Appendix K

Modelling and Analysis Report

Thorndon Quay and Hutt Road – Single Stage Business Case

Transport Modelling and Analysis

2 February 2022

Let's GET Wellington MOVING

WAKA KOTAHI NZ TRANSPORT AGENCY

greater WELLINGTON REGIONAL COUNCIL Te Pane Matua Taiao

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Introduction

Overview

This report has been prepared to outline the approach of the second phase of transport modelling for the Thorndon Quay and Hutt Road Single-Stage Business Case (SSBC). It details the methodology and provides outputs to assess the impact of the proposed scheme. This builds on the work carried out in Phase 1.

The Project

The Thorndon Quay and Hutt Road SSBC project is one of the LGWM's Early Delivery Interventions whose benefits could be delivered relatively quickly and are not constrained by the scope of the larger elements in the programme such as Mass Transit. The project has selected a preferred option which is tested within this report.

Thorndon Quay and Hutt Road are part of the critical northern route to and from Wellington City. Achievable benefits identified early include bus priority, reliability improvements and safety improvements for people cycling between the City and the planned Te Ara Tupua Ngauranga to Petone walking and cycling link.

The objectives of the Thorndon Quay and Hutt Road SSBC are to:

1. Improve reliability of bus services equivalent to current daytime speed and variability by 2026 and maintain to 2036;
2. Improve Level of Service (LoS) for non-car modes by 2026 and maintain to 2036 – Walking LoS (C), Cycling LoS (A/B). Public Transport – Sufficient capacity for growth;
3. Reduce the safety risk along Thorndon Quay and Hutt Road for all vulnerable road users and Hutt Road for vehicles by 2030;
4. Amenity aligns with Place and Movement Framework for Thorndon Quay by 2036; and
5. Freight – Maintain similar access for people and freight to the ferry terminal / CentrePort.
6. The analysis is intended to provide quantitative outputs to assess the benefits and impacts of the options against:
7. Investment Objective 1 – Reliability of bus services;
8. Investment Objective 2 – Active mode levels of service; and
9. Investment Objective 5 – Freight Reliability.

Summary of Phase 1

Phase 1

The Phase 1 modelling work was undertaken at high level using a first principles approach to the assessment of the network and four corridor options. These options are shown in Table 1.

Table 1 Concept Options

Concept	Elements			Common Elements
	Thorndon Quay Bus Lane	Thorndon Quay Cycle Lane	Hutt Road Special Vehicle Lanes	
1	Southbound	Bi-Directional	Southbound	• Speed limit changes • Intersection upgrades • Pedestrian crossing improvements • Bus stop balancing • Thorndon Quay Amenity • Hutt Road Safety Audit Recommendations
2	Both-Directions	Uni-Directional	Both Directions	
3	Southbound	Uni-Directional	Southbound	
4	Both-Directions	Bi-Directional	Both Directions	

The modelling assessment which was carried out for the above utilised the WTSM and AIMSUN models for public transport, route and mode choice and traffic forecasts. The AIMSUN model is developed for 2026, and a 10% uplift was applied to estimate for a 2036 scenario. This is based on a 1% growth rate per year over 10 years.

Assessment for active modes along the corridor was carried out using the Danish Level of Service method, and the crossing level of service was based on the crossing spacing and crossing delay times as per Austroads.

The Phase 1 analysis concluded as follows:

1. There is a very strong case for bus priority (southbound) in the morning peak (as per Concept 1 and Concept 3) as it is expected that there will be significant travel time benefits;
2. There is a case for bus priority (northbound) in the evening peak, however the expected benefit is lower than benefits in the southbound morning peak;
3. It is expected that with peak period bus priority, the bus journey times will be in the order of 10-11 minutes which is lower than currently observed, and in the case of the morning peak period, significantly lower than the do-minimum;

4. There does not appear to be a strong case for all-day bus priority along the corridor as the level of service (reliability) is expected to remain good in off-peak periods through to 2036. However, along Hutt Road there would likely be a lesser impact to other road users if the Special Vehicle Lane was implemented before congestion develops throughout the day;
5. The type of Special Vehicle Lane is a balancing act between improving reliability for buses, improving reliability for freight, managing the impact of converting a general traffic lane to a Special Vehicle Lane, and ensuring that the volume of traffic in the Special Vehicle Lane does not negate its benefits. As a result, the recommendation at this stage (excluding safety considerations is to exclude a T2 lane from further investigation);
6. The roundabout at Aotea Quay / Mainfreight entrance should be included under all options to provide an additional access to the Interisland Ferry Terminal, and / or to mitigate potential impacts of restricting right turn movements on Hutt Road if a raised median is implemented. The roundabout at Aotea Quay may negate the need to allow trucks in the Special Vehicle Lane to achieve the investment objective related to access to the Ferry Terminal;
7. Consider additional controlled pedestrian crossing points along Thorndon Quay to reduce the spacing between the current (which will be upgraded) and proposed crossing at Tinakori Road and the motorway overpass (where bus stops are proposed). More crossings will improve the level of service by reducing the distance to walk between formal crossing points. The provision of additional crossings is unlikely to have a significant impact on the reliability of public transport along the corridor;
8. Uni-directional cycle paths on Thorndon Quay (between the motorway overpass and Thorndon Quay) are expected to result in a poor level of service for cycling and walking due to the constrained width, hence extending the existing bi-directional cycle path is recommended;
9. The provision of a bi-directional path along Thorndon Quay provides a good level of service (B/C) and a higher level of service than the uni-directional cycle paths (D/E) using the Danish Cycling Level of Service method. This is primarily due to the path width and the buffer between the cycle path and the road. However, this assessment does not consider the safety implications of a bi-directional cycle path, which is being addressed through the Investment Objective related to safety;
10. The elasticities of the public transport response, the routing in AIMSUN, and the potential impacts outside the modelled periods in both the AIMUSN models and WTSM models are to be further investigated in Stage 2 of the project to confirm the assessment of the reliability for trucks.

Phase 2 Methodology

Introduction

Following on from the Phase 1 analysis, it was proposed to utilise the N2A AIMSUN model to determine the travel time benefits and network operation. This section of the report details the process undertaken to assess the impact of the proposed scheme and its key performance indicators against the investment objectives. As part of the assessment the roundabout intersection at the Aotea Quay / Mainfreight entrance has been removed due to a separate study being carried out on the new Interisland ferries which are to be operational soon. Therefore, this report has not included this assessment.

It should be noted that a review of the approach detailed below, along with the assessment has been checked by Flow Transportation Specialists (Peer Review) and the methodology has been robustly tested to confirm it is suitable for this project.

Model Development

The modelling of the network in AIMSUN was carried out by the Wellington Analytics Unit working closely with the consultant team. As part of the process a modelling specification report was produced and issued to the modelling team. This set out the proposed network changes including all traffic signal and pedestrian improvements as well as the dedicated Special Vehicle Lane. Initially it was decided to create a sub-area of the wider AIMSUN model to carry out the assessment at a Mesoscopic level and extract the economic information.

Whilst a more detailed Microsimulation model was considered due to the more detailed vehicle interaction outputs and would improve representation such as vehicle weaving however due to time frames and the fact that the mesoscopic model would reflect potential wider scale re-routing (i.e onto SH1) and trip re-timing that might result from the introduction of bus priority measures on Hutt Road this process was completed at a mesoscopic level of detail.

Following the 2026 model runs, a detailed review of the assessment was carried out. During this review it was identified that whilst the original aim to use the AIMSUN strategic model was to understand the wider network impacts, the wider outputs were too strategic and provided insufficient detail for the economics for a corridor-based assessment such as this project.

Therefore, the decision was taken to utilise the volume outputs from AIMSUN and input them into SIDRA Network software platform to enable a detailed assessment to be carried out across the corridor. It should be noted that following discussions between LGWM, Wellington Analytics Unit and the peer reviewers, only the 2026 assessment has been carried out. This is because the network would already be at capacity in 2026 and therefore limited growth can occur on the network.

The process undertaken for this is detailed below in Figure 1.

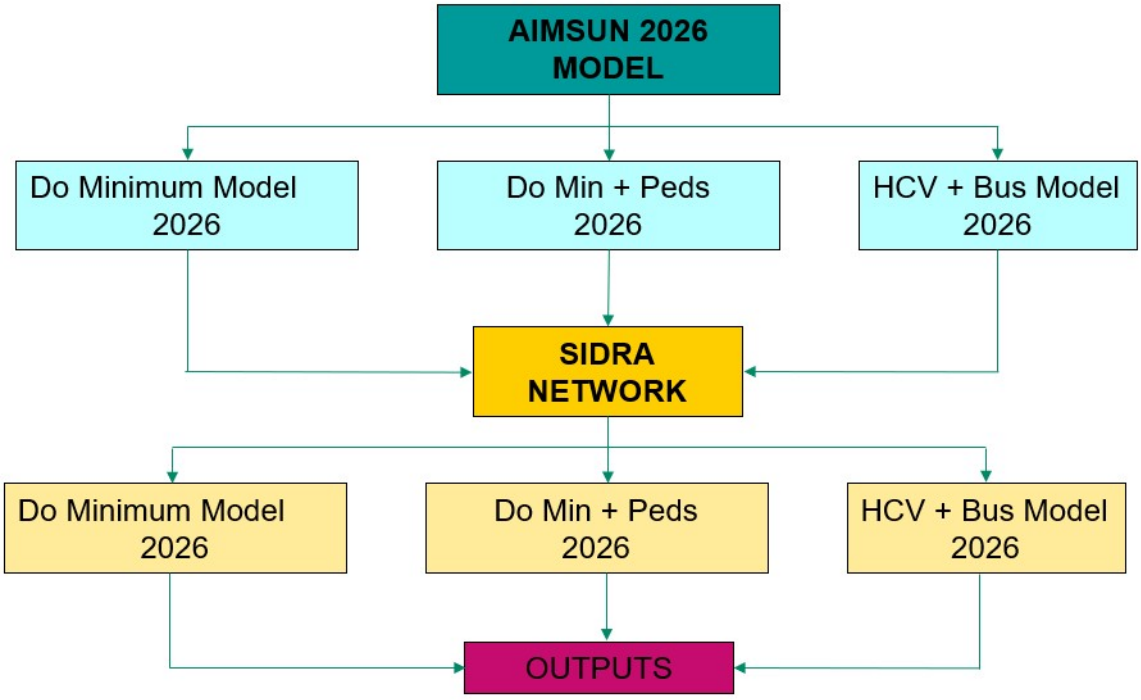


Figure 1 Modelling Process

Options developed

As part of the Aimsun level of assessment three options were developed. These were:

- Do minimum;
- Do minimum + pedestrian improvements; and
- HCV and Bus option.

The details of these options are provided below.

Do Minimum

The do minimum network is the current network layout to test the options against. During the development of the model and the subsequent data analysis, it became apparent that the bus travel time, and vehicle travel time benefits were not being identically compared to the HCV and Bus model. This was due to additional items being added to the scheme such as pedestrian safety improvements including signalised pedestrian crossings at mid-block points and new signalised pedestrian crossings at existing intersections. This resulted in an increase of the bus and vehicle travel times and therefore not a direct comparison of the options.

Therefore, a decision was taken to develop a do minimum + pedestrians' option which would expand the do minimum to only include those safety measures which would likely have been implemented in the future for pedestrians.

Do Minimum + Pedestrians

The model was developed to enable the pedestrian safety improvements detailed above to be included. This provides a more realistic do minimum for comparison.

Bus + HCV Option

This option includes a special vehicle lane on Hutt Road and Thorndon Quay. This is a tidal option with the lane re-allocated to buses and HCVs in the southbound for the AM peak and the northbound in the PM peak.

AIMSUN outputs

As set out above, the assessment of the network was carried out using outputs received from the Wellington Analytics Unit. The outputs were provided in four-hour, two-hour and 1-hour assessments. For the SIDRA assessments the one-hour counts were utilised to calculate the travel time along the network in each scenario. It should be noted that the following information is based arrival of vehicles into the network over a four-hour period and the information provided is specific screen line volumes from the model and therefore representing volumes passing set points and not total network traffic volumes.

The Aimsun results showed little difference in vehicle traffic using the corridor in the AM and PM peak in the do minimum and do minimum + pedestrians' options. However, a significant change was identified in the HCV and bus option. This would see traffic diverted across to State Highway 1 from the corridor which, given the reduction in capacity, would be appropriate. The extent of this is shown below in the figures below. Whilst a larger impact is shown in the AM peak, the impact is significantly less the PM peak.

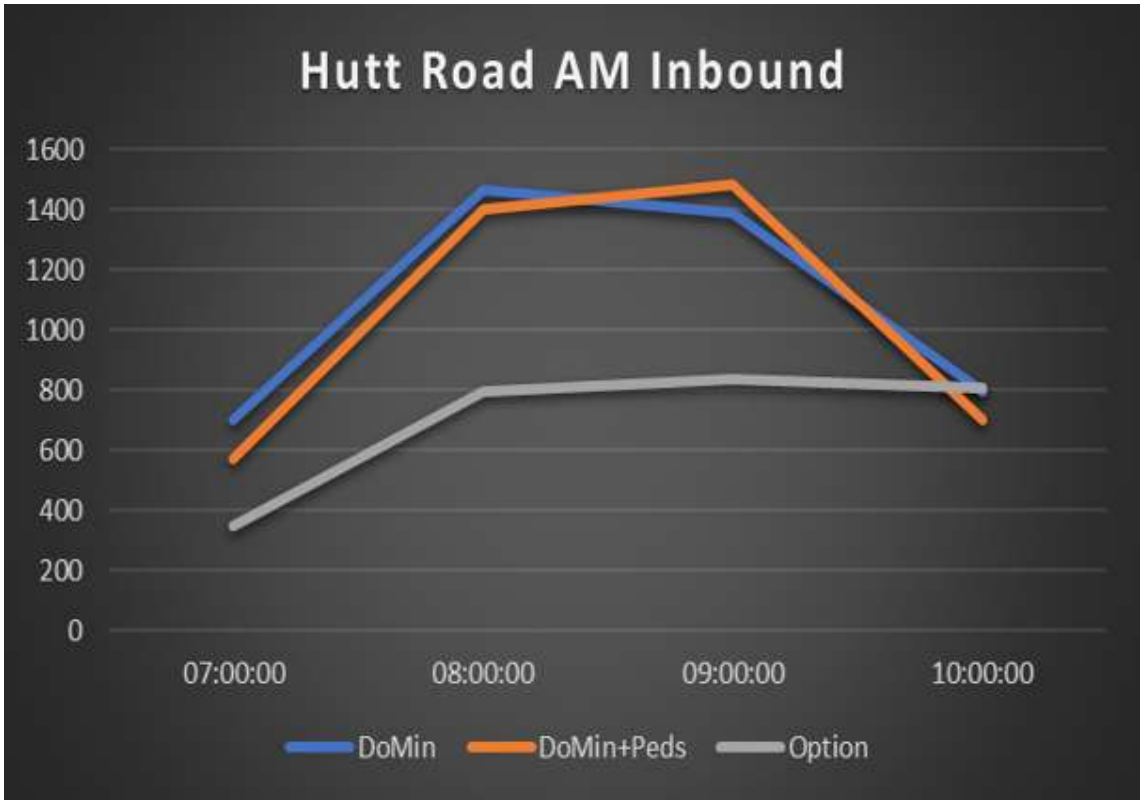


Figure 2 – Traffic Volumes on Hutt Road in the AM Peak Southbound from AIMSUN

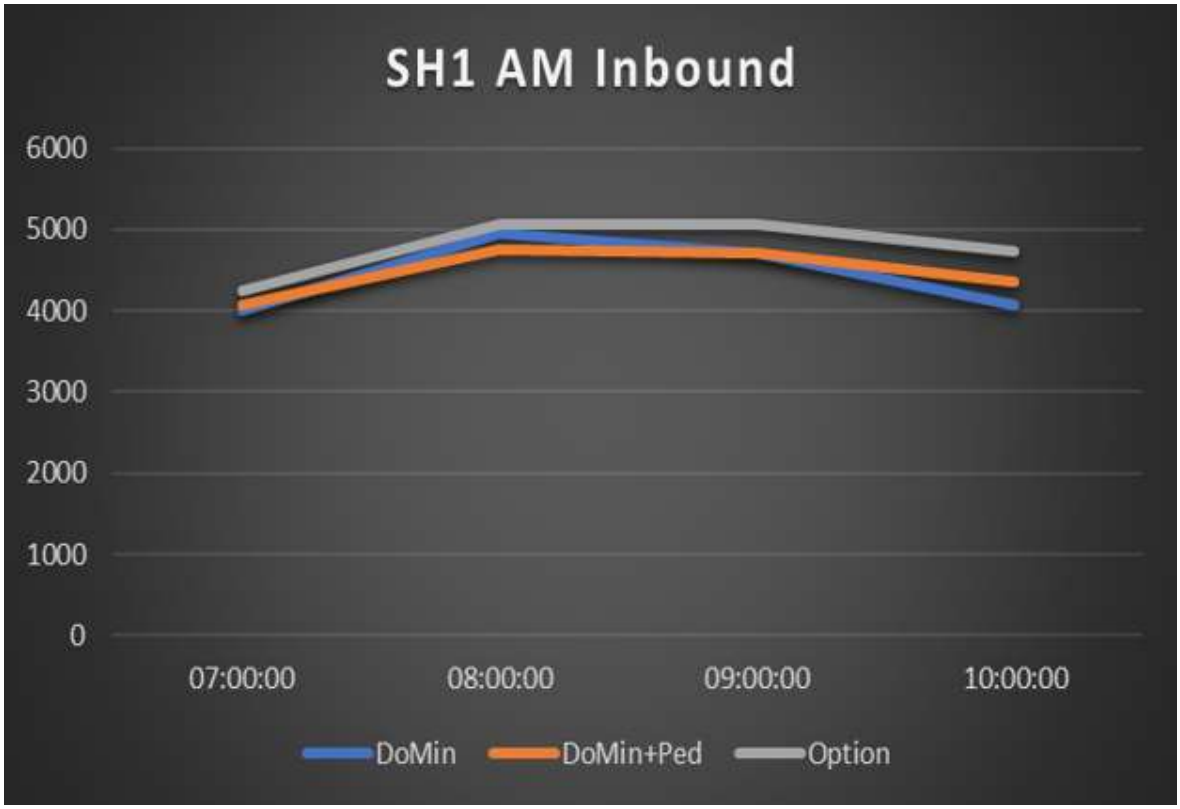


Figure 3 – Traffic Volumes on State Highway 1 in the AM Peak Southbound from AIMSUN

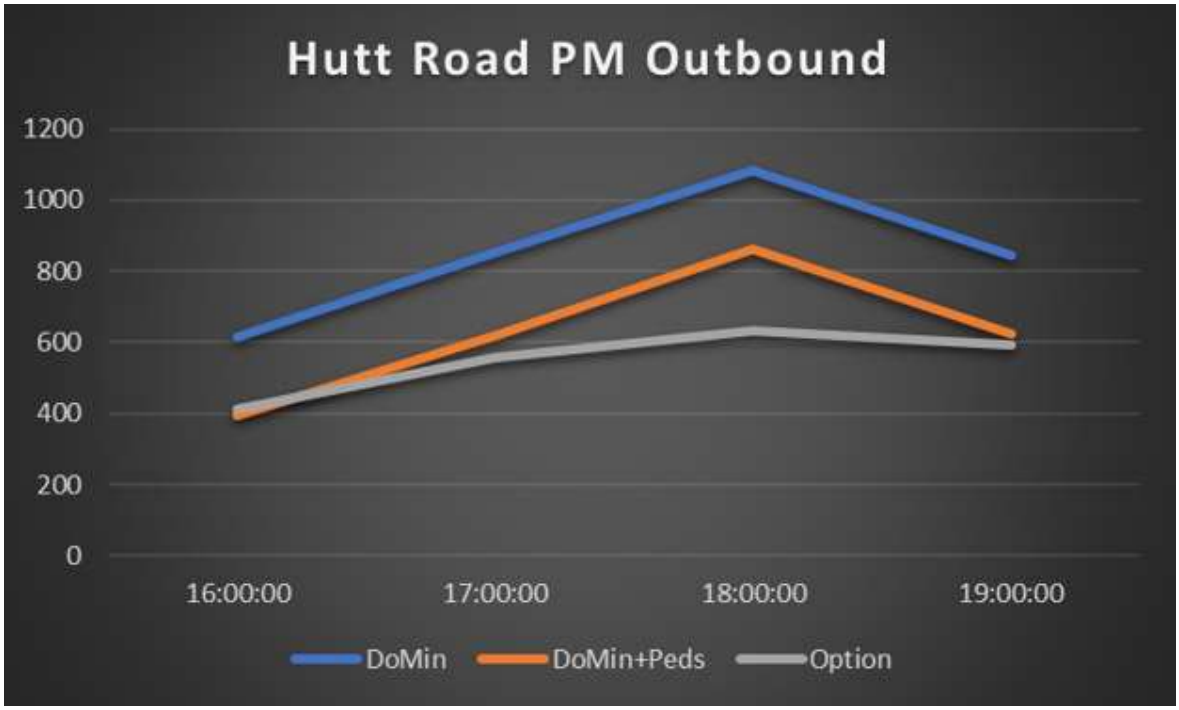


Figure 4 Traffic Volumes on Hutt Road in the PM Peak Northbound from AIMSUN

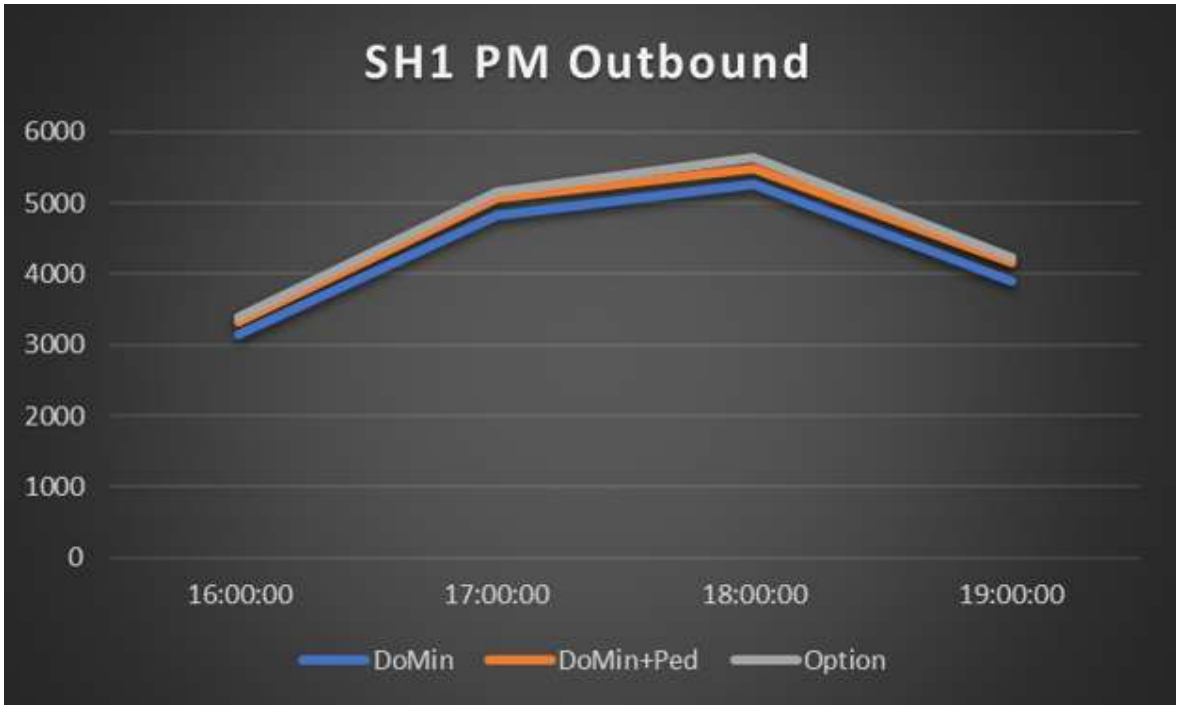


Figure 5 – Traffic Volumes on State Highway 1 in the PM Peak Northbound from AIMSUN

Upon receipt of the data, a review was carried out on the three options to ensure that the data was fit for purpose. The review identified a need for the vehicle volumes to be split out of the original data set into a set which could be used by SIDRA. This required extracting the total

HCV, cars and buses and allocating this data to the correct movement specification for SIDRA.

A review of the traffic changes from AIMSUN was carried out and the table below summaries the changes in traffic volumes on SH1 and Hutt Road between 7:30am and 8:30am which is the peak hour within the AM peak period. The table demonstrates the differences between the Do Minimum, Do Minimum + Pedestrian and the Options (Bus + HCV)

Table 2 – Total Diversion of Traffic AM Peak

Route	Section	Direction	Flow	Flow Difference	
			Do Min AM	Do Min + Ped AM	Bus and HCV
South Ngauranga	SH1	Northbound	3,280	20	-40
		Southbound	4,960	20	100
	Hutt Road	Northbound	400	-40	0
		Southbound	1,840	-80	-880
	Total	Northbound	**3,680**	**-20**	**-40**
		Southbound	**6,800**	**-60**	**-780**

The table shows the following:

- Minimal change in traffic volumes between the Do Minimum and Do Minimum + Pedestrian option.
- A reduction of 880 vehicles (compared to the Do Minimum) on Hutt Road and a corresponding increase of 100 vehicles on State Highway 1.

A review of the traffic volumes by 15-minute time slice between 6am and 10am on Hutt Road has been carried out. This is shown in Figure 6

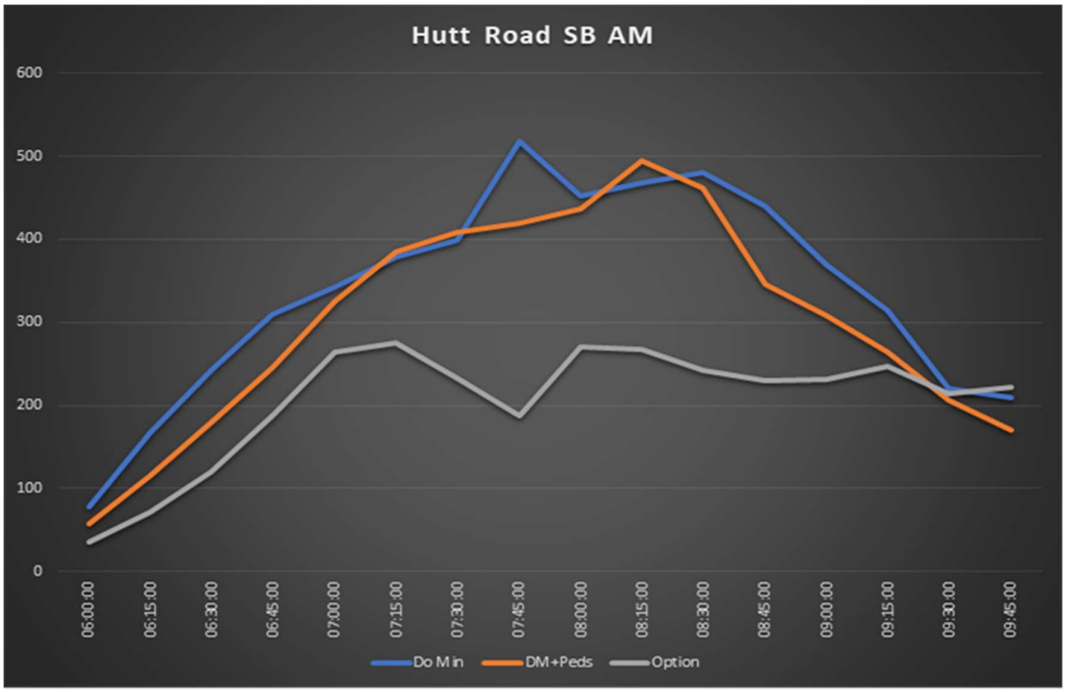


Figure 6 Hutt Road Traffic Volumes

Figure 6 shows the following key information:

- Traffic volumes are around 30% higher during the peak of the peak (7:30am to 8:30am) compared to 7am and 9am.
- The flow profile is broadly similar between Do Minimum and the Do Minimum + Pedestrians.
- Under the option scenario, traffic volumes remain broadly consistent between 7am and 8am due to the reduced capacity, with the difference in volume between the Do Minimum and Option by 15-minute time slice ranging from around 50 to 100 vehicles at 7:15am / 8:15am to nearer 300 at 7:45am.

The reduced capacity on Hutt Road results in the following:

- People diverting to State Highway 1 and travelling at the same time.
- People diverting to State Highway 1 and travelling earlier or later to avoid congestion.
- People travelling later but continuing to use Hutt Road.
- People using alternative diversionary routes such as Burma Road and Ngiao Gorge.

Figure 7 below shows changes in traffic volumes on State Highway 1 between the Do Minimum, Do Minimum + Pedestrian and the Option (bus + HCV).

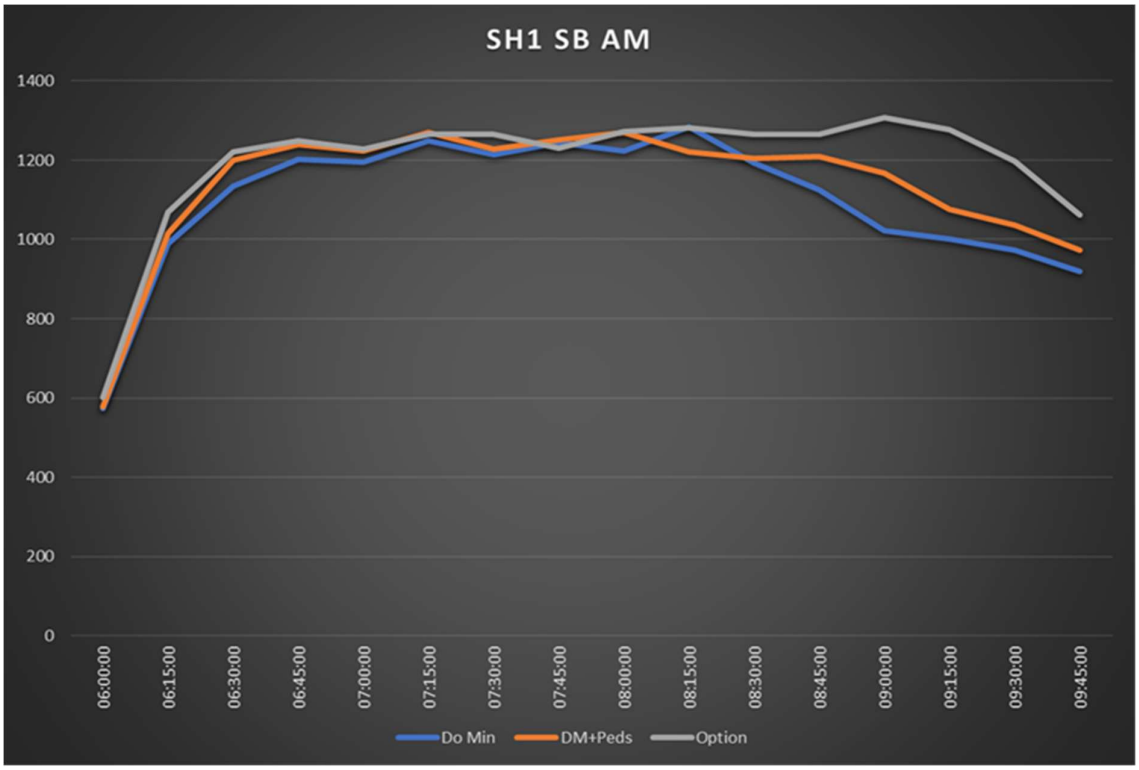


Figure 7 – SH1 Southbound Traffic Volumes

Figure 7 shows the following:

- A very broad peak, starting at 6:30am and continuing to 9am.
- The option results in peak spreading beyond 9am, with the 8:30am peak extending beyond 9am because of traffic diverting from Hutt Road.

Through the process of extraction, some minor side streets such as Rangiora Avenue, Westminster Street, School Road and Sar Street were not included in the model due to the limited access nature of these streets. Given no current data existed for these streets we carried the same assumptions from Phase 1 through to Phase 2 which was a total of 100 vehicles split evenly across each movement entering and exiting these side streets to the main corridor.

Summary of the AIMSUN results

The Aimsun model has shown that whilst it does react to the changes, in the option of a dedicated special vehicle lane, it has reacted by creating a significant re-diversion of vehicles to SH1 and the wider road network. The images shown above for SH1 show that the peak is extended to approximately 09:15 in the option from 08:15 in the do minimum. This could be either due to peak spreading (people leaving earlier or later) or more vehicles joining the back of the queue on SH1 and therefore taking longer to reach their destination.

Whilst this is an issue for SH1 and the economics, in relation of reporting disbenefits, the project corridor would benefit from the significant diversion and whilst diversion is expected a further test was needed to determine what would the worst-case impact be should no diversion occur. This sensitivity test is detailed after the SIDRA model results section further within this document.

Further information and more detail of the AIMSUN assessment is included within Appendix A of this report.

SIDRA model development

SIDRA Network models were developed within SIDRA Intersection 9.0 for each of the three options detailed above.

Do Minimum

The do minimum SIDRA model was previously used in Phase 1 and replicates the current arrangement along the Thorndon Quay and Hutt Road. Each intersection has been reviewed against site observations and the single phasing and timing has been taken from the SCATS data provided. It has been cross checked against the modelling in AIMSUN to ensure that both the AIMSUN model network and the SIDRA model network are the same in terms of lanes, location of signals and intersection layouts.

Do Minimum + Pedestrians

Building from the Do Minimum model and utilising the preliminary design provided by BECA, this SIDRA network model has been developed to include safety improvements such as providing signalised crossings at intersections and signalised mid-block crossings. It has not included changes such as Onslow Road where the proposed scheme signalises the southbound approach to the signal. This enables the safety benefits of these interventions to be isolated.

Signal phasing for this option was determined using practical cycle times. A maximum cycle time of 150 seconds was used with a rounding time of one second. The default time for amber and all-red times of two and four seconds respectively were used. At the Jarden Mill / Hutt Road intersection a dummy movement of 20 seconds was included to allow pedestrians sufficient time to cross on the eastern approach.

Peak Hour Factors (PHF) and Flow Constant was set to 100% for all options modelled. To support the economics; tests were completed based on incremental reduction of the Flow Factors to represent the four-hour spread.

Like the Do Minimum, a review of the AIMSUN layout and the SIDRA layout, has been carried out to confirm that the layouts tested are the same.

Bus + HCV

The HCV Bus Network is a direct reflection of the preliminary design and accounts for the changes to the network to implement the full scheme. This includes:

- Provision of a Special Vehicle Lane in the AM peak in the southbound direction.
- Provision of a Special Vehicle Lane in the PM peak in the northbound direction.
- All changes to lane configurations required by the design.
- All new traffic signal intersections and pedestrian crossings throughout the corridor.

Like the Do Minimum + Pedestrian assessment signal phasing has been determined using practical cycle times. Maximum cycle time of 150 seconds was used with a one second

rounding time. Default for amber and all-red times of two and four seconds were used respectively. As requested by the peer reviewers we have ensured that the phasing matched both the do minimum and the do minimum + peds match throughout the scheme. There may be an opportunity in the detailed design phase to improve the final option network by implementing specific phasing and timing at specific intersections.

As completed in the Do Minimum and Do Minimum + Pedestrian assessments, a review of the layout compared to the AIMSUN layout has been carried out to ensure consistency across both model platforms.

Travel time extraction

SIDRA Intersection 9.0 software does not provide travel time outputs for specific vehicle types. Therefore, the travel times were calculated manually. A macro was built to extract specific results from the SIDRA model into an excel sheet.

The macro developed uses the lane length, posted speed limit and average delay from SIDRA to calculate travel time by adding the average delay to the free flow travel time between each intersection. In addition to the above, the macro displays other parameters such as Level of Service (LoS), degree of saturation, queue lengths and the number of vehicles at the approach to each intersection.

Using the travel time calculated for each lane, bus travel times were obtained by considering which lanes buses are likely to utilise along the network. Figure 8 shows the network outputs for a single lane at an intersection. These were summed for all intersections used in the bus route between the Mulgrave Street / Lambton Quay intersection and the Hutt Road / Jarden Mile Intersection.

Scenario	Average Delay (sec)	Lane Length (m)	Posted speed km/hr (across leg)	Time (sec)
1PMJardenMile	67.21	90.0	80.0	125.7
1PMJardenMile	66.75	150.0	80.0	73.5
1PMJardenMile	80.46	1300.0	80.0	139.0
1PMJardenMile	91.39	1300.0	80.0	149.9
1PMJardenMile	32.25	220.0	100.0	40.2
1PMJardenMile	83.69	370.0	100.0	97.0
1PMJardenMile	83.79	235.0	100.0	92.3
1PMJardenMile	26.62	80.0	100.0	29.5
1PMJardenMile	52.20	40.0	100.0	53.6
1PMJardenMile	51.56	500.0	100.0	69.6
1PMJardenMile	51.56	500.0	100.0	69.6
1PMJardenMile	78.32	25.0	100.0	79.2
1PMJardenMile	30.21	350.0	50.0	55.4
1PMJardenMile	67.41	20.0	50.0	68.9
2PMOnslowRd	56.74	1300.0	80.0	115.2
2PMOnslowRd	60.66	1300.0	80.0	119.2
2PMOnslowRd	65.18	500.0	50.0	101.2
2PMOnslowRd	12.77	60.0	80.0	15.5
2PMOnslowRd	21.51	330.0	80.0	=($H$20/($I$20* (1000 / 3600))+$G$20
2PMOnslowRd	26.07	330.0	80.0	40.9
2aPMRangioracrossing	7.70	330.0	60.0	27.5
2aPMRangioracrossing	5.40	330.0	60.0	25.2

Figure 8 Example of extracted data.

It should be noted that the same process has been used to calculate vehicle travel times and HCV travel time (between Hutt Road / Jarden Mile Intersection and Aotea Quay). The full outputs for the spreadsheets are including in Appendix B of this report.

Corridor Assessments

Journey time summaries

AM peak period

Table 3 below summarises the journey times along the corridor with the three different options.

Table 3 2026 AM Peak Period Southbound Journey Times

Option	Bus (corridor length)	HCV (Jarden Mile to Aotea Quay)	Car (corridor length)
Do minimum	8.7 minutes	5.7 minutes	8.6 minutes
Do minimum + pedestrian	13.5 minutes	6.5 minutes	13.30 minutes
HCV + Bus	7.4 minutes	4.0 minutes	9.1 minutes
SH1 Do Minimum[1]	NA	NA	10 minutes
SH1 HCV + Bus Option[2]	N/A	N/A	10min 30 seconds (average over time-period)

The results show that in the AM peak buses current take approximately 8.7 minutes to complete the journey from the intersection of Jarden Mile / Hutt Road to the intersection of Thorndon Quay / Mulgrave Street intersection. It should be noted that SIDRA does not include dwell times for buses along the corridor and therefore for comparison these have not been included within the assessment.

With the addition of the pedestrian safety improvement along the corridor this increases to 13.5 minutes a 4.8-minute increase. This demonstrates that the additional safety measures will have a general impact on the travel time in a southbound direction.

The implementation of a dedicated Special Vehicle Lane improves this travel time from 13.5 minutes to 7.4 minutes - a total reduction of 6.1 minutes for buses. It should be noted that this does not include dwell times as detailed previously.

For HCVs the travel time is taken from the intersection of Jarden Mile / Hutt Road to Aotea Quay where HCVs would typically leave the route to access the Interisland Ferry terminal. Currently the journey is modelled at approximately 5.7 minutes in the do minimum option.

[1] Taken from the N2A AIMSUN Model.

[2] Taken from the N2A AIMSUN Model.

This increases to 6.5 minutes in the do minimum + pedestrian assessment which would be expected given the additional network changes. With the implementation of the special vehicle lane this decreases to 4.0 minutes, which is a 1.7-minute travel time saving.

Whilst car travel time increases by 4.7 minutes between the do minimum and the do minimum + pedestrian network, we do see a reduction between the do minimum + pedestrian and HCV + Bus option of approximately 4.2 minutes. This is attributed to the reduction of vehicle volume on the corridor with the traffic diverting to State Highway 1 as directed from the AIMSUN model which results in approximately 30 seconds additional travel time for vehicles on SH1. This is due to upstream constraints and potentially a longer travel time will occur either side of the peak however most journeys from Kapiti, Porirua, Johnsonville to Wellington CBD and beyond.

In this context, an 'average' commute from Porirua or North Wellington taking 30 to 35 minutes would experience a negligible increase in travel time along SH1.

Further information on this is included within Appendix A.

PM peak period

Table 4 below summarises the journey times along the corridor with the three different options.

Table 4 2026 PM Peak Period Northbound Journey Times

Option	Bus	HCV	Car
Do minimum	8.80 minutes	5.20 minutes	8.20 minutes
Do minimum + pedestrian	8.50 minutes	4.50 minutes	8.80 minutes
HCV + Bus	8.70 minutes	4.80 minutes	9.00 minutes

The results of the PM assessment show that currently buses take approximately 8.8 minutes to travel from the southern extent of the scheme to the Jarden Mile / Hutt Road intersection. This is a similar travel time with the do minimum + pedestrians. With the HCV + Bus option in place, the travel time decreases slightly to 8.7 minutes - a 0.1-minute saving. It should be noted that the Phase 1 report also set out a minimal benefit in the northbound approach.

A review of the results shows that where the buses join Thorndon Quay at Lambton Street intersection, the low number of vehicles from the bus station to the main road is resulting little green time to buses. SIDRA does not allow a pre-emption for buses and it is understood that should this be carried out further travel time benefits would be achieved. This can be tested and confirmed in the detail design element of the project in accordance with traffic signal designers.

For cars, an increase in travel time is observed between the do minimum and do minimum + peds of approximately 0.6 minute. The HCV+Bus option has a 0.2-minute increase on car travel time over the do minimum + pedestrians.

However, with the improved AM peak bus travel time introduced with the project, it is envisaged that more people will move from car trip to bus trips (given the journey time saving) and this will lead to an increased PT patronage in the PM peak that supports the justification for bus lanes. Whilst travel time is a key demographic, it is also the reliability and perception of level of service which will lead to mode shift.

Level of Service for the corridor and options are included in Appendix B.

Sensitivity tests

A review of the data above has shown that the option to remove a traffic lane in the AM peak results in similar light vehicle travel times as the current base scenario. This is due to the AIMSUN model rediverting a significant volume of traffic around the network and mainly into State Highway 1 where potentially traffic will be joining the back of the existing queue and not being counted within the screenline data. To test the potential worst-case scenario a sensitivity test was carried out, following discussions and agreement with both the peer reviewer and the client advisors, to assume limited redistribution on the network within the HCV and Bus option.

Given the safety schemes could potentially be implemented without the bus lane, it was deemed that the Do Minimum + Pedestrian volumes should be tested. Whilst this included some minor redistribution to SH1 and further areas it was discussed that this data would be the most relevant to test.

The results of this assessment are shown below:

Table 5 2026 AM Sensitivity Test

Option	Bus	HCV	Car
HCV + Bus Option with Do Min + Pedestrian Volumes	7.5 minutes	4.1 minutes	21.5 minutes
HCV + Bus Option (Original)	7.4 minutes	4 minutes	9.1 minutes

Table 5 above shows the impact on the design option with limited diversion. It shows that with the limited diversion of traffic from the corridor to SH1 that the travel time for light vehicles will increased by 12.4 minutes in the AM peak and will effectively be over capacity in the AM peak hour for light vehicles. However, for the HCV and Bus option, the travel time remains consistent with a 0.1-minute difference and therefore meets the investment objectives of the project.

Based on this, the economic elements have been carried out on the two above scenarios.

Investment objectives

The investment objectives of the scheme, in relation to the corridor assessments are:

- Investment Objective 1 – Reliability of bus services;
- Investment Objective 5 – Freight Reliability.

For the AM assessment both objectives have been met with the provision of the HCV + Bus Lane. For the PM assessment, whilst the bus travel time is similar - there is an improvement in the freight reliability and therefore it can be concluded that the scheme meets the investment objectives.

Active Modes Assessment

Introduction

Phase 1 of the assessment utilised the Danish Level of Service method (spreadsheet supplied by Waka Kotahi). For the preferred option the route has been split into the various segments in line with the changing road layouts, types of facilities and corridor widths. This route sees a footway and a bi-directional cycle path on the eastern side of Hutt Road and Thorndon Quay.

It should be noted that this section relates to Investment Objective 2 of Improving the level of service for people walking and cycling along and across Thorndon Quay and Hutt Road.

Danish Level of Service

The Danish Level of Service method utilises various elements of data to estimate the level of service along sections of carriageway. This includes:

- AADT volumes;
- Average Speeds;
- Land Use
- Cross Sections of the Sidewalk, buffer between sidewalk and bicycle paths, bicycle track and buffers between bicycle facility and drive lane.

By entering the relevant information into the spreadsheet, it calculates the level of service for that section based on that data provided.

Given that along the corridor the cycle path and footpath change within the CBD for the preferred option, each section was disaggregated to provide a robust assessment of the scheme. The results of the assessment are shown in the section below.

Results of the Assessment

The LoS estimated using the Danish Cycling Method are provided in Table 8.

Table 6 Active Modes Level of Service

Segment	Walk LoS	Cycle LoS
Existing Corridor (taken from Phase 1 Report)	D	F
Jarden Mile to Motorway Overpass	D	C
Motorway Overpass to Sar Street	C	B
Sar Street to Tinakori Road	C	B
Tinakori Road to Celebration Church	C	A
Celebration Church to Canape Company	C	A
Canape Company to Davis Street	C	A
Davis Street to Moore Street	C	A
Moore Street to Mulgrave Street	C	B

As the above table shows, the existing walking LoS is D with the cycle LoS being F. The proposed scheme will provide a dedicated footway and bi-directional cycle path the entire length of the corridor and therefore the improvements in the Level of Service can be seen with most of the sections resulting in a LoS C for walking and between LoS A and B for cycling. This is a significant improvement over the current situation and meets the Investment Objective of improving the Level of Service for people walking and cycling along the project corridor.

Conclusion

This report has been prepared to detail the results of the assessment work carried out for the second phase of the Thorndon Quay and Hutt Road project. It has detailed the modelling approach undertaken. This included a combination of software from the strategic model in AIMSUN to the completion of a SIDRA network to provide a detailed assessment of the options. The assessment has focused on three options, do minimum, do minimum + pedestrian and HCV and bus lane option.

Corridor Assessment

The assessment has demonstrated that in the AM peak, travel time benefits can be realised with the provision of a dedicated special vehicle lane travelling southbound which meets the investment objectives set out at the start of the project. A travel time benefit of approximately five minutes is observed on the corridor for buses in 2026.

For HCVs the investment objective is to maintain similar travel times on the corridor, and this appears to be represented within the assessments completed. With an approximate two-minute travel time saving between Jarden Mile / Hutt Road and the Aotea Quay intersection. It should be noted that further studies are being carried out by a third-party for the access to the port which includes higher HVC volumes due to the new interisland ferries.

General vehicle traffic shows a decrease in travel time compared to the do min + pedestrian option when compared to the HCV and Bus option. However, this is due in part to a high percentage of traffic redistribution on the network which would be expected given the reduction of through traffic lanes proposed in this option.

For the PM Peak similar travel times are identified for buses in the peak hour. However, for buses this could be due to a lack of pre-emption for buses at the Lambton intersection. With SIDRA unable to allow for this option, it will be tested in detail in the detailed design stage with traffic signal designers.

The sensitivity testing carried out has focused on reviewing the vehicle travel time in the AM peak. It has demonstrated that, in the event of no diversion or mode shift and with the option in place, that vehicle traffic will have significant delay increasing travel time from nine minutes to 22 minutes. It has also shown that with the event of change of traffic volumes the travel time will be reduced along the corridor with tests at 10% reduction and 25% reductions demonstrating this.

The modelling has demonstrated that the project will see travel time benefits for bus and HCV vehicles whilst impacting vehicle travel time. This would be expected given the significant improvement for buses and hcv with dedicated peak time facilities. It therefore meets the investment objective of improved bus reliability and improved bus travel times.

Active modes

Similar to phase one, the danish method to calculate Level of Service for walking and cycling has been completed. A breakdown of the main corridor into various segments was carried out to test the Level of Service where changes in width for pedestrians or cyclists was identified. The result of this is a significant improvement over the existing Level of Service which is currently D for walking and F for cyclists. The improvements see Level of Service results of largely Level of Service C for pedestrians and between A and B for cyclists.

The Investment objective related to active modes was to improve the Level of Service for people walking and cycling along the corridor which has been proven in the assessment.

Appendix A – AIMSUN Model Report

Thorndon Quay Hutt Rd AIMSUN Modelling

1. Context

This brief note summarises the modelling work undertaken in AIMSUN to support the Thorndon Quay Hutt Rd Single Stage Business Case. The options have all been modelled using the Ngauranga to Airport (N2AM) Model.

It should be noted that the purpose of the AIMSUN modelling was to feed into more detailed SIDRA modelling.

Both models use different input assumptions, and outputs from both models should not be compared against each other.

2. Methodology and scope

The modelling work has focussed on a 2026 model year in the AM peak, with the following model scenarios undertaken:

- Do Minimum – essentially the current network in 2026
- Do Minimum + Pedestrian Crossings – the future baseline, a Do Minimum plus 5 signalised crossings and a range of safety improvements proposed for the corridor
- Option – the TQHR preferred option, with one lane along Hutt Rd allocated as an SPV lane for buses / trucks and one lane on Thorndon Quay for buses only

The AIMSUN meso-scopic model has been used for this analysis. Whilst consideration was given to using a micro-simulation model of the corridor, it was decided that a meso-scopic DUE model was more appropriate for the following reason:

- the primary purpose of the modelling was to inform economics and assessment, not detailed operational design
- the meso model will account for wider route choice as a result of the options and identify traffic diversion and changes in travel times on alternative corridors as a result of the option

The following should also be noted:

- peak spreading functionality is turned on in the model, whereby one of the response to changes in travel times (costs) is for people to change their time of travel, travelling later / earlier in order to avoid congestion
- the Hutt Rd project is at the periphery of the modelled area, which from previous analysis create challenges in terms of route choice sensitivity between SH1 / SH2 and Hutt Rd as on partial travel costs are represents (i.e. a trip from Kapiti to the CBD taking 50+ minutes would be 'modelled' as from the edge of the model extent in Johnsonville to the CBD); therefore the costs that the model uses to inform route choice are not the true costs that the user would experience
- merges are complex and most models struggle to accurately replicate observed behaviour

3. AIMSUN model baseline performance

Figure 1 summarises AM peak 2016 observed traffic volumes vs 2026 future demand at key locations in the AM peak, southbound, between 7am and 9am.

Figure 1 Comparison of 2016 observed and 2026 modelled traffic volumes

Intersection	Movements	2016 Observed			2026 Modelled			% Diff
		Car	Truck	Total	Car	Truck	Total	
Jarden Mile / Hutt Road	Centennial Highway to Hutt Rd S	1,463	64	1,527	1,795	146	1,941	27%
	SH2 off-ramp to Hutt Rd	692	55	747	778	81	859	15%
Onslow Road / Hutt Road	Hutt Rd N to Hutt Rd S	2,133	120	2,253	2,494	213	2,707	20%
	Hutt Rd N to Onslow Rd	93	10	103	98	19	117	14%
Kaiwharawhara Road / Hutt Road	Hutt Rd N to Aotea Quay	2,718	100	2,818	3,035	185	3,220	14%
	Hutt Rd N to Kaiwharawhara	222	19	241	172	34	206	-15%
	SH1 SB (N to AQ)	9,639	718	10,357	9,095	558	9,653	-7%

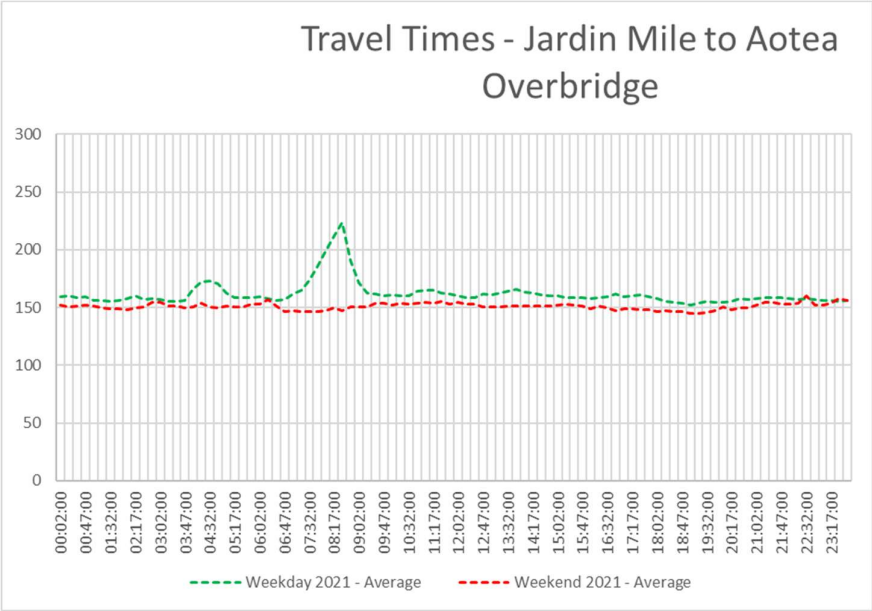
It shows that forecast traffic volumes in 2026 are around 15% to 20% higher than 2016 observed volumes on Hutt Rd but around 5% lower on SH1 in the AM peak between 7am and 9am.

Background growth in traffic volumes on this corridor has been around 5% (during peak periods) during the period 2016 to 2021. If this trend were to continue, and also taking into account the upstream constraints on the corridor, it suggests that the AIMSUN model might be slightly over-representing the attractiveness of Hutt Rd and slightly under-representing the attractiveness of SH1.

The figure below shows weekday (green) and weekend (red) average Hutt Rd travel times between Jardin Mile (south of intersection) and Aotea over-bridge for March 2021.

Accepting that Covid-19 will have had an impact on traffic volumes and travel times (Wellington was at alert level 1 in March), it shows that peak period highway travel times appear to be 60s to 90s slower than during the off-peak.

Figure 2 Highway travel times, jardin Mile to Aotea Overbridge (via Hutt Rd)



4. Model outputs

The sections below present the following key model outputs:

- observed data
- changes in PT travel times and highway travel times along Hutt Rd
- change in traffic volumes by user class
- changes in highway travel times, traffic volumes and flow profile along Hutt Rd
- diversion between Hutt Rd and SH1

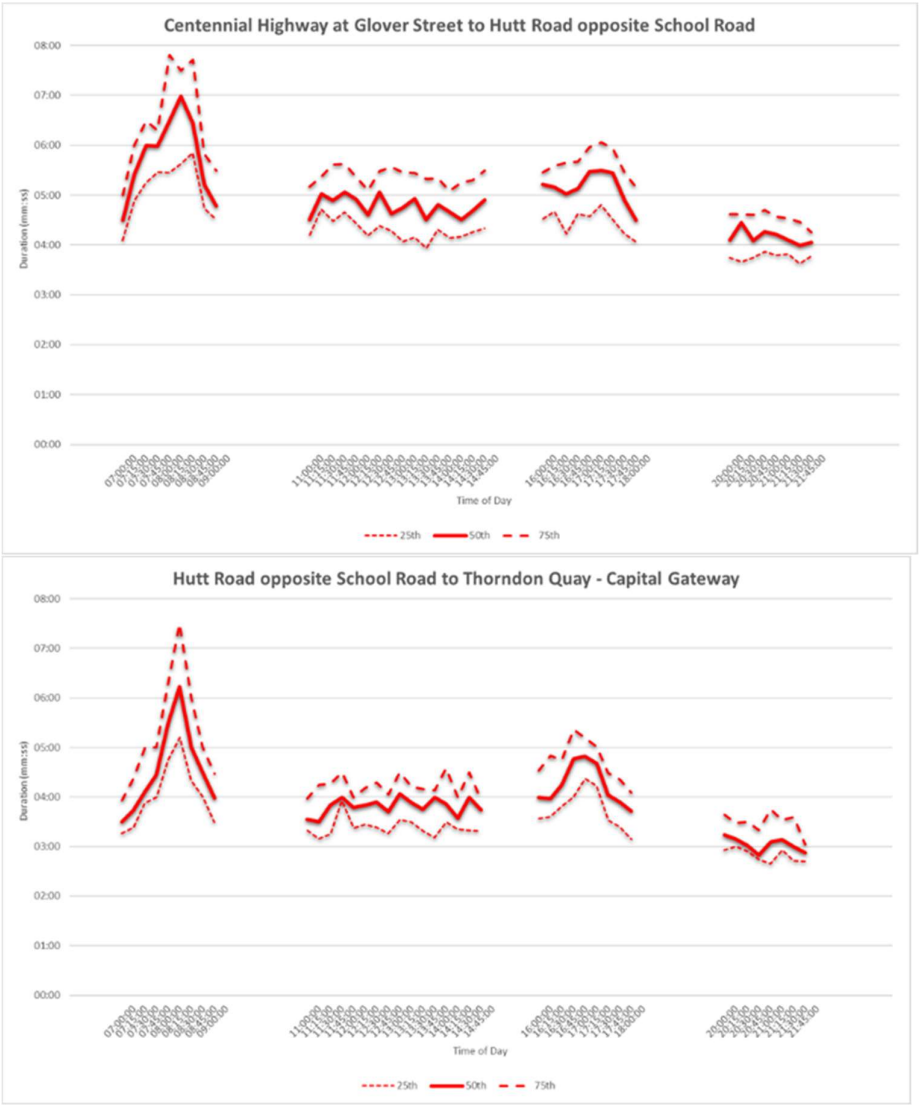
Observed PT travel time data

Analysis of PT travel times during the AM peak (7am to 9am) inbound and PM peak (4pm to 6pm) outbound has been undertaken.

It shows the following in relation to corridor travel times:

- AM peak inbound – between **2min and 6 min** increases in bus travel time compared to off-peak (median)
- PM peak outbound – between **~1min and 2 min** increase in bus travel time compared to off-peak (median)

Figure 3 Observed bus travel times along Hutt Rd, March 2020



Note that the data is unable to differentiate between stop dwell time and drive time; it is likely that some of the difference between off-peak and peak is due to lower boardings and alighting along the corridor in peak periods compared to the off-peak and shorter SCATS phase times in the off-peak

Median travel times for the route from Jarden Mile to Capital gateway are shown below. These travel times are sourced from Metlink March 2021 travel times (note these are for the period March 8th onwards when Wellington was at Alert Level 1)

Table 1 Observed PT travel times by section and time period, inbound

	Inbound - TQ	Inbound- HR	Total
AM (7am to 9am)	00:04:38	00:05:53	00:10:31
IP (11am to 3pm)	00:03:49	00:04:47	00:08:36
PM (4pm to 6pm)	00:04:14	00:05:09	00:09:24
Off-peak (8pm to 10pm)	00:03:03	00:04:10	00:07:12

The analysis above shows a **3 min to 3min 30s** difference between the AM peak and off-peak travel times that could be indicative of the travel time benefits that a peak period bus lane could deliver.

Looking at Hutt Rd specifically, the analysis shows that median **bus travel times are 90s slower on Hutt Rd in the AM peak compared to the off-peak**. Given that bus travel times are a function of general traffic travel times as there are no bus priority measures currently in place on the corridor, the data supports the highway travel times (Figure 2) that suggests a 90s differential between AM peak and off-peak travel times between Jardin Mile and Aotea overbridge.

Summary of modelled travel times

The table below shows car and bus travel times for the Do Min + peds and Option in the 7.30am to 8.30am period.

Analysis of bus travel times using distance vs time graphs showed a significant delay at the new Thorndon Quay / Mulgrave St signalised intersection (it is presently a priority intersection)

The bus (adjusted) travel times show what bus travel times could be if there was signal pre-emption at Mulgrave St (buses currently incur 40s of delay here) and at Kaiwharawhara / Hutt Rd (buses currently incur 30s delay here); it is accepted that should pre-emption be assumed, there could be corresponding adverse impacts for general traffic

Overall, the modelling show the following:

- a 15sec improvement in bus travel times under the Option
- up to a minute and a half in bus travel time savings in the option if signal pre-emption at Mulgrave St (40s max delay, 20s average) and Hutt Rd / Kaiwharawhara Rd (40s max delay, 20s average) were assumed
- a 3 min 30s increase in car travel times on the corridor under the option in the AM peak

Table 2 Comparison of car and PT travel times for Do Min + Peds and Option

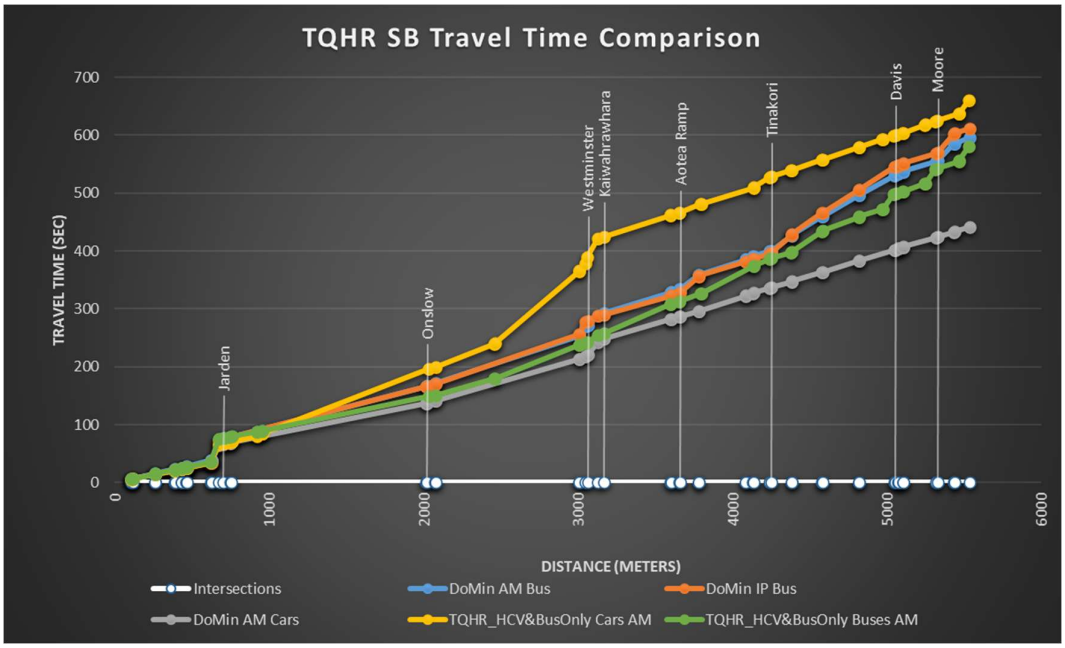
Period/Direction	Mode	Do Min inc peds	Option	Diff	% Diff
AM peak (IB)	Car	442	661	219	50%
	Bus	596	581	-15	3%
	Bus – adjusted (low)	596	536	-60	16%
	Bus – adjusted (low)	596	506	-90	25%

Increases in car travel time between the Do Min and Option generally occurs between Onslow Rd and Kaiwharawhara as shown in the southbound travel time graph below.

This shows that delays for cars as a result of the option exceed 2 minutes for each time slice from 7.45 to 9.00, with a maximum of 3m 30s (8am) and 4 min 30s (8.45am). These delays mainly occur on the section approaching Hutt Rd / Kaiwharawhara intersection (see below, yellow line on the chart) – this is plausible as Hutt Rd goes from 2 lanes to 1 lane in the Option.

There is no noticeable change in car travel time on Thorndon Quay.

Figure 4 Thorndon Quay Hutt Rd Southbound AM Peak car travels times, 2026



Delays along Hutt Rd might be expected to be 'capped' as it is a constrained corridor at both ends (Ngauranga Gorge / Jardin Mile is the AM peak constraint, exiting the CBD is the constraint in the PM peak)

The model show a relatively plausible outcome (reported in subsequent sections of the note) whereby when delays get to a certain level, people would re-assign to SH1 and other alternative routes and / or travel earlier or later in order to travel when less congested.

Traffic volumes

The tables below show changes in traffic volumes between the Do Min, Do Min + Peds and Option between 7.30am to 8.30am for the following sections and screenlines

- North of Ngauranga
- South of Ngauranga
- South of Aotea Interchange
- CBD screenline

The model outputs show the following:

	Section	Direction	Flow			Flow Difference	
			Do Min	Do Min + Peds	Option	Do Min + Peds	Option
North Ngauranga	SH1	NB	2,040	2,080	2,020	40	-20
		SB	4,780	4,600	4,140	-180	-640
	SH2	NB	3,180	3,200	3,080	20	-100
		SB	3,340	3,700	3,360	360	20
	Burma Road	NB	480	480	480	0	0
		SB	980	1,000	1,000	20	20
	Total	**NB**	**5,700**	**5,760**	**5,580**	**60**	**-120**
		SB	**9,100**	**9,300**	**8,500**	**200**	**-600**

North Ngauranga

- A shift in demand between SH2 (increase) and SH1 (decrease) between Do Min and Do Min + Peds:
  - this is a function of the sensitivity of the model around the periphery of the model, with demand shifting between 15 minute time slices from one scenario to the next
  - when analysed over a broader 2hr or 4hr time period, this differences are less
- A reduction in traffic volumes on SH1 between 7.30am and 8.30am of 640, a result of the sensitivity of the model in this area coupled with peak spreading whereby people travel earlier / later to avoid the additional congestion on Hutt Rd in the peak of the peak

	Section	Direction	Flow			Flow Difference	
			Do Min	Do Min + Peds	Option	Do Min + Peds	Option
South Ngauranga	SH1	NB	3,280	3,300	3,240	20	-40
		SB	4,960	4,980	5,060	20	100
	Hutt Road	NB	400	360	400	-40	0
		SB	1,840	1,760	960	-80	-880
	Total	**NB**	**3,680**	**3,660**	**3,640**	**-20**	**-40**
		SB	**6,800**	**6,740**	**6,020**	**-60**	**-780**

South Ngauranga

- Minimal change between Do Min and Do Min + peds
- A decrease of 800 vehicles on Hutt Rd as a result of the capacity reduction on Hutt Rd in the Option
- A smaller corresponding increase of 100 on SH1, reflective of the fact that SH1 is at capacity and displaced traffic from Hutt Rd travels earlier / later in order to avoid congestion

	Section	Direction	Flow			Flow Difference	
			Do Min	Do Min + Peds	Option	Do Min + Peds	Option
South Aotea Interchange	Aotea Quay	NB	660	740	780	80	120
		SB	2,400	2,260	2,160	-140	-240
	SH1	NB	2,800	2,720	2,740	-80	-60
		SB	3,720	3,980	3,820	260	100
	Thorndon Quay	NB	480	480	400	0	-80
		SB	1,500	1,340	740	-160	-760
	Grant Road	NB	160	180	180	20	20
		SB	680	680	700	0	20
	Total	**NB**	**4,100**	**4,120**	**4,100**	**20**	**0**
		SB	**8,300**	**8,260**	**7,420**	**-40**	**-880**

South Aotea Interchange

- A decrease on Thorndon Quay as a result of upstream decreases on Hutt Rd
- A small decrease on Waterloo Quay and small increase on Mulgrave St

	Section	Direction	Flow			Flow Difference	
			Do Min	Do Min + Peds	Option	Do Min + Peds	Option
Mid CBD	Waterloo Quay	NB	1,000	1,020	1,040	20	40
		SB	2,080	1,940	1,840	-140	-240
	Thorndon Quay	NB	400	400	320	0	-80
		SB	800	700	360	-100	-440
	Mulgrave Street	SB	1,040	1,260	1,280	220	240
	Molesworth Street	NB	600	580	540	-20	-60
	SH1 SB On Ramp	SB	700	700	580	0	-120
	SH1 NB On Ramp	NB	420	460	420	40	0
	SH1	NB	2,060	1,960	1,980	-100	-80
		SB	2,600	2,680	2,420	80	-180
	Tinakori	NB	460	480	540	20	80
		SB	600	600	540	0	-60
	Total	**NB**	**4,940**	**4,900**	**4,840**	**-40**	**-100**
		SB	**7,820**	**7,880**	**7,020**	**60**	**-800**

Mid CBD

- A reduction in traffic on Thorndon Quay, driven by decrease on Hutt Rd
- A small increase on Mulgrave as a result of increased traffic on SH1

Hutt Rd

The table below summarises cars and trucks on Hutt Rd and SH1 during the AM peak between 7am and 9am.

Table 3 Changes in traffic volumes on Hutt Rd – 2026 AM southbound, DO Min + peds and option

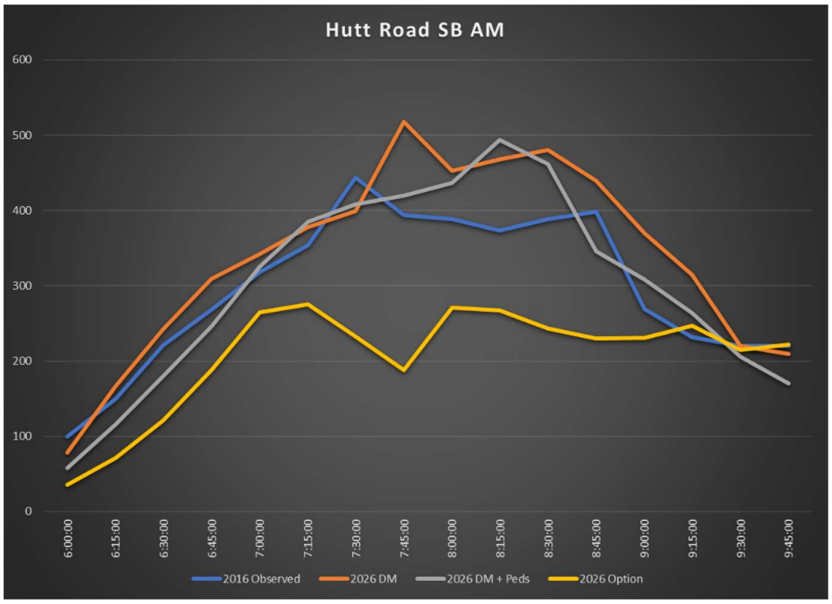
Period/Direction	Mode	Do Min inc peds	Option	Diff	% Diff
SH1	Car	8,900	9,550	650	7%
	Truck	550	550	0	
	Total	9,450	10,100	650	7%
Hutt Rd	Car	3,200	1,750	-1,450	-45%
	Truck	200	200	0	
	Total	3,400	1,950	-1,450	-40%

It shows the following:

- A 50% reduction in cars on Hutt Rd between the Do Min + Peds and Option due to the reduction in traffic capacity for general traffic from 2 lanes to 1 lane
- Around 200 trucks on Hutt Rd in the AM peak between 7am and 9am

The figure below summaries traffic volumes for the 2026 Do Min + peds and 2026 Option by 15 minute time slice between 6am and 10am (with the 2016 observed for Reference).

Figure 5 Hutt Rd southbound traffic volumes, AM peak 2026



It shows that whilst between 6am and 7am the option traffic volumes are only marginally lower than those in the Do Min + peds, Hutt Rd reaches capacity for general traffic around

7am in the option, with between 200 and 300 fewer vehicles during the 'peak of the peak' (7.30am to 8.30am) compared to the DO Min + peds.

In terms of trucks, 200 trucks per hour in the option on Hutt Rd equates to just below 2 trucks a minute. It should be noted that the model potentially over-estimates the number of trucks on Hutt Rd by around 50% (based on the 2016 observed data), meaning that 200 trucks is probably at the upper end of what we might expect to observe in reality. By comparison, around 80 buses use the corridor in the AM peak.

The relatively low number of trucks provides assurance that trucks will not negatively impact upon bus operations.

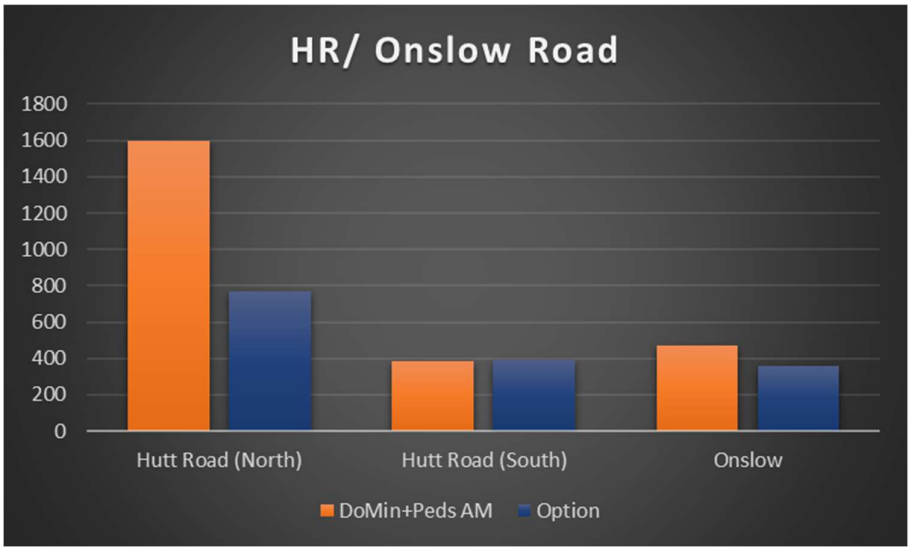
DM + Ped vs Option

The figures below show changes in traffic volumes between the Do Min, Do Min + Peds and Option between 7.30am to 8.30am for key intersections on Hutt Rd.

It shows for Onslow Road:

- A halving of traffic coming from the north from 1600 to 800 vehicles in the peak hour, the result of general traffic capacity being effectively reduced from 2 to 1 lane
- A small decrease (100) in vehicles heading onto Hutt Rd southbound from Onslow Rd, a result of increased travel times on Hutt Rd resulting in some rerouting via Kaiwharawhara and Grant Road

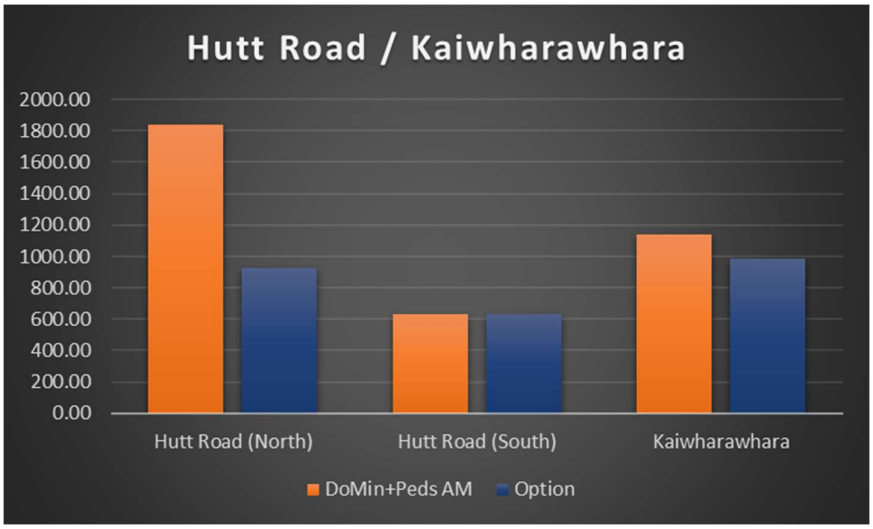
Figure 6 Hutt Rd / onslow Road traffic volumes, AM peak 2026



It shows for Hutt Rd / Kaiwharawhara:

- A halving of traffic coming from the north from 1600 to 800 vehicles in the peak hour, the result of general traffic capacity being effectively reduced from 2 to 1 lane
- A small decrease (100) in vehicles heading onto Hutt Rd southbound from Onslow Rd, a result of increased travel times on Hutt Rd resulting in some rerouting via Kaiwharawhara and Grant Road

Figure 7 Hutt Rd / Kaiwharawhara Road traffic volumes, AM peak 2026

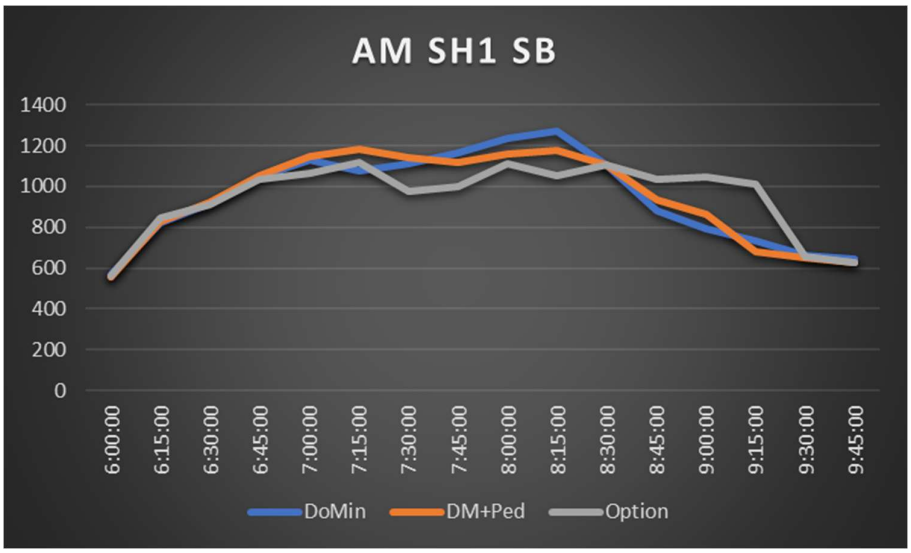


SH1 – Flow profiles and Travel Times

The tables below show changes in traffic volumes between the Do Min, Do Min + Peds and Option between 7.30am to 8.30am for the following sections and screenlines.

It shows that for SH1 southbound, traffic volumes fluctuate across all options by 15 min time slice between 7am and 8.30am, with around 200 vehicles more per 15 minute between 8.45am and 9.15am, the result of peak spreading caused by traffic displaced from SH1.

Figure 8 AM Peak SH1 Southbound traffic volumes, 2026



SH2 shows a similar profile across all time periods.

Figure 9 AM Peak SH2 Southbound traffic volumes, 2026

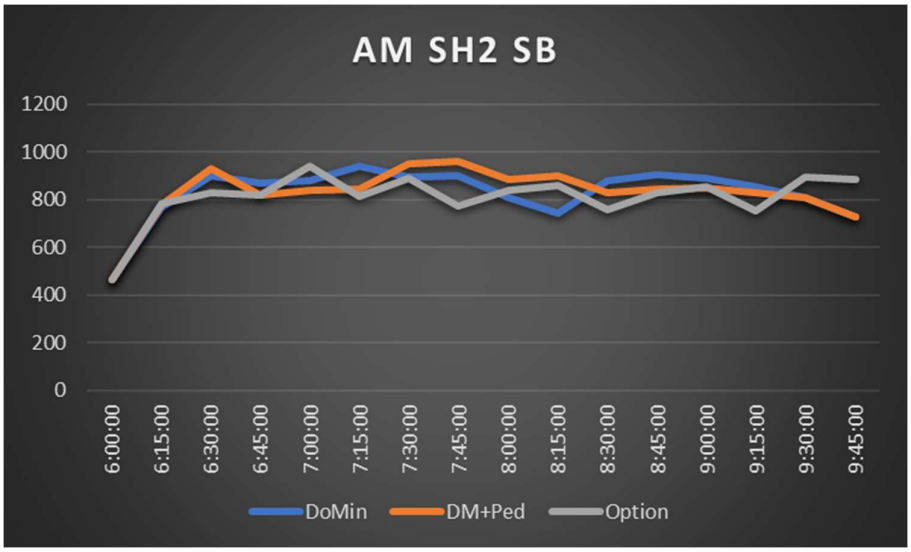
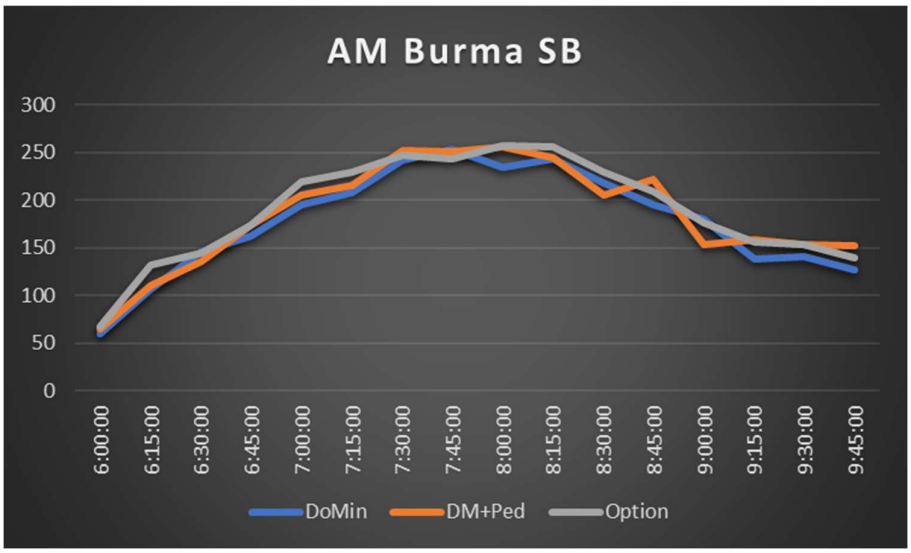


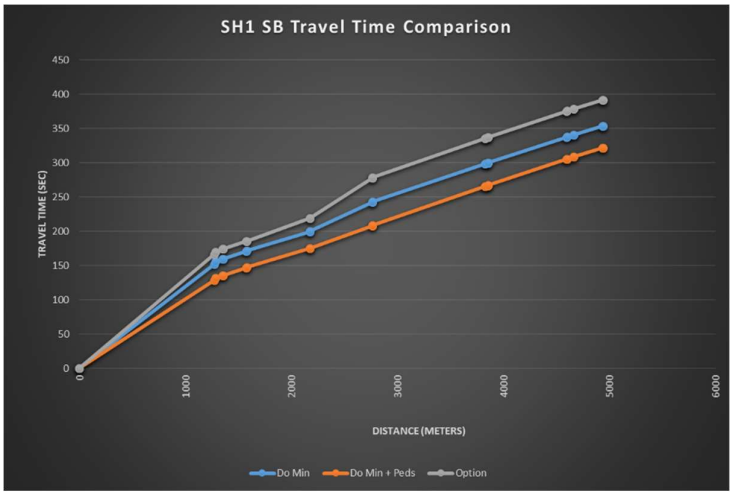
Figure 10 AM Burma Rd Southbound traffic volumes, 2026



There is no significant change in traffic volumes on Burma Rd between the three scenarios, showing that no wider re-routing (i.e. Burma Rd instead of Sh1) is occurring as a result of the option.

The figure below summarises travel times on SH1 between north of the Ngauranga merge and Aotea off-ramp for the AM peak, 2026, southbound

Figure 11 SH1 Travel time comparison, AM peak 2026



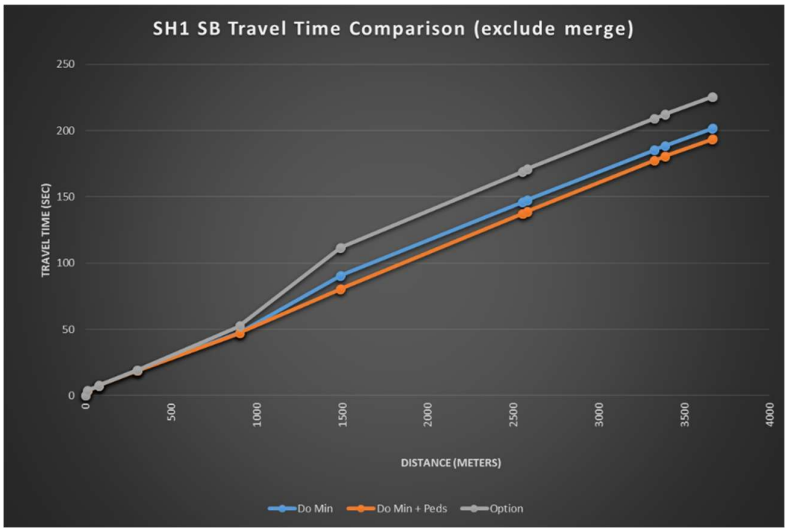
The data shows the following:

- Around a 6-minute travel time in the Do Min, decreasing to 5 min 30s in the Do Min + peds and increasing back to 6 min 30s in the Option
- The greatest divergence in travel times between options occurs in the first 1km of the route

Further analysis in AIMSUN has shown that the merge is the main driver of the change in travel times between options. The AIMSUN model is highly sensitive in this area to small changes in traffic volumes, and this results in changes in travel times along the short section that in reality would not be expected.

If travel times are calculated excluding the merge, as shown below, there is no difference in travel times between the Do Min and Do Min + peds and a 30s increase in travel time between the Do Min + Peds and the Option.

Figure 12 SH1 Travel time comparison, AM peak 2026 (exc merge)



When considered in the context of a journey from Porirua or Kapiti to the CBD, a 30s increase in travel time can be considered negligible.

5. Summary

This section summarises the key metrics, outputs and limitations from the analysis presented in this note.

- Corridor summary
    - 3,000 people travel down the corridor by bus in the AM peak between 7am and 9am
    - 9,600 vehicle (12,500 people) travel down Sh1 the corridor by car
    - 2,000 (2,500 people) travel down Hutt Rd by car
- Trucks
    - Comprise ~5% of traffic on Hutt Rd between 7am and 9am (100 over 2hr)
    - Comprise up to 10% of traffic on SH1 (700 over 2hr)
- Hutt Rd & Thorndon Quay current travel times (noting impact of Covid 19)
    - Bus travel times in the AM peak are between 2 min and 6 min (median 3m 30s) slower than in the off-peak
    - Highway travel times on Hutt Rd are around 90s slower in the AM peak compared to the off-peak
- Hutt Rd & Thorndon Quay forecast PT and car travel times
    - Modelling suggests option will result in a 3 to 4 min for car travel times along the corridor, mainly driven by increases between Onslow Rd and hutt Rd
    - Bus travel times are forecast to improve by between 60s and 90s
- Traffic volumes
    - Hutt Rd traffic volumes forecast to decrease from 1800 to 900 under the option between 7.30am and 8.30am
    - SH1 Traffic volumes are not forecast to change between 7.30am to 8.30am as SH1 is at capacity, however the peak period lengthens with displaced traffic from Hutt Rd travelling earlier / later to avoid congestion
- Sh1 Travel times
    - The option is forecast to increase travel times on SH1 by 30s
    - In the context of most trips using SH1 in the Am peak being longer distance commuter trips, this is considered to be a negligible difference that would not be perceived by most users
- Diversion and change in behaviour
    - The model is generally showing an intuitive change in behaviour
    - On Sh1, peak spreading and displacement from TQHR results in peak extending past 8.30am
    - Burma Rd shows increase and no wider re-routing as a result of the option
    - Onslow Road shows a reduction in traffic volumes under the option, with a corresponding increase on Kaiwharawhara and Churchill / Grant Rd and some peak spreading

6. Limitations

The key limitation is that whilst AIMSUN traffic volumes in 2026 are intuitive compared to 2016 observed, the model is not replicating the slow-moving queue on Hutt Rd that is apparent in the AM peak.

This could be a function of under-assignment on SH1 and not enough demand entering the corridor (either held back upstream or because counts measure actual volumes not demand) or a function of the model not representing the weaving and complex interaction between traffic changing lanes on Hutt Rd that might occur, leading to flow breakdown

Consequently, the model is not capturing the decongestion benefits that bus lanes might be expected to deliver along Hutt Rd and that the observed bus travel times suggest could be realised if travel times comparable to those in the off-peak could be delivered.

Two further minor limitations that won't fundamentally affect conclusions that can be drawn from this work

- there is a slight under-assignment on SH1 (compared to observed traffic volumes)
- the model slightly over-represents trucks on Hutt Rd and under-estimates on SH1

It is suggested that these limitations be accounted for when using model outputs for SIDRA analysis and be addressed during subsequent stages of modelling

Appendix B – Spreadsheet outputs

Do Min - AM Peak

Scenario	Approach Name	Approach Direction	Lane #	Demand Volumes	Deg. Satn	Average Delay (sec)	Lane Length (m)	Posted speed km/hr (across leg)	Time (sec)	Level of Service
1AMJardenMile	Hutt Rd	South	Lane 1	147	12%	8.81	1300.0	80.0	67.3	LOS A
1AMJardenMile	Hutt Rd	South	Lane 2	93	12%	19.52	1300.0	80.0	78.0	LOS B
1AMJardenMile	Hutt Rd	South	Lane 3	251	54%	46.92	220.0	80.0	56.8	LOS D
1AMJardenMile	SH2 Off Ramp	East	Lane 1	433	87%	63.53	220.0	100.0	71.4	LOS E
1AMJardenMile	SH2 Off Ramp	East	Lane 2	316	81%	58.25	370.0	100.0	71.6	LOS E
1AMJardenMile	SH2 Off Ramp	East	Lane 3	313	81%	58.45	235.0	100.0	66.9	LOS E
1AMJardenMile	Centennial Hwy	North	Lane 1	1122	72%	10.67	80.0	100.0	13.6	LOS B
1AMJardenMile	Centennial Hwy	North	Lane 2	515	102%	105.77	500.0	100.0	123.8	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 3	487	102%	106.71	500.0	100.0	124.7	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 4	35	28%	65.22	25.0	100.0	66.1	LOS E
1AMJardenMile	Jarden Mile	West	Lane 1	4	4%	61.96	350.0	50.0	87.2	LOS E
1AMJardenMile	Jarden Mile	West	Lane 2	40	44%	65.27	20.0	50.0	66.7	LOS E
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 1	712	38%	0.23	1300.0	80.0	58.7	LOS A
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 2	701	38%	0.23	1300.0	80.0	58.7	LOS A
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 3	53	33%	62.92	95.0	80.0	67.2	LOS E
2AMOnslowRd	Onslow Rd	North	Lane 1	605	115%	209.57	500.0	50.0	245.6	LOS F
2AMOnslowRd	Hutt Road South	SouthWest	Lane 1	79	6%	9.76	60.0	80.0	12.5	LOS A
2AMOnslowRd	Hutt Road South	SouthWest	Lane 2	156	20%	22.57	370.0	80.0	39.2	LOS C
2AMOnslowRd	Hutt Road South	SouthWest	Lane 3	156	20%	22.57	370.0	80.0	39.2	LOS C
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 1	921	47%	4.32	370.0	60.0	26.5	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 2	906	47%	4.32	370.0	60.0	26.5	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 3	25	2%	6.97	30.0	60.0	8.8	LOS A
3AMRangioraAvenue	Rangiora Avenue	North	Lane 1	50	28%	24.07	300.0	50.0	45.7	LOS C
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 1	275	14%	0.53	620.0	60.0	37.7	LOS A
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 2	270	14%	0.05	620.0	60.0	37.2	LOS A
4AMWestminsterSt	Westminster Street	SouthEast	Lane 1	50	20%	12.93	100.0	60.0	18.9	LOS B
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 1	933	48%	0.39	620.0	60.0	37.6	LOS A
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 2	919	48%	0.24	620.0	60.0	37.4	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 1	262	14%	3.33	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 2	258	14%	3.33	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 3	25	6%	10.06	20.0	60.0	11.3	LOS B
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 1	896	96%	57.49	70.0	60.0	61.7	LOS E
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 2	802	96%	57.91	70.0	60.0	62.1	LOS E
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 3	100	68%	53.58	46.0	60.0	56.3	LOS D
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 1	555	123%	266.29	2000.0	50.0	410.3	LOS F
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 2	593	123%	265.68	2000.0	50.0	409.7	LOS F
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 1	264	18%	4.97	43.0	60.0	7.6	LOS A
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 2	217	37%	26.20	45.0	60.0	28.9	LOS C
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 3	213	37%	26.21	45.0	60.0	28.9	LOS C
6AMSchoolRd	Hutt Rd	NorthEast	Lane 1	1364	65%	2.48	45.0	60.0	5.2	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 2	1342	65%	2.48	45.0	60.0	5.2	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 3	25	3%	5.28	12.0	60.0	6.0	LOS A
6AMSchoolRd	School Rd	NorthWest	Lane 1	50	33%	23.84	150.0	50.0	34.6	LOS C
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 1	355	26%	4.40	430.0	60.0	30.2	LOS A
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 2	348	26%	4.31	430.0	60.0	30.1	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 1	1352	67%	5.64	430.0	60.0	31.4	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 2	1393	67%	1.95	430.0	60.0	27.7	LOS A
7AMAoteaQuay	Aotea Quay	West	Lane 1	220	12%	5.66	500.0	70.0	31.4	LOS A
7AMAoteaQuay	Hutt Road	SouthWest	Lane 1	483	26%	0.08	430.0	45.0	34.5	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 1	247	12%	2.73	430.0	45.0	37.1	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 2	1272	61%	2.98	430.0	45.0	37.4	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 3	25	4%	7.16	21.0	45.0	8.8	LOS A
8AMSarSt	Sar Street	NorthWest	Lane 1	50	53%	61.82	85.0	40.0	69.5	LOS F
8AMSarSt	Hutt Rd West	SouthWest	Lane 1	25	1%	4.01	18.0	45.0	5.5	LOS A
8AMSarSt	Hutt Rd West	SouthWest	Lane 2	428	23%	2.68	100.0	45.0	10.7	LOS A
9AMTinakoriRd	Thorndon Quay	South	Lane 1	167	10%	0.25	770.0	45.0	61.8	LOS A
9AMTinakoriRd	Hutt Road	North	Lane 1	753	46%	3.21	100.0	45.0	11.2	LOS A
9AMTinakoriRd	Hutt Road	North	Lane 2	739	77%	9.99	45.0	45.0	13.6	LOS A
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 1	316	23%	4.31	10.0	45.0	5.1	LOS A
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 2	15	3%	10.76	500.0	45.0	50.8	LOS B
10AMDavisStreet	Thorndon Quay	South	Lane 1	261	16%	3.85	235.0	45.0	22.7	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 1	743	38%	3.08	770.0	45.0	64.7	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 2	31	3%	5.62	15.0	45.0	6.8	LOS A
10AMDavisStreet	Davis Street	SouthWest	Lane 1	89	17%	7.87	500.0	30.0	67.9	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 1	745	38%	2.74	235.0	45.0	21.5	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 2	57	7%	6.79	15.0	45.0	8.0	LOS A
11AMMooreStreet	Moore Street	NorthWest	Lane 1	119	20%	6.77	50.0	30.0	12.8	LOS A
11AMMooreStreet	Thorndon Quay	SouthWest	Lane 1	391	22%	2.10	200.0	45.0	18.1	LOS A
12aAMThorndon/Bus Terminal	Bus Terminal	South	Lane 1	110	9%	3.02	20.0	60.0	4.2	LOS A
12aAMThorndon/Bus Terminal	Thorndon South	SouthEast	Lane 1	278	15%	0.00	33.0	60.0	2.0	LOS A
12aAMThorndon/Bus Terminal	Thorndon North	NorthWest	Lane 1	388	19%	4.20	210.0	60.0	16.8	LOS A
12aAMThorndon/Bus Terminal	Thorndon North	NorthWest	Lane 2	391	19%	4.18	210.0	60.0	16.8	LOS A
12aAMThorndon/Bus Terminal	Thorndon North	NorthWest	Lane 3	11	2%	8.27	210.0	60.0	20.9	LOS A
12bAMMulgrave/Thorndon	Thorndon Quay	SouthEast	Lane 1	278	39%	10.25	500.0	45.0	50.2	LOS B
12bAMMulgrave/Thorndon	Throndon Quay	NorthWest	Lane 1	388	82%	20.07	33.0	45.0	22.7	LOS C
12bAMMulgrave/Thorndon	Throndon Quay	NorthWest	Lane 2	391	82%	20.29	33.0	45.0	22.9	LOS C
12bAMMulgrave/Thorndon	Mulgrave Street	SouthWest	Lane 1	480	82%	13.46	13.0	45.0	14.5	LOS B
12bAMMulgrave/Thorndon	Mulgrave Street	SouthWest	Lane 2	480	82%	13.21	13.0	45.0	14.3	LOS B
12cAMMulgrave/Bus Terminal	Mulgrave North	NorthWest	Lane 1	557	97%	52.23	500.0	45.0	92.2	LOS D
12cAMMulgrave/Bus Terminal	Mulgrave North	NorthWest	Lane 2	503	97%	51.84	500.0	45.0	91.8	LOS D
12cAMMulgrave/Bus Terminal	Mulgrave North	NorthWest	Lane 3	9	2%	9.60	20.0	45.0	11.2	LOS A
12cAMMulgrave/Bus Terminal	Lambton Quay South	SouthWest	Lane 1	19	11%	17.46	500.0	45.0	57.5	LOS B
12cAMMulgrave/Bus Terminal	Lambton Quay North	NorthEast	Lane 1	11		17.20	20.0	45.0	18.8	LOS B

Bus Travel Time

	Distance		Seconds	Minutes
	5100.0	Bus	519.1	8.7
	5113.0	Vehicle	516.7	8.6
	3335.0	HCV	344.9	5.7

Do Min - PM Peak

Scenario	Approach Name	Approach Direction	Lane #	Demand Volumes	Deg. Satn	Average Delay (sec)	Lane Length (m)	Posted speed km/hr	Time (sec)	Level of Service
1PMJardenMile	Hutt Rd	South	Lane 1	405	89%	54.67	1300.0	80.0	51.3	LOS D
1PMJardenMile	Hutt Rd	South	Lane 2	365	89%	56.09	1300.0	80.0	114.6	LOS E
1PMJardenMile	Hutt Rd	South	Lane 3	230	26%	11.56	220.0	80.0	21.5	LOS B
1PMJardenMile	SH2 Off Ramp	East	Lane 1	198	22%	21.89	220.0	100.0	29.8	LOS C
1PMJardenMile	SH2 Off Ramp	East	Lane 2	626	90%	52.97	370.0	100.0	66.3	LOS D
1PMJardenMile	SH2 Off Ramp	East	Lane 3	623	90%	53.05	235.0	100.0	61.5	LOS D
1PMJardenMile	Centennial Hwy	North	Lane 1	772	50%	10.61	80.0	100.0	13.5	LOS B
1PMJardenMile	Centennial Hwy	North	Lane 2	159	59%	46.23	500.0	100.0	64.2	LOS D
1PMJardenMile	Centennial Hwy	North	Lane 3	159	59%	46.22	500.0	100.0	64.2	LOS D
1PMJardenMile	Centennial Hwy	North	Lane 4	1	1%	56.95	25.0	100.0	57.8	LOS E
1PMJardenMile	Jarden Mile	West	Lane 1	56	33%	52.77	350.0	50.0	78.0	LOS D
1PMJardenMile	Jarden Mile	West	Lane 2	131	87%	62.48	20.0	50.0	63.9	LOS E
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 1	245	13%	0.06	1300.0	80.0	58.6	LOS A
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 2	245	13%	0.06	1300.0	80.0	58.6	LOS A
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 3	138	55%	42.02	95.0	80.0	46.3	LOS D
2PMOnslowRd	Onslow Rd	North	Lane 1	179	56%	42.86	500.0	50.0	78.9	LOS D
2PMOnslowRd	Hutt Road South	SouthWest	Lane 1	338	26%	11.88	60.0	80.0	14.6	LOS B
2PMOnslowRd	Hutt Road South	SouthWest	Lane 2	495	58%	21.31	370.0	80.0	38.0	LOS C
2PMOnslowRd	Hutt Road South	SouthWest	Lane 3	453	58%	20.47	370.0	80.0	37.1	LOS C
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 1	295	16%	4.28	370.0	60.0	26.5	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 2	291	16%	4.28	370.0	60.0	26.5	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 3	25	4%	9.25	30.0	60.0	11.0	LOS A
3PMRangioraAvenue	Rangiora Avenue	North	Lane 1	50	18%	16.35	300.0	50.0	38.0	LOS C
3PMRangioraAvenue	Hutt Road	SouthWest	Lane 1	696	37%	0.34	620.0	60.0	37.5	LOS A
3PMRangioraAvenue	Hutt Road	SouthWest	Lane 2	685	37%	0.15	620.0	60.0	37.4	LOS A
4PMWestminsterSt	Westminster Street	SouthEast	Lane 1	50	15%	10.50	100.0	60.0	16.5	LOS B
4PMWestminsterSt	Hutt Road (north)	NorthEast	Lane 1	569	30%	0.35	620.0	60.0	37.6	LOS A
4PMWestminsterSt	Hutt Road (north)	NorthEast	Lane 2	560	30%	0.11	620.0	60.0	37.3	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 1	683	36%	3.35	70.0	60.0	7.5	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 2	673	36%	3.35	70.0	60.0	7.6	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 3	25	3%	6.81	20.0	60.0	8.0	LOS A
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 1	314	29%	7.64	70.0	60.0	11.8	LOS A
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 2	310	29%	7.64	70.0	60.0	11.8	LOS A
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 3	189	110%	141.59	46.0	60.0	144.4	LOS F
5PMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 1	318	77%	35.52	45.0	50.0	38.8	LOS D
5PMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 2	330	77%	35.32	500.0	50.0	71.3	LOS D
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 1	827	56%	5.92	43.0	60.0	8.5	LOS A
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 2	513	96%	53.80	45.0	60.0	54.5	LOS D
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 3	734	96%	52.16	45.0	60.0	54.9	LOS D
6PMSchoolRd	Hutt Rd	NorthEast	Lane 1	561	30%	2.45	45.0	60.0	5.2	LOS A
6PMSchoolRd	Hutt Rd	NorthEast	Lane 2	552	30%	2.45	45.0	60.0	5.2	LOS A
6PMSchoolRd	Hutt Rd	NorthEast	Lane 3	25	14%	18.54	12.0	60.0	19.3	LOS C
6PMSchoolRd	School Rd	NorthWest	Lane 1	50	81%	82.03	150.0	50.0	92.8	LOS F
6PMSchoolRd	Hutt Rd West	SouthWest	Lane 1	1046	55%	4.38	430.0	60.0	30.2	LOS A
6PMSchoolRd	Hutt Rd West	SouthWest	Lane 2	1031	55%	4.35	430.0	60.0	30.2	LOS A
7PMAoteaQuay	Hutt Road East	NorthEast	Lane 1	619	34%	5.67	430.0	60.0	31.5	LOS A
7PMAoteaQuay	Hutt Road East	NorthEast	Lane 2	510	27%	1.72	430.0	60.0	27.5	LOS A
7PMAoteaQuay	Aotea Quay	West	Lane 1	1040	55%	5.72	500.0	70.0	31.4	LOS A
7PMAoteaQuay	Hutt Road	SouthWest	Lane 1	1037	55%	0.28	430.0	45.0	34.7	LOS A
8PMSarSt	Hutt Rd East	NorthEast	Lane 1	515	29%	2.78	430.0	45.0	37.2	LOS A
8PMSarSt	Hutt Rd East	NorthEast	Lane 2	25	10%	17.12	21.0	45.0	18.8	LOS C
8PMSarSt	Sar Street	NorthWest	Lane 1	50	30%	26.95	85.0	40.0	34.6	LOS D
8PMSarSt	Hutt Rd West	SouthWest	Lane 1	25	1%	4.01	18.0	45.0	5.5	LOS A
8PMSarSt	Hutt Rd West	SouthWest	Lane 2	963	52%	2.70	100.0	45.0	10.7	LOS A
9PMTinakoriRd	Thorndon Quay	South	Lane 1	601	33%	0.71	770.0	45.0	62.3	LOS A
9PMTinakoriRd	Hutt Road	North	Lane 1	199	11%	2.73	100.0	45.0	10.7	LOS A
9PMTinakoriRd	Hutt Road	North	Lane 2	286	65%	15.53	45.0	45.0	19.1	LOS C
9PMTinakoriRd	Tinakori Rd	SouthWest	Lane 1	455	51%	8.25	10.0	45.0	9.1	LOS A
9PMTinakoriRd	Tinakori Rd	SouthWest	Lane 2	21	4%	9.68	500.0	45.0	49.7	LOS A
10PMDavisStreet	Thorndon Quay	South	Lane 1	794	47%	4.07	235.0	45.0	22.9	LOS A
10PMDavisStreet	Thorndon Quay	NorthWest	Lane 1	244	14%	3.02	770.0	45.0	64.6	LOS A
10PMDavisStreet	Thorndon Quay	NorthWest	Lane 2	106	27%	12.63	15.0	45.0	13.8	LOS B
10PMDavisStreet	Davis Street	SouthWest	Lane 1	149	24%	7.02	500.0	30.0	67.0	LOS A
11PMMooreStreet	Thorndon Quay	NorthEast	Lane 1	311	17%	2.71	235.0	45.0	21.5	LOS A
11PMMooreStreet	Thorndon Quay	NorthEast	Lane 2	9	3%	13.98	15.0	45.0	15.2	LOS B
11PMMooreStreet	Moore Street	NorthWest	Lane 1	602	79%	12.67	50.0	30.0	18.7	LOS B
11PMMooreStreet	Thorndon Quay	SouthWest	Lane 1	567	31%	1.26	210.0	45.0	18.1	LOS A
12aPMThorndon/Bus Terminal	Bus Terminal	South	Lane 1	111	12%	4.23	20.0	60.0	5.4	LOS A
12aPMThorndon/Bus Terminal	Thorndon South	SouthEast	Lane 1	463	24%	0.01	33.0	60.0	2.0	LOS A
12aPMThorndon/Bus Terminal	Thorndon North	NorthWest	Lane 1	248	13%	4.17	120.0	60.0	11.4	LOS A
12aPMThorndon/Bus Terminal	Thorndon North	NorthWest	Lane 2	248	13%	4.17	210.0	60.0	16.8	LOS A
12aPMThorndon/Bus Terminal	Thorndon North	NorthWest	Lane 3	25	6%	11.03	210.0	60.0	23.6	LOS B
12bPMMulgrave/Thorndon	Thorndon Quay	SouthEast	Lane 1	463	52%	20.57	500.0	45.0	60.6	LOS C
12bPMMulgrave/Thorndon	Throndon Quay	NorthWest	Lane 1	253	32%	20.81	33.0	45.0	23.4	LOS C
12bPMMulgrave/Thorndon	Throndon Quay	NorthWest	Lane 2	253	32%	20.81	33.0	45.0	23.4	LOS C
12bPMMulgrave/Thorndon	Mulgrave Street	SouthWest	Lane 1	408	54%	25.55	13.0	45.0	26.6	LOS C
12bPMMulgrave/Thorndon	Mulgrave Street	SouthWest	Lane 2	408	54%	25.55	13.0	45.0	26.6	LOS C
12cPMMulgrave/Bus Terminal	Mulgrave North	NorthWest	Lane 1	461	56%	5.00	500.0	45.0	45.0	LOS A
12cPMMulgrave/Bus Terminal	Mulgrave North	NorthWest	Lane 2	418	56%	4.25	500.0	45.0	44.2	LOS A
12cPMMulgrave/Bus Terminal	Mulgrave North	NorthWest	Lane 3	8	1%	7.45	20.0	45.0	9.1	LOS A
12cPMMulgrave/Bus Terminal	Lampton Quay South	SouthWest	Lane 1	29	27%	49.26	500.0	45.0	89.3	LOS D
12cPMMulgrave/Bus Terminal	Lampton Quay North	NorthEast	Lane 2	25		49.00	20.0	45.0	50.6	LOS D

			Bus Travel Time	
			Seconds	Minutes
Distance				
5100.0	Bus		526.2	8.8
5113.0	Vehicle		492.8	8.2
3335.0	HCV		314.7	5.2

Do Min + Peds - AM Peak

Scenario	Approach Name	Approach Direction	Lane #	Demand Volumes	Deg. Satn	Average Delay (sec)	Lane Length (m)	Posted speed km/hr (across leg)	Time (sec)	Level of Service
1AMJardenMile	Hutt Rd	South	Lane 1	111	11%	13.57	1300.0	80.0	72.1	LOS B
1AMJardenMile	Hutt Rd	South	Lane 2	87	11%	12.60	1300.0	80.0	71.1	LOS B
1AMJardenMile	Hutt Rd	South	Lane 3	223	93%	96.85	125.0	80.0	102.5	LOS F
1AMJardenMile	SH2 Off Ramp	East	Lane 1	285	64%	50.39	220.0	100.0	58.3	LOS D
1AMJardenMile	SH2 Off Ramp	East	Lane 2	354	182%	799.21	370.0	100.0	812.5	LOS F
1AMJardenMile	SH2 Off Ramp	East	Lane 3	350	182%	799.44	235.0	100.0	807.9	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 1	1093	194%	921.62	80.0	100.0	924.5	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 2	581	65%	30.26	500.0	100.0	48.3	LOS C
1AMJardenMile	Centennial Hwy	North	Lane 3	556	65%	29.47	500.0	100.0	47.5	LOS C
1AMJardenMile	Centennial Hwy	North	Lane 4	29	12%	70.11	25.0	100.0	71.0	LOS E
1AMJardenMile	Jarden Mile	West	Lane 1	5	1%	33.10	350.0	50.0	58.3	LOS C
1AMJardenMile	Jarden Mile	West	Lane 2	46	37%	78.81	20.0	50.0	80.2	LOS E
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 1	717	39%	0.24	1300.0	80.0	58.7	LOS A
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 2	705	39%	0.24	1300.0	80.0	58.7	LOS A
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 3	43	26%	31.67	95.0	80.0	35.9	LOS C
2AMOnslowRd	Onslow Rd	North	Lane 1	469	68%	19.53	500.0	50.0	55.5	LOS B
2AMOnslowRd	Hutt Road South	SouthWest	Lane 1	70	6%	10.36	60.0	80.0	13.1	LOS B
2AMOnslowRd	Hutt Road South	SouthWest	Lane 2	142	66%	25.63	330.0	80.0	40.5	LOS C
2AMOnslowRd	Hutt Road South	SouthWest	Lane 3	142	66%	25.63	330.0	80.0	40.5	LOS C
2aAMRangioracrossing	Hutt Road (north)	NorthEast	Lane 1	887		6.30	330.0	60.0	26.1	LOS A
2aAMRangioracrossing	Hutt Road (north)	NorthEast	Lane 2	873		6.40	330.0	60.0	26.2	LOS A
2aAMRangioracrossing	Hutt Road South	SouthWest	Lane 1	267	22%	2.60	40.0	60.0	5.0	LOS A
2aAMRangioracrossing	Hutt Road South	SouthWest	Lane 2	262	22%	2.60	40.0	60.0	5.0	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 1	812	50%	2.29	40.0	60.0	4.7	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 2	923	50%	2.28	40.0	60.0	4.7	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 3	25	2%	4.83	30.0	60.0	6.6	LOS A
3AMRangioraAvenue	Rangiora Avenue	North	Lane 1	50	18%	14.94	300.0	50.0	36.5	LOS B
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 1	267	14%	0.54	620.0	60.0	37.7	LOS A
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 2	262	14%	0.05	620.0	60.0	37.2	LOS A
4AMWestminsterSt	Westminster Street	SouthEast	Lane 1	50	19%	12.67	100.0	60.0	18.7	LOS B
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 1	887	47%	0.40	620.0	60.0	37.6	LOS A
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 2	873	47%	0.24	620.0	60.0	37.4	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 1	254	13%	3.33	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 2	250	13%	3.33	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 3	25	6%	10.00	20.0	60.0	11.2	LOS A
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 1	873	112%	175.19	70.0	60.0	175.4	LOS F
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 2	776	112%	177.23	70.0	60.0	181.4	LOS F
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 3	104	31%	49.34	46.0	60.0	52.1	LOS D
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 1	564	112%	187.13	2000.0	50.0	331.1	LOS F
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 2	588	112%	186.23	2000.0	50.0	330.2	LOS F
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 1	244	16%	4.84	43.0	60.0	7.4	LOS A
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 2	189	64%	51.05	45.0	60.0	53.7	LOS D
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 3	196	64%	51.34	45.0	60.0	54.0	LOS D
6AMSchoolRd	Hutt Rd	NorthEast	Lane 1	1326	63%	2.48	45.0	60.0	5.2	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 2	1306	63%	2.48	45.0	60.0	5.2	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 3	25	3%	5.04	12.0	60.0	5.8	LOS A
6AMSchoolRd	School Rd	NorthWest	Lane 1	50	34%	20.28	150.0	50.0	31.1	LOS C
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 1	317	17%	4.36	430.0	60.0	30.2	LOS A
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 2	312	17%	4.25	430.0	60.0	30.1	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 1	1319	65%	6.02	430.0	60.0	31.8	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 2	1334	64%	1.91	430.0	60.0	27.7	LOS A
7AMAoteaQuay	Aotea Quay	West	Lane 1	186	10%	5.63	500.0	70.0	31.3	LOS A
7AMAoteaQuay	Hutt Road	SouthWest	Lane 1	443	24%	0.03	150.0	45.0	12.0	LOS A
7aAMAQcrossing	Hutt Rd East	NorthEast	Lane 1	731		5.00	150.0	60.0	14.0	LOS A
7aAMAQcrossing	Hutt Rd East	NorthEast	Lane 2	624		5.20	150.0	60.0	14.2	LOS A
7aAMAQcrossing	Hutt Road West	SouthWest	Lane 1	478	41%	3.02	280.0	60.0	19.8	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 1	214	11%	2.73	280.0	45.0	25.1	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 2	1116	53%	2.81	280.0	45.0	25.2	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 3	25	3%	7.04	21.0	45.0	8.7	LOS A
8AMSarSt	Sar Street	NorthWest	Lane 1	50	31%	20.38	85.0	40.0	28.0	LOS C
8AMSarSt	Hutt Rd West	SouthWest	Lane 1	25	1%	4.01	18.0	45.0	5.5	LOS A
8AMSarSt	Hutt Rd West	SouthWest	Lane 2	453	25%	2.70	100.0	45.0	10.7	LOS A
9AMTinakoriRd	Thorndon Quay	South	Lane 1	182	28%	21.63	260.0	45.0	42.4	LOS C
9AMTinakoriRd	Hutt Road	North	Lane 1	687	118%	219.71	100.0	45.0	227.7	LOS F
9AMTinakoriRd	Hutt Road	North	Lane 2	646	118%	222.09	65.0	45.0	227.3	LOS F
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 1	303	34%	18.08	10.0	45.0	18.9	LOS B
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 2	5	3%	46.53	500.0	45.0	86.5	LOS D
9aAMChurchCrossing	Thorndon Quay	SouthEast	Lane 1	195	22%	3.20	170.0	60.0	13.4	LOS A
9aAMChurchCrossing	Thorndon Quay	NorthWest	Lane 1	340	28%	3.33	260.0	60.0	18.9	LOS A
9aAMChurchCrossing	Thorndon Quay	NorthWest	Lane 2	352	28%	3.32	260.0	60.0	18.9	LOS A
9bAMThorndonCrossing	Thorndon Quay	SouthEast	Lane 1	195	22%	3.20	300.0	60.0	21.2	LOS A
9bAMThorndonCrossing	Thorndon Quay	NorthWest	Lane 1	340	28%	3.33	170.0	60.0	13.5	LOS A
9bAMThorndonCrossing	Thorndon Quay	NorthWest	Lane 2	352	28%	3.32	170.0	60.0	13.5	LOS A
9cAMCafeCrossing	Thorndon Quay	SouthEast	Lane 1	195	22%	3.20	40.0	60.0	5.6	LOS A
9cAMCafeCrossing	Thorndon Quay	NorthWest	Lane 1	130	11%	3.86	300.0	60.0	21.9	LOS A
9cAMCafeCrossing	Thorndon Quay	NorthWest	Lane 2	562	45%	3.70	300.0	60.0	21.7	LOS A
10AMDavisStreet	Thorndon Quay	South	Lane 1	301	18%	3.85	185.0	45.0	18.6	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 1	674	28%	2.21	40.0	45.0	5.4	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 2	32	3%	4.90	15.0	45.0	6.1	LOS A
10AMDavisStreet	Davis Street	SouthWest	Lane 1	60	9%	5.87	500.0	30.0	65.9	LOS A
10aAMMooreCrossing	Thorndon Quay (south)	South	Lane 1	298	32%	3.42	50.0	60.0	6.4	LOS A
10aAMMooreCrossing	Thorndon Quay (north)	North	Lane 1	153	13%	3.95	185.0	60.0	15.0	LOS A
10aAMMooreCrossing	Thorndon Quay (north)	North	Lane 2	566	46%	3.73	185.0	60.0	14.8	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 1	651	27%	2.41	50.0	45.0	6.4	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 2	65	6%	6.26	15.0	45.0	7.5	LOS A
11AMMooreStreet	Moore Street	NorthWest	Lane 1	126	14%	4.43	50.0	30.0	10.4	LOS A
11AMMooreStreet	Thorndon Quay	SouthWest	Lane 1	396	22%	1.86	200.0	45.0	17.9	LOS A
12AMMulgrave/Thondon/Lambton	Lambton Quay	South	Lane 1	18	25%	53.88	500.0	45.0	93.9	LOS D
12AMMulgrave/Thondon/Lambton	Thorndon Quay	SouthEast	Lane 1	293	42%	24.89	500.0	45.0	64.9	LOS C
12AMMulgrave/Thondon/Lambton	Thorndon Quay	NorthWest	Lane 1	14	15%	52.64	200.0	45.0	68.6	LOS D
12AMMulgrave/Thondon/Lambton	Thorndon Quay	NorthWest	Lane 2	654	89%	46.11	200.0	45.0	62.1	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 1	84	12%	23.68	18.0	45.0	25.1	LOS C
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 2	568	90%	47.68	500.0	45.0	87.7	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 3	622	90%	47.90	500.0	45.0	87.8	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 4	10	3%	24.70	30.0	45.0	27.1	LOS C

Distance
5070.0

Bus Travel Time

Seconds	Minutes
808.4	13.5

Distance
5070.0

Vehicle Travel Time

Seconds	Minutes
798.9	13.3

Travel time - Jarden to Aotea

Distance	Seconds	Minutes
3335.0	391.8	6.5

Do Min + Peds - PM Peak

Scenario	Approach Name	Approach Direction	Lane #	Demand Volumes	Deg. Satn	Average Delay (sec)	Lane Length (m)	Posted speed km/hr	Time (sec)	Level of Service
1PMJardenMile	Hutt Rd	South	Lane 1	270	37%	25.93	1300.0	80.0	84.4	LOS C
1PMJardenMile	Hutt Rd	South	Lane 2	262	37%	26.17	1300.0	80.0	84.7	LOS C
1PMJardenMile	Hutt Rd	South	Lane 3	224	94%	97.33	125.0	80.0	103.0	LOS F
1PMJardenMile	SH2 Off Ramp	East	Lane 1	230	35%	35.54	220.0	100.0	43.5	LOS D
1PMJardenMile	SH2 Off Ramp	East	Lane 2	622	163%	635.67	370.0	100.0	649.0	LOS F
1PMJardenMile	SH2 Off Ramp	East	Lane 3	619	163%	635.72	235.0	100.0	644.2	LOS F
1PMJardenMile	Centennial Hwy	North	Lane 1	770	164%	648.78	80.0	100.0	651.7	LOS F
1PMJardenMile	Centennial Hwy	North	Lane 2	189	27%	22.36	500.0	100.0	40.4	LOS C
1PMJardenMile	Centennial Hwy	North	Lane 3	188	27%	22.35	500.0	100.0	40.4	LOS C
1PMJardenMile	Centennial Hwy	North	Lane 4	3	2%	70.84	25.0	100.0	71.7	LOS E
1PMJardenMile	Jarden Mile	West	Lane 1	53	13%	31.32	350.0	50.0	56.5	LOS C
1PMJardenMile	Jarden Mile	West	Lane 2	123	106%	154.49	20.0	50.0	155.9	LOS F
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 1	86	5%	0.02	1300.0	80.0	58.5	LOS A
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 2	86	5%	0.02	1300.0	80.0	58.5	LOS A
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 3	543	90%	44.34	95.0	80.0	48.6	LOS D
2PMOnslowRd	Onslow Rd	North	Lane 1	184	84%	43.95	500.0	50.0	79.9	LOS D
2PMOnslowRd	Hutt Road South	SouthWest	Lane 1	300	37%	20.86	60.0	80.0	36.7	LOS C
2PMOnslowRd	Hutt Road South	SouthWest	Lane 2	362	85%	36.04	330.0	80.0	50.9	LOS D
2PMOnslowRd	Hutt Road South	SouthWest	Lane 3	376	85%	35.81	330.0	80.0	50.7	LOS D
2aPMRangioracrossing	Hutt Road (north)	NorthEast	Lane 1	355		3.50	330.0	60.0	23.3	LOS A
2aPMRangioracrossing	Hutt Road (north)	NorthEast	Lane 2	349		3.60	330.0	60.0	23.4	LOS A
2aPMRangioracrossing	Hutt Road South	SouthWest	Lane 1	719	75%	6.72	40.0	60.0	9.1	LOS A
2aPMRangioracrossing	Hutt Road South	SouthWest	Lane 2	707	75%	6.76	40.0	60.0	9.2	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 1	346	19%	2.27	40.0	60.0	4.7	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 2	340	19%	2.27	40.0	60.0	4.7	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 3	25	4%	7.16	30.0	60.0	9.0	LOS A
3PMRangioraAvenue	Rangiora Avenue	North	Lane 1	50	22%	16.67	300.0	50.0	38.3	LOS C
3PMRangioraAvenue	Hutt Road	SouthWest	Lane 1	704	52%	0.58	620.0	60.0	37.8	LOS A
3PMRangioraAvenue	Hutt Road	SouthWest	Lane 2	697	52%	0.39	620.0	60.0	37.6	LOS A
4PMWestminsterSt	Westminster Street	SouthEast	Lane 1	50	9%	8.85	100.0	60.0	14.8	LOS A
4PMWestminsterSt	Hutt Road (north)	NorthEast	Lane 1	351	29%	0.67	620.0	60.0	37.9	LOS A
4PMWestminsterSt	Hutt Road (north)	NorthEast	Lane 2	416	29%	0.14	620.0	60.0	37.3	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 1	706	37%	3.35	70.0	60.0	7.6	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 2	695	37%	3.35	70.0	60.0	7.6	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 3	25	3%	5.92	20.0	60.0	7.1	LOS A
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 1	518	68%	17.46	70.0	60.0	21.7	LOS B
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 2	455	68%	17.06	70.0	60.0	21.3	LOS B
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 3	163	84%	41.54	46.0	60.0	44.3	LOS D
5PMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 1	316	87%	40.27	45.0	50.0	43.5	LOS D
5PMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 2	320	87%	40.16	2000.0	50.0	184.2	LOS D
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 1	836	60%	7.09	43.0	60.0	9.7	LOS A
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 2	489	89%	30.96	45.0	60.0	33.7	LOS C
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 3	665	89%	30.78	45.0	60.0	33.5	LOS C
6PMSchoolRd	Hutt Rd	NorthEast	Lane 1	689	36%	2.45	45.0	60.0	5.2	LOS A
6PMSchoolRd	Hutt Rd	NorthEast	Lane 2	678	36%	2.45	45.0	60.0	5.2	LOS A
6PMSchoolRd	Hutt Rd	NorthEast	Lane 3	25	12%	16.71	12.0	60.0	17.4	LOS C
6PMSchoolRd	School Rd	NorthWest	Lane 1	50	82%	84.85	150.0	50.0	95.7	LOS F
6PMSchoolRd	Hutt Rd West	SouthWest	Lane 1	1013	53%	4.36	430.0	60.0	30.2	LOS A
6PMSchoolRd	Hutt Rd West	SouthWest	Lane 2	997	53%	4.33	430.0	60.0	30.1	LOS A
7PMAoteaQuay	Hutt Road East	NorthEast	Lane 1	758	40%	5.81	430.0	60.0	31.6	LOS A
7PMAoteaQuay	Hutt Road East	NorthEast	Lane 2	629	35%	1.76	430.0	60.0	27.6	LOS A
7PMAoteaQuay	Aotea Quay	West	Lane 1	863	46%	5.66	500.0	70.0	31.4	LOS A
7PMAoteaQuay	Hutt Road	SouthWest	Lane 1	1147	61%	0.13	150.0	45.0	12.1	LOS A
7aPMAQcrossing	Hutt Rd East	NorthEast	Lane 1	105		2.40	150.0	60.0	11.4	LOS A
7aPMAQcrossing	Hutt Rd East	NorthEast	Lane 2	524		3.30	150.0	60.0	12.3	LOS A
7aPMAQcrossing	Hutt Road West	SouthWest	Lane 1	1167	88%	15.73	280.0	60.0	32.5	LOS B
8PMSarSt	Hutt Rd East	NorthEast	Lane 1	629	45%	2.83	280.0	45.0	25.2	LOS A
8PMSarSt	Hutt Rd East	NorthEast	Lane 2	25	10%	17.53	21.0	45.0	19.2	LOS C
8PMSarSt	Sar Street	NorthWest	Lane 1	50	35%	31.11	85.0	40.0	38.8	LOS D
8PMSarSt	Hutt Rd West	SouthWest	Lane 1	25	1%	4.01	18.0	45.0	5.5	LOS A
8PMSarSt	Hutt Rd West	SouthWest	Lane 2	1142	61%	2.71	100.0	45.0	10.7	LOS A
9PMTinakoriRd	Thorndon Quay	South	Lane 1	679	89%	32.76	260.0	45.0	53.6	LOS C
9PMTinakoriRd	Hutt Road	North	Lane 1	235	33%	15.70	100.0	45.0	23.7	LOS B
9PMTinakoriRd	Hutt Road	North	Lane 2	394	88%	43.26	65.0	45.0	48.5	LOS D
9PMTinakoriRd	Tinakori Rd	SouthWest	Lane 1	511	69%	22.62	10.0	45.0	23.4	LOS C
9PMTinakoriRd	Tinakori Rd	SouthWest	Lane 2	14	9%	39.51	500.0	45.0	79.5	LOS D
9aPMChurchCrossing	Thorndon Quay	SouthEast	Lane 1	524	56%	4.04	170.0	60.0	14.2	LOS A
9aPMChurchCrossing	Thorndon Quay	NorthWest	Lane 1	249	28%	3.35	260.0	60.0	18.9	LOS A
9bPMThorndonCrossing	Thorndon Quay	SouthEast	Lane 1	524	55%	3.99	300.0	60.0	22.0	LOS A
9bPMThorndonCrossing	Thorndon Quay	NorthWest	Lane 1	249	28%	3.35	170.0	60.0	13.5	LOS A
9cPMCafeCrossing	Thorndon Quay	SouthEast	Lane 1	524	55%	3.98	40.0	60.0	6.4	LOS A
9cPMCafeCrossing	Thorndon Quay	NorthWest	Lane 1	249	28%	3.35	300.0	60.0	21.3	LOS A
10PMDavisStreet	Thorndon Quay	South	Lane 1	856	49%	3.97	185.0	45.0	18.8	LOS A
10PMDavisStreet	Thorndon Quay	NorthWest	Lane 1	262	15%	2.30	40.0	45.0	5.5	LOS A
10PMDavisStreet	Thorndon Quay	NorthWest	Lane 2	93	5%	3.35	15.0	45.0	4.6	LOS A
10PMDavisStreet	Davis Street	SouthWest	Lane 1	141	23%	7.53	500.0	30.0	67.5	LOS A
10aPMMooreCrossing	Thorndon Quay	South	Lane 1	854	87%	11.91	50.0	60.0	14.9	LOS B
10aPMMooreCrossing	Thorndon Quay	North	Lane 1	348	38%	3.56	185.0	60.0	14.7	LOS A
11PMMooreStreet	Thorndon Quay	NorthEast	Lane 1	336	19%	2.41	50.0	45.0	6.4	LOS A
11PMMooreStreet	Thorndon Quay	NorthEast	Lane 2	15	3%	10.43	15.0	45.0	11.6	LOS B
11PMMooreStreet	Moore Street	NorthWest	Lane 1	598	124%	233.07	50.0	30.0	239.1	LOS F
11PMMooreStreet	Thorndon Quay	SouthWest	Lane 1	609	34%	1.02	200.0	45.0	17.0	LOS A
12PMMulgrave/Thondon/Lambton	Lambton Quay	South	Lane 1	32	27%	31.00	500.0	45.0	71.0	LOS C
12PMMulgrave/Thondon/Lambton	Thorndon Quay	SouthEast	Lane 1	515	88%	30.03	500.0	45.0	70.0	LOS C
12PMMulgrave/Thondon/Lambton	Throndon Quay	NorthWest	Lane 1	29	24%	30.40	20.0	45.0	32.0	LOS C
12PMMulgrave/Thondon/Lambton	Throndon Quay	NorthWest	Lane 2	497	88%	29.93	200.0	45.0	45.9	LOS C
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 1	64	13%	21.09	18.0	45.0	22.5	LOS C
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 2	399	90%	37.89	500.0	45.0	77.9	LOS D
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 3	431	90%	37.89	500.0	45.0	77.9	LOS D
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 4	8	3%	22.37	30.0	45.0	24.8	LOS C

Bus Travel Time

Distance	Seconds	Minutes
5070.0	511.7	8.5

Vehicle Travel Time

Seconds	Minutes
525.8	8.8

Travel time - Jarden to Aotea

Distance	Seconds	Minutes
3335.0	269.8	4.5

Bus + HCV - AM Peak

Scenario	Approach Name	Approach Direction	Lane #	Demand Volumes	Deg. Satn	Average Delay (sec)	Lane Length (m)	Posted speed km/hr (across leg)	Time (sec)	Level of Service
1AMJardenMile	Hutt Rd	South	Lane 1	109	10%	11.27	90.0	80.0	15.3	LOS B
1AMJardenMile	Hutt Rd	South	Lane 2	76	10%	26.72	150.0	80.0	33.5	LOS C
1AMJardenMile	Hutt Rd	South	Lane 3	123	172%	708.16	1350.0	80.0	768.9	LOS F
1AMJardenMile	Hutt Rd	South	Lane 4	123	172%	707.14	1300.0	80.0	765.6	LOS F
1AMJardenMile	SH2 Off Ramp	East	Lane 1	127	42%	55.18	220.0	100.0	63.1	LOS E
1AMJardenMile	SH2 Off Ramp	East	Lane 2	335	128%	334.06	370.0	100.0	347.4	LOS F
1AMJardenMile	SH2 Off Ramp	East	Lane 3	332	128%	334.32	235.0	100.0	342.8	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 1	993	172%	721.77	80.0	100.0	724.6	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 2	81	15%	22.00	40.0	100.0	23.4	LOS C
1AMJardenMile	Centennial Hwy	North	Lane 3	256	28%	24.16	500.0	100.0	42.2	LOS C
1AMJardenMile	Centennial Hwy	North	Lane 4	290	32%	24.75	500.0	100.0	42.8	LOS C
1AMJardenMile	Centennial Hwy	North	Lane 5	26	35%	88.49	25.0	100.0	89.4	LOS F
1AMJardenMile	Jarden Mile	West	Lane 1	3	1%	32.54	350.0	50.0	57.7	LOS C
1AMJardenMile	Jarden Mile	West	Lane 2	27	10%	64.00	20.0	50.0	65.4	LOS E
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 1	94	17%	31.59	1300.0	80.0	90.1	LOS C
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 2	676	76%	42.83	1300.0	80.0	101.3	LOS D
2AMOnslowRd	Onslow Rd	North	Lane 1	356	75%	56.90	500.0	50.0	92.9	LOS E
2AMOnslowRd	Hutt Road South	SouthWest	Lane 1	57	7%	30.31	60.0	80.0	33.0	LOS C
2AMOnslowRd	Hutt Road South	SouthWest	Lane 2	163	74%	62.76	330.0	80.0	77.6	LOS E
2AMOnslowRd	Hutt Road South	SouthWest	Lane 3	172	74%	62.44	330.0	80.0	77.3	LOS E
2aAMRangioracrossing	Hutt Road (north)	NorthEast	Lane 1	97		1.00	330.0	60.0	20.8	LOS A
2aAMRangioracrossing	Hutt Road (north)	NorthEast	Lane 2	866		4.30	330.0	60.0	24.1	LOS A
2aAMRangioracrossing	Hutt Road South	SouthWest	Lane 1	267	17%	1.79	40.0	60.0	4.2	LOS A
2aAMRangioracrossing	Hutt Road South	SouthWest	Lane 2	270	17%	1.79	40.0	60.0	4.2	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 1	97	8%	2.25	40.0	60.0	4.6	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 2	841	43%	2.28	40.0	60.0	4.7	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 3	25	3%	4.86	30.0	60.0	6.7	LOS A
3AMRangioraAvenue	Rangiora Avenue	North	Lane 1	50	10%	9.31	300.0	50.0	30.9	LOS A
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 1	267	15%	0.54	620.0	60.0	37.7	LOS A
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 2	270	15%	0.05	620.0	60.0	37.2	LOS A
4AMWestminsterSt	Westminster Street	SouthEast	Lane 1	50	9%	7.41	100.0	60.0	13.4	LOS A
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 1	122	9%	1.17	620.0	60.0	38.4	LOS A
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 2	841	43%	0.20	620.0	60.0	37.4	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 1	254	14%	3.33	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 2	258	14%	3.34	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 3	25	3%	6.55	20.0	60.0	7.8	LOS A
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 1	86	17%	22.30	70.0	60.0	26.5	LOS C
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 2	779	99%	81.58	70.0	60.0	85.8	LOS F
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 3	62	14%	39.96	46.0	60.0	42.7	LOS D
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 1	485	98%	84.99	2000.0	50.0	229.0	LOS F
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 2	502	98%	84.04	2000.0	50.0	228.0	LOS F
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 1	286	19%	4.51	43.0	60.0	7.1	LOS A
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 2	168	89%	69.76	45.0	60.0	72.5	LOS E
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 3	181	89%	69.50	45.0	60.0	72.2	LOS E
6AMSchoolRd	Hutt Rd	NorthEast	Lane 1	114	10%	2.42	45.0	60.0	5.1	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 2	1525	79%	2.52	45.0	60.0	5.2	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 3	25	3%	5.08	12.0	60.0	5.8	LOS A
6AMSchoolRd	School Rd	NorthWest	Lane 1	50	26%	15.20	150.0	50.0	26.0	LOS C
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 1	315	17%	4.39	430.0	60.0	30.2	LOS A
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 2	320	17%	4.24	430.0	60.0	30.0	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 1	813	46%	5.53	430.0	60.0	31.3	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 2	850	44%	1.75	430.0	60.0	27.6	LOS A
7AMAoteaQuay	Aotea Quay	West	Lane 1	256	14%	5.65	500.0	70.0	31.4	LOS A
7AMAoteaQuay	Hutt Road	SouthWest	Lane 1	379	21%	0.02	150.0	45.0	12.0	LOS A
7aAMAQcrossing	Hutt Rd East	NorthEast	Lane 1	21		1.40	150.0	60.0	10.4	LOS A
7aAMAQcrossing	Hutt Rd East	NorthEast	Lane 2	907		2.70	150.0	60.0	11.7	LOS A
7aAMAQcrossing	Hutt Road West	SouthWest	Lane 1	412	25%	1.30	280.0	60.0	18.1	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 1	21	2%	3.32	280.0	45.0	25.7	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 2	882	95%	6.24	280.0	45.0	28.6	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 3	25	3%	6.41	21.0	45.0	8.1	LOS A
8AMSarSt	Sar Street	NorthWest	Lane 1	25	2%	3.53	85.0	40.0	11.2	LOS A
8AMSarSt	Sar Street	NorthWest	Lane 2	25	28%	24.83	40.0	40.0	28.4	LOS C
8AMSarSt	Hutt Rd West	SouthWest	Lane 1	61	4%	3.86	100.0	45.0	11.9	LOS A
8AMSarSt	Hutt Rd West	SouthWest	Lane 2	351	19%	2.85	100.0	45.0	10.8	LOS A
9AMTinakoriRd	Thorndon Quay	South	Lane 1	102	19%	42.24	260.0	45.0	63.0	LOS D
9AMTinakoriRd	Hutt Road	North	Lane 1	21	6%	37.69	100.0	45.0	45.7	LOS D
9AMTinakoriRd	Hutt Road	North	Lane 2	296	68%	43.97	100.0	45.0	52.0	LOS D
9AMTinakoriRd	Hutt Road	North	Lane 3	432	67%	33.73	65.0	45.0	38.9	LOS C
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 1	321	31%	18.41	10.0	45.0	19.2	LOS B
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 2	15	9%	70.66	500.0	45.0	110.7	LOS E
9aAMChurchCrossing	Thorndon Quay	SouthEast	Lane 1	126	8%	1.18	170.0	60.0	11.4	LOS A
9aAMChurchCrossing	Thorndon Quay	NorthWest	Lane 1	21	2%	0.28	260.0	60.0	15.9	LOS A
9aAMChurchCrossing	Thorndon Quay	NorthWest	Lane 2	311	19%	0.74	260.0	60.0	16.3	LOS A
9bAMThorndonCrossing	Thorndon Quay	SouthEast	Lane 1	126	8%	1.72	300.0	60.0	19.7	LOS A
9bAMThorndonCrossing	Thorndon Quay	NorthWest	Lane 1	21	2%	0.28	170.0	60.0	10.5	LOS A
9bAMThorndonCrossing	Thorndon Quay	NorthWest	Lane 2	311	19%	0.33	170.0	60.0	10.5	LOS A
9cAMCafeCrossing	Thorndon Quay	SouthEast	Lane 1	126	8%	1.83	40.0	60.0	4.2	LOS A
9cAMCafeCrossing	Thorndon Quay	NorthWest	Lane 1	21	2%	0.28	300.0	60.0	18.3	LOS A
9cAMCafeCrossing	Thorndon Quay	NorthWest	Lane 2	311	19%	0.33	300.0	60.0	18.3	LOS A
10AMDavisStreet	Thorndon Quay	South	Lane 1	116	7%	4.82	12.0	45.0	5.8	LOS A
10AMDavisStreet	Thorndon Quay	South	Lane 2	104	6%	3.22	185.0	45.0	18.0	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 1	21	2%	2.20	40.0	45.0	5.4	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 2	345	31%	2.96	40.0	45.0	6.2	LOS A
10AMDavisStreet	Davis Street	SouthWest	Lane 1	80	7%	3.11	500.0	30.0	63.1	LOS A
10aAMMooreCrossing	Thorndon Quay (south)	South	Lane 1	267	17%	2.15	50.0	60.0	5.2	LOS A
10aAMMooreCrossing	Thorndon Quay (north)	North	Lane 1	21	2%	1.87	185.0	60.0	13.0	LOS A
10aAMMooreCrossing	Thorndon Quay (north)	North	Lane 2	346	22%	2.24	185.0	60.0	13.3	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 1	21	2%	0.00	50.0	45.0	4.0	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 2	340	20%	1.17	50.0	45.0	5.2	LOS A
11AMMooreStreet	Moore Street	NorthWest	Lane 1	118	16%	4.83	50.0	30.0	10.8	LOS A
11AMMooreStreet	Thorndon Quay	SouthWest	Lane 1	124	7%	4.03	20.0	45.0	5.6	LOS A
11AMMooreStreet	Thorndon Quay	SouthWest	Lane 2	192	11%	0.01	200.0	45.0	16.0	LOS A
12AMMulgrave/Thondon/Lambton	Lambton Quay	South	Lane 1	18	20%	41.21	500.0	45.0	81.2	LOS D
12AMMulgrave/Thondon/Lambton	Thorndon Quay	SouthEast	Lane 1	213	41%	24.34	500.0	45.0	64.3	LOS C
12AMMulgrave/Thondon/Lambton	Throndon Quay	NorthWest	Lane 1	7	8%	39.81	200.0	45.0	55.8	LOS D
12AMMulgrave/Thondon/Lambton	Throndon Quay	NorthWest	Lane 2	339	88%	40.88	200.0	45.0	56.9	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 1	81	11%	18.64	18.0	45.0	20.1	LOS B
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 2	590	89%	39.69	500.0	45.0	79.7	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 3	636	89%	39.74	500.0	45.0	79.7	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 4	14	4%	19.87	30.0	45.0	22.3	LOS B

Bus Travel Time	
Seconds	444.9
Minutes	7.4

Vehicle travel Time	
Seconds	547.3
Minutes	9.1

Travel time - Aotea to Jarden	
Seconds	240.3
Minutes	4.0

Bus + HCV - PM Peak

Scenario	Approach Name	Approach Direction	Lane #	Demand Volumes	Deg. Satn	Average Delay (sec)	Lane Length (m)	Posted speed km/hr	Time (sec)	Level of Service
1PMJardenMile	Hutt Rd	South	Lane 1	226	49%	67.21	90.0	80.0	125.7	LOS E
1PMJardenMile	Hutt Rd	South	Lane 2	209	49%	66.75	150.0	80.0	125.3	LOS E
1PMJardenMile	Hutt Rd	South	Lane 3	29	30%	80.46	1300.0	80.0	139.0	LOS F
1PMJardenMile	Hutt Rd	South	Lane 4	148	90%	91.39	1300.0	80.0	149.9	LOS F
1PMJardenMile	SH2 Off Ramp	East	Lane 1	171	19%	32.25	220.0	100.0	40.2	LOS C
1PMJardenMile	SH2 Off Ramp	East	Lane 2	634	95%	83.69	370.0	100.0	97.0	LOS F
1PMJardenMile	SH2 Off Ramp	East	Lane 3	631	95%	83.79	235.0	100.0	92.3	LOS F
1PMJardenMile	Centennial Hwy	North	Lane 1	776	86%	26.62	80.0	100.0	29.5	LOS C
1PMJardenMile	Centennial Hwy	North	Lane 2	43	15%	52.20	40.0	100.0	53.6	LOS D
1PMJardenMile	Centennial Hwy	North	Lane 3	99	22%	51.56	500.0	100.0	69.6	LOS D
1PMJardenMile	Centennial Hwy	North	Lane 4	99	22%	51.56	500.0	100.0	69.6	LOS D
1PMJardenMile	Centennial Hwy	North	Lane 5	4	3%	78.32	25.0	100.0	79.2	LOS E
1PMJardenMile	Jarden Mile	West	Lane 1	50	11%	30.21	350.0	50.0	55.4	LOS C
1PMJardenMile	Jarden Mile	West	Lane 2	106	45%	67.41	20.0	50.0	68.9	LOS E
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 1	260	64%	56.74	1300.0	80.0	115.2	LOS E
2PMOnslowRd	Hutt Rd North	NorthEast	Lane 2	245	64%	60.66	1300.0	80.0	119.2	LOS E
2PMOnslowRd	Onslow Rd	North	Lane 1	190	64%	65.18	500.0	50.0	101.2	LOS E
2PMOnslowRd	Hutt Road South	SouthWest	Lane 1	241	19%	12.77	60.0	80.0	15.5	LOS B
2PMOnslowRd	Hutt Road South	SouthWest	Lane 2	53	9%	21.51	330.0	80.0	36.4	LOS C
2PMOnslowRd	Hutt Road South	SouthWest	Lane 3	495	65%	26.07	330.0	80.0	40.9	LOS C
2aPMRangioracrossing	Hutt Road (north)	NorthEast	Lane 1	244		7.70	330.0	60.0	27.5	LOS A
2aPMRangioracrossing	Hutt Road (north)	NorthEast	Lane 2	255		5.40	330.0	60.0	25.2	LOS A
2aPMRangioracrossing	Hutt Road South	SouthWest	Lane 1	66	6%	1.63	40.0	60.0	4.0	LOS A
2aPMRangioracrossing	Hutt Road South	SouthWest	Lane 2	764	46%	2.53	40.0	60.0	4.9	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 1	231	13%	2.26	40.0	60.0	4.7	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 2	243	13%	2.27	40.0	60.0	4.7	LOS A
3PMRangioraAvenue	Hutt Road	NorthEast	Lane 3	25	3%	5.53	30.0	60.0	7.3	LOS A
3PMRangioraAvenue	Rangiora Avenue	North	Lane 1	50	12%	7.81	300.0	50.0	29.4	LOS A
3PMRangioraAvenue	Hutt Road	SouthWest	Lane 1	91	7%	1.49	620.0	60.0	38.7	LOS A
3PMRangioraAvenue	Hutt Road	SouthWest	Lane 2	739	38%	0.16	620.0	60.0	37.4	LOS A
4PMWestminsterSt	Westminster Street	SouthEast	Lane 1	50	6%	7.13	100.0	60.0	13.1	LOS A
4PMWestminsterSt	Hutt Road (north)	NorthEast	Lane 1	244	14%	0.61	620.0	60.0	37.8	LOS A
4PMWestminsterSt	Hutt Road (north)	NorthEast	Lane 2	255	14%	0.04	620.0	60.0	37.2	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 1	66	6%	3.30	70.0	60.0	7.5	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 2	739	38%	3.35	70.0	60.0	7.6	LOS A
4PMWestminsterSt	Hutt Road (south)	SouthWest	Lane 3	25	2%	5.42	20.0	60.0	6.6	LOS A
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 1	241	22%	6.17	70.0	60.0	10.4	LOS A
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 2	254	22%	6.16	70.0	60.0	10.4	LOS A
5PMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 3	146	75%	38.37	46.0	60.0	41.1	LOS D
5PMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 1	253	80%	35.81	45.0	50.0	39.0	LOS D
5PMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 2	295	80%	35.05	2000.0	50.0	179.1	LOS D
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 1	796	56%	6.60	43.0	60.0	9.2	LOS A
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 2	54	11%	13.23	45.0	60.0	15.9	LOS B
5PMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 3	682	89%	30.16	45.0	60.0	32.9	LOS C
6PMSchoolRd	Hutt Rd	NorthEast	Lane 1	455	25%	2.45	45.0	60.0	5.1	LOS A
6PMSchoolRd	Hutt Rd	NorthEast	Lane 2	469	25%	2.45	45.0	60.0	5.1	LOS A
6PMSchoolRd	Hutt Rd	NorthEast	Lane 3	25	10%	13.22	12.0	60.0	13.9	LOS B
6PMSchoolRd	School Rd	NorthWest	Lane 1	50	38%	22.44	150.0	50.0	33.2	LOS C
6PMSchoolRd	Hutt Rd West	SouthWest	Lane 1	97	8%	5.24	430.0	60.0	31.0	LOS A
6PMSchoolRd	Hutt Rd West	SouthWest	Lane 2	1460	75%	4.57	430.0	60.0	30.4	LOS A
7PMAoteaQuay	Hutt Road East	NorthEast	Lane 1	464	26%	5.51	430.0	60.0	31.3	LOS A
7PMAoteaQuay	Hutt Road East	NorthEast	Lane 2	490	26%	1.70	430.0	60.0	27.5	LOS A
7PMAoteaQuay	Aotea Quay	West	Lane 1	776	41%	5.62	500.0	70.0	31.3	LOS A
7PMAoteaQuay	Hutt Road	SouthWest	Lane 1	781	42%	0.06	150.0	45.0	12.1	LOS A
7aPMAQcrossing	Hutt Rd East	NorthEast	Lane 1	87		1.30	150.0	60.0	10.3	LOS A
7aPMAQcrossing	Hutt Rd East	NorthEast	Lane 2	438		1.70	150.0	60.0	10.7	LOS A
7aPMAQcrossing	Hutt Road West	SouthWest	Lane 1	32	3%	2.41	280.0	60.0	19.2	LOS A
7aPMAQcrossing	Hutt Road West	SouthWest	Lane 2	756	46%	1.82	280.0	60.0	18.6	LOS A
8PMSarSt	Hutt Rd East	NorthEast	Lane 1	500	28%	2.91	280.0	45.0	25.3	LOS A
8PMSarSt	Hutt Rd East	NorthEast	Lane 2	25	6%	10.31	21.0	45.0	12.0	LOS B
8PMSarSt	Sar Street	NorthWest	Lane 1	25	2%	3.54	85.0	40.0	11.2	LOS A
8PMSarSt	Sar Street	NorthWest	Lane 2	25	11%	18.22	40.0	40.0	21.8	LOS C
8PMSarSt	Hutt Rd West	SouthWest	Lane 1	57	4%	3.62	100.0	45.0	11.6	LOS A
8PMSarSt	Hutt Rd West	SouthWest	Lane 2	731	39%	2.85	100.0	45.0	10.9	LOS A
9PMTinakoriRd	Thorndon Quay	South	Lane 1	52	15%	47.18	260.0	45.0	68.0	LOS D
9PMTinakoriRd	Thorndon Quay	South	Lane 2	221	46%	50.64	260.0	45.0	71.4	LOS D
9PMTinakoriRd	Hutt Road	North	Lane 1	177	40%	49.26	100.0	45.0	57.3	LOS D
9PMTinakoriRd	Hutt Road	North	Lane 2	285	30%	23.29	65.0	45.0	28.5	LOS C
9PMTinakoriRd	Tinakori Rd	SouthWest	Lane 1	535	45%	16.15	10.0	45.0	16.9	LOS B
9PMTinakoriRd	Tinakori Rd	SouthWest	Lane 2	9	6%	73.76	500.0	45.0	113.8	LOS E
9aPMChurchCrossing	Thorndon Quay	SouthEast	Lane 1	33	3%	1.14	170.0	60.0	11.3	LOS A
9aPMChurchCrossing	Thorndon Quay	SouthEast	Lane 2	305	19%	1.31	170.0	60.0	11.5	LOS A
9aPMChurchCrossing	Thorndon Quay	NorthWest	Lane 1	186	13%	0.69	260.0	60.0	16.3	LOS A
9bPMThorndonCrossing	Thorndon Quay	SouthEast	Lane 1	33	3%	1.40	300.0	60.0	19.4	LOS A
9bPMThorndonCrossing	Thorndon Quay	SouthEast	Lane 2	305	19%	1.61	300.0	60.0	19.6	LOS A
9bPMThorndonCrossing	Thorndon Quay	NorthWest	Lane 1	186	13%	0.31	170.0	60.0	10.5	LOS A
9cPMCafeCrossing	Thorndon Quay	SouthEast	Lane 1	33	3%	2.27	40.0	60.0	4.7	LOS A
9cPMCafeCrossing	Thorndon Quay	SouthEast	Lane 2	305	19%	2.66	40.0	60.0	5.1	LOS A
9cPMCafeCrossing	Thorndon Quay	NorthWest	Lane 1	36	4%	0.32	55.0	60.0	3.6	LOS A
9cPMCafeCrossing	Thorndon Quay	NorthWest	Lane 2	150	9%	0.34	300.0	60.0	18.3	LOS A
10PMDavisStreet	Thorndon Quay	South	Lane 1	523	33%	4.76	185.0	45.0	19.8	LOS A
10PMDavisStreet	Thorndon Quay	South	Lane 2	239	13%	3.05	185.0	45.0	17.9	LOS A
10PMDavisStreet	Thorndon Quay	NorthWest	Lane 1	59	4%	2.27	40.0	45.0	5.5	LOS A
10PMDavisStreet	Thorndon Quay	NorthWest	Lane 2	399	22%	2.92	40.0	45.0	6.1	LOS A
10PMDavisStreet	Davis Street	SouthWest	Lane 1	87	9%	3.93	500.0	30.0	63.9	LOS A
10aPMMooreCrossing	Thorndon Quay	South	Lane 1	33	3%	1.89	50.0	60.0	4.9	LOS A
10aPMMooreCrossing	Thorndon Quay	South	Lane 2	570	35%	2.61	50.0	60.0	5.6	LOS A
10aPMMooreCrossing	Thorndon Quay	North	Lane 1	238	16%	1.43	185.0	60.0	12.5	LOS A
11PMMooreStreet	Thorndon Quay	NorthEast	Lane 1	236	14%	0.59	50.0	45.0	4.6	LOS A
11PMMooreStreet	Moore Street	NorthWest	Lane 1	577	66%	7.08	50.0	30.0	13.1	LOS A
11PMMooreStreet	Thorndon Quay	SouthWest	Lane 1	377	22%	3.70	200.0	45.0	19.7	LOS A
11PMMooreStreet	Thorndon Quay	SouthWest	Lane 2	162	11%	0.02	200.0	45.0	16.0	LOS A
12PMMulgrave/Thondon/Lambton	Lambton Quay	South	Lane 1	31	26%	31.51	500.0	45.0	77.5	LOS C
12PMMulgrave/Thondon/Lambton	Thorndon Quay	SouthEast	Lane 1	415	88%	32.36	500.0	45.0	72.4	LOS C
12PMMulgrave/Thondon/Lambton	Thorndon Quay	NorthWest	Lane 1	29	24%	31.01	20.0	45.0	32.6	LOS C
12PMMulgrave/Thondon/Lambton	Throndon Quay	NorthWest	Lane 2	344	79%	25.78	200.0	45.0	41.8	LOS C
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 1	96	16%	18.57	18.0	45.0	20.0	LOS B
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 2	472	89%	35.62	500.0	45.0	75.6	LOS D
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 3	526	89%	35.64	500.0	45.0	75.6	LOS D
12PMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 4	9	3%	19.58	30.0	45.0	22.0	LOS B

Distance	Travel Time	
5070.0	Seconds	521.2
	Minutes	8.7

Distance	Vehicle Travel Time	
5070.0	Seconds	538.5
	Minutes	9.0

Distance	Travel time - Aotea to Jarden	
3335.0	Seconds	290.6
	Minutes	4.8

Appendix C – Sensitivity Test Outputs

WAKA KOTAHI NZ TRANSPORT AGENCY

greater WELLINGTON REGIONAL COUNCIL Te Pane Matua Taiao

Absolutely Positively Wellington City Council Me Heke Ki Pōneke

www.lgwm.nz

Scenario	Approach Name	Approach Direction	Lane #	Demand Volumes	Deg. Satn	Average Delay (sec)	Lane Length (m)	Posted speed km/hr (across leg)	Time (sec)	Level of Service
1AMJardenMile	Hutt Rd	South	Lane 1	111	9%	5.53	90.0	80.0	9.6	LOS A
1AMJardenMile	Hutt Rd	South	Lane 2	87	9%	21.11	150.0	80.0	27.9	LOS C
1AMJardenMile	Hutt Rd	South	Lane 3	112	127%	322.03	1350.0	80.0	382.8	LOS F
1AMJardenMile	Hutt Rd	South	Lane 4	112	127%	322.03	1300.0	80.0	380.5	LOS F
1AMJardenMile	SH2 Off Ramp	East	Lane 1	285	91%	78.74	220.0	100.0	86.7	LOS E
1AMJardenMile	SH2 Off Ramp	East	Lane 2	354	134%	387.33	370.0	100.0	400.7	LOS F
1AMJardenMile	SH2 Off Ramp	East	Lane 3	350	134%	387.60	235.0	100.0	396.1	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 1	1093	205%	1018.36	80.0	100.0	1021.2	LOS F
1AMJardenMile	Centennial Hwy	North	Lane 2	110	20%	26.93	40.0	100.0	28.4	LOS C
1AMJardenMile	Centennial Hwy	North	Lane 3	592	65%	37.87	500.0	100.0	55.9	LOS D
1AMJardenMile	Centennial Hwy	North	Lane 4	435	74%	37.36	500.0	100.0	55.4	LOS D
1AMJardenMile	Centennial Hwy	North	Lane 5	29	40%	89.01	25.0	100.0	89.9	LOS F
1AMJardenMile	Jarden Mile	West	Lane 1	5	2%	33.04	350.0	50.0	58.2	LOS C
1AMJardenMile	Jarden Mile	West	Lane 2	46	27%	67.46	20.0	50.0	68.9	LOS E
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 1	143	24%	31.36	1300.0	80.0	89.9	LOS C
2AMOnslowRd	Hutt Rd North	NorthEast	Lane 2	1322	140%	418.91	1300.0	80.0	477.4	LOS F
2AMOnslowRd	Onslow Rd	North	Lane 1	469	141%	446.12	500.0	50.0	482.1	LOS F
2AMOnslowRd	Hutt Road South	SouthWest	Lane 1	70	9%	32.34	60.0	80.0	35.0	LOS C
2AMOnslowRd	Hutt Road South	SouthWest	Lane 2	138	136%	378.01	330.0	80.0	392.9	LOS F
2AMOnslowRd	Hutt Road South	SouthWest	Lane 3	146	136%	377.74	330.0	80.0	392.6	LOS F
2aAMRangioracrossing	Hutt Rd North	NorthEast	Lane 1	146		1.10	330.0	60.0	20.9	LOS A
2aAMRangioracrossing	Hutt Rd North	NorthEast	Lane 2	1614		4.10	330.0	60.0	23.9	LOS A
2aAMRangioracrossing	Hutt Road South	SouthWest	Lane 1	263	17%	1.79	40.0	60.0	4.2	LOS A
2aAMRangioracrossing	Hutt Road South	SouthWest	Lane 2	266	17%	1.79	40.0	60.0	4.2	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 1	146	12%	2.25	40.0	60.0	4.6	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 2	1589	62%	2.29	40.0	60.0	4.7	LOS A
3AMRangioraAvenue	Hutt Road	NorthEast	Lane 3	25	2%	4.85	30.0	60.0	6.6	LOS A
3AMRangioraAvenue	Rangiora Avenue	North	Lane 1	50	27%	16.29	300.0	50.0	37.9	LOS C
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 1	263	15%	0.55	620.0	60.0	37.8	LOS A
3AMRangioraAvenue	Hutt Road	SouthWest	Lane 2	266	15%	0.05	620.0	60.0	37.2	LOS A
4AMWestminsterSt	Westminster Street	SouthEast	Lane 1	50	14%	9.54	100.0	60.0	15.5	LOS A
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 1	171	13%	0.71	620.0	60.0	37.9	LOS A
4AMWestminsterSt	Hutt Road (north)	NorthEast	Lane 2	1589	64%	0.45	620.0	60.0	37.6	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 1	250	14%	3.33	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 2	254	14%	3.34	70.0	60.0	7.5	LOS A
4AMWestminsterSt	Hutt Road (south)	SouthWest	Lane 3	25	5%	8.69	20.0	60.0	9.9	LOS A
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 1	143	26%	20.83	70.0	60.0	25.0	LOS C
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 2	1506	141%	422.23	70.0	60.0	426.4	LOS F
5AMKaiwharawharaRd	Hutt Road East	NorthEast	Lane 3	104	37%	56.30	46.0	60.0	59.1	LOS E
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 1	176	25%	24.86	2000.0	50.0	168.9	LOS C
5AMKaiwharawharaRd	Kaiwharawhara Rd- NW	NorthWest	Lane 2	976	143%	449.10	2000.0	50.0	593.1	LOS F
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 1	244	16%	4.72	43.0	60.0	7.3	LOS A
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 2	190	38%	37.95	45.0	60.0	40.6	LOS D
5AMKaiwharawharaRd	Hutt Road West	SouthWest	Lane 3	195	38%	37.91	45.0	60.0	40.6	LOS D
6AMSchoolRd	Hutt Rd	NorthEast	Lane 1	175	15%	2.43	45.0	60.0	5.1	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 2	2457	78%	2.51	45.0	60.0	5.2	LOS A
6AMSchoolRd	Hutt Rd	NorthEast	Lane 3	25	2%	5.02	12.0	60.0	5.7	LOS A
6AMSchoolRd	School Rd	NorthWest	Lane 1	50	24%	15.61	150.0	50.0	26.4	LOS C
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 1	310	30%	4.46	430.0	60.0	30.3	LOS A
6AMSchoolRd	Hutt Rd West	SouthWest	Lane 2	319	30%	4.31	430.0	60.0	30.1	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 1	1374	54%	5.71	430.0	60.0	31.5	LOS A
7AMAoteaQuay	Hutt Road East	NorthEast	Lane 2	1279	41%	1.74	430.0	60.0	27.5	LOS A
7AMAoteaQuay	Aotea Quay	West	Lane 1	186	10%	5.63	500.0	70.0	31.3	LOS A
7AMAoteaQuay	Hutt Road	SouthWest	Lane 1	443	24%	0.03	150.0	45.0	12.0	LOS A
7aAMAQcrossing	Hutt Road East	NorthEast	Lane 1	21		1.40	150.0	60.0	10.4	LOS A
7aAMAQcrossing	Hutt Road East	NorthEast	Lane 2	1334		2.60	150.0	60.0	11.6	LOS A
7aAMAQcrossing	Hutt Road West	SouthWest	Lane 1	478	29%	1.11	280.0	60.0	17.9	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 1	21	2%	3.32	280.0	45.0	25.7	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 2	1309	45%	2.96	280.0	45.0	25.4	LOS A
8AMSarSt	Hutt Rd East	NorthEast	Lane 3	25	2%	6.80	21.0	45.0	8.5	LOS A
8AMSarSt	Sar Street	NorthWest	Lane 1	25	2%	3.56	85.0	40.0	11.2	LOS A
8AMSarSt	Sar Street	NorthWest	Lane 2	25	27%	23.85	40.0	40.0	27.5	LOS C
8AMSarSt	Hutt Rd West	SouthWest	Lane 1	72	4%	3.90	100.0	45.0	11.9	LOS A
8AMSarSt	Hutt Rd West	SouthWest	Lane 2	406	22%	2.85	100.0	45.0	10.8	LOS A
9AMTinakoriRd	Thorndon Quay	South	Lane 1	182	27%	33.13	260.0	45.0	53.9	LOS C
9AMTinakoriRd	Hutt Road	North	Lane 1	21	5%	30.48	100.0	45.0	38.5	LOS C
9AMTinakoriRd	Hutt Road	North	Lane 2	666	88%	53.21	100.0	45.0	61.2	LOS D
9AMTinakoriRd	Hutt Road	North	Lane 3	646	88%	57.27	65.0	45.0	62.5	LOS E
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 1	303	32%	23.75	10.0	45.0	24.6	LOS C
9AMTinakoriRd	Tinakori Rd	SouthWest	Lane 2	5	3%	69.68	500.0	45.0	109.7	LOS E
9aAMChurchCrossing	Thorndon Quay	SouthEast	Lane 1	195	13%	1.23	170.0	60.0	11.4	LOS A
9aAMChurchCrossing	Thorndon Quay	NorthWest	Lane 1	21	2%	0.28	260.0	60.0	15.9	LOS A
9aAMChurchCrossing	Thorndon Quay	NorthWest	Lane 2	671	27%	0.36	260.0	60.0	16.0	LOS A
9bAMThorndonCrossing	Thorndon Quay	SouthEast	Lane 1	195	13%	1.79	300.0	60.0	19.8	LOS A
9bAMThorndonCrossing	Thorndon Quay	NorthWest	Lane 1	21	2%	0.28	170.0	60.0	10.5	LOS A
9bAMThorndonCrossing	Thorndon Quay	NorthWest	Lane 2	671	27%	0.36	170.0	60.0	10.6	LOS A
9cAMCafeCrossing	Thorndon Quay	SouthEast	Lane 1	195	13%	1.89	40.0	60.0	4.3	LOS A
9cAMCafeCrossing	Thorndon Quay	NorthWest	Lane 1	21	2%	0.28	300.0	60.0	18.3	LOS A
9cAMCafeCrossing	Thorndon Quay	NorthWest	Lane 2	671	27%	0.36	300.0	60.0	18.4	LOS A
10AMDavisStreet	Thorndon Quay	South	Lane 1	121	7%	4.80	12.0	45.0	5.8	LOS A
10AMDavisStreet	Thorndon Quay	South	Lane 2	180	10%	3.19	185.0	45.0	18.0	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 1	20	2%	2.20	40.0	45.0	5.4	LOS A
10AMDavisStreet	Thorndon Quay	NorthWest	Lane 2	686	40%	2.66	40.0	45.0	5.9	LOS A
10AMDavisStreet	Davis Street	SouthWest	Lane 1	60	6%	3.46	500.0	30.0	63.5	LOS A
10aAMMooreCrossing	Thorndon Quay (south)	South	Lane 1	298	19%	2.19	50.0	60.0	5.2	LOS A
10aAMMooreCrossing	Thorndon Quay (north)	North	Lane 1	20	2%	1.87	185.0	60.0	13.0	LOS A
10aAMMooreCrossing	Thorndon Quay (north)	North	Lane 2	699	30%	2.45	185.0	60.0	13.6	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 1	20	2%	0.00	50.0	45.0	4.0	LOS A
11AMMooreStreet	Thorndon Quay	NorthEast	Lane 2	696	30%	1.07	50.0	45.0	5.1	LOS A
11AMMooreStreet	Moore Street	NorthWest	Lane 1	126	21%	6.45	50.0	30.0	12.5	LOS A
11AMMooreStreet	Thorndon Quay	SouthWest	Lane 1	181	10%	4.02	20.0	45.0	5.6	LOS A
11AMMooreStreet	Thorndon Quay	SouthWest	Lane 2	215	12%	0.02	200.0	45.0	16.0	LOS A
12AMMulgrave/Thondon/Lambton	Lambton Quay	South	Lane 1	18	24%	51.46	500.0	45.0	91.5	LOS D
12AMMulgrave/Thondon/Lambton	Thorndon Quay	SouthEast	Lane 1	293	45%	25.22	500.0	45.0	65.2	LOS C
12AMMulgrave/Thondon/Lambton	Throndon Quay	NorthWest	Lane 1	14	19%	50.62	200.0	45.0	66.6	LOS D
12AMMulgrave/Thondon/Lambton	Throndon Quay	NorthWest	Lane 2	654	90%	48.08	200.0	45.0	64.1	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 1	84	12%	22.48	18.0	45.0	23.9	LOS C
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 2	568	89%	43.34	500.0	45.0	83.3	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 3	622	89%	43.52	500.0	45.0	83.5	LOS D
12AMMulgrave/Thondon/Lambton	Mulgrave Street	SouthWest	Lane 4	10	3%	23.53	30.0	45.0	25.9	LOS C

Distance	Bus Travel Time	
5070.0	Seconds	451.6
	Minutes	7.5

Distance	Vehicle travel Time	
5070.0	Seconds	1290.3
	Minutes	21.5

Distance	Travel time - Aotea to Jarden	
3335.0	Seconds	243.4
	Minutes	4.1