

13 Transport

Overview

The purpose of this Chapter is to provide a summary of the transportation effects of the Project.

The existing environment comprises the primary urban road network on the edge of Wellington City centre that provides access to the eastern suburbs of Wellington and the Airport. It is subject to congestion, delay and journey time variability, particularly during peak periods and at weekends. The road network in the Project Area also suffers from a high crash record (305 crashes over the period 2007 – 2012).

Importantly the Project Area is at the interface between a major east west traffic corridor and a major north-south corridor which also provides a critical public transport function. It is that conflict between north south and east west movements that creates the congestion problem. In terms of transport efficiency without the Project and fully allowing for planned improvements to bus services and a 5% increase in the use of public transport, these problems are predicted to get worse as travel demand grows for all modes and changes in land use occur. This growth ahead of the proposed Project would mean that congestion would become even more significant and walking, cycling and public transport would also have reduced levels of service.

The solution to this conflict, is to partially grade separate east west traffic from north south traffic, resulting in the Project providing vital improvements to the strategic and local transport network. By separating conflicting north-south and east-west movements the project will free up SH1 west bound strategic highway movements and better focus arterial traffic to SH1. This will in turn reduce traffic flows along key links (notably Dufferin, Rugby and Sussex Streets) so as to improve north-south movements and provide the opportunity for significant improvements to public transport. This is consistent with key priorities in the Ngauranga to Wellington Airport Corridor Plan (N2ACP).

With the Project in place the consequence is that journey times will be reduced on a number of key routes, with SH1 westbound seeing the biggest reduction in journey times and small improvements also occurring on eastbound routes. Likewise journey times for passenger transport are also improved, with up to a 41% reduction for southbound buses travelling from Kent Terrace to Adelaide Road. Queue reductions are also expected within the Project Area, with significant reductions occurring at the Vivian Street intersection with Kent Terrace, Paterson Street intersection with Dufferin Street, and Rugby Street intersection with Adelaide Road.

In addition to the benefits for public transport, there are significant proposed improvements to the active modes of walking and cycling. For example:

improvements to the existing walking and cycling pathways and the introduction of two new segregated walking and cyclist connections through the Project Area are proposed. These will improve efficiency and safety for cyclists and pedestrians. Improvements at Dufferin Street will improve access (pick up and drop off, and bus stop facilities) for schools and for Government House. Access improvements will be provided for users of the Basin Reserve, and for walking and cycling commuters travelling through the Basin Reserve, as a result of the northern gateway building and the associated entryway changes.

From a transport perspective the effects of the Project are predominantly positive but there will also be a small number of negative transportation effects. Egress from Mount Victoria onto SH1 via Hania and Ellice Streets is adjusted to make these routes less desirable, albeit much safer than existing and with added benefits to cyclists and pedestrians. There are also reductions in on street car parking availability on roads around the Basin Reserve and on Pirie Street. A peak hour clearways scheme will operate on Vivian Street between Tory Street and Cambridge Terrace between 7am -9am and 4pm -6pm. While this clearway will help to improve eastbound journey times through the Project Area, it has the negative effect of reducing car parking while it is in operation and links into the Memorial Park being constructed.

The Project has also been 'future-proofed' by a design that accommodates the future duplication of the Mount Victoria Tunnel.

Overall, it is considered that the Project will result in significant transportation improvements and benefits across all transportation modes. Importantly the proposed improvements will serve the Airport and the Region (and continued growth) and facilitate WCC's plans to intensify and accommodate development on Adelaide Road, and in Newtown, Kilbirnie and Miramar.

13.1 Introduction

This Chapter summarises the transportation effects of the Project and is based on Technical Report 4: *Assessment of Traffic and Transportation Effects* (TR4) in Volume 3 of these documents and the draft CTMP in Volume 4 of these documents.

TR4 establishes a baseline transport environment which is developed by considering the existing transport environment and how that might change over time at 2021 and then at 2031. The baseline establishes what will happen without the Project and is described for transport purposes as the 'do minimum' scenario. The project is then inserted into this baseline and transport performance of the network compared in order to understand its effects on the transport environment.

This transport assessment considers all the key users of transport network and how population and land use changes will affect the network in the future. In terms of

the current programme it is expected that the Wellington Northern Corridor RoNS will be completed by 2031. The assessment has considered the ability of the Project to support traffic volumes on the completion of that work within the 2031 timeframe.

The assessment is informed by a range of national and international guidance documents and takes account of national, regional and local legislation, statutory documents and policies. Particularly significant policy documents are the Wellington Urban Development Strategy (UDS) and the Ngauranga to Airport Corridor Plan (N2ACP).

13.2 The Baseline Transport Environment

In order to assess the transportation effects it is important to outline the existing demographics, land uses that can influence travel demand, existing transport infrastructure and the current and future transport patterns.

13.2.1 Demographics

Regional demographics have a range of implications for transportation in the Project Area. Overall, the Wellington region is expected to grow in population from 488,000 in 2011 to between 475,000 and 591,000 in 2021. The population of Wellington City grew by 27% in the period of 1996 to 2011 (estimated) to a total of approximately 200,000. By 2031 the medium growth scenario predicts a population of approximately 240,000 and 230,000 by 2021.

Key factors in the existing demographics that influence the Project are the very high concentration of employment in the CBD, significant residential populations in the City's southern and eastern suburbs, Wellington Airport to the east along with key film related industries, Wellington Regional Hospital to the south and the number of educational activities concentrated in this area. These factors mean that the Project Area is a key part of the route for journeys within Wellington City and its southern and eastern communities to and from employment, recreation or education in Wellington.

In the immediate vicinity of the Project Area¹¹⁴ the population is characterised by higher proportions of 15 – 29 year olds and students than other parts of the city, and lower levels of access to vehicles. These factors mean that this population will generally have a higher demand for active modes and passenger transport. Similarly, travel to work data suggests that people

¹¹⁴ In the area covered by census area units Mount Cook – Wallace Street, Mount Victoria West, Adelaide and Willis Street – Cambridge Terrace.

immediately to the south of the Project Area, who need to travel through the Project Area to the CBD, are high users of active modes and passenger transport.

13.2.2 Land use change

The pattern of growth in Wellington City is influenced by the UDS and the subsequent implementation of the Wellington City District Plan (WCDP). The UDS seeks to focus future population and housing growth in a 'growth spine', which comprises the CBD and other growth nodes from Johnsonville to Miramar. Adelaide Road, just to the south of the Project Area has been identified as one such growth node, as has Newtown (further south) and Kilbirnie and Miramar (to the east). The District Plan has been amended to reflect this growth spine concept particularly in Adelaide Road adjoining the Project Area.

Population growth in these nodes will increase the demand for movement, using a range of transport modes, through the Project Area. In order for growth at these nodes to be realised and for growth to continue in the CBD, transport infrastructure, including that in the Project Area, will need to be significantly improved.

In particular, transport infrastructure improvements are needed to assist land use change by delivering an increase in passenger transport services and thereby enable much higher levels of public transport mobility than exists today. The Project will provide such infrastructure improvements, by separating north-south and east-west movements.

Grade separation is necessary to achieve improvements to highway traffic and for passenger transport to operate more effectively. In doing so the project will also enable more road space to be allocated to buses and cycling. In addition, the Project will compliment land use change proposed through the UDS by providing much improved access for all modes to strategic destinations such as the airport, Wellington Regional Hospital and the City's southern and eastern suburbs.

13.2.2.1 Land use in and around the Project Area

The Project Area and its immediate surroundings comprise a mix of land uses including residential, commercial, institutional and significant community and recreation facilities. The different activities have implications for transportation needs in the area. These include:

- intermittent, yet high attendance games and events at the Basin Reserve. Given the limited on-site car parking at the Basin Reserve, the audience for these events largely arrives on foot [recreation];
- the three schools located in the south east portion of the Project Area and another two that along with Massey University are just outside the Project Area. These educational uses generate high demand for passenger transport

and pedestrian facilities and/or services and facilities, and involve peak drop-off periods [community];

- Government House, which can generate the need for formal processions through the Project Area to Parliament [institutional / community]; and
- Wellington Regional Hospital that requires safe and reliable access to this critical facility [community].

The educational facilities within or immediately adjoining the Project Area are St Mark's Church School, Wellington College, Wellington East Girls College, Mount Cook School and Wellington High School with Massey University adjoining Wellington High. These facilities have an important influence on bus, pedestrian and private vehicle movements in the Project Area. For example, pedestrian activity in the Project Area has distinct peaks between 3 and 4 pm, corresponding with the end of the school day. These peaks are particularly evident at the Ellice/Paterson and Ellice/Dufferin intersections, where pedestrians between 3 and 4 pm account for between 25-30% of daily totals.

The Mount Victoria residential area is immediately to the east of the Project Area and the Hania / Ellice intersection provides one access point to it. Traffic attempting to exit from this area onto the roads circling the Basin Reserve is confronted with a complicated and unclear intersection. For those wishing to exit the Hania / Ellice intersection and head south along Adelaide Road, there is a need to cross two lanes of State highway traffic. This situation means that users of the intersection have been assessed to have delays of up to 12 minutes at peak times.

Another important factor is access to the Hospital located on Riddiford Street to the south of the Project Area. Ambulances and other hospital traffic are often affected by congestion and try to avoid this area because of the uncertainty associated with it.

13.2.3 Existing Transport Infrastructure

13.2.3.1 Road network and Layout

A key feature of the Project Area is that it has a dual State highway / local road function. It needs to accommodate general traffic, a north south public transport function while also catering for pedestrians and cyclists. This is reflected in the current network and layout. These modes are further analysed in this section.

Eastbound

For SH1 eastbound the Project Area starts at the eastern side of the intersection of Tory Street with Vivian Street leading up to Kent and Cambridge Terraces. Kent and Cambridge Terraces serve as an arterial road for Wellington City, providing a key section in the City's passenger transport spine¹¹⁵, with Kent Terrace south of Vivian

¹¹⁵ As defined in the Ngauranga to Wellington Airport Corridor Plan.

Street also being part of the State highway. Three lanes operate on Kent Terrace in the southbound direction, with parallel parking on both sides. Between 4 and 6 pm the eastern parking lane operates as a clearway for a bus lane and parking is prohibited. At the Basin Reserve end of Kent Terrace there is a signalised pedestrian crossing, with priority signals for buses.

Turning east into Ellice Street, the road continues to serve a dual State highway / local arterial function. Importantly this short stretch of the road provides access to the residential area of Mount Victoria, Wellington East Girls College and local churches. The carriageway contains three lanes, with parking on the eastern side. While footpaths are located on both sides of the road through this section, the pedestrian journey on the left side of the road requires crossing uncontrolled intersections.

Into Dufferin Street the road continues its dual State highway/local arterial function. The three lanes on Ellice Street increase to four, with two of these continuing westbound into Paterson Street and on to the Mount Victoria Tunnel and the other two continuing around the Basin Reserve. The Dufferin/Paterson intersection has signalised pedestrian crossing facilities over both Paterson Street (north-south) and Dufferin Street (east-west). No on-street parking is provided in this stretch east of Paterson Street to the Mount Victoria Tunnel entrance.

Westbound

Westbound the Project Area starts at the western extent of the Mount Victoria Tunnel and heads down Paterson Street to its intersection with Dufferin Street. Paterson Street operates as two lanes in both directions with footpaths on either side. The stretch of the northern footpath/pavement from the Mount Victoria Tunnel to Brougham Street doubles as a cycleway.

Vehicles heading westbound down Paterson Street turn onto Dufferin Street, which has a dual State highway / local arterial function. There are footpaths located on either side of Dufferin Street, with an access road along the western side for St Mark's School, Wellington College and Government House. Along this access road there is parallel parking provision and a zebra crossing linking across to the school bus pick up and drop off facility.

Dufferin Street turns east into Rugby Street, which has a dual State highway / local arterial function. Between Dufferin Street and Adelaide Road, Rugby Street has four lanes. Two lanes go straight on (towards Sussex Street), the third splits to provide a further straight on lane as well as access to Adelaide Road, and the fourth lane provides exclusive access to Adelaide Road and on to Newtown. At the Adelaide/Rugby intersection there are crossing facilities, providing for both pedestrians and cyclists.

Between Dufferin Street and Adelaide Road there is parallel parking and footpaths located on both sides of Rugby Street.

West of the Adelaide/Rugby Road intersection parallel parking is only provided on the northern side of Rugby Street. Footpaths continue on both sides. However, on the southern side pedestrians are required to make uncontrolled crossings at the Rugby/Sussex intersection.

Turning north into Sussex Street the road continues its dual function as State highway and local road. Along Sussex Street there are three lanes, footpaths on both sides and parallel parking provision on the western side only. At the Sussex Street/Buckle Street intersection the three lanes are designated left only, left and right, and right only. There are no formalised pedestrian crossings along Sussex Street although one has been provided across the entrance to the realigned Buckle Street while the NWM Project is under construction.

Turning into Buckle Street (from Sussex Street) SH1 operates as two lanes and will enter the undergrounded portion of Buckle Street when it is completed. Turning east (around the Basin Reserve) into Buckle Street and then left into Cambridge Terrace the road operates as a local arterial also with two lanes. The carriageway on Cambridge Terrace widens into three lanes opposite the Mitsubishi Motors building, with parallel parking and footpaths on both sides. A single lane is also provided across the front of the Basin Reserve (CS Dempster Gate) entrance for eastbound vehicles from Sussex Street.

13.2.3.2 Passenger transport facilities

The road network through the Project Area is a key part of the City's passenger transport spine. Coupled with the anticipated future intensification along Adelaide Road, and the associated increased passenger transport demand, this is a critical factor that needs to be addressed in the design of the Project.

Figure 13-1 shows the locations of the bus stops in the vicinity of the Basin Reserve. It also shows the distance between each stop. All bus stops except those immediately north and south of the Basin Reserve are closer than the best practice spacing of 400m between stops.

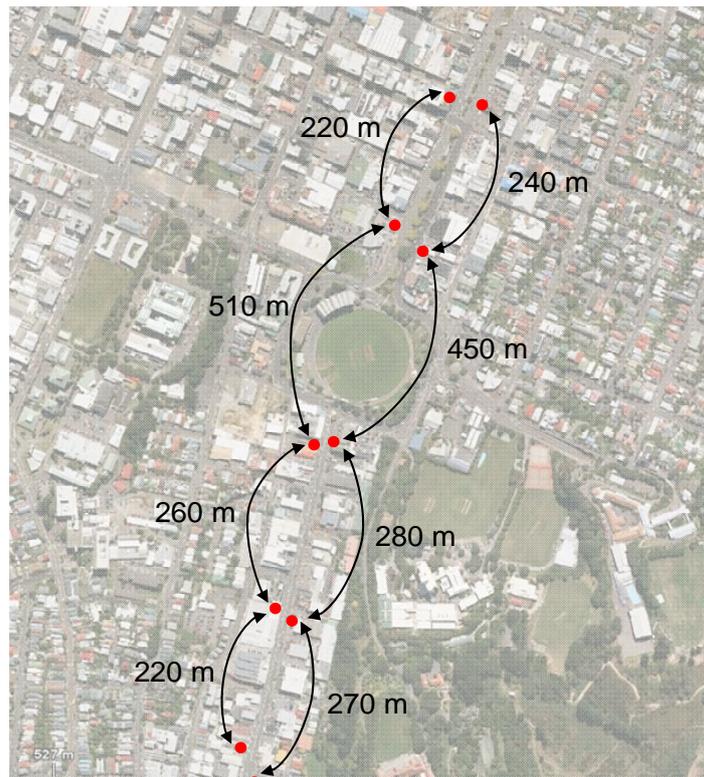


Figure 13-1 Bus Stop Locations

The bus stops either side of Adelaide Road immediately to the south of the Basin Reserve are an important component of the passenger transport facilities for schools (particularly Wellington College, Wellington High School and Wellington East Girls) within the Project Area.

Bus lanes are currently located on Adelaide Road northbound in the AM peak and on Kent Terrace, southbound in the PM peak. A bus priority signal operates at the Kent Terrace pedestrian crossing facility. WCC has plans to expand the bus priority facilities in areas adjoining the Project Area including Adelaide Road southbound and passenger transport improvements along the Railway Station to Kilbirnie spine are being investigated as part of the Public Transport Spine Study. The bus lane improvements plans have been incorporated into do minimum modelling used for this assessment.

13.2.3.3 Pedestrian and cycle facilities

Pedestrian footpaths are located on both sides of all roads around the Basin Reserve. Pedestrians are also able to use the path through the Basin Reserve during daylight hours. Crossing facilities are located at the Adelaide/Rugby intersection, Paterson/Dufferin intersection and on Kent Terrace, just north of the Kent/Ellice

corner. No crossing facilities are located on the western side of the Basin Reserve from Adelaide Road to Tory Street or Cambridge Terrace.

The only dedicated on-road cycle lane is a short stretch, south bound, around the Rugby/Adelaide Road corner. Elsewhere cyclists can share paths with pedestrians through the Mount Victoria Tunnel, within the Basin Reserve and along the north side of Buckle Street. The only signalised cycle crossings are at the Adelaide/Rugby intersection.

13.2.4 Current and Future Transport Patterns

13.2.4.1 Modelling and Assumptions

A hierarchy of models has been used to inform the assessment of the Project. This approach conforms with industry best practice. The relationship of the models used is illustrated in Table 13-2. The different models provide information at different urban scales and at different levels of detail. Each of the models is described in detail in section 3.2 and Appendix 4.1 of Technical Report 4: *Assessment of Traffic and Transportation Effects* in Volume 3 of the Documents.

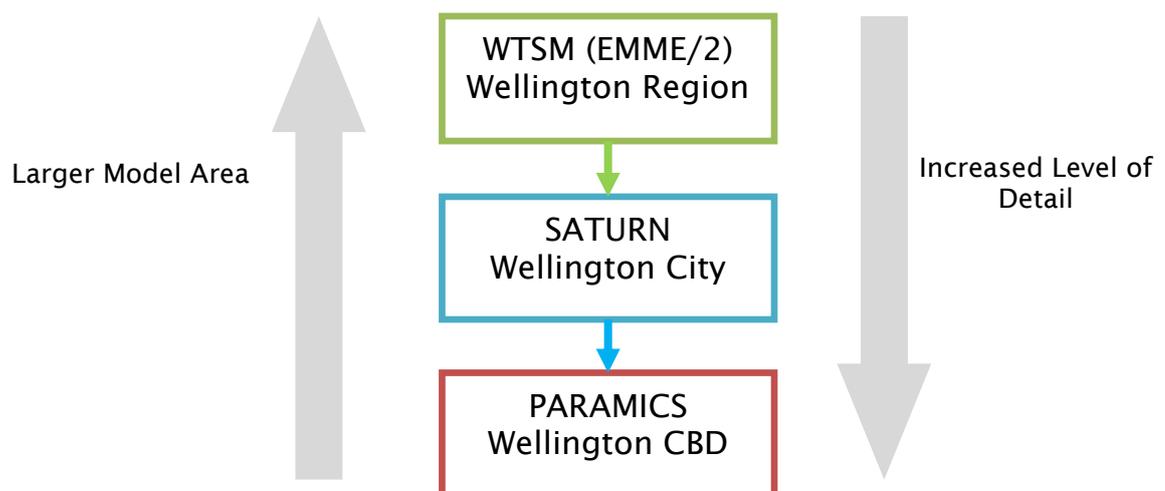


Figure 13-2 Model Relationship

At the highest level in the region the Wellington Regional Transport Strategy Model (WTSM) covers the whole Wellington Region. WTSM has enabled the Project team to forecast the number of people that will be travelling by car or by public transport and it takes into account key land use and population growth data. The model also allowed the Project team to understand at a high level where transport movements within the city will begin and end (trip matrices). These trip matrices were then used as the basis for more detailed trip matrices used within the SATURN and Paramics

models. WTSM is also particularly useful as it can forecast the proportion of trips made using non-motorised transport (i.e. on foot).

The Wellington SATURN model 2006 covers most of the city. It is used to assign the WTSM traffic demand onto the road network and assess route choice. It is a traffic model used to assess re-routing associated with congestion and infrastructure changes. The SATURN model was developed and validated to a base year of 2006¹¹⁶ before the inner city bypass was complete. The SATURN model has subsequently been updated to reflect the current (2009) road network including the inner city bypass. Demands from the WTSM are taken to predict forecast year changes in traffic for 2021 and 2031.

The Wellington s-Paramics model 2009 covers the area between the CBD and Ruahine Street. S-Paramics is a micro-simulation tool that represents individual vehicle movements. The level of detail possible within s-Paramics means that it is well suited for traffic design and assessment. It is very good at modelling the operation of signalised intersections, bus priority, and pedestrian crossings. It is therefore the primary traffic engineering design tool for the detailed analysis. A weekend model has also been built to better understand the benefits of the Project at weekends.

In addition to the models shown above Sidra modelling was used to model and assess the performance of individual intersections. Sidra is a good tool for comparing alternative intersection layouts and identifying an optimised layout for testing as part of the wider network using SATURN and/or Paramics.

To enable the assessment of the Project's transport effects various assumptions have had to be made. These assumptions cover demographic trends relating to population, households and employment, land use trends and future transportation projects.

In relation to future transportation projects a 'do minimum' scenario has been developed. The do-minimum scenario incorporates:

- the minimum investment needed in the study corridor to maintain operations; and
- a number of other transport initiatives planned outside of the Project Area on the State highway network and local roads that are supported by key agencies including the NZTA, GWRC and WCC.

It is of note that different WTSM matrices have been used in the 2021 Do Minimum model compared to the 2009 Base Model. The difference between the 2009 and 2021 matrices have been incorporated to accommodate known changes to the network as well as changes in land use and population/ employment. Changes have included: bus lanes on Manners Mall, Courtenay Place, Adelaide Road and Kent/Cambridge Terraces; signals at Hanson/John Street, Riddiford/Hospital, Constable/Owen, Mulgrave/Aitken; as well as speed reductions on Tory and Cuba

¹¹⁶ 2006 Wellington City Council Traffic Model -Validation and Forecasting Report, Opus International Consultants Limited, 2009. A peer review of the base model has been completed by Tim Kelly.

Street. These changes to the matrices affect the forecasted traffic volumes and provide a more accurate basis for understanding transport and for assessing potential effects.

A detailed description of the assumptions used in the assessment and of the do minimum scenario is included in section 3.3 of Technical Report 4: Assessment of Traffic and Transportation Effects.

13.2.4.2 Modelled traffic flows

Three sources of data have been considered to help assess traffic levels on the road network within and immediately adjoining the Project Area. These are:

- NZTA traffic counts from 2007 to 2011;
- Traffic counts collected from around the Basin Reserve in February and March 2009; and,
- Modelled traffic flows for a base year of 2009 and in 2021 (using a 'do minimum' scenario).

Figure 13-3 below summarises the results from the 2007 to 2011 traffic counts.

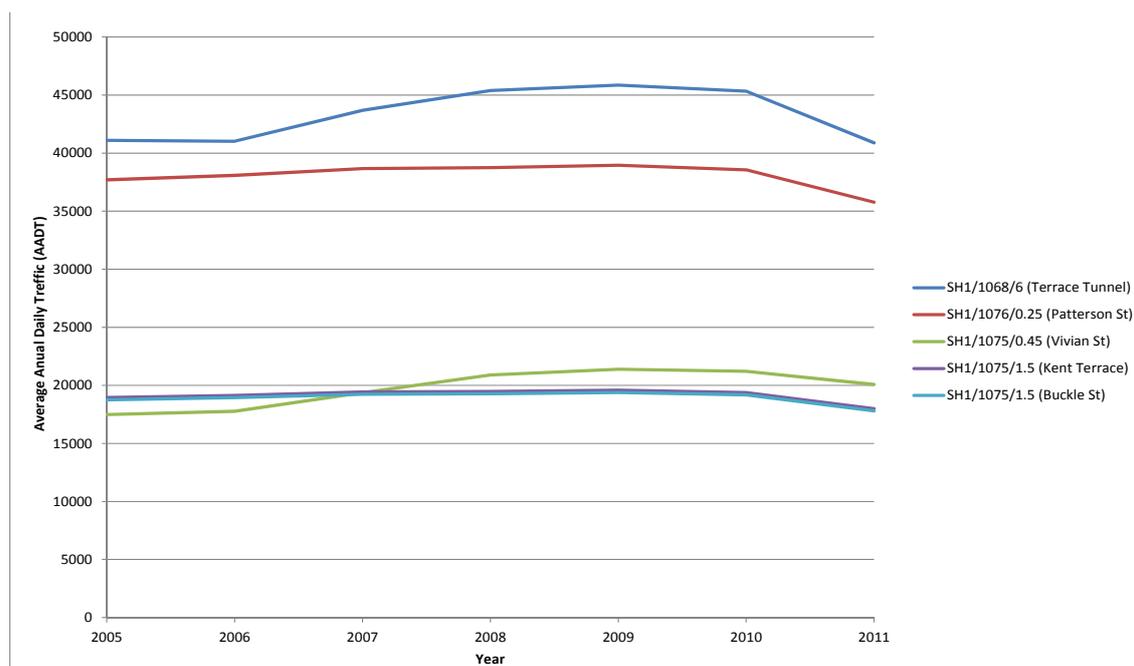


Figure 13-3 Annual Average Daily Traffic 2007-2011

Notes:

Data for Terrace Tunnel and Paterson Street are two-way traffic volumes.

Between Dec 2010 and March 2011 the Terrace and Mount Victoria tunnels were closed at night time for refurbishment purposes, and traffic was redirected onto alternative routes. This resulted in the decline of AADT for 2011.

The 2009 traffic counts provide a snapshot of travel patterns on the date that the counts were made. They provide data covering the number of cars and heavy commercial vehicles (HCV) at different points within the Project Area for the AM peak, inter-peak and PM peak periods. The count data show that the HCV levels are low when compared with other parts of the State highway network. This is explainable because of the general levels of congestion, the narrow lanes through the Mount Victoria Tunnel and the related restriction on hazardous goods travel through the Tunnel.

Modelling of the existing situation compared baseline 2009 daily traffic flows with those that can be expected in 2021 based on a 'do minimum' scenario. The results from the modelling are shown in Table 13-2 and Table 13-2 below.

Table 13-1 2009 and 2021 Do Minimum SH1 Eastbound Daily Flows (Vehicles per Day)

Location	2009 Base	2021 Do-Min	Relative Change (%)
Kent Terrace	25,200	28,900	3,700 (15%)
Dufferin Street	27,700	30,500	2,800 (10%)
Paterson Street	18,500	18,700	200 (1%)

Table 13-2 2009 and 2021 Do Minimum SH1 Westbound Daily Flows (Vehicles per Day)

Location	2009 Base	2021 Do-Min	Relative Change (%)
Paterson Street	19,300	19,600	300 (2%)
Rugby Street east	28,000	31,200	3,200 (11%)
Rugby Street (through Adelaide Road intersection)	20,400	21,100	700 (3%)
Sussex Street	30,600	33,000	2,400 (8%)
Buckle Street	21,000	21,200	200 (1%)

Table 13-3 2009 and 2021 Daily Flows on Selected Roads within Road Network (Vehicles per Day)

Location	2009 Base	2021 Do-Min	Relative Change (%)
Adelaide Road NB	11,200	13,300	2,100 (19%)
Adelaide Road SB	7,600	10,100	2,500 (33%)
Cambridge Terrace	10,900	11,500	600 (6%)
Taranaki Street, two way flow (ICB - Vivian)	17,500	20,100	2,600 (15%)
Tasman Street, two way flow (Rugby - Buckle)	3,400	1,600	-1,800 (-53%)
Tory Street, two way flow (Buckle - Vivian)	8,200	5,700	-2,500 (-30%)

For eastbound traffic the modelling indicates that traffic flows will increase between 10 – 15% up to Paterson Street, with a 1% increase on Paterson Street by 2021. There is only a slight increase on Paterson Street because the Mount Victoria Tunnel is already (at 2009) operating at capacity. This constraint leads to a redistribution of traffic flows (for example to Adelaide Road and Oriental Parade) as people take alternative routes.

For the westbound traffic the modelling predicts a 2% increase in traffic flows on Paterson Street and a 3 – 11% increase on Rugby Street east, Rugby Street through the Adelaide Road intersection and Sussex Street by 2021. There is only a 1 % increase on Buckle Street by 2021. This increase on Buckle Street is only slight because of the natural ‘throttle’ on the network of Mount Victoria Tunnel (although with duplication of the tunnel this throttle will be removed) and the Dufferin/Paterson Street intersection, but also because the Buckle Street underpass removes access to and from Tory Street and also removes the direct left turn (south) into Taranaki Street from the Buckle Street underpass. These changes influence traffic flows on the network.

Modelling data for the road network adjoining the Project Area indicates that traffic flows are expected to increase significantly on Adelaide Road and to a lesser extent on Cambridge Terrace and Taranaki Street, while flows on Tasman and Tory Streets are expected to decline as a result of the Memorial Park Underpass Project.

13.2.4.3 'Do minimum' network performance

Three key factors have been considered to help assess the expected performance of the Project Area road network without the Project. The factors are overall network statistics, journey times and intersection queue length.

Overall network statistics

The overall network statistics show that the total travel time and delay increases significantly between 2009 and 2021 and further in 2031 (in the do minimum scenarios). Without the Project the increase in total delay time is up to 74% and travel time is up to 35% between 2009 and 2031.

These increases in journey time delays occur despite significant transport improvements that are included in the do minimum scenario such as the Mount Victoria and Terrace Tunnel duplication and the ICB improvements (see Part A, Chapter 1 of the AEE for more detail). These results emphasise the deterioration of the network in future years without the Project despite significant planned investment.

Journey times

2009 week day (recorded in 2009) and 2011 weekend (recorded in 2011) journey times for the SH are shown on Figure 13-4. The figure shows a median journey variability between Willis Street and Evans Bay Parade of between 387 to 932 seconds in a westbound direction and 391 to 784 seconds in an eastbound direction. In other words the same journey taken at the same time of day can vary by a factor of between 2 and 3. This significant variability highlights the level of congestion during peak periods and the difficulty for road users to plan travel times, which is particularly important for those travelling between the CBD and airport.

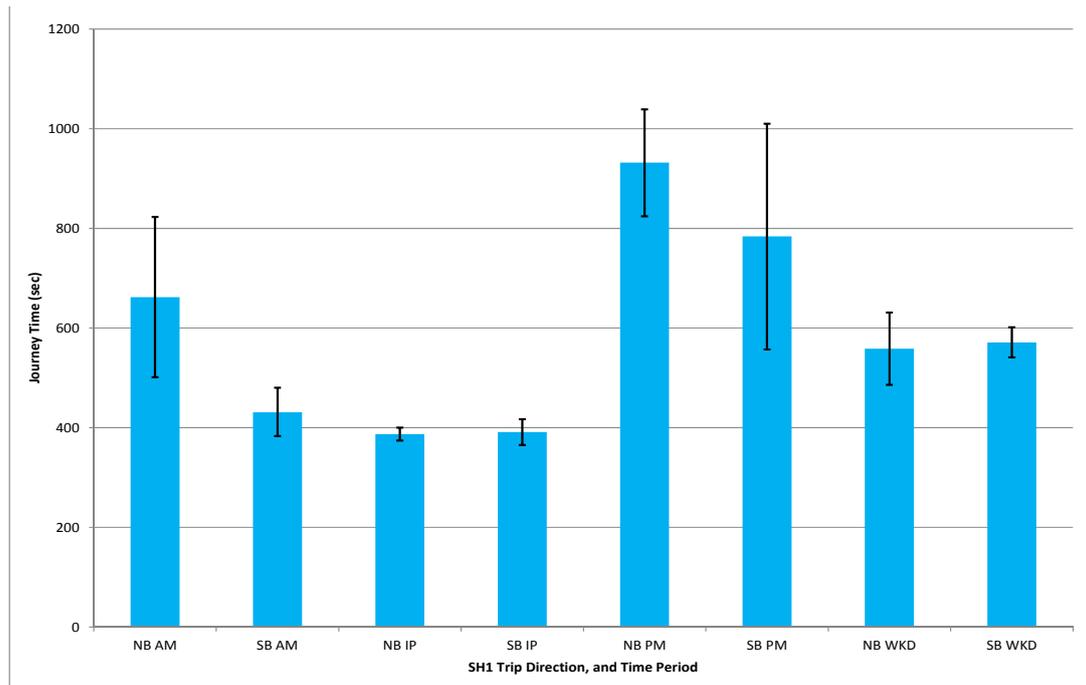


Figure 13-4 SH1 Journey Times (Willis Street -- Evans Bay Parade) Existing Situation, with Variability Bars

At the Project Area level the tables below show how journey times are expected to change by 2021 around the Basin Reserve only in the Do Minimum scenario (without Project). East and westbound State highway journey times are shown in Figure 13-5 and north and south local road movements are shown in Figure 13-6 below.

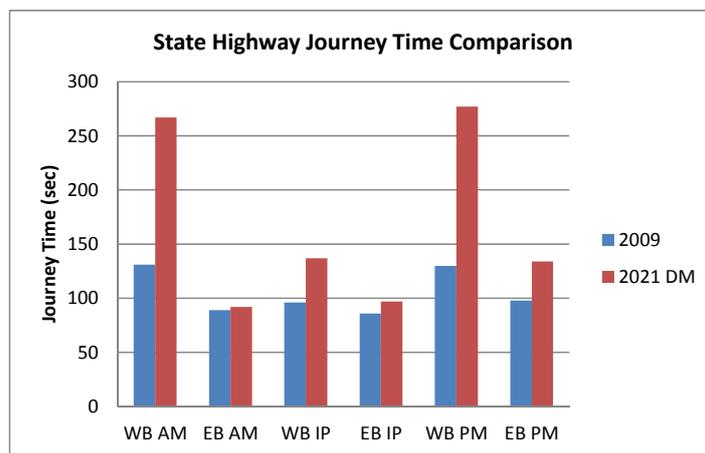


Figure 13-5 State highway journey time comparison, 2009 vs 2021¹¹⁷

¹¹⁷ Eastbound SH1 (Taranaki – Paterson), Westbound SH1 (Mount Victoria Tunnel – Taranaki), Northbound Adelaide to Cambridge (Douglas – pedestrian crossing), Southbound Kent to Adelaide (pedestrian crossing – Girton)

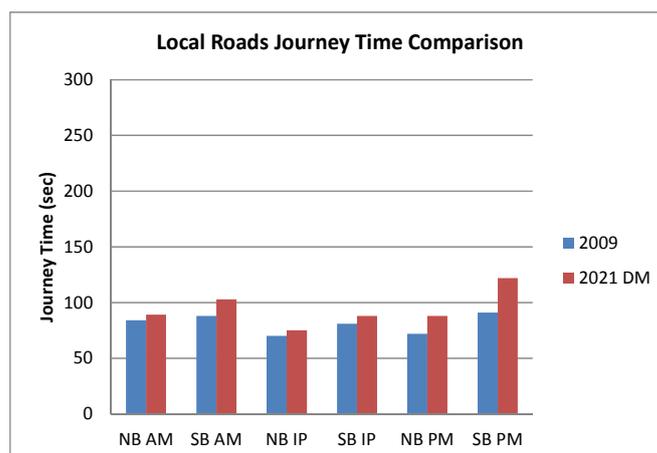


Figure 13-6 Local network journey time comparison, 2009 vs 2021¹¹⁸

The figures above show that journey times around the Basin on westbound SH1 in the peaks in particular are expected to double. Journey times across the network generally increase as compared with current.

Intersection queue lengths

Intersection queue lengths in 2021, under the do minimum scenario, have also been modelled. Modelling shows that the two key intersections of (1) Dufferin/Paterson and (2) Adelaide/Rugby degrade further when compared to 2009. The Dufferin/Paterson intersection faces high demand from conflicting westbound SH1 traffic and southbound local traffic. This intersection operates as a bottleneck limiting flows to the Adelaide/Rugby intersection. Any improvements in the efficiency of the Dufferin/Paterson intersection will only result in greater congestion at the Adelaide/Rugby intersection.

13.2.4.4 Pedestrians and Cyclists

Pedestrian and cyclist flows have been estimated based on data from a 2009 Pedestrian/Cyclist count and a 2012 pedestrian interception survey. During the 2009 count the highest number of pedestrians occurred at the Adelaide/Rugby intersection (2114) and the highest number of cyclists occurred at the corner of Cambridge Terrace and Buckle Street (397).

These numbers account for significant volumes of pedestrian movements to/from the south and across Adelaide Road at the Adelaide/Rugby intersection. Although

¹¹⁸ Eastbound SH1 (Taranaki – Paterson), Westbound SH1 (Mount Victoria Tunnel – Taranaki), Northbound Adelaide to Cambridge (Douglas – pedestrian crossing), Southbound Kent to Adelaide (pedestrian crossing – Girton)

cyclist numbers are much lower than pedestrian numbers they highlight the importance of the north-south corridor between Adelaide Road and Kent and Cambridge Terraces for cyclists.

The pedestrian interception survey had 1129 responses with information collected including the journeys' origin street and suburb, destination street and suburb, route used, number of times a week the journey was made, and age and gender of the pedestrian. Data from the 2012 pedestrian interception survey infers that the strongest desire line is north/south, either through the Basin Reserve or around the footpath network on its eastern side. Reflecting the lack of crossing facilities, only limited use is made of the footpaths on the western side of the Basin Reserve. The data also shows that the Adelaide/Rugby and Paterson/Dufferin intersections are also high use areas for pedestrians, much of which is related to school students and associated parent movements.

13.2.4.5 Passenger transport usage

There are currently seven public bus services that travel through the Project Area, two of which serve strategic city routes (CBD-Island Bay and Lyall Bay-Karori). In addition, numerous school bus services operate in association with Wellington East Girls', Wellington College and St Mark's schools.

In 2009 a range of survey information was collected in relation to the public bus services to enable the assessment of current usage and speeds in the vicinity of the Project Area. The data collected shows that the stops just south of the Basin Reserve on Adelaide Road experience the highest levels of boarding and alighting. This relates to the proximity of various schools as well as the fact that the stop represents a fare boundary.

As would be expected, the survey data clearly shows higher rates of public transport occupancy at peak periods. The highest occupancy levels occur in the Friday peaks and the most crowded services are the two services on strategic city routes. A feature of the occupancy data is the consistency of passenger levels across the Project Area. This indicates that, despite the presence of the schools within the Project Area, most public transport travel is through the Project Area, rather than it being a destination or origin for journeys.

The data collected on bus speeds shows that in both directions (north and south), speeds decline with proximity to the CBD. Services heading northbound move at the quickest speed along Adelaide Road, aided in the AM peak by the bus priority lane, and slowest along Cambridge Terrace, where delays at the intersection with Vivian Street are likely to be a factor. Southbound services are the slowest along Kent Terrace. This occurs even in the PM peak despite the bus priority lane, and reflects the level of congestion at the Pirie Street intersection and at the Dufferin/Paterson intersection.

13.2.4.6 Crash Record

An analysis of the current crash and safety record of the Project Area has been made using data from the NZTA Crash Analysis System for period from April 2007 to March 2012.

In this period 305 accidents have been reported within the Project Area. Of these 250 were non-injury, 48 minor injury, 5 involved serious injury and 1 involved a fatality. Rear end/obstruction type crashes accounted for 43% of the reported accidents. These accidents are characteristics of highly congested areas where merging and queuing is present. The data indicates that environmental factors are not a major influence on the crash record within the Project Area, as 63% of crashes have occurred in the day time and 72 % when its dry.

Eighteen of the reported crashes involved pedestrians and cyclists. The Adelaide/Rugby intersection is a 'hotspot' with four of the accidents occurring at this point.

Overall although there is a high crash rate the severity of such crashes is usually low as the crash record indicates that serious injury crashes are unlikely on the roads around the Basin Reserve given the low speeds and congested nature of the area. Furthermore the environmental conditions are not usually a factor in crashes and accidents tend to occur at intersections (rather than mid-block).

13.2.4.7 Car Parking

The current availability and use of car parking within the Project Area is summarised in Table 13-4 . This is based on parking survey information gathered in April 2012 and November 2012¹¹⁹.

Table 13-4 Existing Parking Spaces*

Location	Parks	Utilisation Assessment
Vivian Street (between Tory and Cambridge)	21	Low to medium utilisation during weekday peak hours and medium to high utilisation during weekday evenings and during weekends
Pirie Street	5	Well utilised
Hania Street 1	28	Well utilised during the day on a weekday and well utilised on a Sunday
The Street Church (Hania Street)	20	Not well utilised during the week and on a Sunday 70% utilisation
Hania Street 2	30	Well utilised
Hania Street 3	8	Well utilised during the day on a weekday and well utilised on a Sunday

¹¹⁹ April 2012 survey was undertaken on 26th (Thursday) and 29th (Sunday). November 2012 survey was a weekday survey in the AM and PM Peak at Vivian Street, College Street and Kent and Cambridge Terraces.

Location	Parks	Utilisation Assessment
Ellice/Dufferin Corner	5	Well utilised in the morning and early afternoon on a weekday and on a Sunday
Ellice Street 1	21	Not well utilised during a weekday (approximately 50% utilisation), on a Sunday the parks are well utilised
Ellice Street 1 Residential	5	Not well utilised both weekday and weekends the parks are at 40-60% utilisation)
St Joseph's Church	41	During a weekday there is 17-61%* utilisation of the parking spaces. On a Sunday the car park is well utilised
Brougham Street	9	Average utilisation on a weekday ranging from 11-89%*. On Sunday well utilised
Brougham Street Residential	5	Not well utilised on a weekday (0-40%)* on a Sunday average utilisation (60-80%)*
Ellice Street 2	22	Average to well utilised on a weekday (32-100%)*. On a Sunday the parks are well utilised (73-95%)*
Ellice Street 2 Residential	5	Well utilised in the morning and evening during a week day, and during the day the parks have average utilisation (20-80%)*. High utilisation on a Sunday
Ellice Street 3	6	Average utilisation during a week day (17-83%)* with high utilisation in evening. Average utilisation during a Sunday (50-67%)
Ellice Street 3 Bus Stop Parks	6	Average utilisation in the morning and evening on a week day (17-50%)* with no utilisation during the day. Low to average utilisation on a Sunday (33-50%)
Ellice Street 4	10	Well utilised in the morning (100%) and evening (75-92%)* and average utilisation during the day (50-67%)*. Well utilised on a Sunday
Ellice Street 4 Residential	7	Well utilised during a weekday and Sunday.
Austin Street 1	6	Average utilisation (33-67%)* during a week day and weekend
Austin Street 1 Residential	4	Average to well utilised (67-100%)
Ellice Street Parks	4	Low utilisation in the morning and evening on a week day and average utilisation during the day (25-75%)*. On a Sunday the parks have low utilisation
Kent Terrace	7	Low utilisation during the day with average utilisation between 4 and 6pm (57-71%)*. Average utilisation on a Sunday (0-57%)*
Cambridge Terrace	7	Low to average utilisation on a week day (14-57%)* and on a Sunday (29-57%)*
Tory Street	12	Low utilisation on a week day and Sunday (0-33%)*
Tasman Street	36	Average to well utilised during a week day (42-97%)* and on a Sunday the parks have average utilisation (67%)*
Tasman Street Residential	5	Low utilisation during a week day (20-40%)* and on a Sunday (20%)
Sussex Street	18	Average utilisation on a week day (39-61%) and well utilised on a Sunday (83-94%)*
Rugby Street 1	17	Average utilisation during a weekday (47-82%)* and on a Sunday the parks have low utilisation (6-12%)*
Rugby Street 2	14	Average utilisation during a week day (64-71%)* and on a Sunday (64%)*
Dufferin Street	7	Low utilisation during a week day (0-14%) and on a Sunday (14%)

*Car park utilisation bands can vary widely which reflects use during school drop-off and pick-up and lower demand generally throughout the day.



Figure 13-7 Map of parking areas surrounding the Project Area

13.2.5 Feedback from Emergency Services

The location of the Project Area relative to the Wellington Regional Hospital, CBD and southern and eastern suburbs means that it is an important response route for the emergency services. Within this context, the following comments have been received from emergency service providers.

The following concerns were raised by the Police:

- Direct access from the central city to the Mount Victoria Tunnel and the ability to go direct from Newtown is required;
- The police have a growing number of dignitaries which they escort to Government House and the War Memorial. Visitors to the War Memorial may require temporary closure of Buckle Street;
- Concerns were raised about how traffic travels between Kent and Cambridge Terraces to Adelaide Road and vice versa;
- Parents and guardians of St Mark's pupils who have parking issues are vocal.
- Police responses are more likely to require a car to go from the central city to the southern and eastern suburbs rather than the reverse journey;
- Need to ease the pressure off the bottom end of Vivian Street; and
- Network access for emergency response facilities should be provided to give efficient access to all parts of the new network.

The NZ Fire Service provided feedback, which included;

- Increasingly more difficult to travel between the city and Newtown;
- Mount Victoria Tunnel used when travelling from the central city to the eastern suburbs. Fire engines are often called upon to go from Oriental Bay to the eastern suburbs; and
- Stations are located at Kilbirnie, Brooklyn, Newtown and Oriental Bay.

The Wellington Free Ambulance provided feedback which included:

- They try to avoid the Basin area if possible, instead using Taranaki and Wallace Streets from the north and west; and
- Bus lanes are utilised where they exist.

The Project Area is a key strategic linkage to and from the Wellington Hospital for patients not just emergency services.

13.2.6 Summary of the Existing Problem

In the Project Area, SH1 and the associated local roads have a number of capacity constraints. This factor and the conflicting nature of the road network's dual local and State highway functions impact on:

- travel times, congestion, reliability and route security for motorists on SH1 as a strategic link between Wellington CBD and the southern and eastern portions of the City, including the Wellington Airport;
- the desirability of keeping arterial traffic on SH1;
- passenger transport journey times and reliability;
- movement of people using active travel modes (walking and cycling);
- emergency services and in particular access to and from Wellington Hospital;
- access to local communities, schools and facilities;
- safety for all travel modes (walking, cycling, and vehicles); and
- environmental conditions associated with congestion levels.

These existing problems are at their worst during the peak periods, school start and finish times and weekend peak periods, particularly between 11am and 5pm. The Dufferin/Paterson intersection exemplifies the current conflict and is currently a particular bottleneck in the transport network.

Under the 'do minimum' scenario it is predicted that with increasing traffic volumes, congestion and journey times around the Basin Reserve will worsen by 2021. These traffic volumes are expected to adversely impact on pedestrian and cycle movements, and access to Government House and the Basin Reserve itself.

Worsening congestion and journey times will not only impact on the level of service for general vehicles, but will also have a significant impact on bus journey times. This will affect the viability of developing a high quality north-south passenger transport corridor, which is a critical element of the N2ACP, and ultimately the ability of the City to effectively achieve the objectives of its UDS.

In the future, the failure to address westbound journey times and capacity at the Paterson/Dufferin and Rugby/Adelaide intersections will significantly impact on the viability of the planned Mt Vic tunnel duplication.

13.3 Assessment of Transportation Effects

13.3.1 Road Network

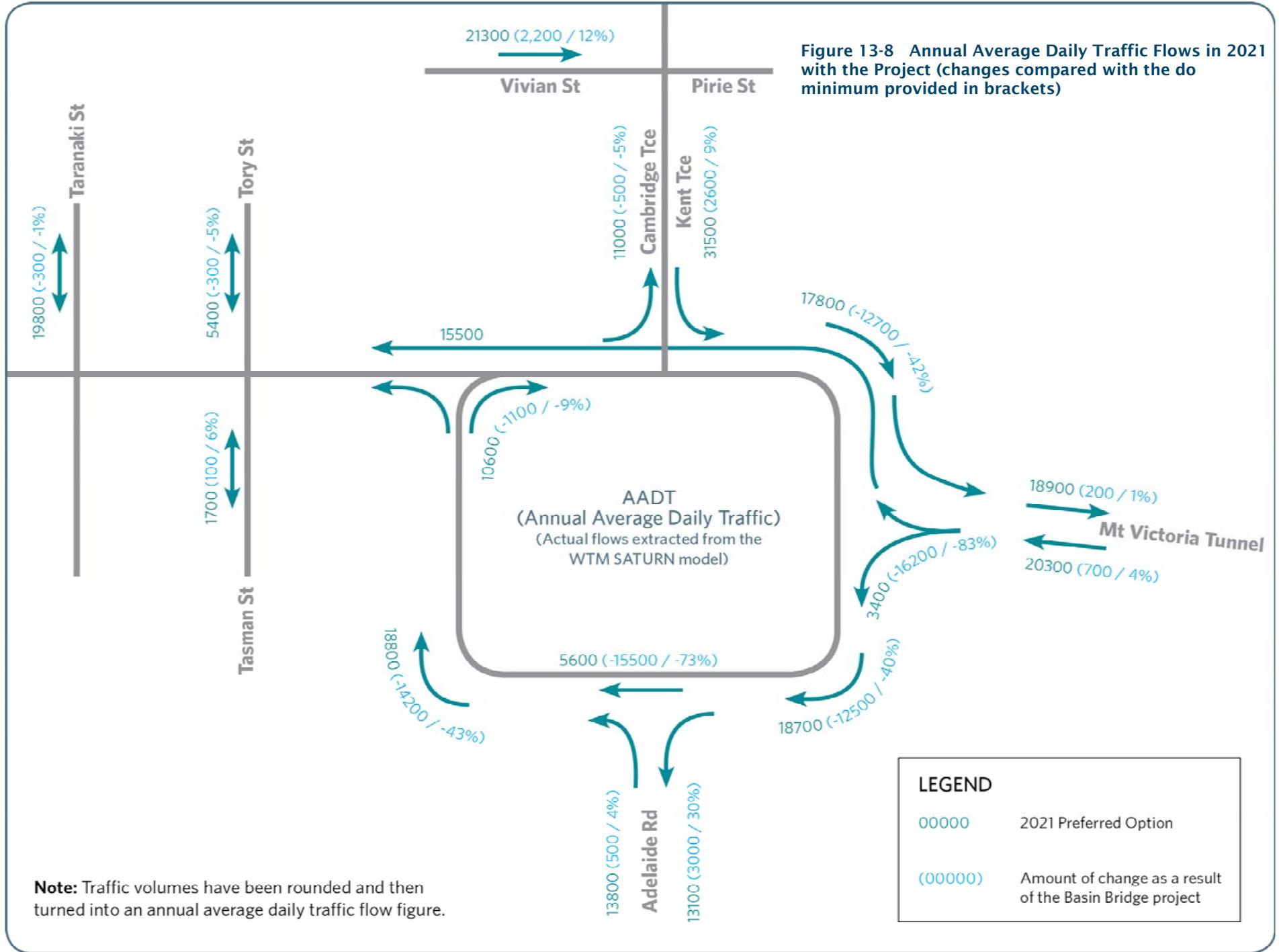
13.3.1.1 Traffic Flows

Figure 13-8 shows overall traffic flows around the Basin Reserve and the change in volumes following completion of the Project in 2021.

The transport modelling has identified the following key changes to traffic flows on the surrounding network as a consequence of the Project being completed in 2021:

- reductions of 16,200 vpd or 83% in the amount of traffic turning from Paterson Street onto Dufferin Street, in the vicinity of St Mark's School, Wellington College and Government House;
- significant reductions in the level of traffic on Rugby Street east (by 12,500 vpd or 40%), Rugby Street (by 15,500 vpd or 73%) and Sussex Street (by 14,200 or 43%) due to westbound State highway traffic being diverted onto the new bridge;
- traffic increases on Vivian Street of 2,200 vpd (12%) due to the increased capacity and efficiency created by the peak hour clearway and improvements to the Cambridge/Kent/Pirie intersection;
- traffic increases on Kent Terrace by 2,600 vpd (9%) due to the re-routing of traffic from the Hania/Ellice intersection to the Kent/Pirie intersection and the Project's improvements to the Basin Reserve network;
- traffic increases on Adelaide Road by 3,500 or 15% in both directions. The biggest increase is in the southbound direction (3,000 vpd (30%) as it becomes a more desirable route than Taranaki/Wallace Streets due to reduced congestion around the Basin Reserve; and
- traffic increases on Buckle Street (west of Sussex Street) by 3,200 vpd (15%) due to the new bridge and the consequential reduction in congestion around the Basin Reserve.

Figure 13-8 Annual Average Daily Traffic Flows in 2021 with the Project (changes compared with the do minimum provided in brackets)



Note: Traffic volumes have been rounded and then turned into an annual average daily traffic flow figure.

LEGEND	
00000	2021 Preferred Option
(00000)	Amount of change as a result of the Basin Bridge project

Away from the Project Area it has been determined that the proposed network improvements will have only small changes in traffic flows such as on Oriental Parade however the Mount Victoria tunnel Duplication will realise additional transportation benefits.

13.3.1.2 Journey Times

Figure 13-9 and Figure 13-10 below show how journey times¹²⁰ change on the State highway network and on the local road network.

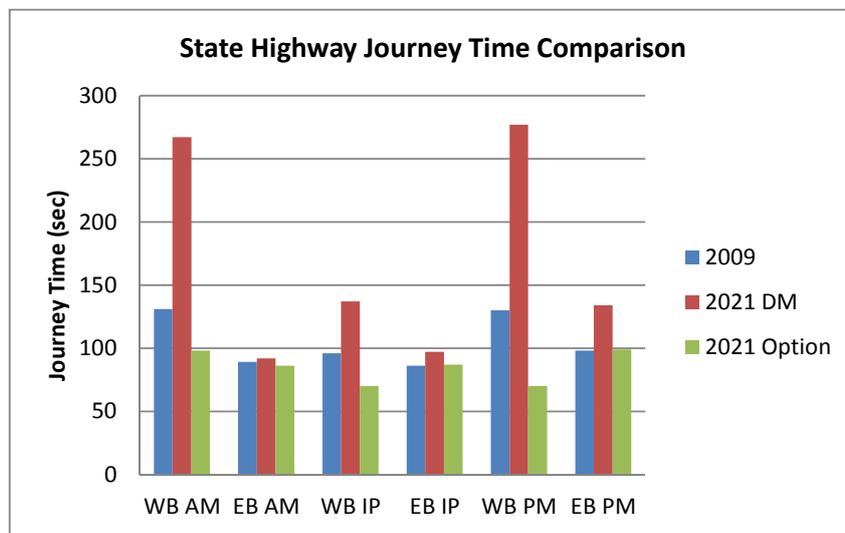


Figure 13-9 State highway journey time comparison (2021 option means with Project)

¹²⁰ The journey time data excludes the delay at the Vivian/Cambridge intersection (consistent for 2009, 2021 Do Minimum (DM) and 2021 Project). Given that this intersection is improved through this Project journey time savings for the 'with Project' scenario will be higher. The journey time data has included the Cuba Street intersection delay as this is outside the Project Area. SH1 west bound (WB) journey times for 2009 and 2021 DM paths start at the Mount Victoria Tunnel and end at Taranaki Street. The 2021 with Project journey time starts at Paterson Street and therefore does not include the time between exiting the tunnel and reaching Paterson Street.

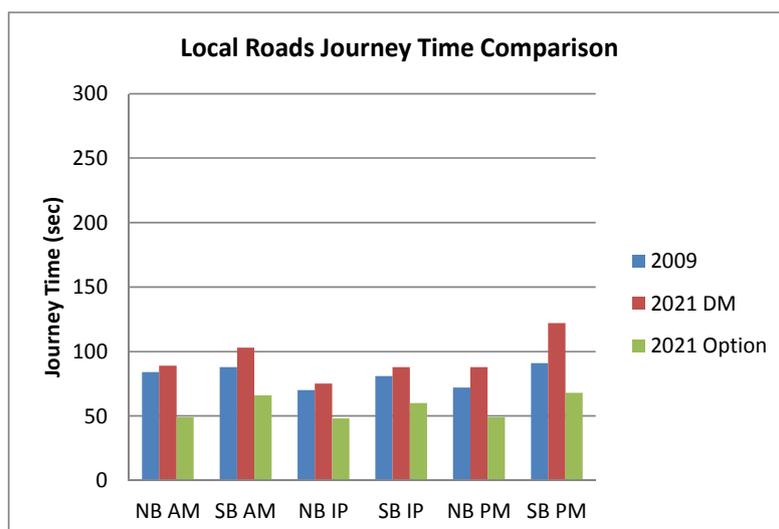


Figure 13-10 Local roads journey time comparison (2021 option means with Project)

Overall, when comparing the 'with Project' journey times at 2021 with those under the 'do-minimum' scenario in the same year, the Project will result in a significant reduction in journey time. The most significant is in the westbound SH1 travel time, which reduces by up to 54% during peak periods as compared with 2021 do minimum scenario.

This is the result of the congestion relief provided by the additional capacity and more importantly a significant reduction of conflict between western SH1 users and north-south local road users through the provision of grade separation. This is due to the role of the Dufferin Paterson Street Intersection being replaced by grade separation.

Improved journey times and reduced journey time variability will also be achieved for north/south local road users. This will result from a reduction of a traffic signal phase at the intersection of Adelaide Road and Rugby Street and the reduced conflict at the Ellice Street/ Kent Terrace and Paterson/ Dufferin intersections.

When comparing the 2021 'with Project' and 'do minimum' journey times, key reductions include:

- westbound SH1 journey times (between Goa St to Boulcott Street on ramp just north of the Terrace tunnel) are reduced by nearly 7 and a half minutes (54%) in the AM peak with the Project;
- eastbound SH1 journey times (between the Terrace Tunnel off ramp - Goa Street) are reduced by up to 1.3 minutes (16%) in the PM peak;
- northbound journey times between Cambridge Terrace to Adelaide Road (Courtenay Place - Hospital Road -) are reduced by just under two minutes (39%) in the AM peak; and,

- southbound journey times between Kent Terrace to Adelaide Road (Courtenay Place - Hospital Rd) are reduced by as much as a minute (23%) in the PM peak period.

13.3.1.3 Queues

Modelling of queue lengths at key intersections following implementation of the Project indicates that the following notable changes can be expected during the am peak:

- 11 vehicle (65%) reduction in Vivian Street queue length at the intersection with Kent Terrace;
- 15 vehicle (83%) reduction in the Hania Street queue length at the intersection with Ellice Street;
- 22 vehicle (76%) reduction in the queue length on Paterson Street at the intersection with Dufferin Street; and
- no queue forming at Rugby Street/ Adelaide Road as a result of the Project (12 vehicle reduction).

During the pm peak notable changes that can be expected are, as follows:

- 6 vehicle (67%) reduction in the Hania Street queue length at the intersection with Ellice Street;
- 21 vehicle (91%) reduction in the queue length on Paterson Street at the intersection with Dufferin Street; and
- no queues on either Rugby Street (12 vehicle reduction) or Adelaide Road (9 vehicle reduction) as a result of the Project.

Under the 2021 'do minimum' scenario it has been noted (see section 13.2.4.3 above) that the Dufferin/Paterson and Adelaide/Rugby intersections are significant constraints within the existing road network. The extent of these constraints is expected to result in vehicles diverting along Evans Bay Parade and Oriental Parade to avoid the congestion of the Basin Reserve. With the Project these constraints will be removed and the diversion of traffic on to the local road network will be reduced.

Overall the improvements in queue lengths throughout much of the Project Area will have a significant influence on the improved journey times projected in Figure 13-9 and Figure 13-10 above.

13.3.1.4 Level of Service on the State Highway

Level of service (LOS) is a measure which describes operational conditions and perception of these conditions by motorists and/or passengers. For westbound state highway traffic, the implementation of the Project will generate a significant

improvement in the LOS for those motorists using the new bridge, compared with the LOS they would experience without the Project on the existing road network.

The Project will not generate significant improvements in the LOS eastbound state highway traffic as the main constraint is the Mount Victoria Tunnel. This reflects the less significant changes that are proposed as part of the Project to the eastbound state highway route.

Detailed analysis of the LOS changes anticipated from the Project is provided in Technical Report 4: *Assessment of Traffic and Transportation Effects* in Volume 3 of these documents.

13.3.1.5 Overall network performance

The introduction of the Project not only results in a localised improvement to the network. The total network statistics for Wellington City (as per SATURN network) improve significantly with a reduction in total delay time of up to 10%. Total travel time reduces by as much as 2% when comparing the do minimum against the Project in isolation.

The network statistics show that the Project does not overall induce traffic¹²¹ in Wellington City with the Project causing less than 0.1% (approximately 100 car trips) increase in car based trips.

13.3.1.6 Intersection Changes

Various detailed intersection improvements are proposed as part of the Project and involve changes to the geometry and to signal phasing. As well as improving the flow of general traffic passenger transport and active modes also benefit as a result of these improvements. In summary these improvements involve:

- the Vivian/Cambridge/Kent/Pirie intersection will be improved by new phasing with reallocated green time for vehicles exiting Pirie Street. The geometry of the intersection will also be modified. This improvement also mitigates the reduction in egress capacity from Mount Victoria to SH 1 at the Basin Reserve, via Hania and Ellice Streets, which is expected to re-route vehicles to the Vivian/Kent/Cambridge/Pirie intersection;
- the Paterson/Dufferin intersection will benefit from significantly reduced traffic volumes as 83% of traffic using this intersection is diverted onto the new bridge. In addition the intersection will be improved with the provision of pedestrian and cyclist signalised crossing facilities connecting to shared facilities, phasing changes to provide priority for vehicles travelling from Kent Terrace to Adelaide Road, and the provision of a dedicated bus lane; and

¹²¹ Induced traffic includes new vehicle trips on the network that may not have travelled previously or switched from PT as calculated using WTSM.

- the Rugby/Adelaide intersection will be improved by changing phasing from three phases to two, allowing pedestrians and cyclists to cross on demand. The crossing distance will also be reduced on Rugby Street from three lanes to one (plus a shoulder).

13.3.1.7 Sensitivity Testing

Sensitivity analysis has been undertaken to test the robustness and reliability of the modelling results. For this purpose three key parameters were changed:

- the assessment year was pushed out to 2031 and the Mount Victoria Tunnel Duplication Project was included;
- high growth¹²² assumptions were used instead of medium growth assumptions; and,
- additional land use activities were added to the 'do minimum' and 'with Project' scenarios. These included supermarkets on Rugby and John Streets, the development of the Adelaide growth node and the ASB Sports Centre.

Details regarding the model outputs under each of these altered scenarios can be found in Section 9.3 and Appendix 4.6 of Technical Report 4: *Assessment of Traffic and Transportation Effects* in Volume 3 of these documents.

Generally the sensitivity analysis indicates that changes in travel demand that would occur under these alternative scenarios, such as under the high growth scenario, will impact on travel flows on specific links. Likewise localised changes in traffic flow would also be expected with changes in local land use patterns, such as those that may occur on Adelaide Road, Tory Street and Tasman Street. However, key changes to traffic flows are expected only with significant changes in infrastructure, such as those experienced by the duplication of the Mount Victoria Tunnel in 2031.

In this regard it is noted that the Project has been designed to accommodate these altered demands through the removal of traffic from roads around the Basin Reserve and by removing conflicts at key intersections. Therefore the Project's traffic related benefits, described throughout this section of the AEE, would remain under the altered scenarios used for the sensitivity analysis.

¹²² High growth scenarios take into consideration population, employment and household variants to 2031 and assumes that the following transport projects have been completed:

- Airport to Mount Victoria – improvements to Ruahine Street and Wellington Road and duplication of the Mount Victoria Tunnel;
- Terrace Tunnel duplication;
- Otaki to north of Levin (outside of WTM SATURN area but included in 2031 WTSM);
- Transmission Gully (Linden to MacKays) (outside of WTM SATURN area but included in 2031 WTSM); and,
- Petone to Grenada Link Road

13.3.2 Accessibility

From the modelling it can be concluded that the Project will result in an overall net improvement in accessibility and the movement of people and freight through separating east/west and north/south traffic. It will also improve the operation of intersections and provide new and improved pedestrian, cycle and passenger transport facilities. This net improvement takes into account the minor negative effects that have been identified associated with access at Hania and Ellice streets.

13.3.2.1 Schools

Access to the schools within the Project Area will be significantly improved. Access to the drop off area by St Mark's and Wellington College, and to Government House, is a current problem. While not fully resolving this existing problem, the Project will improve access by significantly reducing the level of traffic (83%) in the vicinity and by introducing an improved layout to the drop off / school bus facilities. The new layout is simpler and safe and has been designed in consultation with the schools.

School buses serving Wellington East Girls currently travel via Ellice Street to connect to the roads around the Basin Reserve to head east, south or west. The Project does not alter these movements and the school buses will be able to efficiently use the low volume connection from Ellice Street to the Dufferin/Paterson intersection. The new direct connection will make this movement significantly safer and less susceptible to variability. Sufficient capacity will be available for school buses on this lane way because a good proportion of residential traffic from Mount Victoria will re-route and use the improved Pirie Street intersection to access Kent Terrace and SH1 (as described below).

13.3.2.2 Mount Victoria

For Mount Victoria residents, the proposed changes at the Hania/Ellice intersections will reduce the attractiveness of, and accessibility to, the Basin Reserve road network. Vehicles will be able to access SH1 eastbound through the Mount Victoria Tunnel from this location or onto Paterson Street via a link road near the Paterson / Dufferin intersection. Whilst access to Dufferin Street and Adelaide Road or Buckle Street (westbound SH1) will be possible it will be via a low speed environment 'lane' connection.

To mitigate the effects of the expected re-routing to the Pirie/Cambridge/Vivian/Kent intersection, operational and geometric improvements to this intersection are proposed. These improvements include the:

- provision of an additional lane on the Pirie Street approach;
- provision of a third right turn lane on the Vivian Street (SH1) approach; and

- adjustment to signal timings allocating more green time for vehicles exiting Pirie Street.

These will improve the performance of the intersection which will be able to accommodate the projected additional traffic growth and all potential re-routing of traffic from Mount Victoria. It will perform better than the existing intersection would perform in 2021 under the do-minimum scenario.

This improved intersection, along with the low volume link between Ellice/Hania and Paterson Streets, will help to reduce 'rat running' through Mount Victoria and focus movements to strategic links such as Kent Terrace. For most this will result in a positive outcome for Mount Victoria and the wider network. The only real impact will be those travelling from Ellice Street to Hania Street who will be restricted and required to use an alternative route.

13.3.2.3 Basin Reserve

As part of the Project it is proposed to construct an additional building, the northern gateway building, within the Basin Reserve. The purpose of the building is to mitigate the visual effect of the bridge on users of the Basin Reserve, and in particular on batsmen.

The introduction of the northern gateway building to the Basin Reserve will result in changes to access at both the northern and southern entrances to the ground. These changes include relocating the Dempster Gate to the southern side of the Basin Reserve beside the Reid Gate and, on the northern side of the ground, the creation of a wide entrance under the northern gateway building.

These access changes will have a positive effect on access to and from the Basin Reserve. Currently the gates at the northern end are limited and are offset from the crossing point. The new entrance will provide a much better flow to and from the concourse area in front of the Basin Reserve, which will assist movement during events and on a daily basis for commuters walking or cycling through the Basin Reserve.

13.3.3 Emergency Services

Access to and from Wellington Hospital and the south/east of Wellington will be enhanced through reduced north-south local road congestion and the ability for emergency service vehicles to utilise the proposed bus lanes in the event of an emergency. This is especially relevant during peak times in which congestion currently results in regular periods of "gridlock" in which emergency access and responses times can be impacted.

More specifically it is noted that the Project addresses concerns previously raised by emergency services by:

- improving the operation of the Vivian / Cambridge intersection, and thereby providing better access from the city centre to the Mount Victoria Tunnel;
- modelling results confirm that should the NWM Park underpass be closed the surrounding network will cope with the SH1 traffic provided signal settings and pedestrian provision is modified;
- proposed VMS signage will be able to advise road users of alternative routes if the bridge or NWM Park underpass is closed; and
- improvements for north-south local road traffic travelling between Kent Terrace and Adelaide Road and Adelaide Road and Cambridge Terrace will result from the Project assisting movements to and from the Hospital and other locations to the south.

13.3.4 Safety

The Project will provide a positive impact in terms of safety for general traffic, pedestrians and cyclists.

In this regard the significantly reduced conflict between east-west State highway and north-south local road traffic and a reduction in traffic volumes will lead to a reduction in the large number of crashes that occur at intersections around the Basin Reserve. For example at the Paterson/Dufferin intersection a net reduction of approximately 15,000 vehicles per day is anticipated, which can be expected to reduce conflicts between pedestrians and cars as a result of westbound vehicles now using the Basin Bridge which has no pedestrian or cycle conflict points (in relation to movements on the bridge from Paterson Street to Buckle Street compared with making this movement at-grade).

Crashes involving pedestrians and cyclists currently account for 6 percent of all crashes within the Project Area. The reduction in traffic volumes, in combination with the improvement and provision of facilities for pedestrians and cyclists, will reduce the potential number of crashes involving pedestrians and cyclists.

The Pirie/Cambridge/Vivian/Kent intersection had 43 crashes recorded, most non-injury. These improvements will improve the operation and performance of the intersection and, therefore, can be expected to reduce crashes as well as providing better access to Mount Victoria.

13.3.5 Passenger Transport

Overall, the Project will provide significant improvements for the efficiency of passenger transport. The key change is the reduction in the conflict between the north-south passenger transport services and east-west State highway traffic that is provided through grade separation.

Other key improvements include:

- the relocation of the south bound bus stop from Adelaide Road to Rugby Street moves it closer to the adjoining schools and enables safer access;
- shifting the existing bus priority signal south on Kent Terrace and improving the detection to ensure buses activate the signal in advance of arriving at the stop line; and
- the introduction of bus lanes at the approach to intersections around the Basin Reserve (as a consequence of the significant reductions in State highway traffic on Dufferin and Rugby Street).

As is shown on the Figure 13-11 and Figure 13-12 below these improvements will create up to a 41% improvement in travel time for bus services through the Project Area and reduce variability with similar journey times occurring across all periods. The reduced journey time variability is a significant improvement for current/future PT operation and customer satisfaction.

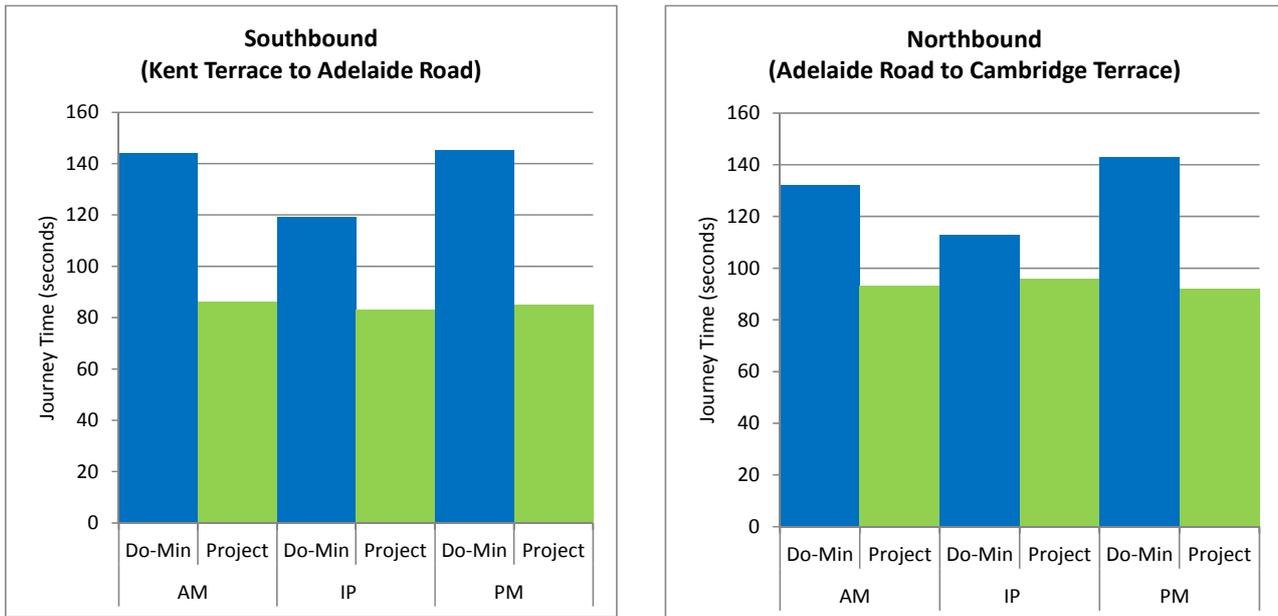


Figure 13-11 (left) Southbound bus routes 2021 travel times

Figure 13-12 (right) Northbound bus routes 2021 travel times

13.3.6 Pedestrian and Cycle Facilities

A significant number of new pedestrian and cycle facilities are proposed as part of the Project. These are illustrated in Figure 13-13 below.

A key feature of the proposed pedestrian and cycle facilities is the shared path on the northern side of the bridge. This shared path will provide a direct link between Buckle Street and the southern parts of Mount Victoria. This will be a significant improvement on the current situation which involves 4 crossings (2 controlled, 2 uncontrolled) and descending/climbing an 8 metre rise. This facility will also connect into the future upgraded pedestrian and cycle facility being planned as part of the Mount Victoria Tunnel duplication project.

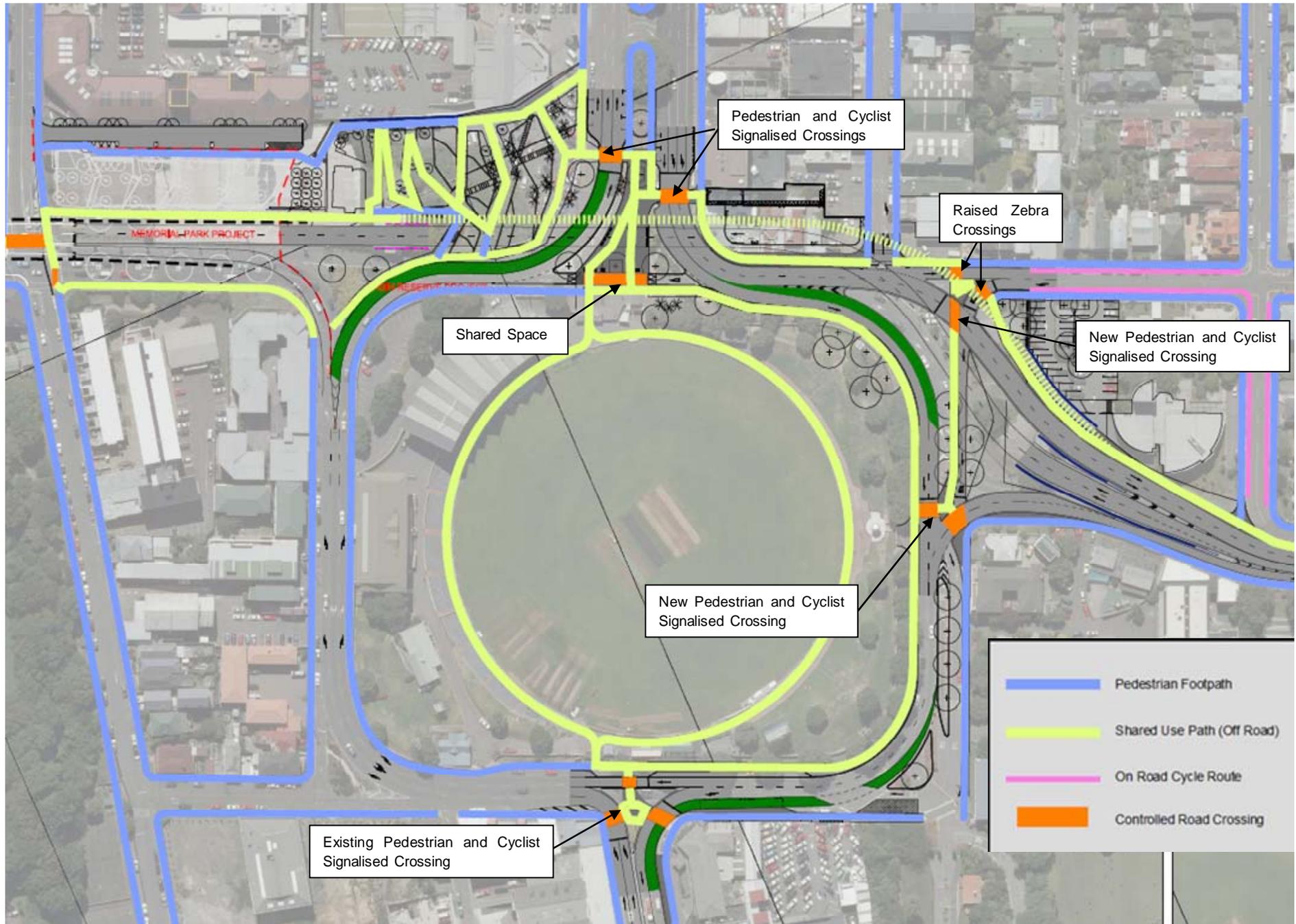


Figure 13-13 Proposed Pedestrian and Cycle Facilities

Several other shared facilities are also proposed providing significantly improved north-south and east west links. These are designed to connect to the schools within and near the Project Area.

Additional footpath links are proposed on the northern side of Sussex Street and through the NWM Park and also connecting to the shared paths in the eastern section of the park.

A further key feature of the improved cycle and pedestrian facilities will be the introduction or upgrade of road crossings. Examples include:

- the provision of two raised zebra crossings on Ellice Street immediately east of the Ellice/Hania intersection. These will be connected by a central shared island. Drop kerbs will also be installed at this point for cyclists. Cycle 'Give Way' markings will be used, and cyclists will need to apply these rules before crossing Ellice Street;
- upgrade of the existing pedestrian signalised crossings to pedestrian and cyclist crossings on Kent and Cambridge Terraces and relocating these closer to the Basin Reserve to better align with desire lines;
- upgrade of the existing pedestrian signalised crossings to pedestrian and cyclist signalised crossings at the Dufferin/Paterson intersection; and
- drop kerbs will be provided at the Buckle and Sussex intersection. There are desire lines at this location and therefore the informal crossing will facilitate these movements.

The package of improvements for cyclists and pedestrians will also include improvements to the signal phasing and geometry of intersections in the Project Area. An example is the changes proposed to the Adelaide/Rugby intersection. These include the widening of the central island on Rugby Street and changing the signal phasing to a two phase system, with one phase being an all movement pedestrian phase and the other being a vehicle phase. With a 74% reduction in forecast traffic passing this point, the signals are proposed to operate on a pedestrian/cycle demand basis.

In addition to the significant reduction in at grade traffic flows, which will reduce pedestrian and cycle severance and improve the environment, the proposed new cycling and pedestrian facilities will provide significant benefits to walking and cycling in the area. Overall it is considered that these changes will help encourage the uptake of walking and cycling.

13.3.7 Parking

The Project will result in the net loss of 12 parking spaces. These are outlined in Table 13-5 below.

Table 13-5 Changes in Public Parking

Location	Type	Assessment
Vivian Street	On Street	21 parks removed during peak traffic (7am–9am and 4pm–6pm) to allow for additional intersection approach lane.
Pirie Street	On Street	5 parks removed for intersection improvements
Cambridge Terrace East	On Street	2 new parks, resulting from the relocation of pedestrian crossing.
Cambridge Terrace West	On Street	2 new parks, resulting from the relocation of pedestrian crossing.
Ellice Dufferin Corner	Off Street	5 parks removed for Eastbound SH1 alignment.
Ellice Street West	On Street	4 parks removed
Ellice Street – Building under the bridge	Off-street	5 car parking spaces provided to serve the new Building
Ellice Street East	On Street	2 parks removed to provide safe sightlines to new pedestrian crossing.
St Joseph’s Church	Off-street	Parking layout is revised within the church property.
Dufferin Street	On-Street	2 car parking spaces removed to provide space for bus stops.

In total, there will be a net reduction of 12 car parks from within the Project Area. Within this overall impact, particular adverse effect may result from the loss of space for cars to park on the St Joseph’s church property. The Church advises that while 41 car parking spaces are marked out on site, the car park regularly accommodates up to 51 cars¹²³. During the Sunday service demand for car parking spaces exceeds supply and as a result Church goes use alternatives, typically on surrounding streets. To mitigate this effect a new car park layout has been developed in consultation with the Church. This will provide 46 marked car parking spaces on the St Joseph’s Church property.

¹²³ This statement has been corroborated through a parking survey. See Technical Report 4.

The introduction of clearways on Vivian Street will improve the efficiency of traffic through this portion of the Project Area, but also will result in reduced parking in this area during peak times (7-9 am and 4-6 pm). Survey results show that typically during the morning peak between 3 and 6 spaces are used and in the evening peak, between 5 and 11 spaces are used. There are a number of alternative un-used spaces on nearby roads, notably on Kent and Cambridge Terraces but also on College Street immediately north and parallel to Vivian Street¹²⁴. It is therefore considered that there will be no material impact on overall parking availability in the area. Similarly the loss of 5 parking spaces on Pirie Street is likely to re-distribute demand to either Hania Street or to Kent Terrace and Cambridge Terrace.

13.3.8 Future Proofing

The Project is part of a wider network, which is the subject of proposals for further improvement. It is important that the Project is designed to integrate with and provide for the changes that will occur on the wider network. Particular elements that have been included in the Project to enable its integration with other projects are as follows:

- one of the key objectives of the Project is to facilitate the development of an improved passenger transportation spine between the Wellington Railway Station and the Hospital through Kent / Cambridge Terraces and onto Adelaide Road. The Project will remove a significant amount of traffic circulating around the Basin Reserve, and by doing so will allow for road space to be set aside for passenger transport usage. The Project has also been designed to accommodate the range of passenger transport options around the Basin Reserve that are being considered by the PTSS (bus, rapid transit bus, or tram)¹²⁵. As a result, future modifications to the bridge structure can be avoided;
- the design for the bridge has been closely coordinated with the proposed scheme to duplicate the Mount Victoria Tunnel. For instance,
 - the posted speed limit throughout the Project area will be 50 km/h, which will tie in with the 50km/h limit planned for the duplicate tunnel;
 - the proposed pedestrian / cycle facility on the north side of the bridge will connect into a pedestrian/cycle new facility planned as part of the

¹²⁴ Car parking surveys have been undertaken twice, on 26 April 2012 and 29 November 2012, which show that up to half of car parking spaces on Kent and Cambridge Terraces and College Street are used in the AM and PM peak.

¹²⁵ Project drawings were provided to the PTSS project team on 28 November 2012. The PTSS team's assessment of the drawings has confirmed that the Project design will accommodate all relevant transport modes.

- duplicate tunnel which in turn connects to new pedestrian/cycle facilities on Ruahine Street and Wellington Road; and
- the design of the bridge and the eastbound changes will also facilitate the incorporation of passenger transport options into the tunnel duplication.
- the Project has been designed to incorporate linkages for pedestrians, cyclists and motorist travelling between the two projects; and
- future proofing has also been considered in relation to utilities. For example, two 100mm ducts with appropriate pull-pits and associated infrastructure will be provided as part of the bridge structure. New fibre optic cable will be provided in or on the bridge as part of the Project and will connect to the fibre optic cable which currently runs along Buckle Street / Arthur Street to Cambridge Terrace.

13.4 Assessment of the Construction Effects on Transportation

The Project is to be largely constructed within the confines of the existing road network and as a result there will be negative effects on the operation of the transport network from construction activities or Temporary Traffic Management (TTM) measures.

13.4.1 Staging

In order to reduce overall disruption and to construct the bridge as efficiently as possible it is necessary to consider how construction will be staged.

Pier construction will be constructed in a west to east sequence (see chapter 6 of the AEE above for detail). Vehicle movements will be restricted to one lane between Sussex Street and Cambridge Terrace during the construction of the bridge piers on either side of Cambridge Terrace. However, this will provide sufficient capacity to meet current and predicted demands.

The western abutment will be built off line from the existing road network, and therefore will not affect the road network.

Where the bridge crosses existing roads, a bridging system for the false work¹²⁶ will be installed. The bridging system will maintain vehicular access and minimise disruption to the trolley buses by maintaining power through the site. Construction

¹²⁶ 'False work' means the temporary structures that will be used during construction to support the bridge until its construction is sufficiently advanced to support itself.

work will be completed above live traffic within a system of handrails, solid flooring, screens and safety nets that will manage the risk of items falling on to the vehicles below.

Construction works associated with SH1 eastbound within the Project Area will largely be constructed off line. Work however will need to be carefully managed and co-ordinated with the construction of SH1 westbound in the same area.

Construction activities associated with the proposed SH1 westbound network in the south-east quadrant of the Project Area (Dufferin Street/Rugby Street/Adelaide Road) is expected to generate the most significant effects on traffic flows. These works entail the construction of the eastern abutment and the tie-in to the existing carriageway on the approach from the Mount Victoria Tunnel.

To minimise traffic disruption during these works it is planned that a lane on the new bridge will be opened to provide additional capacity on the network before work is started on the southern retaining wall of the eastern abutment. The Paterson Street/Dufferin Street single lane link is planned to be kept open to traffic. If this is not feasible then either the wall will be constructed during a short term closure of the link (e.g. over the Christmas holiday) and / or the footpath on the southern side of Paterson street may need to be converted temporarily to a single lane carriageway.

This work will require careful traffic management as the area is confined and options for accommodating traffic flows are reduced. Work will need to be coordinated with school drop-off and pick-up activities as well as any particularly significant events at Government House. Further detail on project construction methods and measures to reduce or mitigate adverse effects is included in Technical Report 1 Design Philosophy Statement and in the Construction Environmental Management Plan in Volume 4 of this application.

13.4.2 Pedestrian, cycling and public transport

In relation to the construction impact of the Project on pedestrian and cycle access it is noted that the segmented nature of the bridge construction will mean that access restrictions are localised and that there should not be a need for significant deviations. Any long-term closures or closures of critical pedestrian/cyclist infrastructure will be well communicated with the public and alternative routes identified.

Disruption can be expected to public and school bus routes during the construction period. Activities likely to impact upon these services will be identified at the construction planning stage, and consultation undertaken with affected parties to determine the best way to reduce impacts.

13.4.3 Property access

Access to properties will be maintained in all but exceptional circumstances. In these instances communication will be undertaken with the affected parties and agreements reached. In the absence of specific detail of where, when and for what duration any such access restrictions will apply, the CEMP details through a requirement for Site Specific Management Plans (SSTMP's), methods available for managing temporary disruption to access.

13.4.4 Compounds

There will be a compound with site offices located at the corner of Sussex Street and Buckle Street. Depending on the contractor's methodology there may however be a need for satellite offices at other locations. As part of the process a SSTMP will be produced for each site detailing vehicular access, parking arrangements and protocols and procedures to be used by all staff accessing the site offices.

13.4.5 Movements

Total vehicle movements associated with construction activities are expected to be low compared to the high traffic volumes currently using SH1 in the Project Area. The operation of any oversize and overweight vehicles will need to occur in accordance with normal highway and local road restrictions and appropriate permits granted prior to movements occurring. These movements have the potential to have a minor impact at the time in which they occur, however this will be managed and monitored as part of the Construction Transport Management Plan (CTMP).

Overall, it is expected that adverse effects will occur during the construction phase. To reduce the significance of these effects careful consideration has been given to Project staging and sequencing, and to traffic management during construction. This is reflected in the CTMP in Volume 4 of these documents and proposed designation conditions. As a result of these measures, and considering the temporary nature of these effects, it is considered that the construction phase transportation effects will be appropriately mitigated.

13.5 Measures to Avoid Remedy or Mitigate Actual or Potential Adverse Effects

The assessment of effects on transportation contained in sections 13.3 and 13.4 above has identified three adverse effects that warrant mitigation. These effects relate to:

- modified access from Mount Victoria;
- reduced car parking provision; and

- the impacts of construction activities.

Mitigation measures for each of these identified adverse effects are addressed in turn.

13.5.1 Mount Victoria Access

All vehicle movements to and from Mount Victoria (from Hania and Ellice Streets) to the Basin Reserve are retained. However access from Ellice Street to Dufferin Street is via a low speed lane which is designed to facilitate a pedestrian / cycling environment and to encourage use of Pirie Street.

To mitigate any negative effects of this less attractive access, intersection improvements are proposed for the Pirie/Cambridge/Vivian/Kent intersection. Analysis of these improvements indicates that in 2021 the amended intersection performs better with the anticipated traffic growth plus re-routing of all traffic, than both existing intersections would perform in 2021 with traffic growth alone¹²⁷.

The restricted access at Hania/Ellice is also expected to reduce the amount of 'rat running' through Mount Victoria and focus movements to strategic links such as Kent Terrace. Overall this will result in a positive outcome for Mount Victoria and the wider network.

13.5.2 Reduced car parking

The Project will result in an overall reduction of 12 car parking spaces throughout the Project Area refer to Table 13.4 above.

21 car parking spaces will be lost from Vivian Street during the AM and PM peak only. As described above there is an under utilisation of car parking generally in the area in locations closest to the proposed reductions in spaces, particularly in locations close to Vivian Street. There is concern from some local businesses on Vivian Street, although some other businesses were neutral or supportive of the clearways proposal on Vivian Street.

On-street car parking on Dufferin Street is well used during the morning peak and when school finishes during which time only drop-off and pick-up area is allowed. Activity during this time is informally policed by St Mark's School who ensure that movement of children is efficient and that drivers move on quickly. Additional car parking to service St Mark's School is available via private agreement at the St Joseph's Church and this is expected to continue.

The Project proposes a reconfiguration of the existing on-street parking in order to make bus drop-off and pick-ups more efficient and to better relate to the needs of

¹²⁷ A detailed analysis of the proposed intersection changes is included in Appendix 8 of Technical Report 4: Assessment of Traffic and Transport Effects.

the school users (St Mark's School, and Wellington College). The configuration has been developed in consultation with the schools who have indicated that the loss of 2 car parking spaces is not significant. In any event it is noted that once the Project is open then traffic on Dufferin Street and Rugby Street will reduce significantly so that on-street car parking spaces on the Basin Reserve side of these streets will become more easy to use for those wanting to visit the schools.

Consequently, overall effects are considered to be minor. In effect the Project will result in the potential for better utilisation of available car parking where only up to half are generally used on Kent and Cambridge Terraces and College Street in the AM and PM peak. This helps manage effects. Mindful of the policies and objectives of the Wellington City District Plan to promote increased use of public transport and cycling, by amongst other things restricting supply of car parking spaces overall, it is considered that additional car parking mitigation is not required.

13.5.3 Construction

During construction some potential adverse construction traffic and transport effects are anticipated, which will be primarily of a temporary or short term nature. In advance of the construction methodology being finalised, a management plan approach is proposed. Management plans are standard practice and provide a transparent process for selecting appropriate mitigation to manage any construction effects.

All potential construction traffic and transportation effects will be managed using a CTMP, supported by a number of Site Specific Transport Management Plans (SSTMPs). A draft version of the CTMP is included in Volume 4. The draft CTMP identifies the standards to be adhered to, the objectives in developing SSTMPs and the issues that must be considered, and as well as how the effects of transport management methods, and construction traffic on local roads could be managed. Key team members' roles and responsibilities are also included.

Table 13-6 identifies the types of mitigation measures that can be used to minimise these different construction traffic and transport effects. For further detail see the Draft CTMP in Volume 5.

Table 13-6 Construction Traffic Mitigation Measures

Assessed Potential Effect	Proposed Measures to Mitigate
Travel times	Monitor and maintain acceptable travel times and congestion. Adjust CTMP & TTMP as required.
Network capacity reduction	Minimise disruption by improving capacity at key intersections within the project Area,

Assessed Potential Effect	Proposed Measures to Mitigate
	e.g. the Pirie / Cambridge / Vivian / Kent intersection before implementing access changes at Hania/Ellice
Disruptive construction works	Programme during periods of low activity, e.g. school holidays
Visual disruption	Implement visual screens to avoid 'rubber necking' by passing motorists.
Disruption to traffic, pedestrians and cyclists	Implement convenient, signposted alternative routes
Changes in parking	Temporary changes in parking will be considered as part of the TMP.

13.6 Summary

The transport network around the Basin Reserve is a key transport node within the Wellington network. The current area is subject to congestion, delay and journey time variability, particularly during peak periods and weekends. Without the Project these problems are predicted to get worse as travel demand grows and changes in land use occur in the immediate vicinity (Adelaide Road) and the wider Wellington area (Wellington Airport and the southern/eastern suburbs).

The Project will introduce significant improvements to the transport network within the Project Area. The result of such improvements will be reduced journey times and congestion, and improved route reliability. Consequently general traffic, passenger transport services and emergency services will all receive a superior level of service through this part of the network.

The most important aspect to unlocking the potential for improvements to the transport network is that there is grade separation of westbound State Highway traffic from the north south arterial network which will enable future development and enhancement of the public transport spine. Eastbound state highway traffic does not have to intersect with the local network.

The Project also involves the significant enhancement of walking and cycling facilities in the Project Area. Coupled with the benefits gained from the rerouting of traffic to the new bridge, these facilities will greatly increase the level of service for pedestrians and cyclists.

Access arrangements for key land uses in the vicinity of the Project will also be improved. This is particularly the case for St Mark's School, Wellington College and Government House.

It is considered that the Project gives effect to the GPS, and the N2ACP Corridor Plan. It will in particular enable the development of an efficient passenger transport spine and provide the basis for implementing bus lanes on Adelaide Road and on Cambridge Terrace. In doing so the Project also supports the realisation of Wellington City's Urban Development Strategy.

The integrated transport assessment of the Project has identified three potential adverse effects namely some reduction in accessibility from Mount Victoria, reduced car parking and construction effects. The adverse effects will be adequately mitigated by elements of the Project design or construction management.

Given these points it is considered that overall the Project will have a significant positive transportation effect.