			AM							PM						
			SATURN			WTSM			Forecast	SATURN			WTSM			Forecast
SH	Link	Direction	2016 Test 58 2026	2026 Test 66	SATURN %	2016 TG&PG	2026 TG&PG	WTSM % G	Proj % Growth	2016 Test 58 2026	2026 Test 66	SATURN %	2016 TG&P	2026 TG&PG	WTSM % G	Proj % Growth
2	**South of Petone**	**NB**	2563	2764	**8%**	4360	4940	**13%**		3322	3778	**14%**	7440	7470	**0%**	
2	**Petone to Dowse**	**NB**	2068	2420	**17%**	4320	5000	**16%**		2957	3297	**11%**	6970	7050	**1%**	
2	**Dowse to Melling**	**NB**	1568	1755	**12%**	2650	3050	**15%**		2813	2725	**-3%**	4900	4720	**-4%**	
2	**Melling to KGB**	**NB**	1322	1482	**12%**	1620	1910	**18%**		2592	2720	**5%**	4290	4190	**-2%**	
2	**KGB to SH58**	**NB**	1127	1278	**13%**	1960	2340	**19%**		2381	2629	**10%**	3400	3460	**2%**	
2	**SH58 to Fergusson Drive**	**NB**	1391	1644	**18%**	2520	3030	**20%**	**18%**	1961	2009	**2%**	3580	3600	**1%**	**2%**
2	**Fergusson Drive to Moonshine Rd**	**NB**				1800	2140	**19%**	**14%**				2360	2450	**4%**	**10%**
2	**Moonshine Rd to Gibbons**	**NB**				1910	2260	**18%**	**14%**				2380	2490	**5%**	**11%**
2	**Gibbons to Totara Park**	**NB**				1260	1580	**25%**	**21%**				1750	1850	**6%**	**12%**
2	**Totara Park to Akatawara**	**NB**				1640	2080	**27%**	**22%**				2410	2590	**7%**	**13%**
2	**Akatawara to Norana**	**NB**				1000	1390	**39%**	**34%**				910	1100	**21%**	**27%**

			AM							PM						
			SATURN			WTSM			Forecast	SATURN			WTSM			Forecast
SH	Link	Direction	2016 Test 58 2026	2026 Test 66	SATURN %	2016 TG&PG	2026 TG&PG	WTSM % G	Proj % Growth	2016 Test 58 2026	2026 Test 66	SATURN %	2016 TG&P	2026 TG&PG	WTSM % G	Proj % Growth
2	**South of Petone**	**SB**	3992	4224	**6%**	7580	7570	**0%**		2992	3421	**14%**	5170	5720	**11%**	
2	**Petone to Dowse**	**SB**	3141	3264	**4%**	7040	6940	**-1%**		2047	2687	**31%**	5250	5780	**10%**	
2	**Dowse to Melling**	**SB**	3157	3202	**1%**	5260	5120	**-3%**		1629	1855	**14%**	3310	3650	**10%**	
2	**Melling to KGB**	**SB**	2868	2875	**0%**	3770	3560	**-6%**		1417	1366	**-4%**	1820	2040	**12%**	
2	**KGB to SH58**	**SB**	2421	2556	**6%**	3480	3370	**-3%**		1334	1563	**17%**	2080	2270	**9%**	
2	**SH58 to Fergusson Drive**	**SB**	2219	2273	**2%**	3630	3480	**-4%**	**2%**	1436	1677	**17%**	2700	3030	**12%**	**17%**
2	**Fergusson Drive to Moonshine Rd**	**SB**				2570	2580	**0%**	**7%**				2340	2600	**11%**	**10%**
2	**Moonshine Rd to Gibbons**	**SB**				2240	2200	**-2%**	**5%**				2200	2410	**10%**	**9%**
2	**Gibbons to Totara Park**	**SB**				1870	1850	**-1%**	**6%**				1570	1870	**19%**	**18%**
2	**Totara Park to Akatawara**	**SB**				2360	2420	**3%**	**10%**				2010	2430	**21%**	**20%**
2	**Akatawara to Norana**	**SB**				900	1050	**17%**	**24%**				1090	1460	**34%**	**33%**

Running Dist	RS	RP	Location	2009 Avg Weekday AM (07:00-08:00)		2009 Avg Weekday PM (17:00-18:00)		2006 Avg Weekday AM (07:00-08:00)		2006 Avg Weekday PM (17:00-18:00)		2016 Avg Weekday AM (07:00-08:00)		2016 Avg Weekday PM (17:00-18:00)		Growth Rate AM (07:00-08:00)		Growth Rate PM (17:00-18:00)		2019 Avg Weekday AM (07:00-08:00)		2019 Avg Weekday PM (17:00-18:00)	
				Wbd	**Ebd**	**Wbd**	**Ebd**	Wbd	Ebd	Wbd	Ebd	Wbd	Ebd	Wbd	Ebd	Wbd	Ebd	Wbd	Ebd	**Wbd**	**Ebd**	**Wbd**	**Ebd**
0.10		0	0.10 SH2 to Moonshine	**782**	**957**	**897**	**740**	714	936	885	716	537	876	792	564	-25%	-6%	-11%	-21%	**588**	**896**	**802**	**583**
9.15		0	9.15 Moonshine to TG	**715**	**937**	**884**	**690**	714	936	885	716	537	876	792	564	-25%	-6%	-11%	-21%	**538**	**877**	**790**	**543**
9.80		0	9.80 TG to Pauatahanui	**715**	**937**	**884**	**690**	757	979	974	694	576	930	890	540	-24%	-5%	-9%	-22%	**544**	**890**	**808**	**537**
11.00		0	11.00 Joseph Banks to James Cook	**562**	**472**	**434**	**525**	543	658	591	590	418	580	484	567	-23%	-12%	-18%	-4%	**432**	**415**	**355**	**504**
14.65		0	14.65 Oak Ave to SH1	**1325**	**427**	**541**	**1347**	1266	516	534	1048	1188	465	399	1015	-6%	-10%	-25%	-3%	**1243**	**385**	**404**	**1304**
				Extrapolated from TMS				SATURN 2006 Base				SATURN: 2016 Trips on 2026 Test 58 Network				From SATURN models				**2009 figures plus growth rate**			

Running Dist	RS	RP	Location	2019 Avg Weekday AM (07:00-08:00)			2019 Avg Weekday PM (17:00-18:00)		2016 Avg Weekday AM (07:00-08:00)			2016 Avg Weekday PM (17:00-18:00)		2026 Avg Weekday AM (07:00-08:00)			2026Avg Weekday PM (17:00-18:00)		Growth Rate AM (07:00-08:00)			Growth Rate PM (17:00-18:00)		2029 Avg Weekday AM (07:00-08:00)			2029 Avg Weekday PM (17:00-18:00)	
				Wbd	**Ebd**		**Wbd**	**Ebd**	Wbd	Ebd		Wbd	Ebd	Wbd	Ebd		Wbd	Ebd	Wbd	Ebd		Wbd	Ebd	**Wbd**	**Ebd**		**Wbd**	**Ebd**
0.10		0	0.10 SH2 to Moonshine	**588**	**896**	**0**	**802**	**583**	537	876	0	792	564	713	1210	0	1037	641	33%	38%	0	31%	14%	**781**	**1237**	**0**	**1050**	**663**
9.15		0	9.15 Moonshine to TG	**538**	**877**	**0**	**790**	**543**	537	876	0	792	564	713	1210	0	1037	641	33%	38%	0	31%	14%	**714**	**1211**	**0**	**1035**	**618**
9.80		0	9.80 TG to Pauatahanui	**544**	**890**	**0**	**808**	**537**	576	930	0	890	540	323	724	0	551	417	-44%	-22%	0	-38%	-23%	**305**	**693**	**0**	**500**	**414**
11.00		0	11.00 Joseph Banks to James Cook	**432**	**415**	**0**	**355**	**504**	418	580	0	484	567	208	516	0	371	293	-50%	-11%	0	-23%	-48%	**215**	**370**	**0**	**273**	**261**
14.65		0	14.65 Oak Ave to SH1	**1243**	**385**	**0**	**404**	**1304**	1188	465	0	399	1015	838	336	0	369	754	-29%	-28%	0	-8%	-26%	**876**	**278**	**0**	**373**	**968**
				2009 figures plus growth rate					SATURN: 2016 Trips on 2026 Test 58 Network					SATURN: 2026 Trips on 2026 Test 66 Network					From SATURN models					**2019 figures plus growth rate**				

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Appendix B: Traffic Analysis Figures

This appendix includes four figures, ***Figure B-1*** to ***Figure B-4***, which illustrate graphically the current (2009) weekday morning and evening commuter peak traffic volumes, the corresponding predicted future traffic demands (2019 and 2029) and the maximum traffic flows for LOS C, D and E along the corridor study length.

The individual figures are as follows:

- Figure B-1: Weekday AM Peak – Eastbound Volumes and Maximum Flows for LOS C, D & E
- Figure B-2: Weekday AM Peak - Westbound Volumes and Maximum Flows for LOS C, D & E
- Figure B-3: Weekday PM Peak – Eastbound Volumes and Maximum Flows for LOS C, D & E
- Figure B-4: Weekday PM Peak - Westbound Volumes and Maximum Flows for LOS C, D & E

The LOS maximum traffic flow values were calculated in accordance with AUSTROADS *'Guide to Traffic Engineering Practice, Part 2 – Roadway Capacity' and Transport Research Board's Highway Capacity Manual*.

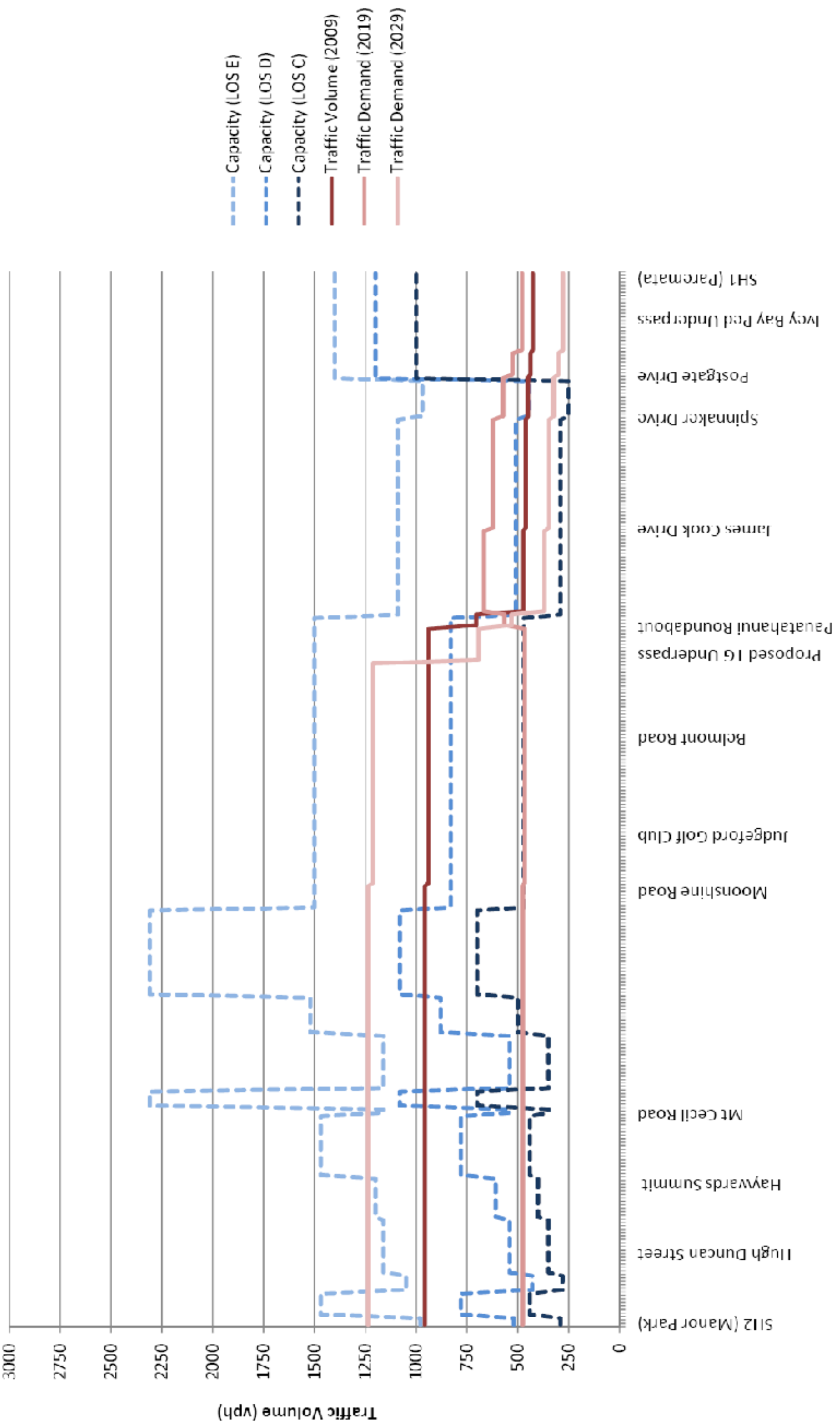

Figure B-1: Weekday AM Peak – Eastbound Volumes and Maximum Flows for LOS C, D & E

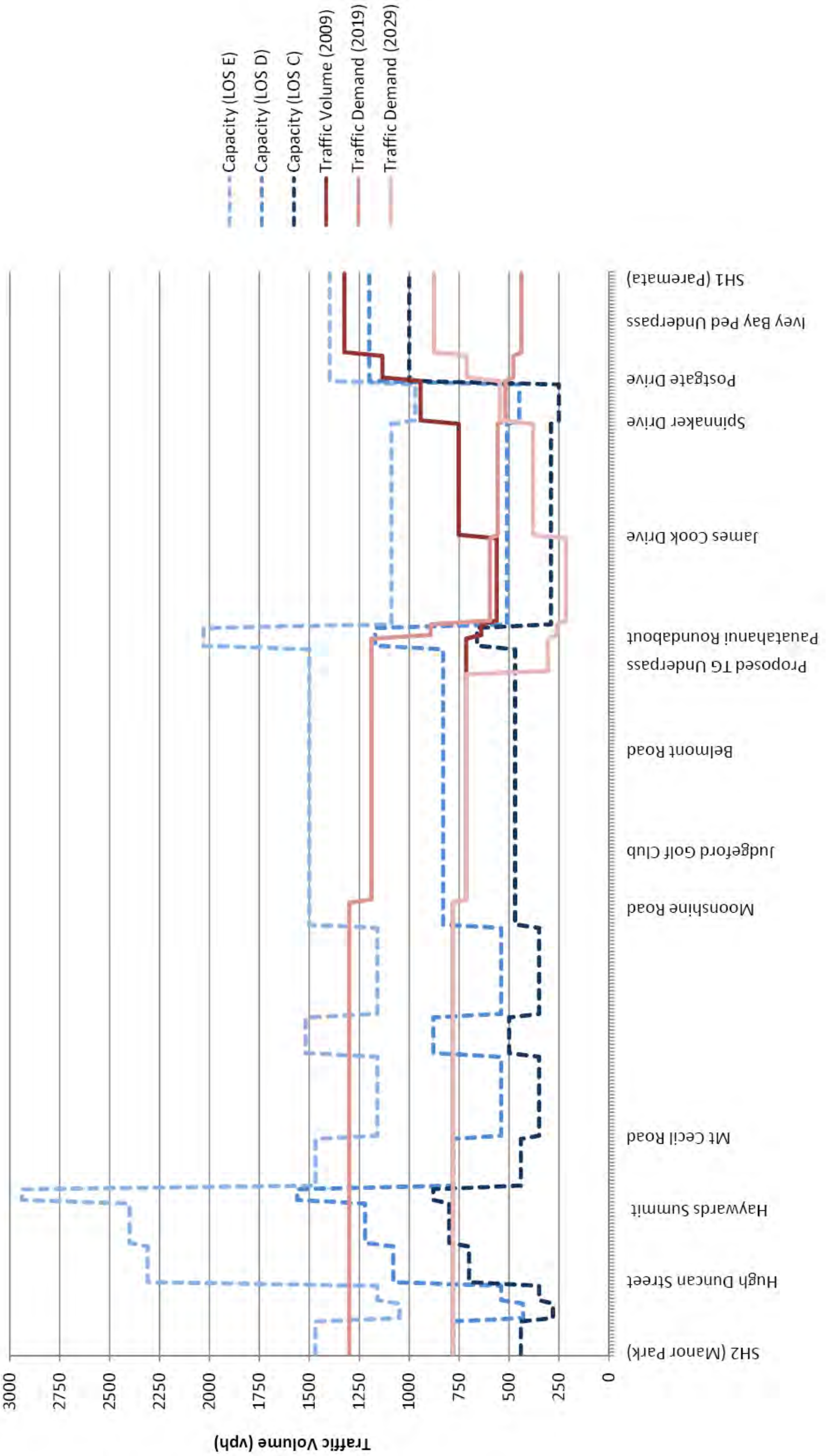

Figure B-2: Weekday AM Peak - Westbound Volumes and Maximum Flows for LOS C, D & E

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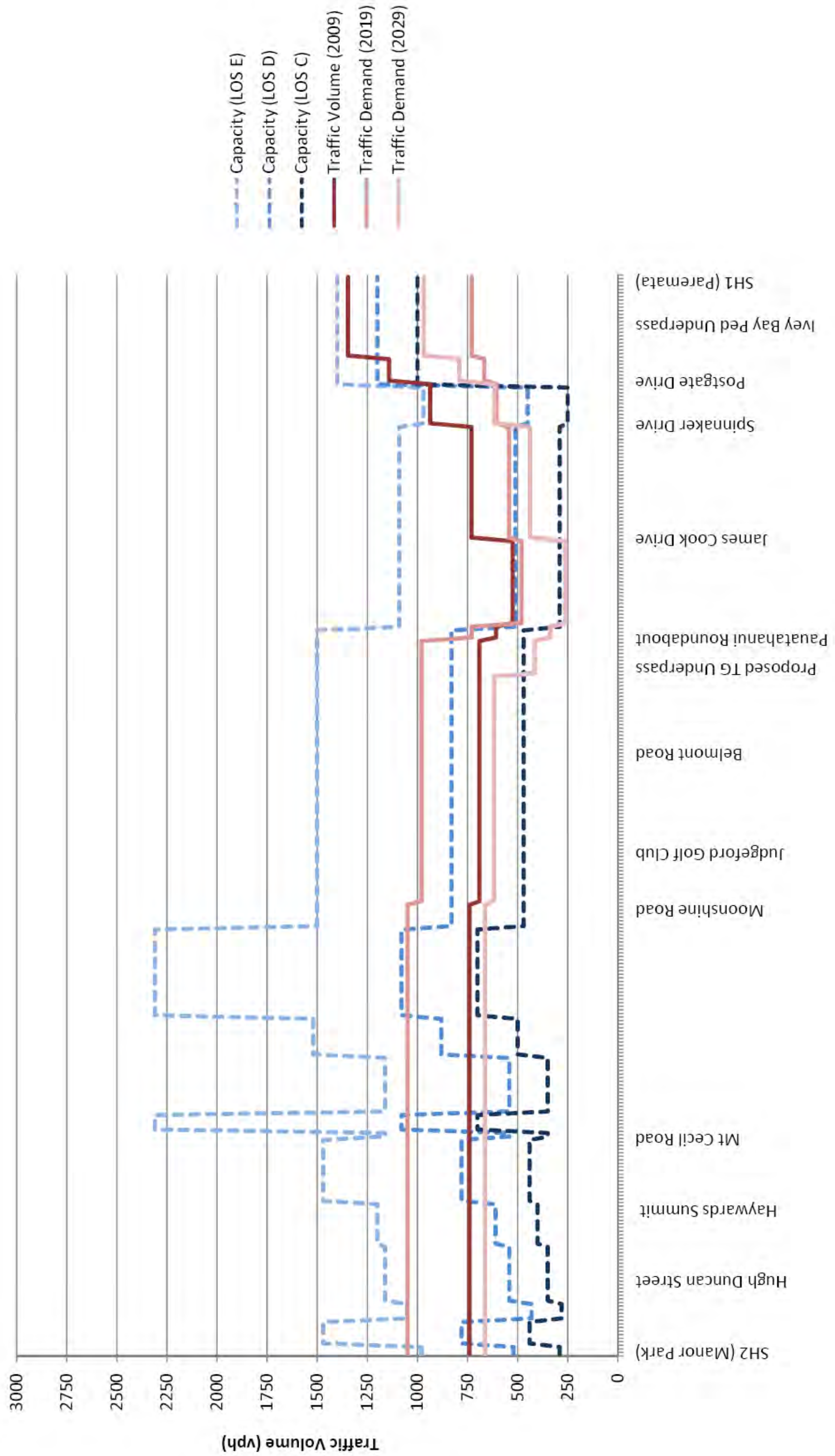

Figure B-3: Weekday PM Peak – Eastbound Volumes and Maximum Flows for LOS C, D & E

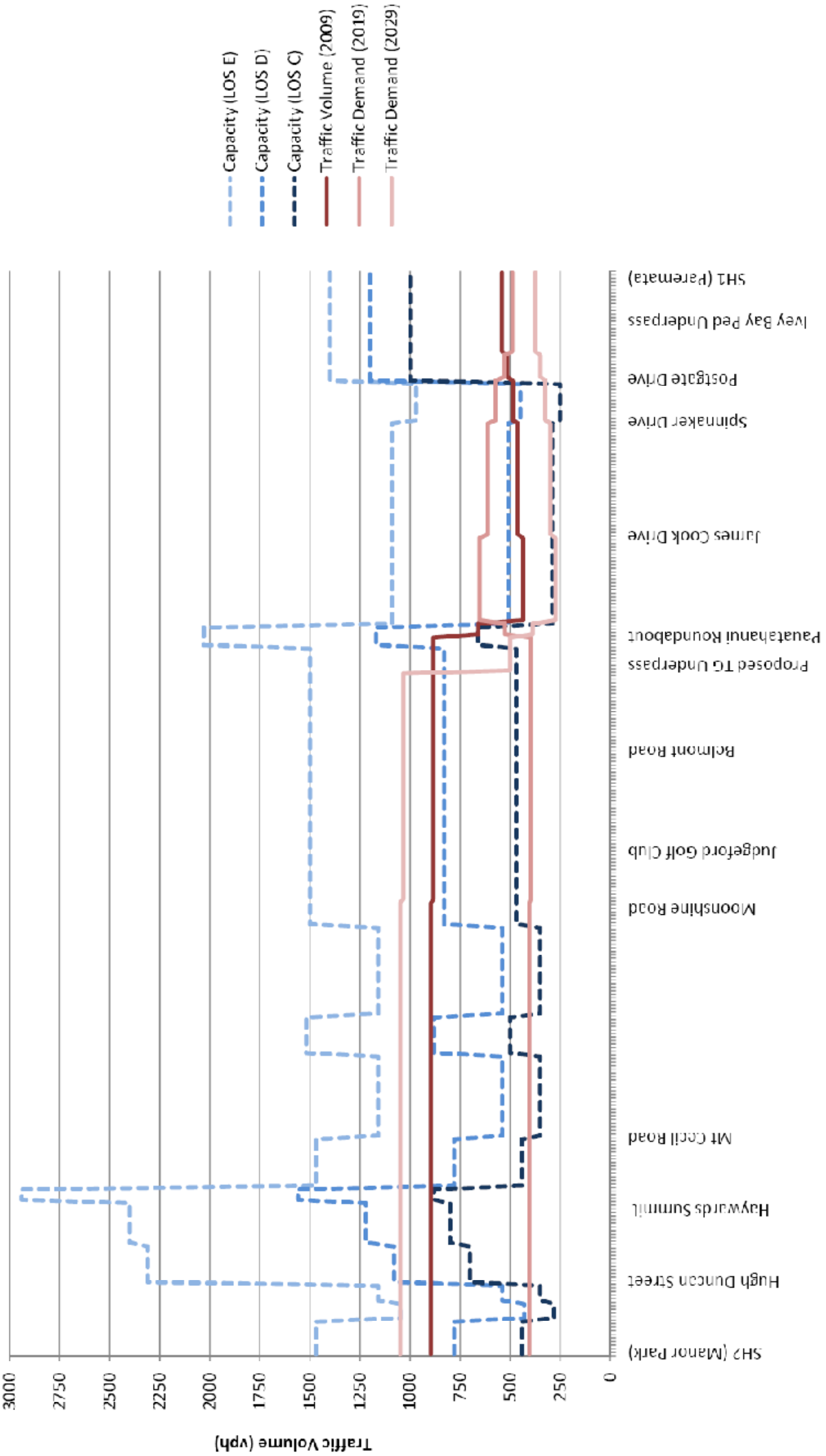

Figure B-4: Weekday PM Peak - Westbound Volumes and Maximum Flows for LOS C, D & E

Appendix C: Traffic Analysis Spreadsheet

The following spreadsheet provides the numerical calculations of the LOS maximum traffic flows and the current and predicted future traffic demands along the corridor study length, which are illustrated graphically in ***Figure B-1*** to ***Figure B-4.***

The LOS maximum traffic flow values were calculated in accordance with AUSTROADS *'Guide to Traffic Engineering Practice, Part 2 – Roadway Capacity' and Transport Research Board's Highway Capacity Manual*.

Running Dist	RS	RP	Location	Peak Hour Capacity (LOS E) Wbd	Peak Hour Capacity (LOS E) Ebd	Peak Hour Capacity (LOS D) Wbd	Peak Hour Capacity (LOS D) Ebd	Peak Hour Capacity (LOS C) Wbd	Peak Hour Capacity (LOS C) Ebd	Capacity Calculation Source Based on Austroads GTEP Part 2 although Highway Capacity Manual figure of 1,700vph per lane used rather than Austroads figure of 2,800 per two way road	Count Station Location	2009 Avg Weekday AM (07:00-08:00) Wbd	2009 Avg Weekday AM (07:00-08:00) Ebd		2009 Avg Weekday PM (17:00-18:00) Wbd	2009 Avg Weekday PM (17:00-18:00) Ebd	Turning Counts AM (07:00-08:00) Wbd	Turning Counts AM (07:00-08:00) Ebd	Turning Counts PM (17:00-18:00) Wbd	Turning Counts PM (17:00-18:00) Ebd	Turning Count Comments	2019 Avg Weekday AM (07:00-08:00) Wbd	2019 Avg Weekday AM (07:00-08:00) Ebd		2019 Avg Weekday PM (17:00-18:00) Wbd	2019 Avg Weekday PM (17:00-18:00) Ebd	2029 Avg Weekday AM (07:00-08:00) Wbd	2029 Avg Weekday AM (07:00-08:00) Ebd		2029 Avg Weekday PM (17:00-18:00) Wbd	2029 Avg Weekday PM (17:00-18:00) Ebd
0.00	0	0.00	SH2 (Manor Park)	1470	930	780	520	440	290	GTEP Pt 2, s 3.2.2 (Level, 55%:45% spit, 80% SD < 450m, 3.5m lanes 1m shoulders,		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.05	0	0.05		1470	930	780	520	440	290	2 lanes Ebd, Capacity Ebd x 1/3 for Signals)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.10	0	0.10		1470	930	780	520	440	290		Count Stn	782	957		897	740						1301	476		404	1049	781	1237		1050	663
0.15	0	0.15		1470	1470	780	730	440	440	GTEP Pt 2, s 3.2.2 (Level, 55%:45% spit, 80% SD < 450m, 3.5m lanes 1m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.20	0	0.20		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.25	0	0.25		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.30	0	0.30	Dry Creek / McDougall Gr	1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.35	0	0.35		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.40	0	0.40		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.45	0	0.45		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.50	0	0.50		1050	1050	430	430	280	280	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 0m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.55	0	0.55		1050	1050	430	430	280	280			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.60	0	0.60		1050	1050	430	430	280	280			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.65	0	0.65		1050	1050	430	430	280	280			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.70	0	0.70		1050	1050	430	430	280	280			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.75	0	0.75		1160	1160	540	540	350	350	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 1m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.80	0	0.80		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.85	0	0.85		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.90	0	0.90		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
0.95	0	0.95	Hugh Duncan Street	1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.00	0	1.00	Hugh Duncan Street	2310	1160	1080	540	700	350	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 1m shoulders,		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.05	0	1.05		2310	1160	1080	540	700	350	2 lanes Wbd)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.10	0	1.10		2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.15	0	1.15	Kaitawa Street	2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.20	0	1.20		2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.25	0	1.25		2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.30	0	1.30		2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.35	0	1.35		2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.40	0	1.40		2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.45	0	1.45	Old Haywards Road	2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.50	0	1.50		2310	1160	1080	540	700	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.55	0	1.55		2400	1200	1220	610	800	400	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 2m shoulders,		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.60	0	1.60		2400	1200	1220	610	800	400	2 lanes Wbd)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.65	0	1.65		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.70	0	1.70		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.75	0	1.75		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.80	0	1.80		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.85	0	1.85		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.90	0	1.90		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
1.95	0	1.95		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.00	0	2.00	Haywards Summit	2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.05	0	2.05		2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.10	0	2.10	Haywards Summit	2400	1200	1220	610	800	400			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.15	0	2.15		2940	1470	1560	730	880	440	GTEP Pt 2, s 3.2.2 (Level, 55%:45% spit, 80% SD < 450m, 3.5m lanes 1m shoulders,		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.20	0	2.20		2940	1470	1560	730	880	440	2 lanes Wbd)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.25	0	2.25		2940	1470	1560	730	880	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.30	0	2.30		2940	1470	1560	730	880	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.35	0	2.35		1470	1470	780	730	440	440	GTEP Pt 2, s 3.2.2 (Level, 55%:45% spit, 80% SD < 450m, 3.5m lanes 1m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.40	0	2.40		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.45	0	2.45		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.50	0	2.50		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.55	0	2.55		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.60	0	2.60		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.65	0	2.65		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.70	0	2.70		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.75	0	2.75		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.80	0	2.80		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.85	0	2.85		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.90	0	2.90		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
2.95	0	2.95		1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.00	0	3.00	Mt Cecil Road	1470	1470	780	730	440	440			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.05	0	3.05		1160	1160	540	540	350	350	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 1m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.10	0	3.10		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.15	0	3.15		1160	2310	540	1080	350	700	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 1m shoulders,		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.20	0	3.20		1160	2310	540	1080	350	700	2 lanes Ebd)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.25	0	3.25		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.30	0	3.30		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.35	0	3.35		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.40	0	3.40		1160	1160	540	540	350	350	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 1m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.45	0	3.45		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.50	0	3.50		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.55	0	3.55		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.60	0	3.60		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.65	0	3.65		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.70	0	3.70		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.75	0	3.75		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.80	0	3.80		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.85	0	3.85		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.90	0	3.90		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
3.95	0	3.95		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.00	0	4.00		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.05	0	4.05		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.10	0	4.10		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.15	0	4.15		1160	1160	540	540	350	350			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.20	0	4.20		1520	1520	880	880	500	500	GTEP Pt 2, s 3.2.2 (Level, 55%:45% spit, 80% SD < 450m, 3.5m lanes 2m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.25	0	4.25		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.30	0	4.30		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.35	0	4.35		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.40	0	4.40		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.45	0	4.45		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.50	0	4.50		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.55	0	4.55		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.60	0	4.60		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.65	0	4.65		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.70	0	4.70		1520	1520	880	880	500	500			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.75	0	4.75	Harris Road	1160	2310	540	1080	350	700	GTEP Pt 2, s 3.2.2 (Rolling, 55%:45% split, 80% SD < 450m, 3.5m lanes, 1m shoulders,		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.80	0	4.80		1160	2310	540	1080	350	700	2 lanes Ebd)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.85	0	4.85		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.90	0	4.90		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
4.95	0	4.95		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.00	0	5.00		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.05	0	5.05		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.10	0	5.10		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.15	0	5.15		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.20	0	5.20		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.25	0	5.25		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.30	0	5.30		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.35	0	5.35		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.40	0	5.40		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.45	0	5.45		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.50	0	5.50		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.55	0	5.55		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663

Running Dist	RS	RP	Location	Peak Hour Capacity (LOS E)		Peak Hour Capacity (LOS D)		Peak Hour Capacity (LOS C)		Capacity Calculation Source Based on Austroads GTEP Part 2 although Highway Capacity Manual figure of 1,700vph per lane used rather than Austroads figure of 2,800 per two way road	Count Station Location	2009 Avg Weekday AM (07:00-08:00)			2009 Avg Weekday PM (17:00-18:00)		Turning Counts AM (07:00-08:00)		Turning Counts PM (17:00-18:00)		Turning Count Comments	2019 Avg Weekday AM (07:00-08:00)			2019 Avg Weekday PM (17:00-18:00)		2029 Avg Weekday AM (07:00-08:00)			2029 Avg Weekday PM (17:00-18:00)	
				Wbd	Ebd	Wbd	Ebd	Wbd	Ebd			Wbd	Ebd		Wbd	Ebd	Wbd	Ebd	Wbd	Ebd		Wbd	Ebd		Wbd	Ebd	Wbd	Ebd		Wbd	Ebd
5.60	0	5.60		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.65	0	5.65		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.70	0	5.70		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.75	0	5.75		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.80	0	5.80		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.85	0	5.85		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.90	0	5.90		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
5.95	0	5.95		1160	2310	540	1080	350	700			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.00	0	6.00		1500	1500	830	830	470	470	GTEP Pt 2, s 3.2.2 (Level, 55%:45% split, 80% SD < 450m, 3.5m lanes, 1m & 2m shoulders)		782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.05	0	6.05		1500	1500	830	830	470	470			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.10	0	6.10		1500	1500	830	830	470	470			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.15	0	6.15		1500	1500	830	830	470	470			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.20	0	6.20	Moonshire Road	1500	1500	830	830	470	470			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.25	0	6.25		1500	1500	830	830	470	470			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.30	0	6.30	Moonshire Road	1500	1500	830	830	470	470			782	957	0	897	740						1301	476	0	404	1049	781	1237	0	1050	663
6.35	0	6.35		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.40	0	6.40		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.45	0	6.45		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.50	0	6.50		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.55	0	6.55		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.60	0	6.60		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.65	0	6.65		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.70	0	6.70		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.75	0	6.75		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.80	0	6.80		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.85	0	6.85	Paustahanui Bridge #2	1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.90	0	6.90		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
6.95	0	6.95		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.00	0	7.00	Judgeford Golf Club	1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.05	0	7.05		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.10	0	7.10		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.15	0	7.15		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.20	0	7.20		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.25	0	7.25		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	714	1211		1035	618
7.30	0	7.30	Mulhern Road	1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.35	0	7.35		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.40	0	7.40		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.45	0	7.45		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.50	0	7.50	Paustahanui Bridge #3	1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.55	0	7.55		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.60	0	7.60		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.65	0	7.65		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.70	0	7.70		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.75	0	7.75		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.80	0	7.80		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.85	0	7.85		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.90	0	7.90		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
7.95	0	7.95		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.00	0	8.00		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.05	0	8.05	Murphys Rd / Flightys Rd	1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.10	0	8.10		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.15	0	8.15		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.20	0	8.20		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.25	0	8.25		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.30	0	8.30		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.35	0	8.35		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.40	0	8.40	Belmont Road	1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.45	0	8.45		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.50	0	8.50		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.55	0	8.55		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.60	0	8.60		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.65	0	8.65		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.70	0	8.70		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.75	0	8.75		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.80	0	8.80		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.85	0	8.85		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.90	0	8.90		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
8.95	0	8.95	Paustahanui Bridge #7	1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
9.00	0	9.00		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
9.05	0	9.05		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
9.10	0	9.10		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
9.15	0	9.15		1500	1500	830	830	470	470		Count Stn	715	937		884	690						1189	456		399	978	714	1211		1035	618
9.20	0	9.20		1500	1500	830	830	470	470			715	937	0	884	690						1189	456	0	399	978	714	1211	0	1035	618
9.25	0	9.25		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	714	1211		1035	618
9.30	0	9.30		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	714	1211		1035	618
9.35	0	9.35	Bradey Road	1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	714	1211		1035	618
9.40	0	9.40		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	714	1211		1035	618
9.45	0	9.45		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	714	1211		1035	618
9.50	0	9.50		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	714	1211		1035	618
9.55	0	9.55	Proposed TG Underpass	1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	305	693		500	414
9.60	0	9.60	Proposed TG Underpass	1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	305	693		500	414
9.65	0	9.65		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	305	693		500	414
9.70	0	9.70		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	305	693		500	414
9.75	0	9.75		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	305	693		500	414
9.80	0	9.80		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	305	693		500	414
9.85	0	9.85		1500	1500	830	830	470	470			715	937		884	690						1189	456		399	978	305	693		500	414
9.90	0	9.90		2050	1500	1170	830	660	470	GTEP Pt 2, s 3.2.2 (As above, but 2 lanes Wbd, Capacity Wbd x 2/3 for roundabout)		715	937		884	690						1189	456		399	978	305	693		500	414
9.95	0	9.95		2050	1500	1170	830	660	470			715	937		884	690						1189	456		399	978	305	693		500	414
10.00	0	10.00	Paustahanui Roundabout	2050	1500	1170	830	660	470			715	937		884	690						1189	456		399	978	305	693		500	414
10.05	0	10.05		2050	1500	1170	830	660	470			639	705		659	608						692	556		526	729	260	531		336	337
10.10	0	10.10	New Paustahanui Bridge No.8	2050	1500	1170	830	660	470			639	705		659	608						692	556		526	729	260	531		336	337
10.15	0	10.15		2050	1500	1170	830	660	470			639	705		659	608						692	556		526	729	260	531		336	337
10.20	0	10.20		1090	1090	510	510	290	290	GTEP Pt 2, s 3.2.2 (Level, 55%:45% split, 80% SD < 450m, 2.7m lanes, 0m and 1m shoulders)		639	705		659	608						692	556		526	729	260	531		336	337
10.25	0	10.25	Joseph Banks Drive	1090	1090	510	510	290	290			562	472	0	434	525						596	657	0	653	480	215	370	0	273	261
10.30	0	10.30		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.35	0	10.35		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.40	0	10.40		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.45	0	10.45		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.50	0	10.50		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.55	0	10.55		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.60	0	10.60		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.65	0	10.65		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.70	0	10.70		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.75	0	10.75		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.80	0	10.80		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.85	0	10.85		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.90	0	10.90		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
10.95	0	10.95		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
11.00	0	11.00		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
11.05	0	11.05		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
11.10	0	11.10		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261
11.15	0	11.15		1090	1090	510	510	290	290			562	472		434	525						596	657		653	480	215	370		273	261

Running Dist	RS	RP	Location	Peak Hour Capacity (LOS E) Wbd	Peak Hour Capacity (LOS E) Ebd	Peak Hour Capacity (LOS D) Wbd	Peak Hour Capacity (LOS D) Ebd	Peak Hour Capacity (LOS C) Wbd	Peak Hour Capacity (LOS C) Ebd	Capacity Calculation Source Based on Austroads GTEP Part 2 although Highway Capacity Manual figure of 1,700vph per lane used rather than Austroads figure of 2,800 per two way road
11.20	0	11.20		1090	1090	510	510	290	290	
11.25	0	11.25		1090	1090	510	510	290	290	
11.30	0	11.30		1090	1090	510	510	290	290	
11.35	0	11.35		1090	1090	510	510	290	290	
11.40	0	11.40	James Cook Drive	1090	1090	510	510	290	290	
11.45	0	11.45	James Cook Drive	1090	1090	510	510	290	290	
11.50	0	11.50		1090	1090	510	510	290	290	
11.55	0	11.55		1090	1090	510	510	290	290	
11.60	0	11.60		1090	1090	510	510	290	290	
11.65	0	11.65		1090	1090	510	510	290	290	
11.70	0	11.70		1090	1090	510	510	290	290	
11.75	0	11.75		1090	1090	510	510	290	290	
11.80	0	11.80		1090	1090	510	510	290	290	
11.85	0	11.85		1090	1090	510	510	290	290	
11.90	0	11.90		1090	1090	510	510	290	290	
11.95	0	11.95		1090	1090	510	510	290	290	
12.00	0	12.00		1090	1090	510	510	290	290	
12.05	0	12.05		1090	1090	510	510	290	290	
12.10	0	12.10		1090	1090	510	510	290	290	
12.15	0	12.15		1090	1090	510	510	290	290	
12.20	0	12.20		1090	1090	510	510	290	290	
12.25	0	12.25		1090	1090	510	510	290	290	
12.30	0	12.30		1090	1090	510	510	290	290	
12.35	0	12.35		1090	1090	510	510	290	290	
12.40	0	12.40		1090	1090	510	510	290	290	
12.45	0	12.45		1090	1090	510	510	290	290	
12.50	0	12.50		1090	1090	510	510	290	290	
12.55	0	12.55		1090	1090	510	510	290	290	
12.60	0	12.60		1090	1090	510	510	290	290	
12.65	0	12.65		1090	1090	510	510	290	290	
12.70	0	12.70		1090	1090	510	510	290	290	
12.75	0	12.75		1090	1090	510	510	290	290	
12.80	0	12.80		1090	1090	510	510	290	290	
12.85	0	12.85		1090	1090	510	510	290	290	
12.90	0	12.90		1090	1090	510	510	290	290	
12.95	0	12.95		1090	1090	510	510	290	290	
13.00	0	13.00	Spinnaker Drive	1090	1090	510	510	290	290	
13.05	0	13.05	Spinnaker Drive	970	970	450	450	250	250	GTEP Pt 2, s 3.2.2 (Levo, 75%:25% split, 80% SD < 450m, 2.7m lanes, 1m&0m shoulders)
13.10	0	13.10		970	970	450	450	250	250	
13.15	0	13.15		970	970	450	450	250	250	
13.20	0	13.20		970	970	450	450	250	250	
13.25	0	13.25		970	970	450	450	250	250	
13.30	0	13.30		970	970	450	450	250	250	
13.35	0	13.35		970	970	450	450	250	250	
13.40	0	13.40		970	970	450	450	250	250	
13.45	0	13.45		970	970	450	450	250	250	
13.50	0	13.50		970	970	450	450	250	250	
13.55	0	13.55		970	970	450	450	250	250	
13.60	0	13.60	Postgate Drive	1400	1400	1200	1200	1000	1000	GTEP Pt 2, s 3.1
13.65	0	13.65		1400	1400	1200	1200	1000	1000	
13.70	0	13.70		1400	1400	1200	1200	1000	1000	
13.75	0	13.75		1400	1400	1200	1200	1000	1000	
13.80	0	13.80		1400	1400	1200	1200	1000	1000	
13.85	0	13.85		1400	1400	1200	1200	1000	1000	
13.90	0	13.90		1400	1400	1200	1200	1000	1000	
13.95	0	13.95	Oak Ave	1400	1400	1200	1200	1000	1000	
14.00	0	14.00		1400	1400	1200	1200	1000	1000	
14.05	0	14.05		1400	1400	1200	1200	1000	1000	
14.10	0	14.10		1400	1400	1200	1200	1000	1000	
14.15	0	14.15		1400	1400	1200	1200	1000	1000	
14.20	0	14.20		1400	1400	1200	1200	1000	1000	
14.25	0	14.25		1400	1400	1200	1200	1000	1000	
14.30	0	14.30		1400	1400	1200	1200	1000	1000	
14.35	0	14.35		1400	1400	1200	1200	1000	1000	
14.40	0	14.40	Ivey Bay Ped Underpass	1400	1400	1200	1200	1000	1000	
14.45	0	14.45		1400	1400	1200	1200	1000	1000	
14.50	0	14.50		1400	1400	1200	1200	1000	1000	
14.55	0	14.55		1400	1400	1200	1200	1000	1000	
14.60	0	14.60		1400	1400	1200	1200	1000	1000	
14.65	0	14.65		1400	1400	1200	1200	1000	1000	
14.70	0	14.70		1400	1400	1200	1200	1000	1000	
14.75	0	14.75		1400	1400	1200	1200	1000	1000	
14.80	0	14.80		1400	1400	1200	1200	1000	1000	
14.85	0	14.85		1400	1400	1200	1200	1000	1000	
14.90	0	14.90		1400	1400	1200	1200	1000	1000	
14.95	0	14.95		1400	1400	1200	1200	1000	1000	
15.00	0	15.00	SH1 (Paremata)	1400	1400	1200	1200	1000	1000	
15.05	0	15.05	SH1	1400	1400	1200	1200	1000	1000	
15.10	0	15.10	SH1	1400	1400	1200	1200	1000	1000	

Running Dist	Count Station Location	2009 Avg Weekday AM (07:00-08:00) Wbd	2009 Avg Weekday AM (07:00-08:00) Ebd		2009 Avg Weekday PM (17:00-18:00) Wbd	2009 Avg Weekday PM (17:00-18:00) Ebd	Turning Counts AM (07:00-08:00) Wbd	Turning Counts AM (07:00-08:00) Ebd	Turning Counts PM (17:00-18:00) Wbd	Turning Counts PM (17:00-18:00) Ebd	Turning Count Comments	2019 Avg Weekday AM (07:00-08:00) Wbd	2019 Avg Weekday AM (07:00-08:00) Ebd		2019 Avg Weekday PM (17:00-18:00) Wbd	2019 Avg Weekday PM (17:00-18:00) Ebd	2029 Avg Weekday AM (07:00-08:00) Wbd	2029 Avg Weekday AM (07:00-08:00) Ebd		2029 Avg Weekday PM (17:00-18:00) Wbd	2029 Avg Weekday PM (17:00-18:00) Ebd
11.20		532	472		434	525						596	667		653	480	215	370		273	261
11.25		532	472		434	525						596	667		653	480	215	370		273	261
11.30		532	472		434	525						596	667		653	480	215	370		273	261
11.35		532	472		434	525						596	667		653	480	215	370		273	261
11.40		532	472		434	525						596	667		653	480	215	370		273	261
11.45		753	461		461	731						556	620		612	542	380	347		298	437
11.50		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.55		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.60		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.65		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.70		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.75		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.80		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.85		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.90		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
11.95		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.00		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.05		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.10		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.15		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.20		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.25		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.30		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.35		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.40		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.45		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.50		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.55		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.60		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.65		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.70		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.75		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.80		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.85		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.90		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
12.95		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
13.00		753	461	0	461	731						556	620	0	612	542	380	347	0	298	437
13.05		944	450		488	936						517	573		571	504	546	324		323	614
13.10		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.15		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.20		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.25		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.30		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.35		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.40		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.45		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.50		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.55		944	450	0	488	936						517	573	0	571	504	546	324	0	323	614
13.60		944	450	0	488	936	277	-181	41	-224	MWH Count 2008	517	573	0	571	504	546	324	0	323	614
13.65		1134	438		514	1142						477	526		531	566	711	301		348	791
13.70		1134	438	0	514	1142						477	526	0	531	566	711	301	0	348	791
13.75		1134	438	0	514	1142						477	526	0	531	566	711	301	0	348	791
13.80		1134	438	0	514	1142						477	526	0	531	566	711	301	0	348	791
13.85		1134	438	0	514	1142						477	526	0	531	566	711	301	0	348	791
13.90		1134	438	0	514	1142						477	526	0	531	566	711	301	0	348	791
13.95		1134	438	0	514	1142						477	526	0	531	566	711	301	0	348	791
14.00		1325	427		541	1347						437	480		490	728	876	278		373	968
14.05		1325	427		541	1347						437	480		490	728	876	278		373	968
14.10		1325	427		541	1347						437	480		490	728	876	278		373	968
14.15		1325	427		541	1347						437	480		490	728	876	278		373	968
14.20		1325	427		541	1347						437	480		490	728	876	278		373	968
14.25		1325	427		541	1347						437	480		490	728	876	278		373	968
14.30		1325	427		541	1347						437	480		490	728	876	278		373	968
14.35		1325	427		541	1347						437	480		490	728	876	278		373	968
14.40		1325	427		541	1347						437	480		490	728	876	278		373	968
14.45		1325	427		541	1347						437	480		490	728	876	278		373	968
14.50		1325	427		541	1347						437	480		490	728	876	278		373	968
14.55		1325	427		541	1347						437	480		490	728	876	278		373	968
14.60		1325	427		541	1347						437	480		490	728	876	278		373	968
14.65		1325	427		541	1347						437	480		490	728	876	278		373	968
14.70		1325	427		541	1347						437	480		490	728	876	278		373	968
14.75		1325	427		541	1347						437	480		490	728	876	278		373	968
14.80		1325	427		541	1347						437	480		490	728	876	278		373	968
14.85		1325	427		541	1347						437	480		490	728	876	278		373	968
14.90		1325	427		541	1347						437	480		490	728	876	278		373	968
14.95		1325	427		541	1347						437	480		490	728	876	278		373	968
15.00		1325	427		541	1347						437	480		490	728	876	278		373	968
15.05		1325	427		541	1347						437	480		490	728	876	278		373	968
15.10		1325	427		541	1347						437	480		490	728	876	278		373	968

Appendix D: Accident Records and Analysis

The NZTA Crash Analysis System (CAS) crash database has been interrogated to identify and analyse crashes and crash trends that have occurred along the SH58 Corridor length.

B.1 Long Term Crash Trends

A total of 1,009 crashes were reported along the SH58 Corridor length in the 20-year period from 1989 to 2008 inclusive. These crashes are summarised by year and by crash severity in ***Table D-1***, and are presented graphically in ***Figure D-1*** and ***Figure D-2*** below.

In addition to the number of crashes, ***Table D-1*** also identifies the annual cost of crashes along the corridor length. These annual crash costs, which were determined in accordance with NZTA's *'Economic Evaluation Manual',* are presented graphically in **Figure D-3** below.

Table D-1 and ***Figure D-1***, ***Figure D-2*** and ***Figure D-3*** below show that there was a peak in injury crashes (20-25/year) in the mid 1990's, and since then the number of injury crashes has hovered around 15/year. There has been a very slight decrease in the total number of crashes since the mid 1990s; the total crash cost peaked in 1997, but in the last five years the crash cost has returned to levels similar to the early 1990s.

The crash records for the last years show no increase in the numbers of injury total numbers of crashes, so it therefore seems that further intervention is required to improve highway safety.

The crash data for the 5-year period from 2004 to 2008 inclusive indicates that there are currently an average of 13 injury crashes, nearly 60 total crashes and crash costs of about $5.6 million per annum along the SH58 Corridor study length. These annual crash numbers and costs illustrate that there is considerable scope for achieving one of the objectives of the Land Transport Management Act (2003), to improve safety and personal security, along the SH58 Corridor length.

Table D-1: SH58 Corridor Crash Summary by Severity by Year (1989-2008)

Crash Year	Number of Crashes by Severity						Total Crash Costs
	Fatal	Serious	Minor	Injury Crashes	Non-Injury	Total Crashes	
1989	0	1	16	**17**	16	**33**	**$3.0 M**
1990	0	6	12	**18**	41	**59**	**$6.7 M**
1991	0	7	14	**21**	28	**49**	**$7.5 M**
1992	0	7	12	**19**	23	**42**	**$7.1 M**
1993	2	5	16	**23**	26	**49**	**$14.0 M**
5-Years (1987-1991)	**2**	**26**	**70**	**98**	**134**	**232**	**$38.4 M**
1994	1	6	16	**23**	35	**58**	**$11.0 M**
1995	1	2	10	**13**	39	**52**	**$7.4 M**
1996	2	4	18	**24**	31	**55**	**$13.5 M**
1997	2	12	10	**24**	48	**72**	**$19.2 M**
1998	1	2	11	**14**	33	**47**	**$7.6 M**
5-Years (1992-1996)	**7**	**26**	**65**	**98**	**186**	**284**	**$58.7 M**
10-Years (1987-1996)	**9**	**52**	**135**	**196**	**320**	**516**	**$97.0 M**
1999	1	9	8	**18**	38	**56**	**$12.8 M**
2000	1	4	7	**12**	27	**39**	**$8.2 M**
2001	1	2	5	**8**	36	**44**	**$7.1 M**
2002	2	6	10	**18**	32	**50**	**$14.3 M**
2003	2	3	12	**17**	26	**43**	**$12.0 M**
5-Years (1997-2001)	**7**	**24**	**42**	**73**	**159**	**232**	**$54.6 M**
2004	0	2	12	**14**	31	**45**	**$3.9 M**
2005	0	5	13	**18**	39	**57**	**$6.2 M**
2006	1	1	14	**16**	45	**61**	**$7.7 M**
2007	0	1	18	**19**	36	**55**	**$3.9 M**
2008	0	4	8	**12**	31	**43**	**$4.8 M**
5-Years (2002-2006)	**1**	**13**	**65**	**79**	**182**	**261**	**$26.4 M**
10-Years (1997-2006)	**8**	**37**	**107**	**152**	**341**	**493**	**$81.0 M**
20-Years (1987-2006)	**17**	**89**	**242**	**348**	**661**	**1,009**	**$178.0 M**

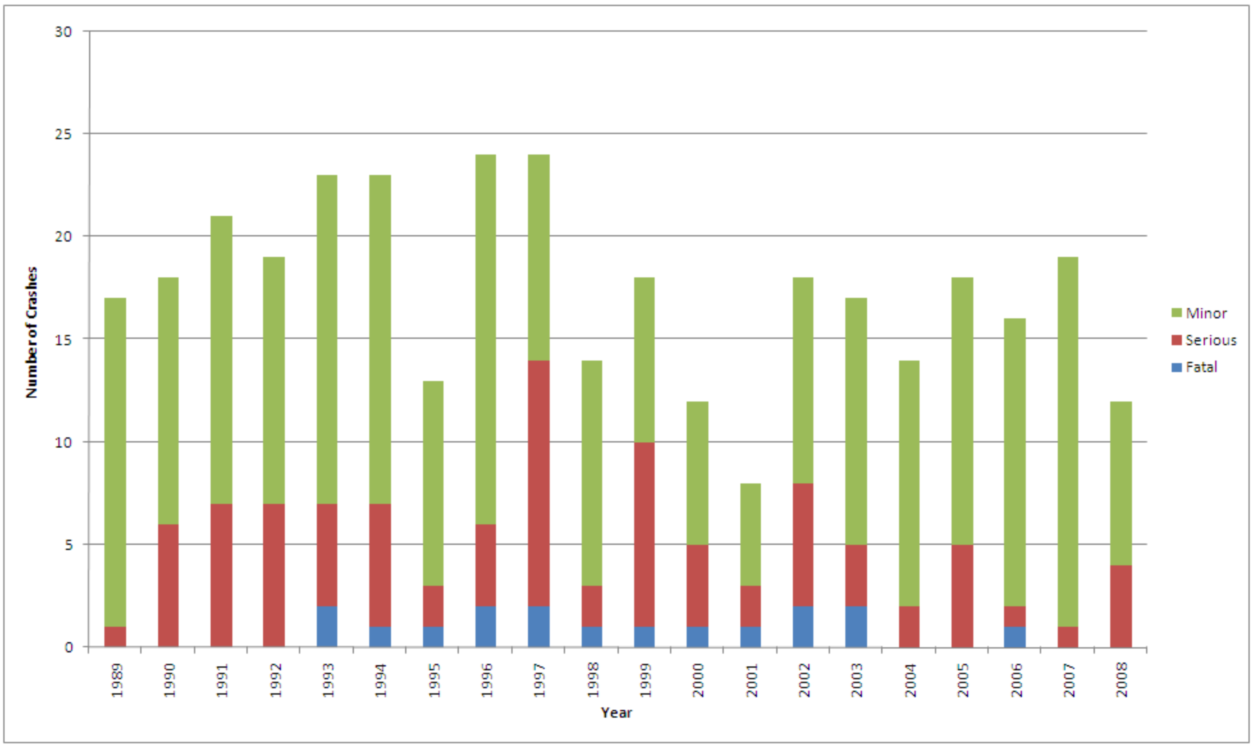

Figure D-1: SH58 Corridor - Injury Crashes (1989-2008)

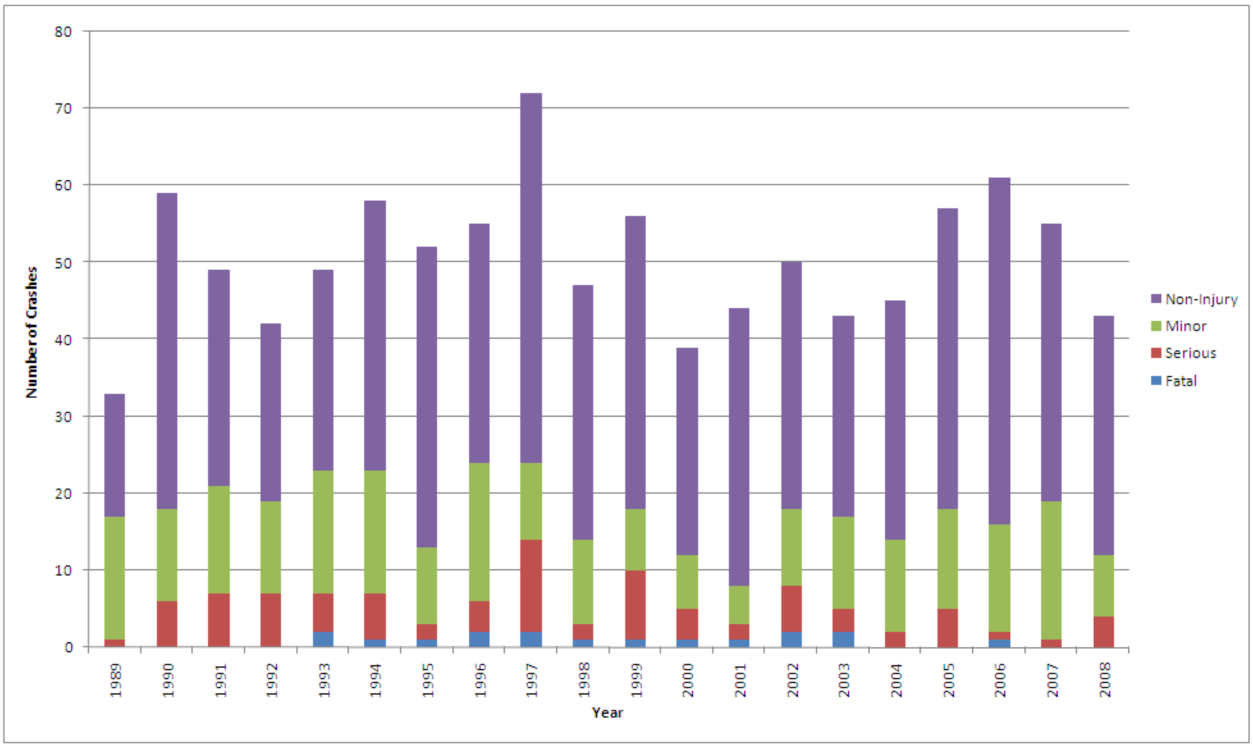

Figure D-2: SH58 Corridor - All Crashes (1989-2008)

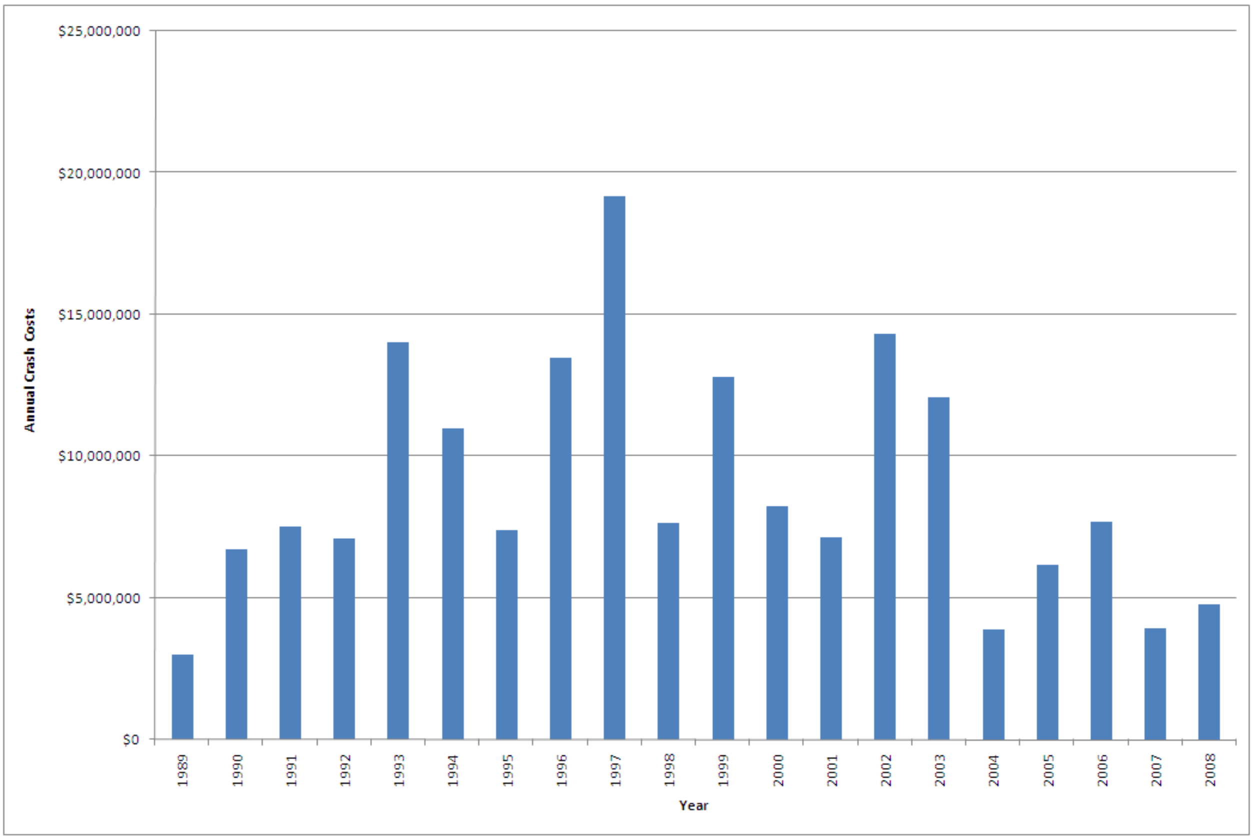

Figure D-3: SH58 Corridor - Annual Crash Costs (1989-2008)

B.2 Analysis of Crashes by Location (Intersections and Mid-Block)

As noted in ***Table D-1*** above, a total of 261 crashes were reported along the SH58 Corridor length during the 5-year period from 2004 to 2008 inclusive. An analysis of these crashes has been undertaken by location. The relevant crashes have been identified for each of the individual intersections and mid-block sections along the SH58 Corridor length.

The reported crashes between 2004 and 2008 (and the corresponding crash costs) for each of the intersection and mid-block locations along the SH58 Corridor length are summarised in ***Table D-2*** and ***Table D-3*** below respectively.

Table D-2: SH58 Corridor Intersection Crashes (2004-2008)

Road Section	Intersection	Number of Crashes by Severity						Total Crash Costs
		Fatal	Serious	Minor	Injury Crashes	Non-Injury	Total Crashes	
Haywards Hill	SH2 (Western Hutt Road)	0	1	1	**2**	3	**5**	**$1,010,700**
	Hebden Crescent	0	1	1	**2**	0	**2**	**$887,500**
	McDougall Grove	0	0	0	**0**	6	**6**	**$266,400**
	Hugh Duncan Street	0	0	0	**0**	1	**1**	**$44,400**
	Kaitawa Street	0	0	1	**1**	0	**1**	**$108,000**
	Atimuri	0	0	0	**0**	1	**1**	**$44,400**
	Old Haywards Road	0	1	0	**1**	0	**1**	**$769,500**
	Mount Cecil Road	0	0	2	**2**	3	**5**	**$349,200**
	Harris Road	0	0	0	**0**	0	**0**	**$0**
Moonshine Road – Pauatahanui Roundabout	Moonshine Road	0	0	1	**1**	2	**3**	**$196,800**
	Mulhern Road	0	0	0	**0**	2	**2**	**$88,800**
	Murphys Road / Flightys Road	0	0	2	**2**	3	**5**	**$349,200**
	Belmont Road	0	0	1	**1**	0	**1**	**$108,000**
	Bradey Road	0	0	0	**0**	0	**0**	**$0**
	Pauatahanui RAB	0	0	3	**3**	13	**16**	**$856,140**
Paua-tahanui-Postgate Drive	Joseph Banks Drive	0	0	0	**0**	2	**2**	**$84,360**
	James Cook Drive	0	0	0	**0**	5	**5**	**$210,900**
	Spinnaker Drive	0	0	4	**4**	4	**8**	**$579,120**
Postgate Drive – SH1	Postgate Drive	0	2	3	**5**	8	**13**	**$1,441,470**
	Oak Avenue	0	0	1	**1**	5	**6**	**$138,750**
	Bayview Rd / Seaview Rd	0	0	3	**3**	3	**6**	**$229,770**
	Paremata Crescent	0	0	0	**0**	6	**6**	**$93,240**
SH58 Corridor	**All Intersection Crashes**	**0**	**5**	**23**	**28**	**67**	**95**	**$7,846,650**

Table D-3: SH58 Corridor Mid-Block Crashes (2004-2008)

Road Section	Mid-Block Section (from north to south)	Number of Crashes by Severity						Total Crash Costs
		Fatal	Seri-ous	Minor	Injury Crashes	Non-Injury	Total Crashes	
Haywards Hill	Hebden Cres – McDougall Grove	0	2	1	**3**	5	**8**	**$1,869,000**
	McDougall Grove – Hugh Duncan St	0	0	1	**1**	3	**4**	**$241,200**
	Hugh Duncan St – Kaitawa St	0	0	1	**1**	1	**2**	**$152,400**
	Kaitawa St – Atimuri	0	0	0	**0**	0	**0**	**$0**
	Old Haywards Rd – Mount Cecil Rd	0	0	5	**5**	9	**14**	**$939,600**
	Mount Cecil Road – Harris Road	0	0	3	**3**	10	**13**	**$768,000**
	Harris Rd – Moonshine Rd	1	1	0	**2**	4	**6**	**$4,747,100**
Moonshine Road – Pauatahanui Roundabout	Moonshine Road – Mulhern Road	0	1	2	**3**	5	**8**	**$1,207,500**
	Mulhern Road – Murphys Road / Flightys Road	0	0	3	**3**	6	**9**	**$590,400**
	Murphys Road / Flighty Road – Belmont Road	0	0	0	**0**	1	**1**	**$44,400**
	Belmont Road – Bradey Road	0	0	3	**3**	1	**4**	**$368,400**
	Bradey Rd – Pauatahanui RAB	0	1	0	**1**	2	**3**	**$858,300**
Paua-tahanui-Postgate	Pauatahanui Roundabout – Joseph Banks Drive	0	0	0	**0**	0	**0**	**$0**
	Joseph Banks Dr – James Cook Dr	0	1	1	**2**	15	**17**	**$1,470,600**
	James Cook Dr – Spinnaker Dr	0	2	13	**15**	38	**53**	**$4,407,240**
	Spinnaker Drive – Postgate Drive	0	0	3	**3**	4	**7**	**$476,030**
Post-gate - SH1	Postgate Drive – Oak Avenue	0	0	1	**1**	4	**5**	**$123,210**
	Bayview Road / Seaview Road – Paremata Crescent	0	0	5	**5**	7	**12**	**$414,030**
SH58 Corridor	**All Mid-Block Crashes**	**1**	**8**	**42**	**51**	**115**	**166**	**$18.7 M**

The reported crashes at the intersections along the corridor length are presented graphically in ***Figure D-4*** (injury crashes only) and ***Figure D-5*** (all crashes), while the reported crashes at mid-block locations are presented in ***Figure D-6*** (injury crashes only) and ***Figure D-7*** (all crashes).

The intersection and mid-block crash costs are presented in ***Figure D-8*** and ***Figure D-9*** respectively.

Table D-2, ***Table D-3*** and ***Figure D-4*** to ***Figure D-9*** below show that a large proportion of the reported crashes and crash costs along the SH58 Corridor study length have occurred at a relatively small number of key intersections and mid-block sections.

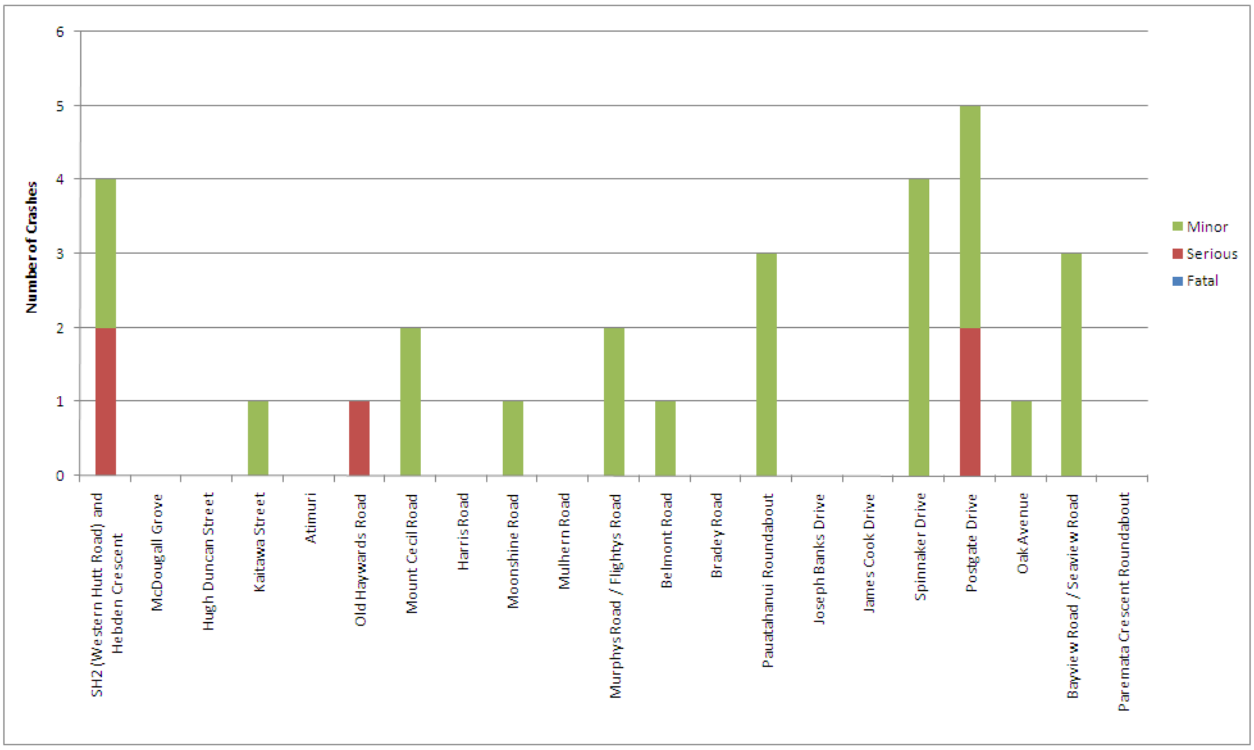

Figure D-4: SH58 Corridor Intersections - Injury Crashes (2004-2008)

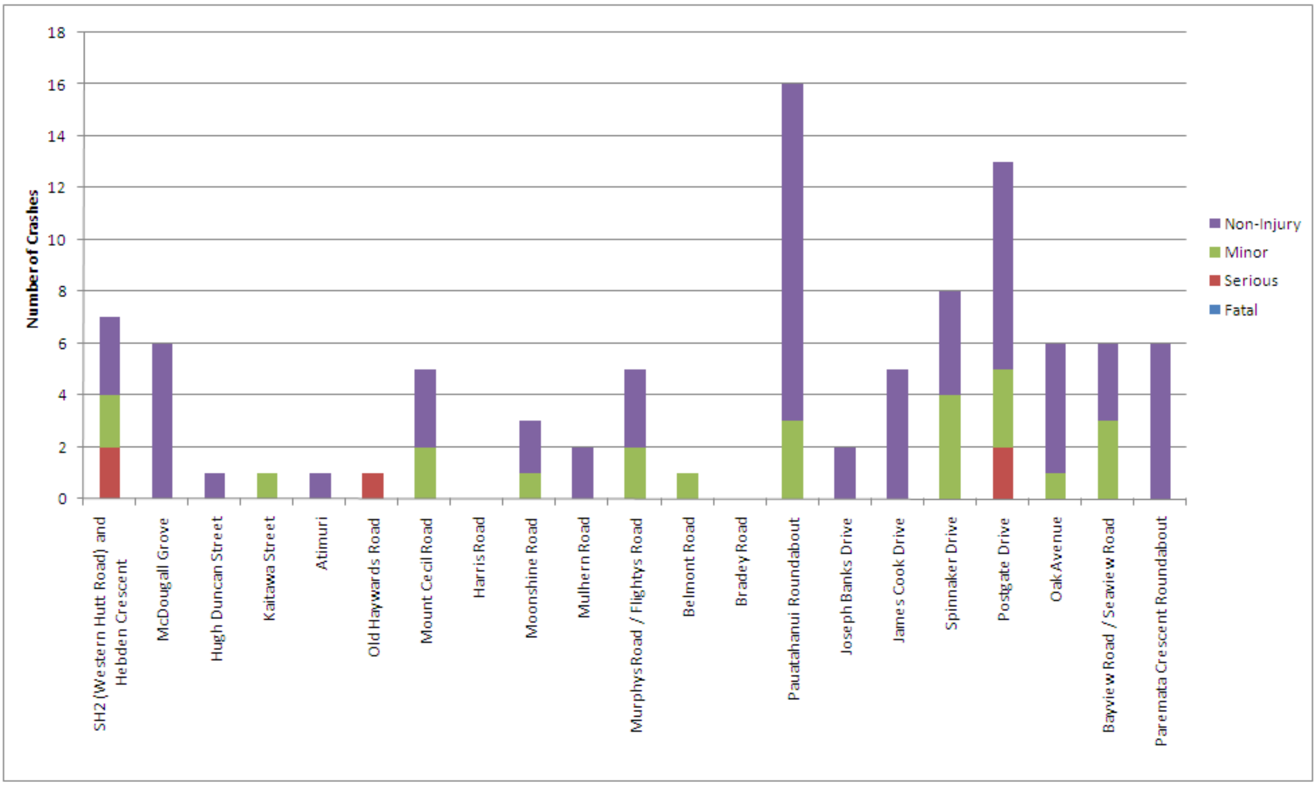

Figure D-5: SH58 Corridor Intersections - All Crashes (2004-2008)

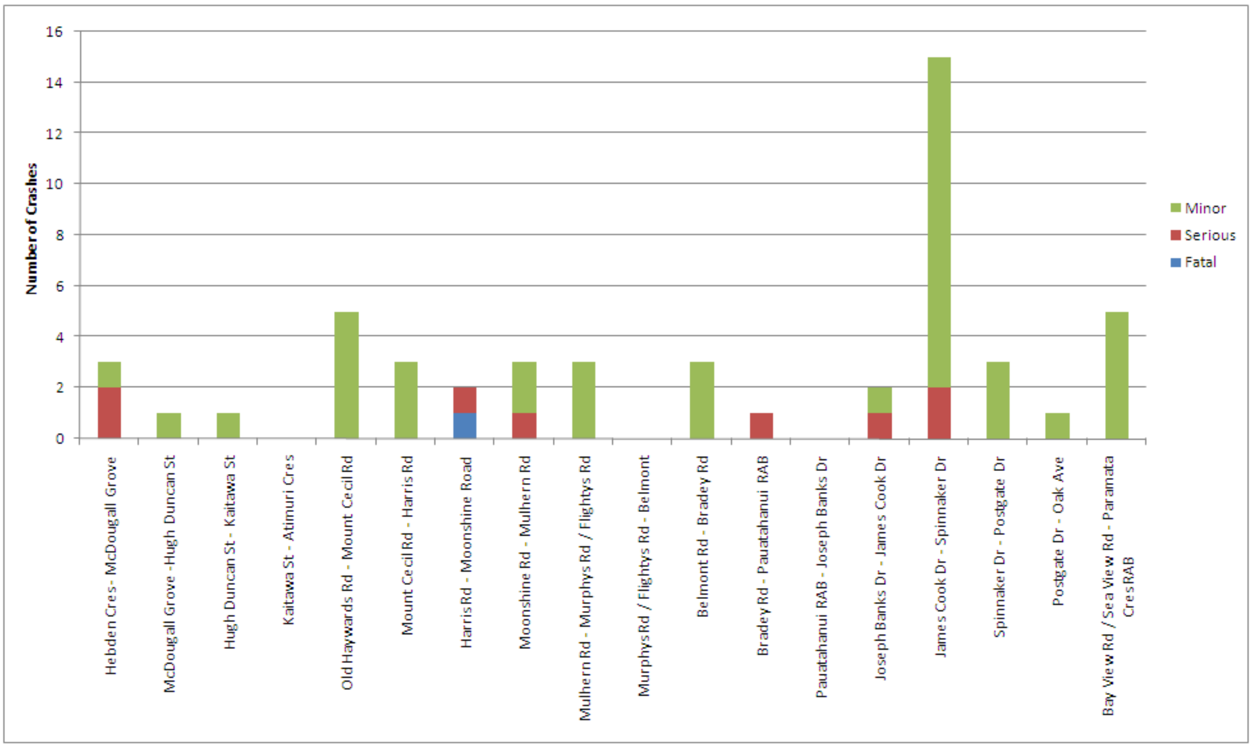

Figure D-6: SH58 Corridor Mid-Block Sections - Injury Crashes (2004-2008)

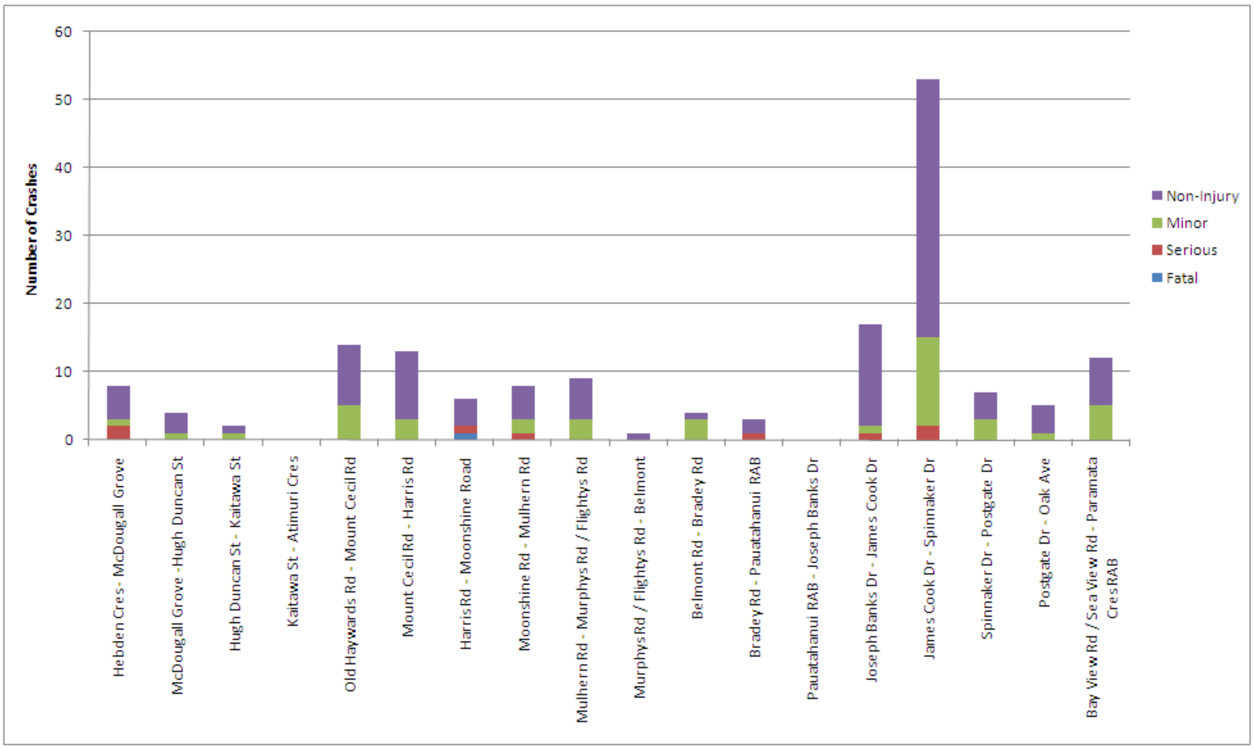

Figure D-7: SH58 Corridor Mid-Block Sections - All Crashes (2004-2008)

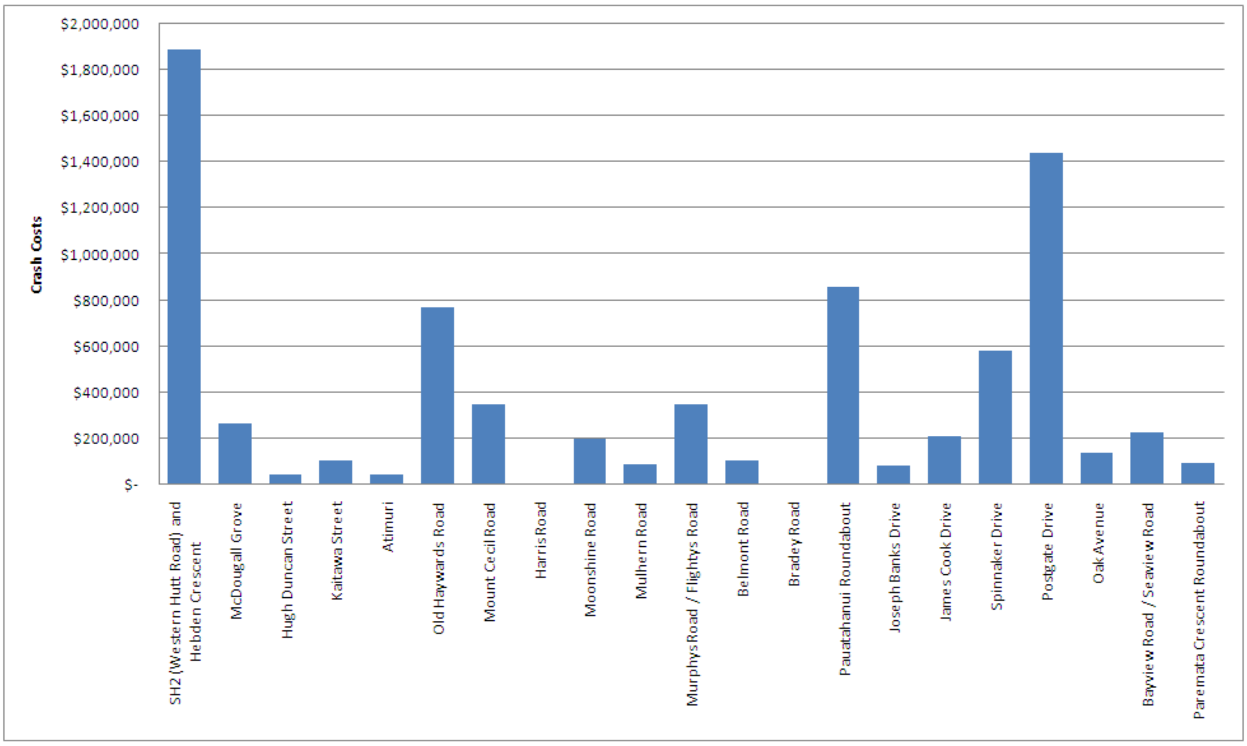

Figure D-8: SH58 Corridor Intersections - Crash Costs (2004-2008)

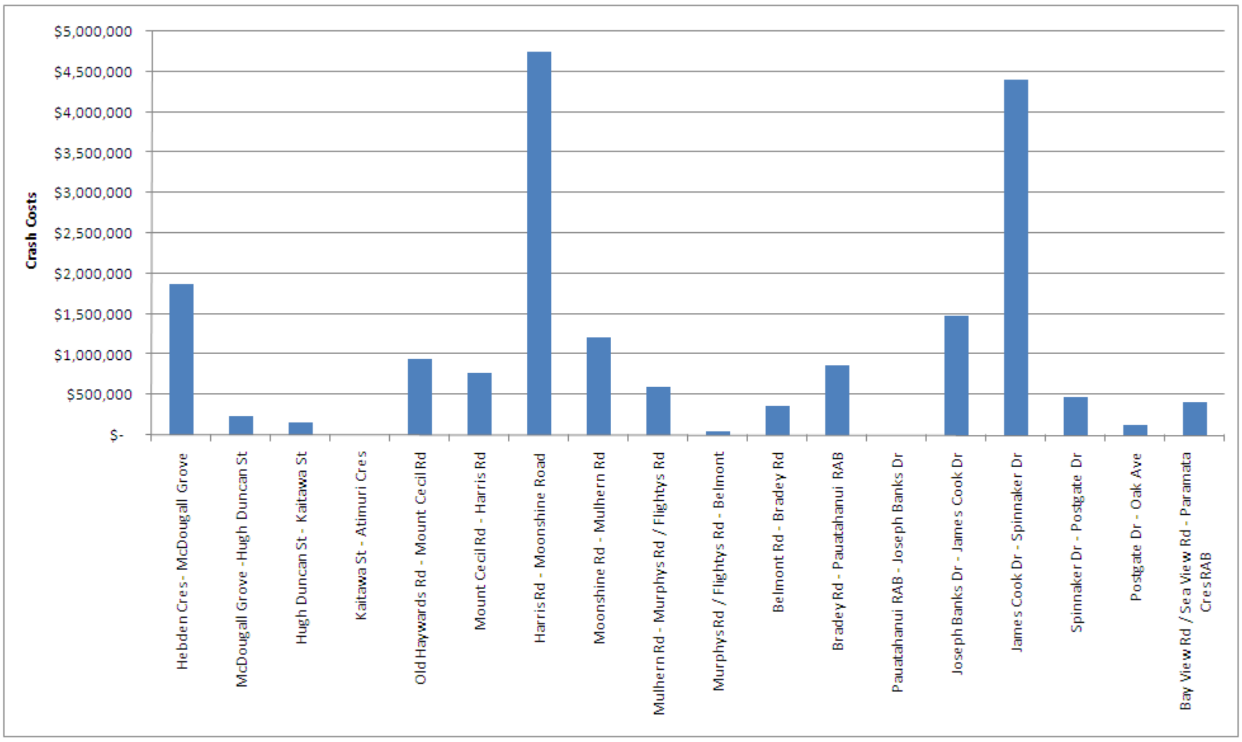

Figure D-9: SH58 Corridor Mid-Block Sections - Crash Costs (2004-2008)

The mid-block injury crash rates are presented in ***Figure D-10*** below, along with typical injury crash rates (which have been calculated in accordance with NZTA's (formerly LTNZ's) *'Economic Evaluation Manual, Appendix A6.5*) for the differing mid-block highway sections along the SH58 Corridor length, namely:

- 2-Lane Rural Highway (with 3.5m lanes, 1.0m shoulders, though rolling/mountainous terrain and occasional passing lanes),

  (typical for the section of SH58 between SH2 and Moonshine Road),

- 2-Lane Rural Highway (with 3.25m lanes, 2.0m shoulders),

  (typical for the section of SH58 between Moonshine Road and Pauatahanui Roundabout),

- 2-Lane Rural Highway (with 2.75m lanes, 0.5m shoulders),

  (typical for the section of SH58 between Pauatahanui Roundabout and Postgate Drive), *and*

- 2-Lane Urban Arterial Highway, with Other Roadside Land-use.

  (typical for the section of SH58 between Postgate Drive and SH1).

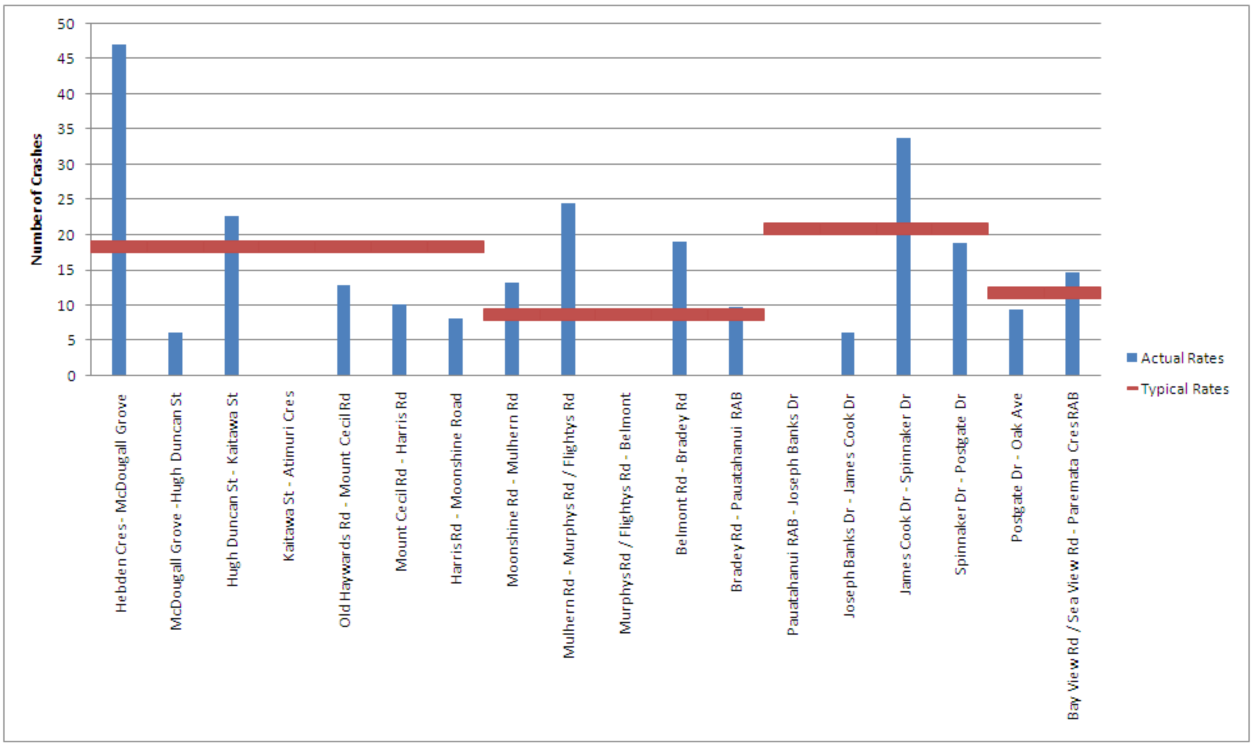

Figure D-10: SH58 Corridor Mid-Block Sections – Injury Crash Rates (per 10^8 veh-km)

Table D-2, ***Table D-3*** and ***Figure D-4*** to ***Figure D-9*** above show that a large proportion of the reported crashes and crash costs along the SH58 Corridor study length have occurred at a relatively small number of key intersections and mid-block sections.

Figure D-10 above shows that most of the mid-block sections have injury crash rates that are comparable with, or lower than, the typical crash rates for similar highway sections. The exceptions are the sections between Hebden Crescent and McDougall Grove, Mulhern Road and Murphy Road/Flightys Road, Belmont Road and Brady Road, and James Cook Drive and Spinnaker Drive which have high mid-block crash rates for the following reasons:

- Approximately ¾ of all crashes between Hebden Crescent and McDougall Grove occurred on wet roads. Also, ¼ of all crashes on this section were “rear-end” crashes associated with the nearby intersection with SH2.
- The section of SH58 between Mulhern Road and Murphy Road/Flightys Road has had both “rear-end” crashes and “loss of control on straight” crashes. Approximately ½ of crashes along this section struck a roadside hazard.
- The section between Belmont Road and Brady Road has had few crashes but ¾ of the crashes resulted in injuries as there was a high number of “head on” crashes.
- Over 65% of crashes between James Cook Drive and Spinnaker Drive were “loss of control”, and nearly 20% of crashes were “head on”. These are likely due to the narrow road width and small shoulders with no little or no clear zones.

B.2.1 Discussion of Crash Numbers and Costs at Intersections

The traffic signal controlled intersection at SH2, including the adjacent priority controlled intersection with Hebden Crescent, has the highest crash cost compared to all other intersections along the corridor length. This is due to the very high proportion of serious injury crashes at these high speed traffic signals. The priority controlled Postgate Drive had a similar number of serious injury crashes, and more minor injury and non-injury crashes, but due to the lower speed environment has a lower crash cost. The Pauatahanui Roundabout had the highest number of crashes, but as the crashes resulted in low severity crashes, the intersection had a relatively low crash cost.

The three intersections noted above account for nearly 40% of the reported crashes and just over 40% of the injury crashes, but over 50% of the crash cost at intersections on the SH58 Corridor.

B.2.2 Discussion of Crash Numbers and Costs along Mid-Block Sections

The mid-block section between James Cook Drive and Spinnaker Drive has had a substantially higher number of reported crashes than any other mid-block section and has the second highest crash cost. The mid-block section between Harris Road and Moonshine Road had the highest crash cost due to a fatal crash which occurred on this section. The mid-block section between Hebden Crescent and McDougall Grove also had a high crash cost, due a high proportion of serious injury crashes.

The three mid-block sections noted above account for around 40% of the reported mid-block crashes along the SH58 Corridor length, and about 60% of the reported crash costs.

B.3 Analysis of Crashes by Highway Section

As noted in ***Table D-1*** above, a total of 261 crashes were reported along the SH58 Corridor length during the latest 5-year period, from 2004 to 2008 inclusive. An analysis of the crash details and environmental factors has been undertaken by highway section.

The reported crashes between 2004 and 2008 for each of the main highway sections along the SH58 Corridor length are summarised in

Table D-4 to ***Table D-7*** and ***Figure D-11*** to ***Figure D-18*** below.

Table D-4: SH58 Crashes between State Highway 2 and Moonshine Road (2004-2008)

Crash Details or Environmental Factors			Intersection Crashes		Mid-Block Crashes		Total Crashes	
Crash Type	Crossing / Turning (Types H, J, K, L, M)		1	(5%)	2	(4%)	3	(4%)
	Head On (Types AB, B)		2	(9%)	5	(11%)	7	(10%)
	Hit Object (Types E)		0	(0%)	3	(6%)	3	(4%)
	Lost Control (Types AD, C, D)		10	(45%)	28	(60%)	38	(55%)
	Miscellaneous (Types Q)		0	(0%)	1	(2%)	1	(1%)
	Overtaking (Types AA, AC, AE-AO, GE)		4	(18%)	2	(4%)	6	(9%)
	Pedestrian (Types N, P)		0	(0%)	0	(0%)	0	(0%)
	Cyclist (included in other types)		0	-	0	-	0	-
	Rear End (Types F, GA-GD, GF, GO)		5	(23%)	6	(13%)	11	(16%)
Crash Time	**Weekday** (Mon 06:00 - Fri 18:59)	AM Peak (06:00-08:59)	3	(14%)	6	(13%)	9	(13%)
		Daytime (09:00-15:29)	6	(27%)	8	(17%)	14	(20%)
		PM Peak (15:30-18:59)	4	(18%)	8	(17%)	12	(17%)
		Night-time (19:00-06:00)	4	(18%)	4	(9%)	8	(12%)
	Weekend (Fri 19:00 - Mon 05:59)	Morning (06:00-11:59)	0	(0%)	2	(4%)	2	(3%)
		Afternoon (12:00-18:59)	4	(18%)	11	(23%)	15	(22%)
		Night-time (19:00-06:00)	1	(5%)	8	(17%)	9	(13%)
Season	Summer (1 December – 28 or 29 February)		6	(27%)	17	(36%)	23	(33%)
	Autumn (1 March – 31 May)		8	(36%)	10	(21%)	18	(26%)
	Winter (1 June – 31 August)		4	(18%)	12	(26%)	16	(23%)
	Spring (1 September – 30 November)		4	(18%)	8	(17%)	12	(17%)
Light	Bright Sun		9	(41%)	14	(30%)	23	(33%)
	Overcast		9	(41%)	17	(36%)	26	(38%)
	Twilight		1	(5%)	3	(6%)	4	(6%)
	Dark		3	(14%)	13	(28%)	16	(23%)
Road	Dry		15	(68%)	27	(57%)	42	(61%)
	Wet		7	(32%)	19	(40%)	26	(38%)
	Ice or Snow		0	(0%)	1	(2%)	1	(1%)
Weather	Fine		16	(73%)	33	(70%)	49	(71%)
	Mist or Fog		2	(9%)	0	(0%)	2	(3%)
	Light Rain		4	(18%)	9	(19%)	13	(19%)
	Heavy Rain		0	(0%)	5	(11%)	5	(7%)
Total Number of Crashes (6.3km)			**22**	**(100%)**	**47**	**(100%)**	**69**	**(100%)**

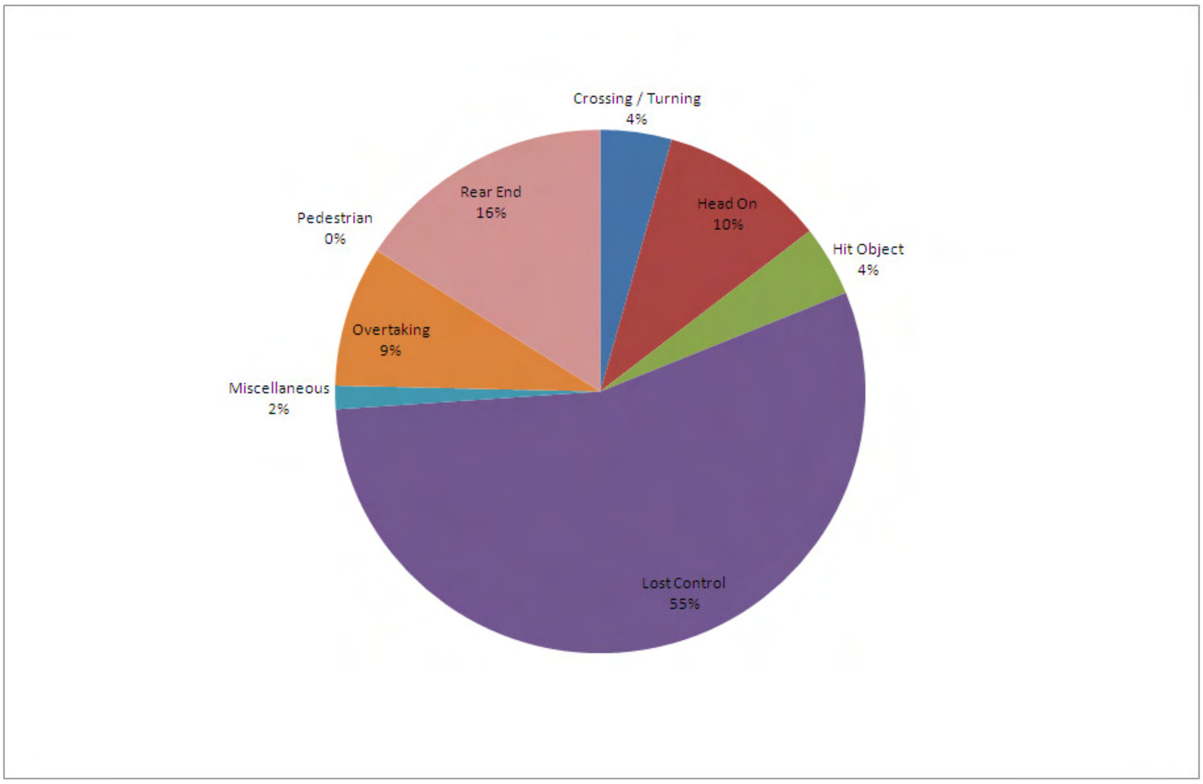

Figure D-11: SH58 Crashes Between State Highway 2 and Moonshine Road - Crash Types

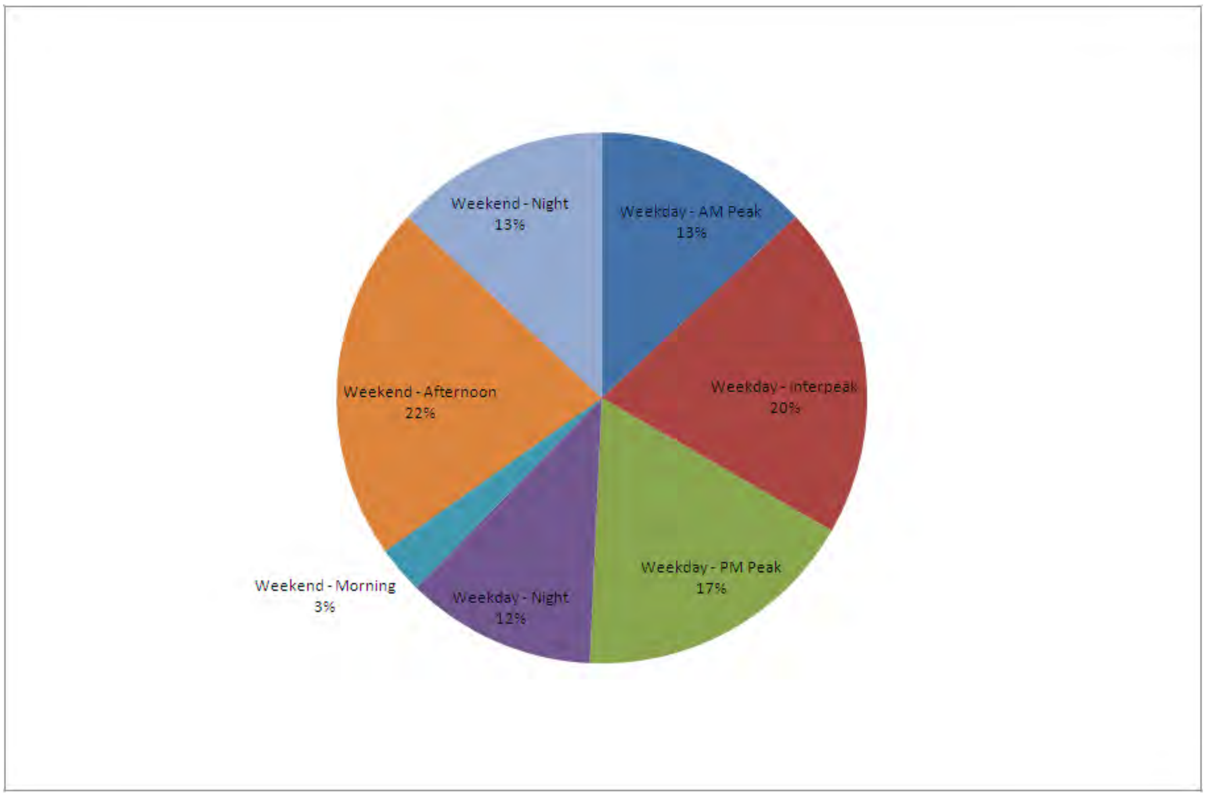

Figure D-12: SH58 Crashes Between State Highway 2 and Moonshine Road - Crash Times

Table D-5: SH58 Crashes between Moonshine Road and Pauatahanui (2004-2008)

Crash Details or Environmental Factors			Intersection Crashes		Mid-Block Crashes		Total Crashes	
Crash Type	Crossing / Turning (Types H, J, K, L, M)		2	(7%)	2	(8%)	4	(8%)
	Head On (Types AB, B)		0	(0%)	4	(16%)	4	(8%)
	Hit Object (Types E)		2	(7%)	2	(8%)	4	(8%)
	Lost Control (Types AD, C, D)		9	(33%)	10	(40%)	19	(36%)
	Miscellaneous (Types Q)		1	(4%)	1	(4%)	2	(4%)
	Overtaking (Types AA, AC, AE-AO, GE)		4	(15%)	1	(4%)	5	(9%)
	Pedestrian (Types N, P)		0	(0%)	0	(0%)	0	(0%)
	Cyclist (included in other types)		0	-	1	-	1	-
	Rear End (Types F, GA-GD, GF, GO)		9	(33%)	5	(20%)	14	(27%)
Crash Time	**Weekday** (Mon 06:00 - Fri 18:59)	AM Peak (06:00-08:59)	6	(22%)	5	(20%)	11	(21%)
		Daytime (09:00-15:29)	5	(19%)	2	(8%)	7	(13%)
		PM Peak (15:30-18:59)	8	(30%)	6	(24%)	14	(27%)
		Night-time (19:00-06:00)	1	(4%)	6	(4%)	7	(13%)
	Weekend (Fri 19:00 - Mon 05:59)	Morning (06:00-11:59)	1	(4%)	1	(4%)	2	(4%)
		Afternoon (12:00-18:59)	3	(11%)	2	(8%)	5	(10%)
		Night-time (19:00-06:00)	3	(11%)	3	(12%)	6	(12%)
Season	Summer (1 December – 28 or 29 February)		6	(22%)	8	(32%)	14	(27%)
	Autumn (1 March – 31 May)		7	(26%)	4	(16%)	11	(21%)
	Winter (1 June – 31 August)		8	(30%)	6	(24%)	14	(27%)
	Spring (1 September – 30 November)		6	(22%)	7	(28%)	13	(25%)
Light	Bright Sun		7	(26%)	7	(28%)	14	(27%)
	Overcast		9	(33%)	9	(36%)	18	(35%)
	Twilight		4	(15%)	1	(4%)	5	(10%)
	Dark		7	(26%)	8	(32%)	15	(29%)
Road	Dry		17	(63%)	23	(92%)	40	(77%)
	Wet		7	(26%)	2	(8%)	9	(17%)
	Ice or Snow		3	(11%)	0	(0%)	3	(6%)
Weather	Fine		21	(78%)	21	(84%)	42	(81%)
	Mist or Fog		0	(0%)	1	(4%)	1	(2%)
	Light Rain		5	(19%)	2	(8%)	7	(13%)
	Heavy Rain		1	(4%)	1	(4%)	2	(4%)
Total Number of Crashes (3.7km)			**27**	**(100%)**	**25**	**(100%)**	**52**	**(100%)**

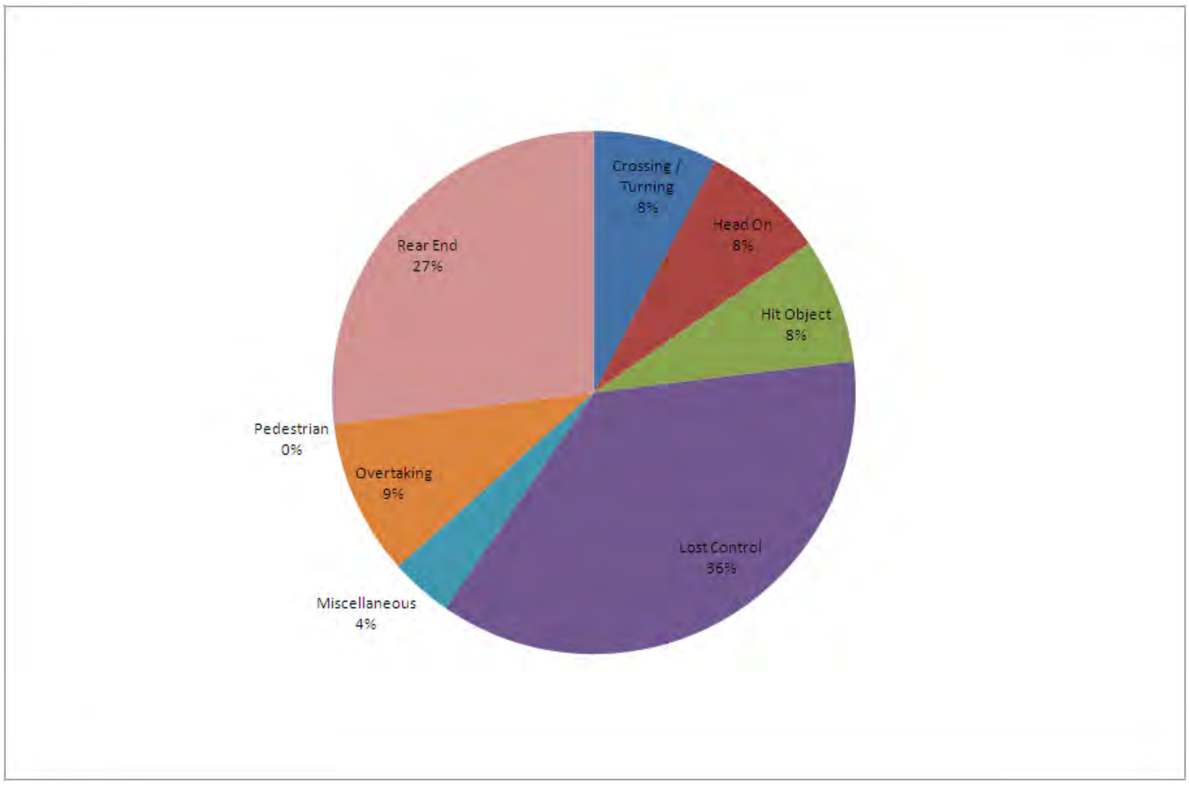

Figure D-13: SH58 Crashes between Moonshine Road and Pauatahanui - Crash Types

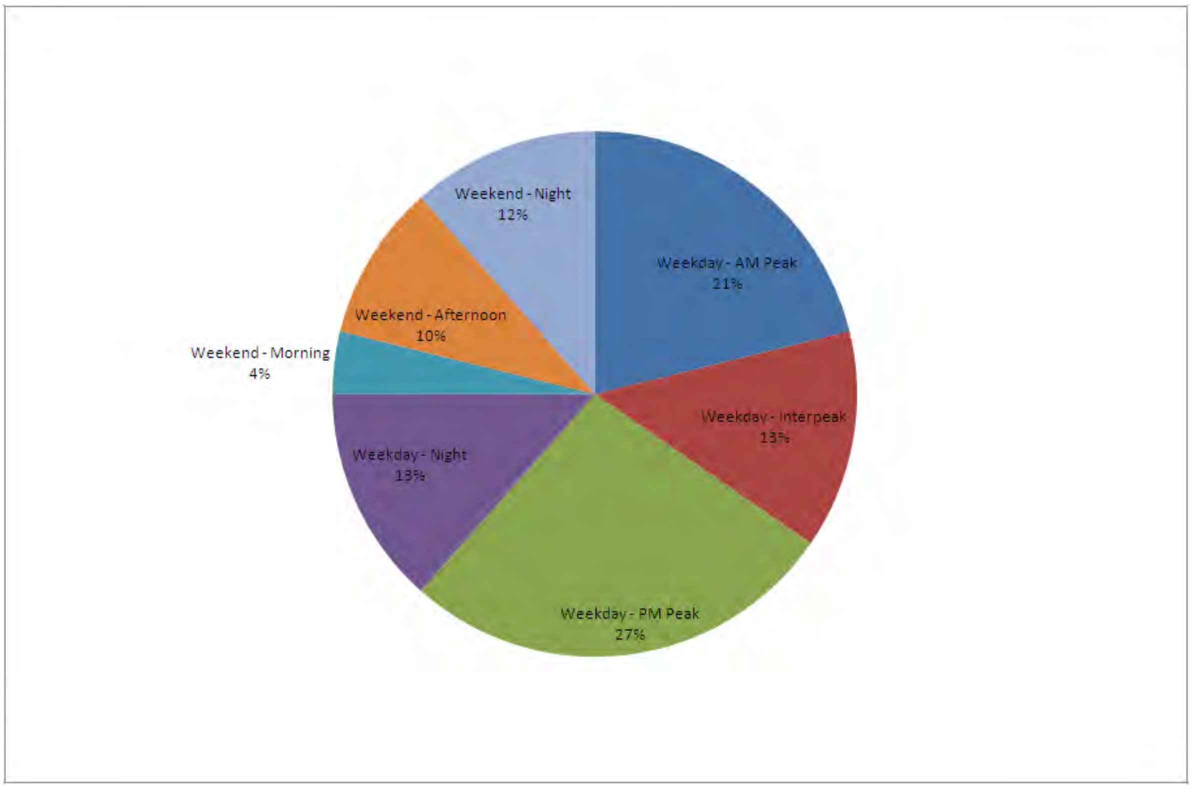

Figure D-14: SH58 Crashes Between Moonshine Road and Pauatahanui - Crash Times

Table D-6: SH58 Crashes between Pauatahanui and Postgate Drive (2004-2008)

Crash Details or Environmental Factors			Intersection Crashes		Mid-Block Crashes		Total Crashes	
Crash Type	Crossing / Turning (Types H, J, K, L, M)		5	(33%)	1	(1%)	6	(7%)
	Head On (Types AB, B)		2	(13%)	20	(26%)	22	(24%)
	Hit Object (Types E)		0	(0%)	1	(1%)	1	(1%)
	Lost Control (Types AD, C, D)		7	(47%)	46	(60%)	53	(58%)
	Miscellaneous (Types Q)		0	(0%)	0	(0%)	0	(0%)
	Overtaking (Types AA, AC, AE-AO, GE)		0	(0%)	1	(1%)	1	(1%)
	Pedestrian (Types N, P)		0	(0%)	0	(0%)	0	(0%)
	Cyclist (included in other types)		0	-	0	-	0	-
	Rear End (Types F, GA-GD, GF, GO)		1	(7%)	8	(10%)	9	(10%)
Crash Time	**Weekday** (Mon 06:00 - Fri 18:59)	AM Peak (06:00-08:59)	2	(13%)	9	(12%)	11	(12%)
		Daytime (09:00-15:29)	5	(33%)	16	(21%)	21	(23%)
		PM Peak (15:30-18:59)	1	(7%)	9	(12%)	10	(11%)
		Night-time (19:00-06:00)	5	(33%)	15	(19%)	17	(18%)
	Weekend (Fri 19:00 - Mon 05:59)	Morning (06:00-11:59)	1	(7%)	6	(8%)	7	(8%)
		Afternoon (12:00-18:59)	2	(13%)	10	(13%)	12	(13%)
		Night-time (19:00-06:00)	2	(13%)	12	(16%)	14	(15%)
Season	Summer (1 December – 28 or 29 February)		4	(27%)	23	(30%)	27	(29%)
	Autumn (1 March – 31 May)		6	(40%)	15	(19%)	21	(23%)
	Winter (1 June – 31 August)		3	(20%)	18	(23%)	21	(23%)
	Spring (1 September – 30 November)		2	(13%)	21	(27%)	23	(25%)
Light	Bright Sun		2	(13%)	13	(17%)	15	(16%)
	Overcast		8	(53%)	35	(45%)	43	(47%)
	Twilight		2	(13%)	4	(5%)	6	(7%)
	Dark		3	(20%)	25	(32%)	28	(30%)
Road	Dry		10	(67%)	32	(42%)	42	(46%)
	Wet		5	(33%)	45	(58%)	50	(54%)
	Ice or Snow		0	(0%)	0	(0%)	0	(0%)
Weather	Fine		11	(73%)	39	(51%)	50	(54%)
	Mist or Fog		0	(0%)	0	(0%)	0	(0%)
	Light Rain		4	(27%)	28	(36%)	32	(35%)
	Heavy Rain		0	(0%)	10	(16%)	10	(11%)
Total Number of Crashes (3.6km)			**15**	**(100%)**	**77**	**(100%)**	**92**	**(100%)**

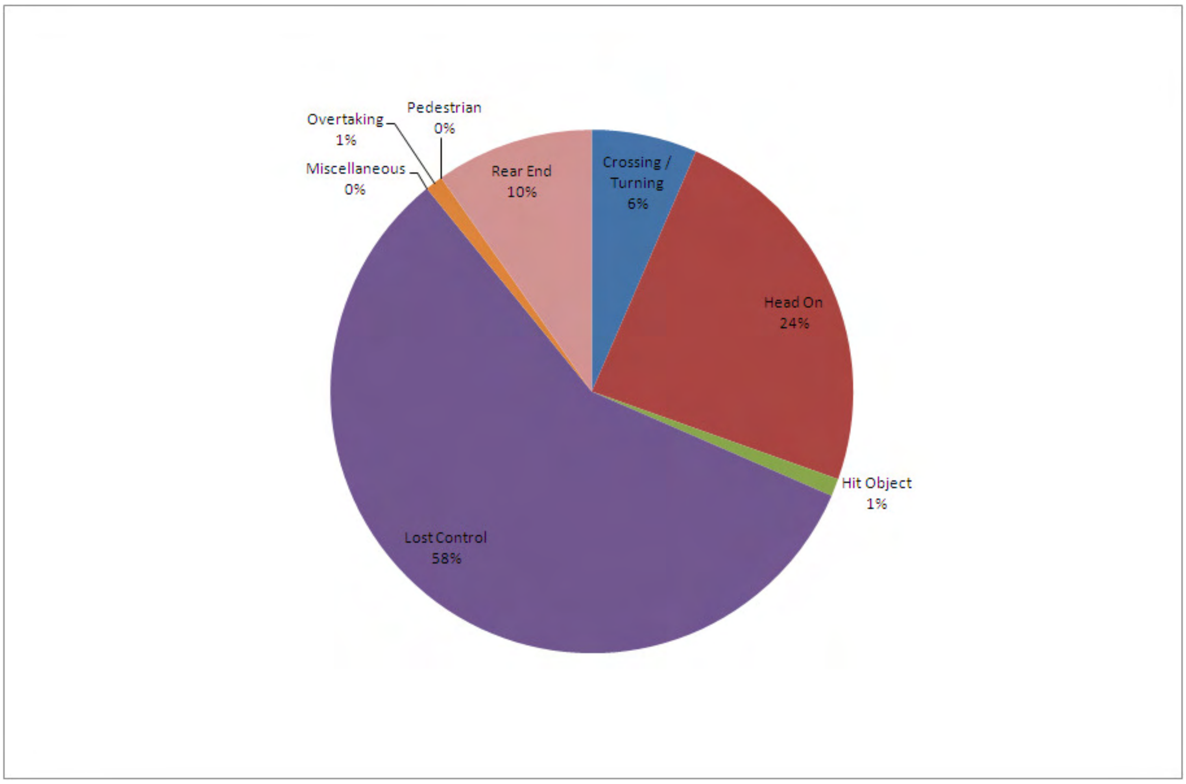

Figure D-15: SH58 Crashes between Pauatahanui and Postgate Drive - Crash Types

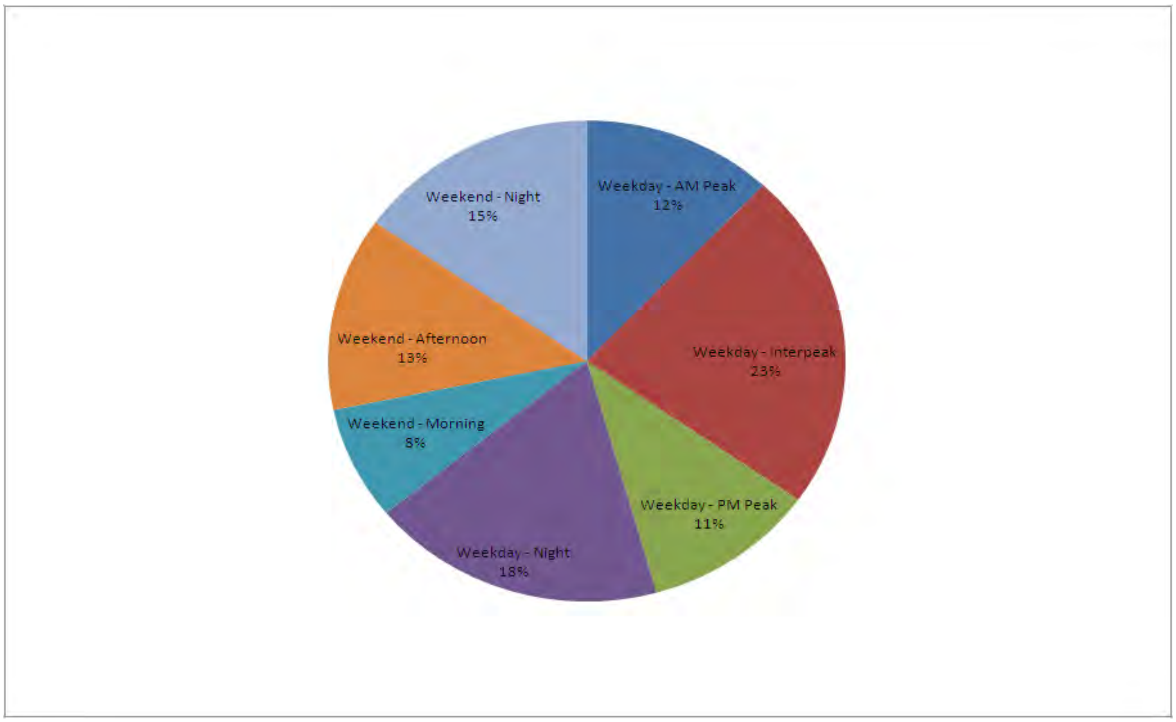

Figure D-16: SH58 Crashes Between Pauatahanui and Postgate Drive - Crash Times

Table D-7: SH58 Crashes between Postgate Drive and Paremata (2004-2008)

Crash Details or Environmental Factors			Intersection Crashes		Mid-Block Crashes		Total Crashes	
Crash Type	Crossing / Turning (Types H, J, K, L, M)		13	(42%)	0	(0%)	13	(27%)
	Head On (Types AB, B)		7	(23%)	6	(35%)	13	(27%)
	Hit Object (Types E)		0	(0%)	0	(0%)	0	(0%)
	Lost Control (Types AD, C, D)		5	(16%)	3	(18%)	8	(17%)
	Miscellaneous (Types Q)		0	(0%)	0	(0%)	0	(0%)
	Overtaking (Types AA, AC, AE-AO, GE)		3	(10%)	1	(6%)	4	(8%)
	Pedestrian (Types N, P)		0	(0%)	0	(0%)	0	(0%)
	Cyclist (included in other types)		0	-	1	-	1	-
	Rear End (Types F, GA-GD, GF, GO)		3	(10%)	7	(41%)	10	(21%)
Crash Time	**Weekday** (Mon 06:00 - Fri 18:59)	AM Peak (06:00–08:59)	5	(16%)	3	(18%)	8	(17%)
		Daytime (09:00–15:29)	5	(16%)	2	(12%)	7	(15%)
		PM Peak (15:30–18:59)	8	(26%)	1	(6%)	9	(19%)
		Night-time (19:00–06:00)	2	(6%)	4	(24%)	6	(13%)
	Weekend (Fri 19:00 - Mon 05:59)	Morning (06:00–11:59)	2	(6%)	0	(0%)	2	(4%)
		Afternoon (12:00–18:59)	6	(19%)	2	(12%)	8	(17%)
		Night-time (19:00–06:00)	3	(10%)	5	(29%)	8	(17%)
Season	Summer (1 December – 28 or 29 February)		11	(35%)	2	(12%)	13	(27%)
	Autumn (1 March – 31 May)		7	(23%)	4	(24%)	11	(23%)
	Winter (1 June – 31 August)		3	(10%)	5	(29%)	8	(17%)
	Spring (1 September – 30 November)		10	(32%)	6	(35%)	16	(33%)
Light	Bright Sun		7	(23%)	6	(35%)	13	(27%)
	Overcast		14	(45%)	3	(18%)	17	(35%)
	Twilight		2	(6%)	0	(0%)	2	(4%)
	Dark		8	(26%)	8	(47%)	16	(33%)
Road	Dry		21	(68%)	14	(82%)	35	(73%)
	Wet		10	(32%)	3	(18%)	13	(27%)
	Ice or Snow		0	(0%)	0	(0%)	0	(0%)
Weather	Fine		23	(74%)	14	(82%)	37	(77%)
	Mist or Fog		0	(0%)	0	(0%)	0	(0%)
	Light Rain		5	(16%)	2	(12%)	7	(15%)
	Heavy Rain		3	(10%)	1	(6%)	4	(8%)
Total Number of Crashes (1.5km)			**34**	**(100%)**	**17**	**(100%)**	**48**	**(100%)**

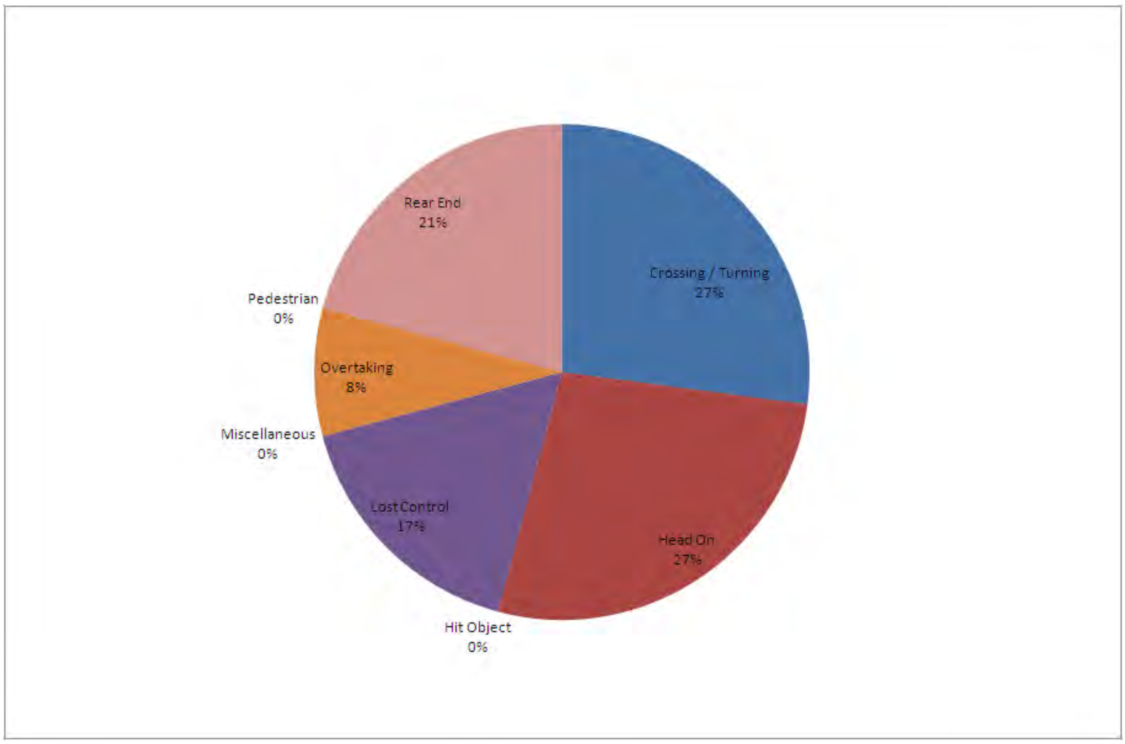

Figure D-17: SH58 Crashes between Postgate Drive and Paremata - Crash Types

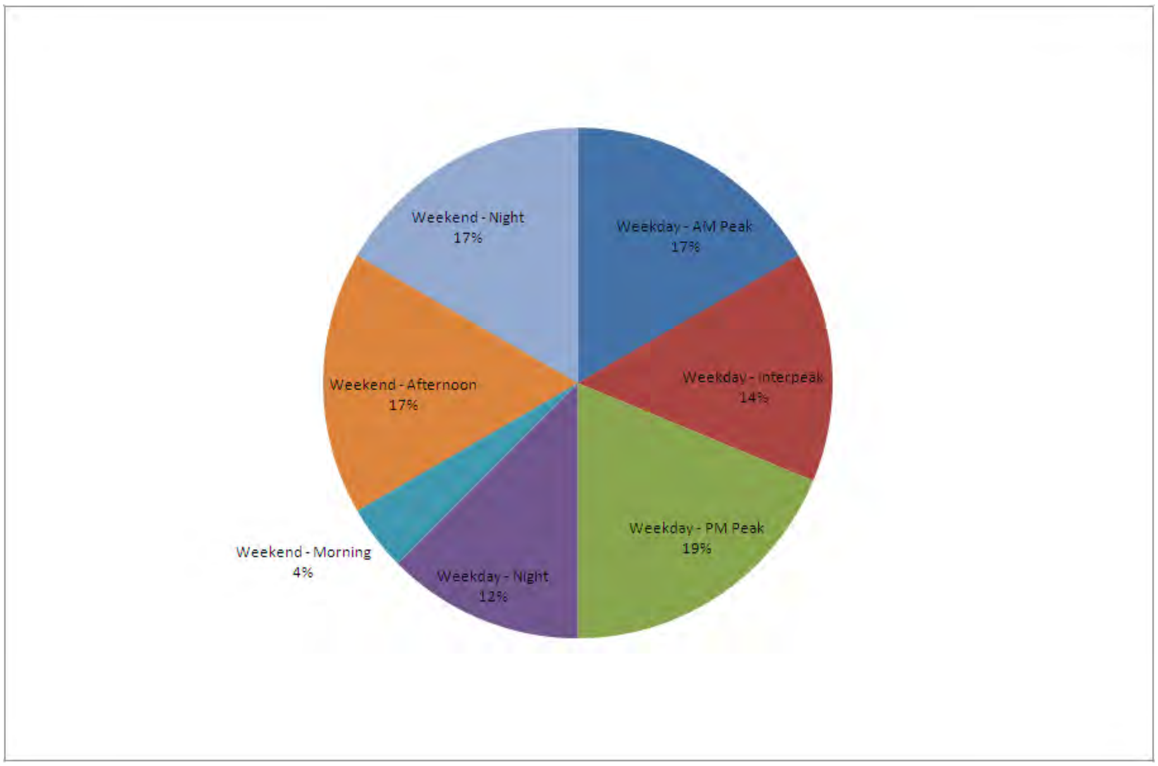

Figure D-18: SH58 Crashes Between Postgate Drive and Paremata - Crash Times

B.3.1 Discussion of Crashes between SH2 and Moonshine Road

Table D-4, ***Figure D-11***and ***Figure D-12*** illustrate that the section of SH58 between SH2 (Western Hutt Road) and Moonshine Road has the following crash characteristics:

- A very high proportion of 'loss of control' crashes (55%). This section of SH58 travels through a section of highway with both horizontal and vertical curve combinations which could have contributed to this high proportion.
- Smaller proportions of 'head-on', 'overtaking' and 'rear-end' crashes (9% - 16%); other crash types did not significantly feature on this section of highway.
- A relatively high proportion of crashes during the weekend afternoon period (22%), which is higher than any other section of SH58. Also a higher proportion of weekday inter-peak crashes suggests that the crashes on this section of road are not necessarily due to high traffic volumes.
- Typical proportions of winter-time, night-time, wet road and wet weather crashes indicates that environmental factors are unlikely to play a more significant role in crashes along this section that the other highway sections along the SH58 Corridor length.

B.3.2 Discussion of Crashes between Moonshine Road and Pauatahanui

Table D-5, ***Figure D-13*** and ***Figure D-14*** illustrate that the section of SH58 between Moonshine Road and Pauatahanui has the following crash characteristics:

- The highest proportion of 'rear-end' crashes (27%), which are likely to be related to the vehicles turning into and out of industrial accessways in this high speed area.
- 'Crossing/turning', 'head-on', 'hit object' and 'overtaking' had similar number of crashes; between 8% and 10%.
- A high proportion of 'loss of control' crashes (36%) which may be related to the curvilinear nature of the highway though this section, but a significant number also occurred at the intersections.
- A high proportion of crashes during the weekday peak periods, which is higher than other sections.
- Typical proportions of winter-time, night-time, wet road and wet weather crashes indicates that environmental factors are unlikely to play a more significant role in crashes along this section that the other highway sections along the SH58 Corridor length.

B.3.3 Discussion of Crashes between Pauatahanui and Postgate Drive

Table D-6, ***Figure D-15*** and ***Figure D-16*** illustrate that the section of SH58 between Pauatahanui and Postgate Drive has the following crash characteristics:

- A very high proportion of 'loss of control' crashes (58%) due to the narrow windy highway around the inlet which has very narrow shoulders, leaving little space for vehicles to recover should they lose control.

- The narrow road also shows its influence in the significant proportion of head-on crashes (24%).

- A high proportion of wet road crashes (54%) indicates that wet conditions do have an influence in this area.

B.3.4 Discussion of Crashes between Postgate Drive and Paremata (SH1)

Table D-7, ***Figure D-17*** and ***Figure D-18*** illustrate that the section of SH58 between Postgate Drive and Paremata Roundabout (SH1) has the following crash characteristics:

- A higher number of crossing/turning crashes (27%) and which reflects the urban nature of this section

- A high proportion of rear-end crashes (21%) also reflects the urban nature of the section and the fact that the highway is approaching capacity.

- No crashes involving pedestrians suggests that pedestrians manage their risk when walking along the highway through the urban area

- Typical proportions of winter-time, night-time, wet road and wet weather crashes indicates that environmental factors are unlikely to play a more significant role in crashes along this section that the other highway sections along the SH58 Corridor length.