Transmission Gully Project

A Waka Kotahi NZ Transport Agency PPP Project

WAKA KOTAHI NZ TRANSPORT AGENCY

JOHNSTAFF

Transmission Gully Monitoring and Benefit Realisation Report – June 2023

Waka Kotahi New Zealand Transport Agency

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Preface

The intention of this report is to provide an initial snapshot of the network impact and benefit, post the opening of Te Aranui o Te Rangihaeata – the Transmission Gully motorway project (TGP) – after one year of operation. A high-level economic assessment based on the initial performance reporting has also been developed.

It is worth noting that the network performance and economic benefit reported are purely based on 'year one' data and may not provide a true reflection of the long-term impact and benefit of the TGP. Traffic patterns and travel behaviours are still settling, following the uncertainty introduced by COVID-19 in the recent years. It is evident that many of the wider impacts, and the associated benefits of the investment will not be able to be determined with confidence for some time, for the following main reasons:

- Accessibility and mobility impacts are often dependent on the effects of development and movement patterns as well as the infrastructure. The infrastructure will potentially enable and accelerate developments; however, it will take time to adequately realise its full benefit.
- Some of the important impacts are due to reduction (or increase) in rare occurrences. This is specifically true for safety and resilience impacts. Therefore, any differences in occurrence of the rare events observed over a short period are not necessarily representative of the underlying pattern. In addition, there is no way of observing what would have happened in the absence of the investment.
- The attribution of system changes to the transport investment made is often drawing a long bow. So, the best we can do is offer a description of system-wide measures and how they change over time.

Given the limitation and opportunities mentioned above, it is recommended to carry out the TGP monitoring and reporting at least on a yearly basis, for the next five years. The level of understanding and the degree of confidence we can have will be built over time. This report focuses on reporting on the transport impact and benefit. It is recommended that the wider area of influence of the investment be considered in future, so that all (or at least the majority) of the system changes can be observed.

Executive Summary

TGP is a four-lane motorway that runs for approximately 27 kilometres between Mackays Crossing to south of Porirua. It is a key part of State Highway 1 and of the Wellington Northern Corridor Programme (Figure 2).[1] TGP opened on 31 March 2022 and provides an alternative state highway corridor to the existing coastal route, now known as State Highway 59. TGP opened with all interchanges and all movements functioning under an early access agreement before all work was fully completed, in order to provide road users with the benefits earlier than they otherwise would have enjoyed.

Johnstaff was commissioned by Waka Kotahi New Zealand Transport Agency (Waka Kotahi) to develop an annual report that monitors and evaluates the performance and benefits of TGP and its impact on the broader road network during its first year of operations, with the focus in two key topics:

- Performance monitoring: The performance of TGP and its impact on the broader road network was assessed against a series of key performance indicators (KPIs) for key commuter, freight and bus routes.
- Evaluation: A high-level estimate of the economic benefits resulting from the first 12 months of TGP operation was developed based on Waka Kotahi's *Monetised Benefits and Costs Manual* ('the Manual').[2]

Our analysis required the comparison of several network performance measures prior to and following the opening of TGP on 31 March 2022. COVID-19 had a significant impact on traffic flows during this period, due in part to lockdown periods, changes in working arrangements and labour shortages, which complicated the tasks of monitoring and evaluating the performance of the road.

Our initial analysis indicates that based on the data after the first year opening of TGP, significant improvements were observed across five key priority areas:

- General vehicle mobility
- Freight vehicle mobility
- Public transport mobility
- User safety, and
- Network resilience.

Strong progress has been made over the first 12 months of operations based on the KPIs identified. The benefit is estimated to have translated into approximately $60 million of economic benefit for New Zealand, which represents an annual yield of approximately five per cent.

However, it is worth noting that there will be an inherent degree of data volatility on a year-to-year basis and that the scope and scale of key trends may not clearly emerge for a number of years. The estimated long-term impacts from an analysis of TGP's first year of operations may therefore not be a true reflection of the longer-term trends observed. In particular, the true impact of TGP on the safety and resilience of the road network is expected to take a number of years to crystallise due to the fact that safety and resilience incidents occur with a relatively low frequency and can therefore vary significantly on an annual basis. Given the limitations and opportunities outlined above, it is recommended that this monitoring and evaluation report is replicated on an annual basis, for (at least) the next five years.

[1] Further information on the Wellington Northern Corridor is available from Wellington Northern Corridor | Waka Kotahi NZ Transport Agency (nzta.govt.nz).

[2] Waka Kotahi, Monetised benefits and costs manual, Version 1.6, April 2023.

1. Background and context

1.1 The Transmission Gully Project

TGP is a four-lane motorway that runs for approximately 27 kilometres between Mackays Crossing to south of Porirua. Te Aranui o Te Rangihaeata – Transmission Gully has been open to the public since March 2022, and continues to provide good, reliable, and safe service and important regional resilience. However, the project has not achieved full completion as of 30 June 2023.

The Transmission Gully project was completed in stages in order to enable the early opening of the motorway to the public, while also allowing work to be undertaken on the wider state highway network that otherwise would have caused significant disruptions for motorists without the alternative route:

Work remaining includes:

- the extension of State Highway 59 between Mackays Crossing and Paekākāriki
- completion of the two-lane roundabouts at State Highway 58 interchange at Pāuatahanui
- recreational track along parts of the route
- maintenance access tracks, and
- various other off-road works, as well as completing the required quality assurance tests, works completion tests and consenting tasks;

which when completed will provide additional efficiency and potential safety benefits not realised and captured in this annual report. It is a key part of State Highway 1 and of the Wellington Northern Corridor Programme (**Figure 2**).[3] TGP opened on 31 March 2022 and provides an alternative state highway corridor to the existing coastal route, now known as State Highway 59.

1.2 Purpose and scope of this report

Johnstaff was commissioned by Waka Kotahi to develop an annual report that monitors and evaluates the performance and benefits of TGP and its impact on the broader road network during its first year of operations:

- **Performance monitoring:** The performance of TGP and its impact on the broader road network was assessed against a series of key performance indicators (KPIs) (**Table 1**) for key commuter, freight and bus routes (**Appendix 1**).
  - A number of KPIs for TGP were identified in the Monitoring Plan[4] and identified by Waka Kotahi to underpin the monitoring of the motorway's performance and impact on the broader network during the first year of operations (shaded blue in Table 1 below). Additional KPIs were identified by Johnstaff to provide a richer view of the changes to network performance during TGP's first year of operations and are also included in Table 1 below.[5]
- **Evaluation:** A high-level estimate of the economic benefits resulting from the first 12 months of TGP operation was developed based on Waka Kotahi's *Monetised Benefits and Costs Manual* ('the Manual').[6]

[3] Further information on the Wellington Northern Corridor is available from Wellington Northern Corridor | Waka Kotahi NZ Transport Agency (nzta.govt.nz).
[4] New Zealand Transport Authority, Wellington Network Operational Readiness for Transmission Gully Opening V0.3.
[5] It is worth noting that the KPIs outlined in Table 1 below may differ somewhat from the original intention outlined in the Detailed Business Case (DBC) under the Roads of National Significance (RoNS).
[6] Waka Kotahi, Monetised benefits and costs manual, Version 1.6, April 2023.

1.3 Approach and limitations

As outlined above, the purpose and scope of this report allows for high-level analysis of the network performance and economic benefits stemming from the opening of TGP based on key commuter, freight and bus routes outlined in the Monitoring Plan. Within this context, detailed traffic modelling was not utilised. Instead, the following data sources provided by Waka Kotahi have been used to underpin the analysis:

- Crash Analysis System (CAS).
- Internally developed Qlik TGP monitoring dashboard including TomTom information on travel times, speeds and variability.
- Traffic Management System (TMS) for traffic volume information at specific locations.

Johnstaff has relied on Waka Kotahi to provide and interpret data from its internal systems as well as identify relevant KPIs and freight routes based on the Monitoring Plan. Further information regarding the framework, procedures and parameters used to develop the economic assessment are provided in Appendix 3.

When interpreting the results below it is worth noting that there will be an inherent degree of data volatility on a year-to-year basis and that the scope and scale of key trends may not clearly emerge for a number of years. The estimated long-term impacts from an analysis of TGP's first year of operations may therefore not be a true reflection of the longer-term trends observed. In particular, the true impact of TGP on the safety and resilience of the road network is expected to take a number of years to crystallise due to the fact that safety and resilience incidents occur with a relatively low frequency and can therefore vary significantly on an annual basis. Given the limitations and opportunities outlined above, it is recommended that this monitoring and evaluation report is replicated on an annual basis, for (at least) the next five years.

1.4 Structure of the report

The structure of the report has been organised to provide several layers of depth and detail to support the needs of the various stakeholders including:

- Overview of findings: Provides an overview of the performance of TGP over the first 12 months of its operation against a number of KPIs and presents the results of a rapid economic evaluation.
- Key priority areas in focus: Provides more detailed analysis based on key priority areas including general vehicle mobility, freight vehicle mobility, public transport mobility, user safety and network resilience.
- Further assessment opportunities: Outlines opportunities to further improve the monitoring and evaluation of TGP over time.
- Appendix 1: Detailed review of the study area: Provides further detail regarding the study area selected to perform the monitoring and evaluation report including key routes and traffic volumes.
- Appendix 2: Detailed data and information analysis: Provides further detail regarding information and data analysis that underpinned the key findings in the body of the report including, but not limited to, detailed safety statistics.
- Appendix 3: Economic framework, procedures and parameters: Provides further detail regarding the framework, procedures and parameters used to develop the rapid economic assessment.
- Appendix 4: Early comparison against modelling prediction: A high level comparison between what our performance monitoring shows comparing to the original modelling work carried out before Transmission Gully opened.

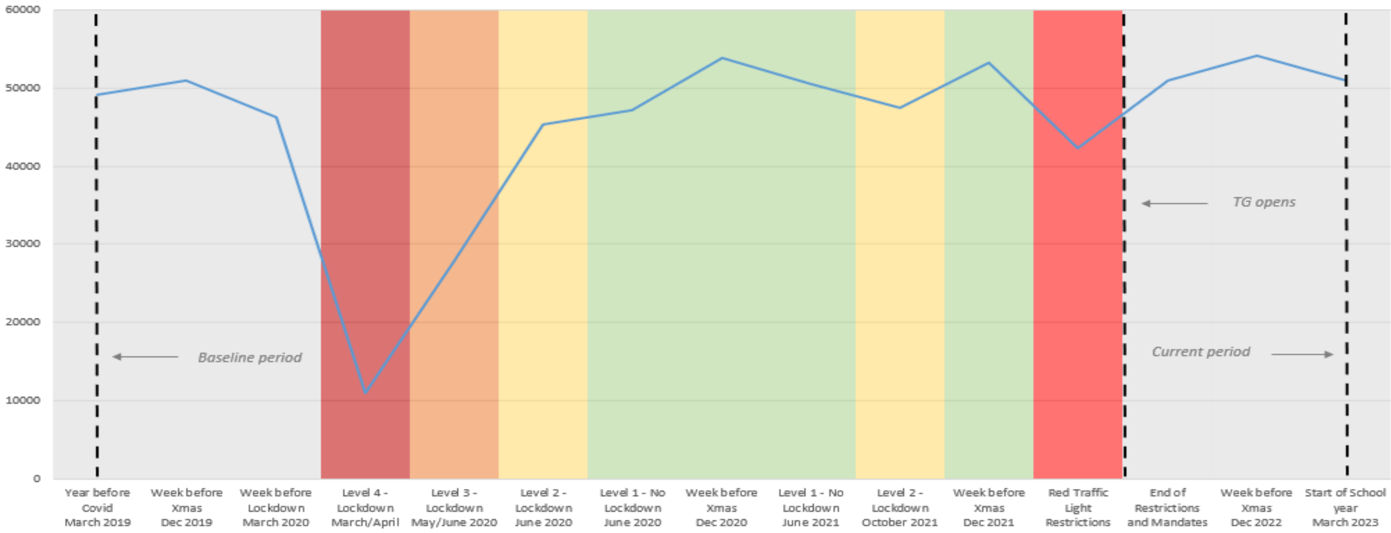
2. Overview of findings

2.1 Implications of COVID-19

Our analysis required the comparison of several network performance measures prior to and following the opening of TGP on 31 March 2022. COVID-19 had a significant impact on traffic flows during this period, due in part to lockdown periods, changes in working arrangements and labour shortages, which complicated the tasks of monitoring and evaluating the performance of the road.

Figure 1 below highlights the average daily traffic volume in both directions from March 2019 to March 2023 near the Tawa Interchange (Figure 2) through successive lockdowns periods across New Zealand. In order to manage the impact of COVID-19 on network performance in our analysis, performance measures such as travel times and variability were examined in March 2023 ('Current period') and compared to March 2019 ('Baseline period').[7]

Figure 1: Daily traffic volumes at Tawa



Source: Johnstaff analysis of data provided by Waka Kotahi

[7] Generally speaking, one potential issue with comparing performance measures over a five-year period is that traffic volumes can increase substantially over this period and influence indicators of traffic speeds and times. The data indicates that volumes have not changed substantially between our current and baseline periods which may partly reflect the introduction of flexible working which has provided an offset to the natural traffic demand growth. Current and baseline periods of up to 12 months were also reviewed to assess the extent to which traffic disruptions or events may be influencing the analysis. The results for key variables such as travel speed using 3 months and 12 months windows of time were largely unchanged. Safety incidents were assessed over a five-year time period prior to TG opening.

2.2 Key headlines

The opening of TGP has led to significant improvements in network performance across the five key priority areas:

- General vehicle mobility
- Freight vehicle mobility
- Public transport mobility
- User safety, and
- Network resilience.

Strong progress has been made over the first 12 months of operations towards most of the KPIs included in the Monitoring Plan and those identified by Johnstaff (**Table 1**). This is estimated to have translated into approximately $60M of economic benefit for New Zealand (**Table 2**), which represents an annual yield of approximately five per cent.[8]

Figure 2: Map of Te Aranui o Te Rangihaeata – the Transmission Gully motorway

Table 1: Key performance indicators for TG

Key priority areas	KPI measures	Performance	Summary
-	KPI 1: The estimated AADT for the SH routes (SH1, SH8, SH2)	●	• Strong and consistent evidence of commuters utilising TGP, and traffic being diverted from SH59.
General vehicle mobility	KPI 2: Change in average travel times on key journeys	●	• Strong and consistent evidence of reduced travel times across the key state highway links and time periods examined.
	KPI 3: Variability of journey times on key journeys during peak periods	●	• Further data analysis is required to better understand the variability of journey times
Freight vehicles mobility	KPI 4: Change in average travel times on key journeys	●	• Strong and consistent evidence of reduced travel times across the key state highway links and time periods examined.
	KPI 5: Variability of journey times on key journeys during peak periods	●	• Further data analysis is required to better understand the variability of journey times
Public transport mobility	KPI 6: Change in average travel times along key bus routes during peak periods.	●	• Since the opening of TGP, average travel times along Bus Route 1 between Grenada Village and Island Bay have improved significantly, especially during the morning and afternoon peaks. • Average travel times along Route 60 and Route 220 recorded more modest changes since the baseline period.
	KPI 7: Variability of bus journey times during peak periods on key routes	●	• Further data analysis is required to better understand the variability of journey times

[8] i.e. the annual economic benefit is roughly 5 per cent of the construction cost ($1.25 billion).

Key priority areas	KPI measures	Performance	Summary
User safety	KPI 8: No. of deaths and serious injuries and minor injury crashes on key journeys	● (green)	• Strong and consistent evidence that TGP has reduced the frequency and severity of safety incidence across the network.
Network resilience	KPI 9: Average journey delay during incidents on key journeys	● (green)	• TGP provides an alternative route to SH59 which offers significant resilience. Based on our case study of the landslide in August 2022, the travel time savings could be approximately between 40 minutes and 80 minutes.

● Improved performance relative to baseline period. ● Performance relative to baseline period is unclear/ mixed. ● educed performance relative to baseline period.

Table 2: Estimated economic benefits from first year of operations (2022/23)

Key priority areas	Economic benefits	$ million
Passenger vehicle mobility	Reduction in average travel times / congestion*	30.8
	Improve reliability	2.3
	Reduces emissions and vehicle operating costs	1.6
Freight vehicles mobility	Reduction in average travel times / congestion*	12.6
	Improve reliability	0.7
	Reduces emissions and vehicle operating costs	2.8
Public transport mobility	Reduction in average travel times / congestion*	0.9
	Improve reliability	-
User safety	Reduced number and severity of crashes	3.9
Network resilience	Expanded options in the event of disruptions	3.7
	Total	59.3

* The Manual states that 'Road users value relief from congested traffic conditions over and above their value of travel time saving'. Additional travel time savings due to congestion have not been estimated due to limited information regarding the capacity and volume of traffic across the network.

3. Key priority areas in focus

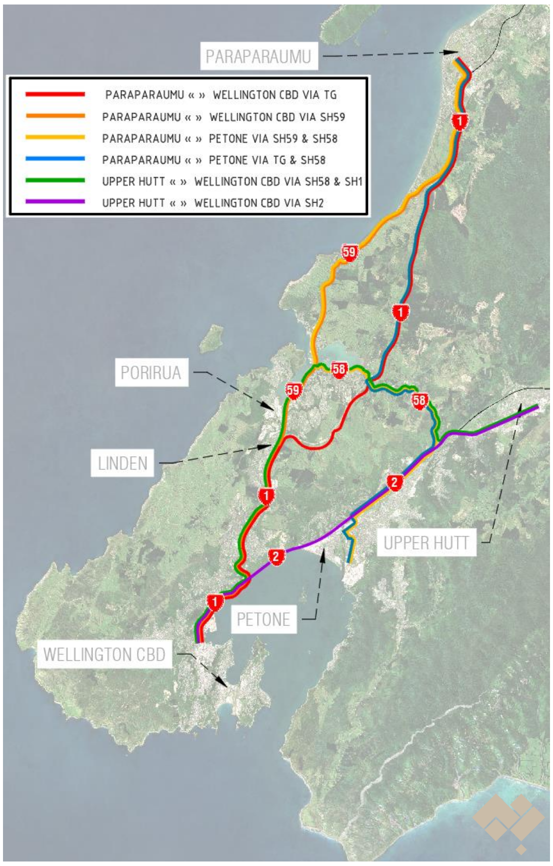
This section examines the changes in network performance across each of the key priority areas outlined in Table 1 and Table 2 above and in turn, the progress made towards KPIs and the expected economic benefits for New Zealand during the first 12 months of operations. The insights presented below are supported by detailed data and analysis contained in **Appendices 1 to 3**.

Key network performance captured through this report has also been compared against the original traffic modelling carried out by FLOW Transportation before Transmission Gully opened. The key summary is captured in **Appendix 4.**

3.1 Passenger mobility

There has been a significant shift in passenger vehicles from SH59 to TGP since March 2022 (Table 5 in Appendix 2), which has helped to reduce travel times, congestion, vehicle operating costs and emissions as well as improve reliability across the key passenger routes examined (Figure 3):

Figure 3: Key commuter routes



- **Traffic volumes:** There has been a significant shift in northbound and southbound traffic volumes from SH59 to TGP since March 2022 due to reduced travel times and improved safety which has resulted in significant progress towards achieving KPI 1. In particular:
    - Close to 25 000 vehicles are estimated to use TGP on a daily basis as of 2023 (Table 5 in Appendix 2).
    - There has been close to a 40 per cent decline in the number of vehicles travelling along SH58 between Porirua and the Pauatahanui Interchange (a narrow and winding two-lane road with higher levels of reported safety incidence) (Table 5 in Appendix 2).
    - The Mungavin Avenue Interchange on SH59 has experienced a 30 per cent drop in traffic volumes since TGP opened (Table 5 in Appendix 2).

- **Travel times:** SH2 and SH59 have both recorded significant average travel time reductions since the opening of TGP. This is due to the transfer of traffic to the new motorway and in turn lower levels of congestion. Average travel times have fallen by more than 10 per cent during the evening peak period (4pm to 7pm), particularly on segments of road that are only one lane in either direction. TGP and SH59 currently offer similar average travel times between Paraparaumu and Wellington CBD suggesting that a network equilibrium may have been reached.[9] Significant travel time savings have been achieved between Paraparaumu and Petone, as TGP provides a new and more direct connection (Table 6 and Table 7). The reduction in travel times outlined above has resulted in significant progress towards KPI 2 and has been valued at $30.8 million in economic benefits over the first 12 months of operations (Table 2).

- **Reliability:** Network reliability relates to the unpredictable variation in commuter's day-to-day travel times. When network reliability is low, commuters can be forced to leave earlier than they would normally do to allow sufficient time in the event of delays. The additional time allowance represents a cost in the sense that this is time that could be used for other activities. Reliability has generally improved across the network, particularly on segments of SH59 that only have one lane in either direction, which has resulted in significant progress towards achieving KPI 3 and has been valued at $2.3 million in economic benefits during the first year of operations (Table 2).

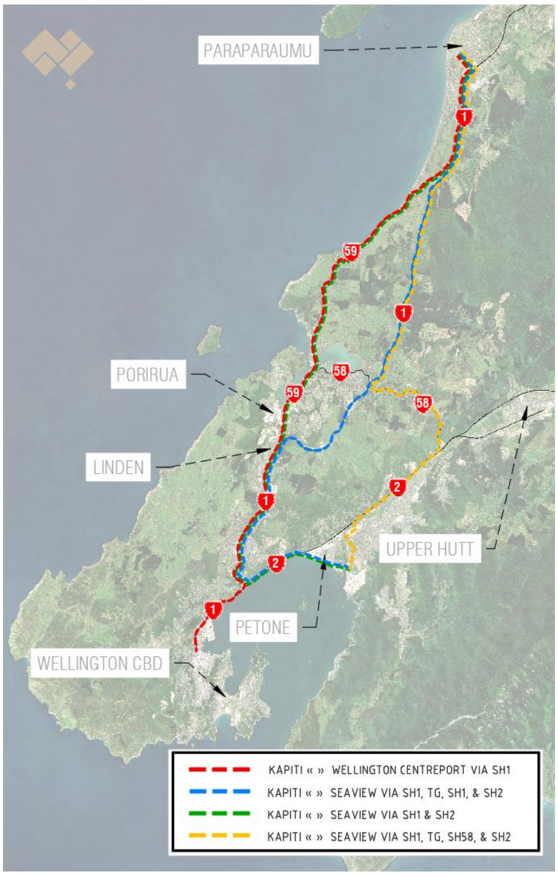
- **Vehicle operating costs and emissions:** Reduced travel times and distances travelled across the network due to the opening of TGP is estimated to have resulted in reduced vehicle operating costs and emissions for commuters and has been value at $1.6 million in economic benefits during the first year of operations (Table 2).

[9] TG and SH59 offer alternative routes between Paraparaumu and Wellington CBD. To the extent that one route offers a shorter travel time than the other, it would be expected that more vehicles would choose this route which would in turn would increase congestion and reduce travel times. Traffic would be expected to continue to transfer to the faster route until the travel times are broadly the same across the two options.

3.2 Freight mobility

Similar to passenger vehicles, there appears to have been a significant shift in freight vehicles from SH59 to TGP since March 2022 (Table 5 in Appendix 2), which has helped to reduce travel times, congestion, vehicle operating costs and emissions as well as improve reliability across the key freight routes examined (Figure 4).

Figure 4: Key freight routes



- **Traffic volumes:** At the time of drafting, Johnstaff is unaware of any data specifically related to freight vehicle movements on TGP. As outlined above however, there has been a significant shift in (non-descript) vehicles from SH59 to the new motorway since March 2022. Anecdotal evidence from Waka Kotahi indicates that close to 75 per cent of freight vehicles are now travelling along TGP, while 25 per cent remain on SH59. This anecdotal evidence suggests that significant progress has been made towards achieving KPI 1.

- **Travel times:** Since the opening of TGP, the travel times on SH59 have improved significantly, especially during the morning and afternoon peak. The travel times between SH59 and TGP are similar for the route of Paraparaumu – Wellington CBD – Petone. However, TGP provides an alternative and more direct route which resulted in significantly reducing the travel time to/from Petone travelling north (Table 8). The reduction in travel times outlined above has resulted in significant progress towards KPI 4 and has been valued at $12.6 million in economic benefits over the first 12 months of operations (Table 2).

- **Reliability:** As outlined above, network reliability relates to the unpredictable variation in commuter's day-to-day travel times. When network reliability is low, commuters can be forced to leave earlier than they would normally do in order to allow sufficient time in the event of delays. The additional time allowance represents a cost in the sense that this is time that could be used for other activities. Reliability has generally improved across the network which has resulted in significant progress towards achieving KPI 5 and has been valued at $0.7 million in economic benefits (Table 2).

- **Vehicle operating costs and emissions:** Reduced travel times and distance travelled across the network due to the opening of the new motorway is estimated to have resulted in reduced vehicle operating costs and emissions for freight vehicles and has been valued at $2.8 million in economic benefits (Table 2).

3.3 Public transport mobility

Two datasets related to public transport were available:

1. Data on general commuter vehicle speeds and travel times along key bus routes (Route 1, 60, 220).

2. Data on the end-to-end travel times of buses along key routes.

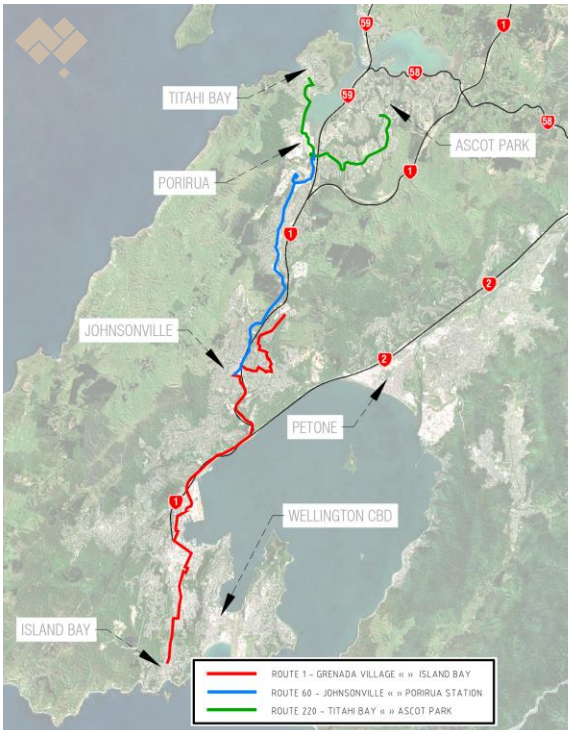
Information from Dataset 2 indicated that the end-to-end journey times of buses along the key routes identified in **Figure 5** have increased relative to the baseline period. A number of factors have the potential to influence end-to-end travel times for buses including, but not limited to, network performance and any factors that change service frequency. [10] Recent media coverage has highlighted significant changes to timetabling and driver shortages in the region over our current assessment period (March 2022). [11] It was therefore difficult based on the data available to isolate the effects TGP and network performance had on bus travel times.

Information from Dataset 1 was therefore used to assess the likely change in end-to-end bus journey times that stem from the new motorway. Based on this data:

- **Average travel times:** Since the opening of TGP, for the three routes we selected to monitor and report, Bus Route 1 between Grenada Village and Island Bay has improved significantly, especially during the morning and afternoon peaks. However, Route 60 and Route 220 travel times have recorded more modest changes since the baseline period (**Table 9**). The reduction in average travel times has been valued at $0.9 million in economic benefits (**Table 2**).

- **Reliability:** Available data indicates that the variability of bus journey times has not reduced during peak periods on key routes. Further data and analysis is required in order to provide a more accurate conclusion regarding the reliability impact to buses.

Figure 5: Key bus routes



[10] Reduced service frequency (all else constant) would be expected to result in more passengers per services and slower end-to-end travel times.

[11] For more information, please see: https://www.rnz.co.nz/news/in-depth/487217/the-crisis-of-our-urban-bus-networks-hundreds-of-services-cancelled-every-day

3.4 User safety

TGP was purpose built with the following key safety features:

- Traffic flows are separated by median and side barriers which reduces the likelihood of head-on or run-off road crashes. In fact, close to 75 per cent of the crashes across TGP associated with an object being struck, involved contact with guides/guard rails, while this number is closer to 25 per cent on SH59 (Appendix 2). The data outlined above has translated to more than 60 barrier collisions being recorded by the operations and maintenance contractor since TGP opened, which is likely to have helped to significantly reduce the severity of safety incidents.
- Two lanes are provided along its full length in each direction allowing vehicles to pass each other.
- Wide shoulders where vehicles are able to pull over in case of an incident allowing other traffic to pass unimpeded.

In contrast, alternative routes such as SH59 and SH58 were constructed a number of years ago under a different set of safety standards and requirements.

Table 3 and Figure 3 below compare the number of reported crashes and their severity along SH58, SH59, and TGP (2022-2023 data only), showing a significant decrease in both number and severity of crashes across key state highway routes. The number and severity of crashes on all three state highways are substantially less than what would be expected if the volume of traffic remained on SH59. The improved safety outcomes have resulted in significant progress towards achieving KPI 8 and have been valued at $3.9 million in economic benefits (Table 2).

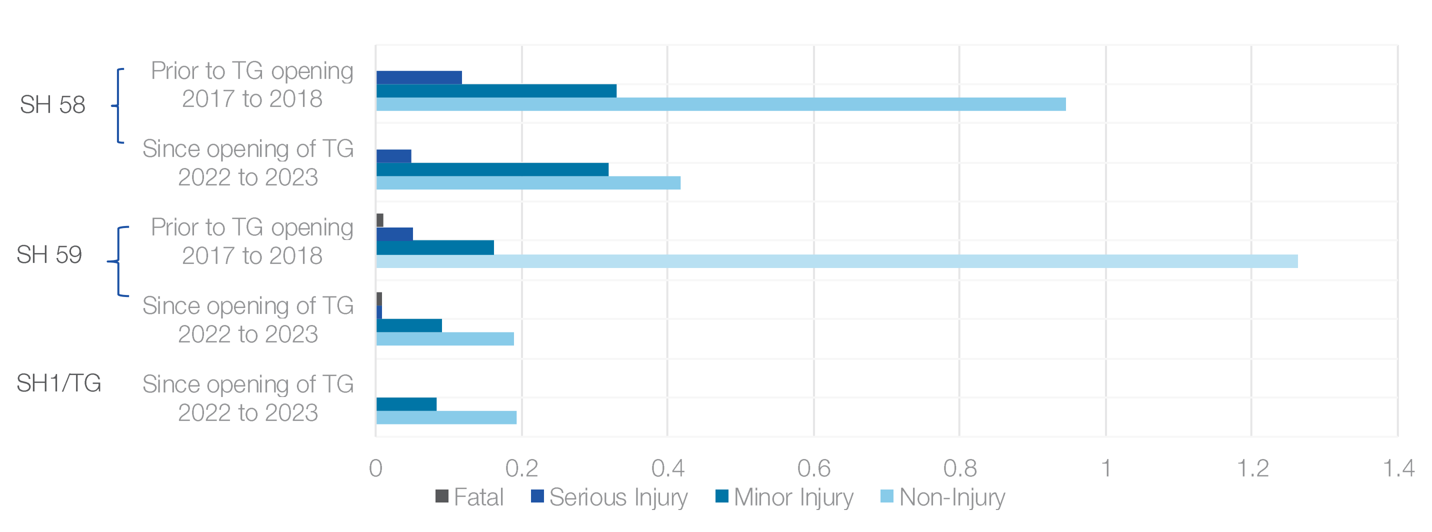
Table 3: Crashes across key state highway segments[12]

Crash numbers (per year)	Fatal	Serious injury	Minor injury	Non-injury	Total crashes
SH59					
1/04/2017 – 31/03/2018	1	5	16	124	146
1/04/2022 – 31/03/2023	1	1	10	21	33
SH58					
1/04/2017 – 31/03/2018	0	5	14	40	59
1/04/2022 – 31/03/2023	0	2	13	17	32
Transmission Gully (SH1)					
1/04/2022 – 31/03/2023	0	0	7	16	23

Source: Johnstaff analysis of data provided by Waka Kotahi

[12] The crash data was provided by Waka Kotahi in June 2023. It is worthwhile noting that the crash database is constantly being updated.

Figure 6: Crash Rates Analysis on Key State Highways (per 100k vehicles)



Source: Johnstaff analysis of data provided by Waka Kotahi

3.5 Network resilience

For this Report, resilience in the context of a road network is defined as:

> *Resilience is the ability of systems (including infrastructure, government, business and communities) to proactively resist, absorb, recover from, or adapt to, disruption within a timeframe which is tolerable from a social, economic, cultural and environmental perspective.*[13]

TGP has helped to improve network resilience in at least two ways:

- **Expanded network capacity:** Expanded network capacity enables commuters to access additional options / routes when a disruption or road closure occurs (e.g. a land slide leading to the closure of SH59). Previously SH59 (formerly SH1) was one of two state highways that connected to Wellington CBD; SH59 and SH2 are on opposite sides of the Tararua Forest, with no links between them for significant lengths of the roads.
- **Expanded motorway capacity:** TGP opened with two lanes in each direction, along with shoulders and several passing lanes. In contrast, SH59 from Paraparaumu is one lane in each direction for extended sections, which means if there is a disruption it can be difficult for (i) emergency response vehicles to access; and (ii) general commuters to pass or take an alternative route.

Box 1 below outlines a case study that illustrates the improvement in network resilience due to the construction of TGP motorway.

Box 1: Case study – Landslides on SH59, August 2022

[13] New Zealand Transport Agency, *Better measurement of the direct and indirect costs and benefits of resilience*, 2020.

Johnstaff have examined the resilience benefits of TGP through a case study based on the landslides that were recorded on SH59, in August 2022.

From Friday, 19 August until 15 September 2022, SH59 was fully closed between Paekākāriki and Pukerua Bay due to multiple slips. The extent of the state highway closure is shown as the red line on the right.

Without TGP, the alternative routes are:

- General vehicles which need to travel to/from Wellington CBD must travel via the old state highway 1 which goes through Paraparaumu and Waikanae, through the undulating and winding Reikorangi Road and Akatarawa Road, to SH2, shown as the dark blue line on the right.
- As heavy trucks are not permitted to travel on Akatarawa Road, the travel route is via Palmerston North and SH2.
- The table below shows the significant additional travel time that would have been required for this particular route if TGP was not operational.

The improved resilience of the road network due to TGP demonstrates the achievement of **KPI 9** and is valued at $3.7 million in economic benefits during the first 12 months of operations (**Table 2**).

Resilience Measures – Travel Time Comparison	Via TG (min)	Via other route without TGP (min)[14]	Travel Time Savings
Between Paraparaumu and Wellington CBD			
AM Peak – Southbound – To Wellington CBD	51	90 min – 110 min	39 min – 59 min
PM Peak – Northbound – To Paraparaumu	47	90 min – 130 min	43 min – 83 min

3.6 Additional benefits

A number of additional benefits are expected to stem from TGP that are not directly captured by the KPIs and economic assessment above including urban amenity benefits, active transport, and the reduced use of inappropriate routes.

3.6.1 Urban amenity

TGP bypasses Porirua, Paekākāriki and Pukerua [Bay]. While an assessment of potential urban amenity benefits received by these communities is outside the scope of this engagement, economic theory and recent media articles suggest that these communities are likely to be receiving benefits in the form of improved amenity, including reduced noise and pollution from lower through traffic (freight vehicles in particular) along SH59. In particular, one local resident has noted through a recent media article:

> *"It's reduced the traffic flows between Paremata and Pukerua, so it's a lot quieter, residents are really enjoying it, there's no hum on the road," she said. "And there's more people actually using Transmission Gully and coming into the city."*[15]

3.6.2 Active transport

Johnstaff understands that cycling and pedestrian monitoring counters have been installed along SH59. At the time of writing, however, limited data was available to analyse. Notwithstanding current data limitations related to active transport, it would be expected that local residents would feel more empowered to use active transport options along and across SH59 due to reduced traffic volumes and particularly freight vehicles.

[14] Based on Google Travel Time, snapshot shown in **Appendix 2**

[15] For more information, please see: https://www.rnz.co.nz/news/national/487044/transmission-gully-marks-one-year-of-being-open

3.6.3 Reduced reliance on local routes

The TGP Business Case noted that local routes such as Paekākāriki Hill Road and Grays Road (not covered in our assessment) suffer from poor geometry and safety history but are used by significant volumes of traffic between the Porirua / Kapiti areas and Hutt Valley as alternatives to the congested SH1 corridor. TGP provides a high-standard route as an alternative to these local traffic movements, which would be expected to result in significant safety benefits.[16]

4. Further assessment opportunities

As outlined above, the purpose of this report is to provide a high-level summary of the performance of the road network following the opening of TGP. A number of opportunities have been identified through consultation with Waka Kotahi stakeholders to improve the quality of the evidence base and economic benefit analysis moving forward. These are summarised in the table below.

Table 4: Opportunities to further improve future monitoring and evaluation of TGP

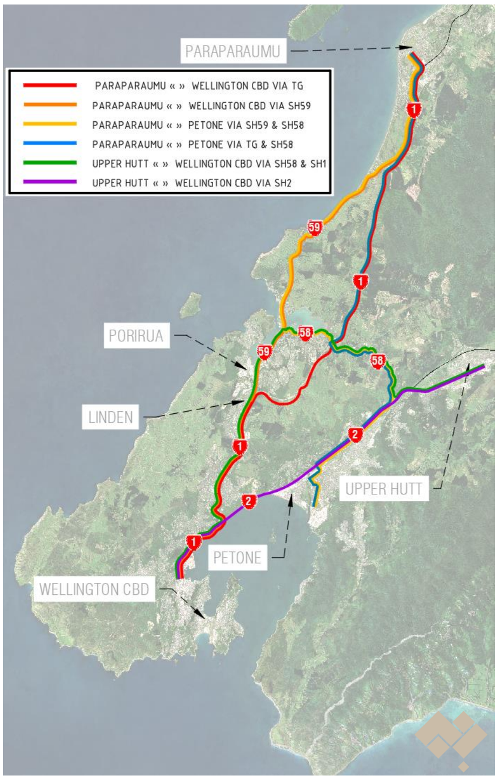
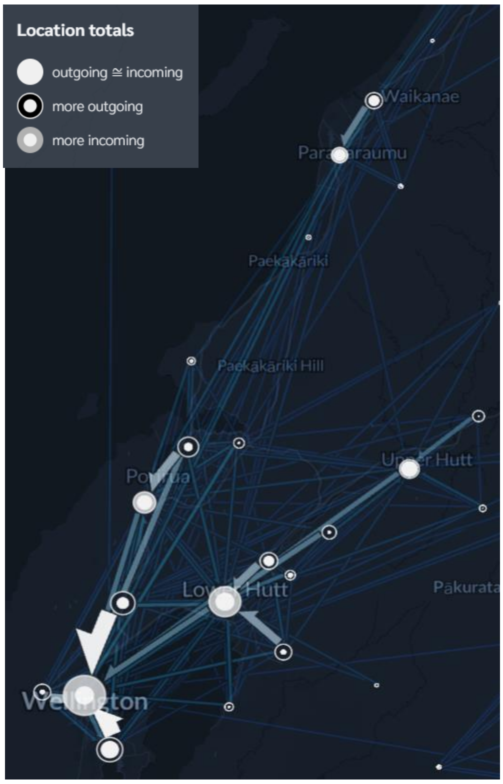
Area of Opportunity	Purpose
Public transport (include bus and train) occupancy data and analysis.	To further understand the multi-modal impact post COVID-19 and after the opening of TGP.
Active mode (Walking and Cycling) information.	To further understand the multi-modal impact post COVID-19 and after the opening of TGP.
Freight specific volume information and demand changes.	To better understand the behaviour change and freight route choices after the opening of TGP.
Include multi-modal evaluation for arterial and local network.	To better understand the wider economic benefit to the arterial and local network.
Include train as a key mode for evaluation, including key journeys to train stations.	To better understand the wider economic benefit for the park and ride (and wider) users.
Dashboard Improvement.	Continuous improvement on the data algorithm and KPIs analysis using the existing Qlik dashboard developed by Waka Kotahi.
Automate and incorporate the economic assessment as part of the dashboard.	Further automate the dashboard analytical ability. This report has developed a robust economic evaluation process, beneficial to include as part of the dashboard.
Incorporate detailed data from 2023 Census on travel patterns.	To further understand the multi-modal impact post COVID-19 and after the opening of TGP.
Further scope to include more sophisticated transport modelling techniques and methods, including a review of the key routes / study area for the economic assessment.	To further understand the multi-modal impact post COVID-19 and after the opening of TGP.

[16] For more information, please see: https://www.nzta.govt.nz/assets/projects/transmission-gully/docs/business-case.pdf

Appendix 1 - Overview of the study areas

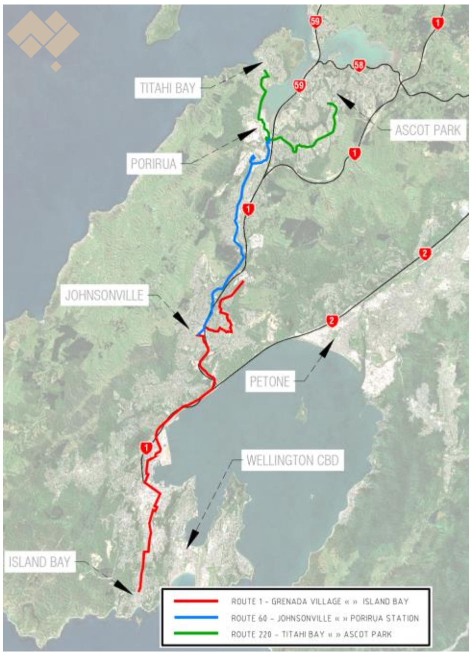
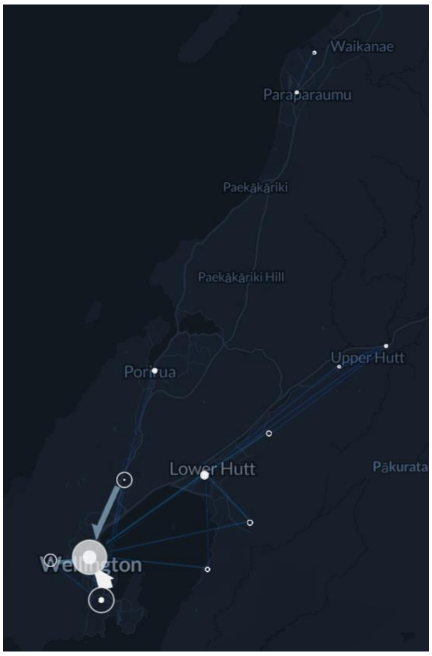
The Figures below outline the key study areas considered for commuter vehicles, freight and buses including key routes that align with traffic flows.

Figure 7: Key passenger vehicle routes and flows

Key general vehicle routes	Car flows (2018)
	

Source: Monitoring Plan and www.flowmap.com.au

Figure 8: Key bus and freight routes

Key Bus Routes	Bus flows (2018)	Key freight routes
		

Source: Monitoring Plan and www.flowmap.com.au

Appendix 2 - Detailed data and information analysis

Traffic volume analysis (commuter and freight)

Detailed traffic volumes are presented below in Table 5 for discrete points across the state highway network (Figure 9).

Figure 9: Location of traffic count stations

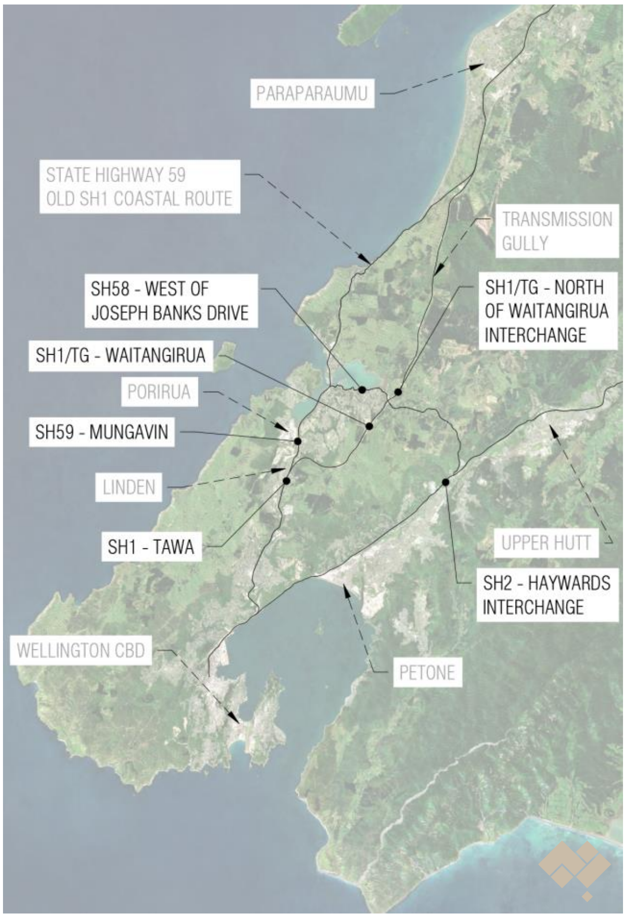


Table 5: Detailed traffic volumes data

		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
SH59	Mungavin	2019		2022- March		2022- May		2023	
NB	Through lane 3	7924	-	6144	178	3365	31	3316	41
	Through lane 4	6587	-	4777	750	1660	128	2680	184
	On ramp 1	-	-	5181	-	4355	-	4541	-
	off ramp 1	-	-	10616	416	10014	327	11022	312
SB	Through lane 2	-	-	5290	118	2348	12	2412	25
	Through lane 1	-	-	5881	869	3931	178	3791	189

		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
SH59	Mungavin	2019		2022- March		2022- May		2023	
	On ramp 1	-	-	9712	395	8923	271	8542	214
	off ramp	-	-	4725	-	3852	-	4082	-
Daily Total:		14511		55052		39395		41351	

		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
SH58	West of Joseph Banks Drive	2019		2022		2022- May		2023	
	Lane 1	6937	-	4867	227	3043	84	3102	69
	Lane 2	6950	-	4978	237	3087	88	3007	54
Daily Total:		13887		10309		6302		6232	

		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
SH2	Haywards Interchange	2019		2022- March		2022- May		2023	
NB-decreasing	Through lane 1	8242	126	8606	351	7928	122	8652	144
	Through lane 2	4672	6	5538	24	4296	9	4963	12
	On ramp	3972	103	3856	229	4026	77	4517	96
	off ramp	3902	56	5096	146	4373	170	4417	94
SB-increasing	Through lane 1	6893	118	9311	403	7928	122	8652	143
	Through lane 2	5145	11	8851	40	4296	9	4963	12
	On ramp	3929	45	3601	161	3443	50	4172	93
	off ramp	3919	95	3856	204	4041	75	4417	94
Daily Total:		41234		50273		40965		45441	

		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
SH1	Tawa	2019		2022- March		2022- May		2023	
NB	Through lane 1	12054	1224	11412	1167	13483	1158	13731	1047
	Through lane 2	11152	245	9375	233	9869	169	10748	194

		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
SH59	Mungavin	2019		2022- March		2022- May		2023	
SB	Through lane 3	9328	304	8798	244	9225	151	9727	191
	Through lane 4	15182	1265	12567	1187	14348	1156	14370	1194
Daily Total:		50754		44983		49559		51202	

		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
SH58	Pauatahanui East	2019		2022- March		2022- May		2023	
	Lane 1	9102	585	6539	452	7912	602	9499	708
	Lane 2	9098	600	6750	398	8011	479	9281	517
Daily Total:		19385		14139		17004		20005	

		Light	Heavy	Light	Heavy
SH1	Waitangirua	2022- April		2022- October	
NB	Both Lanes	12742	-	12658	-
SB	Both Lanes	11919	-	11214	-
Daily Total:		24661		23872	

		Light	Heavy	Light	Heavy
SH2	Waitangirua Interchange	2022- April		2022- October	
NB	Both Lanes	10683	-	11741	-
SB	Both Lanes	10683	-	11741	-
Daily Total:		21366		23482	

Travel times

General Vehicle: CBD to / from Paraparaumu

Detailed travel times estimates are presented below in Table 6 for discrete points across the state highway network (Figure 10).

Figure 10: Passenger commuter routes

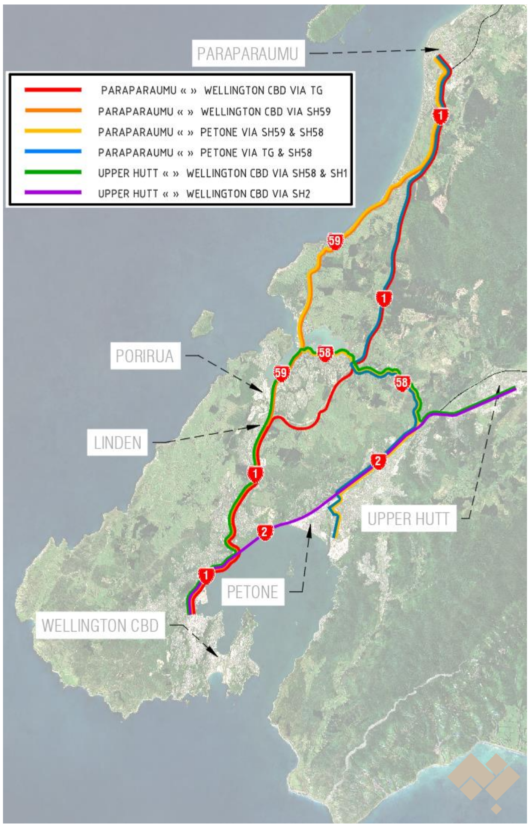


Table 6: Detailed travel time estimates

Travel times along key routes (AM Peak)	2019 via SH59	2023 via SH59	2023 Via TG
Paraparaumu to CBD	57	50	51
CBD to Paraparaumu	48	44	44
Paraparaumu to Petone	55	48	41
Petone to Paraparaumu	51	47	40
Travel times along key routes (Inter Peak)	**2019 via SH59**	**2023 via SH59**	**2023 Via TG**
Paraparaumu to CBD	50	46	46
CBD to Paraparaumu	49	45	45
Paraparaumu to Petone	49	45	39
Petone to Paraparaumu	49	47	40
Travel times along key routes (PM Peak)	**2019 via SH59**	**2023 via SH59**	**2023 Via TG**
Paraparaumu to CBD	53	47	47
CBD to Paraparaumu	56	47	47
Paraparaumu to Petone	52	46	39
Petone to Paraparaumu	54	48	41

General Vehicle: CBD to / from Upper Hut

Detailed travel times estimates are presented below in Table 7 for discrete points across the state highway network (Figure 11).

Figure 11: Passenger commuter routes

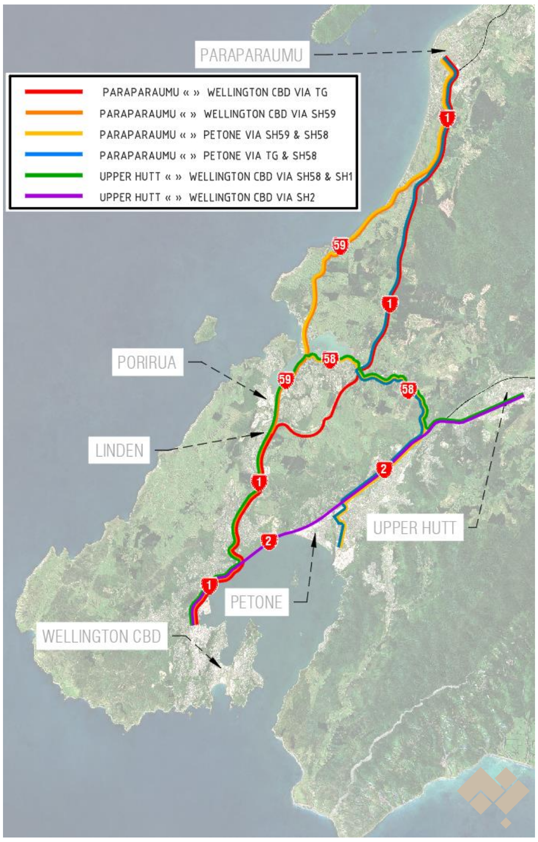


Table 7: Detailed travel time estimates

Travel times along key routes (AM Peak)	2019 via SH2	2023 via SH2	2019 via SH59	2023 via SH59	2023 via TG
Upper Hutt to CBD	36	33	53	47	44
CBD to Upper Hutt	30	28	48	44	39

Travel times along key routes (Inter Peak)	2019 via SH2	2023 via SH2	2019 via SH59	2023 via SH59	2023 via TG
Upper Hutt to CBD	31	30	46	43	33
CBD to Upper Hutt	30	29	46	43	40

Travel times along key routes (PM Peak)	2019 via SH2	2023 via SH2	2019 via SH59	2023 via SH59	2023 via TG
Upper Hutt to CBD	32	30	49	44	33
CBD to Upper Hutt	35	31	50	44	41

Freight routes

Detailed travel times estimates are presented below in Table 8 for discrete points across the state highway network (Figure 12).

Figure 12: Key freight routes

Table 8: Detailed travel time estimates

Travel times along key routes (AM Peak)	2019 via SH59	2023 via SH59	2023 Via TG	2023 Via SH58
CentrePort to Paraparaumu	47	44	43	-
Paraparaumu to CentrePort	56	50	50	-
Seaview to Paraparaumu	57	50	50	40
Paraparaumu to Seaview	55	52	52	42

Travel times along key routes (Inter Peak)	2019 via SH59	2023 via SH59	2023 Via TG	2023 Via SH58
CentrePort to Paraparaumu	48	44	44	-
Paraparaumu to CentrePort	49	46	45	-
Seaview to Paraparaumu	54	50	49	40
Paraparaumu to Seaview	53	50	49	40

Travel times along key routes (PM Peak)	2019 via SH59	2023 via SH59	2023 Via TG	2023 Via SH58
CentrePort to Paraparaumu	55	46	46	-
Paraparaumu to CentrePort	52	46	46	-
Seaview to Paraparaumu	60	51	51	41
Paraparaumu to Seaview	58	51	50	41

Public bus routes

Detailed travel times estimates are presented below in Table 9 for discrete points across the state highway network (Figure 13).

Figure 13: Public bus routes

Table 9: Detailed travel time estimates

Travel times along key routes (AM Peak)	2019	2023
Bus Journey		
Route 1 - Northbound	24	21
Route 1 - Southbound	26	23
Route 60 - Northbound	16	16
Route 60 - Southbound	17	16
Route 220 - Eastbound	15	15
Route 220 - Westbound	13	12

Travel times along key routes (Inter Peak)	2019	2023
Bus Journey		
Route 1 - Northbound	24	22
Route 1 - Southbound	23	21
Route 60 - Northbound	16	16
Route 60 - Southbound	16	16
Route 220 - Eastbound	15	14

Travel times along key routes (AM Peak)	2019	2023
Route 220 - Westbound	12	12

Travel times along key routes (PM Peak)	2019	2023
Bus Journey		
Route 1 - Northbound	27	23
Route 1 - Southbound	24	21
Route 60 - Northbound	17	16
Route 60 - Southbound	16	16
Route 220 - Eastbound	16	14
Route 220 - Westbound	13	12

Safety

Figure 14: Crash Severity by road segment

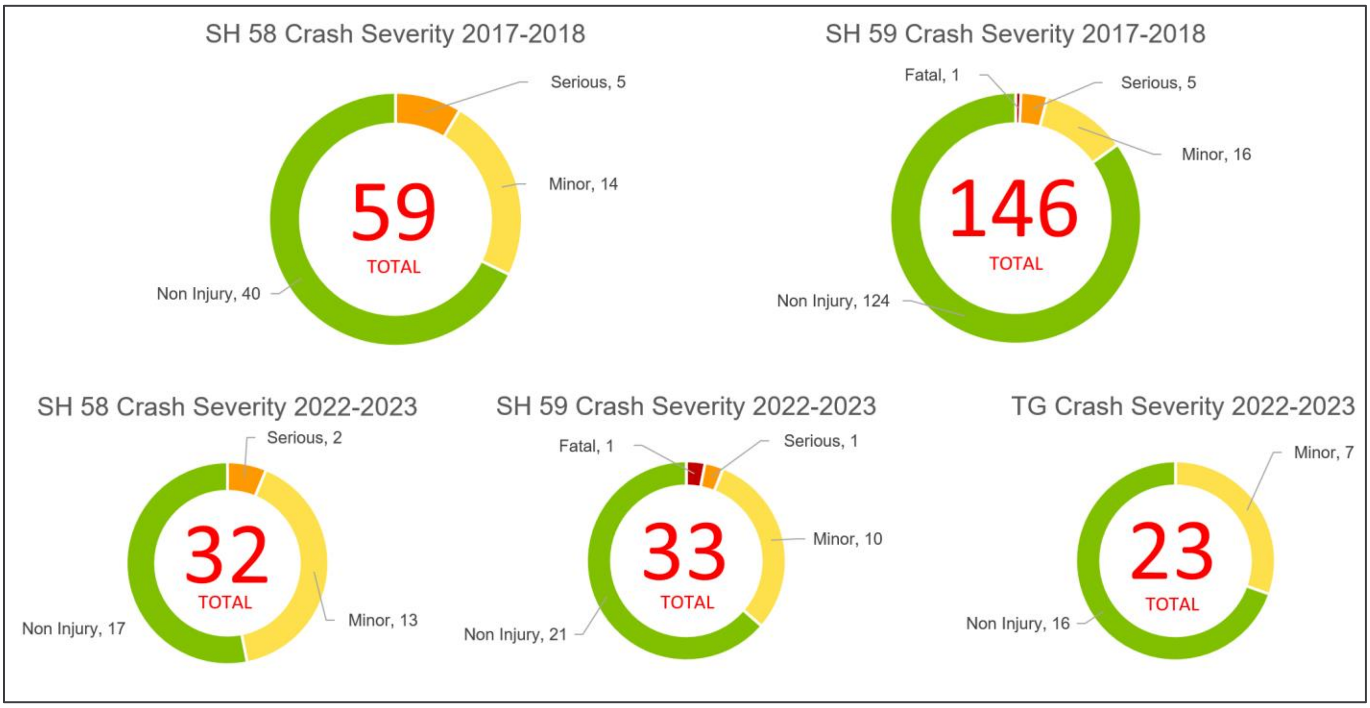


Table 10: Crashes with object struck

Transmission Gully: Crashes with object struck (01/04/2022 to 31/03/2023)		
	Injury	Non-injury
Total (no.)	5	19
Guide/Guard rail (no.)	3	16
Guide/Guard rail (%)	**60**	**84**

SH59: Crashes with object struck (01/04/2022 to 31/03/2023)		
	Injury	Non-injury
Total (no.)	7	13
Guide/Guard rail (no.)	1	4
Guide/Guard rail (%)	**14**	**30**

Appendix 3 - Economic framework, procedures and parameters

The framework, procedures and parameters used to estimate the economic benefits of TGP during the first 12 months of operations have been underpinned by the *Monetised benefits and costs manual*, Waka Kotahi, Version 1.6, April 2023 ('the Manual'). The table below outlines the benefit categories considered.

Table 11: Economic framework

Benefit categories	Evaluation method		Comments
	Monetisation	Qualitative treatment	
Reduction in average travel times (commuter and freight)	✓		
Reduced traffic congestion (commuter and freight)		✓	Requires detailed understanding of traffic volumes and road capacity across the routes included in the study area.
Improve reliability (commuter and freight)	✓		
Emissions and operating cost savings (all vehicles)	✓		
Reduction in average travel times (public transport)	✓		
Reduced congestion (public transport)		✓	Requires detailed understanding of traffic volumes and road capacity for the routes included in the study area.
Improve reliability (public transport)	✓		
Improved resilience	✓		
Reduced safety incidents	✓		
Active transport		✓	Assumed marginal / not relevant based on State Highway user survey.
Urban amenity benefits (bypass regional towns)		✓	Outlined benefits reported in media.

Data cleaning, aggregation, assumptions and validation

Data cleaning: It is assumed that data cleaning of the TomTom data is not required due to the expectation that outlier values are likely to occur during low volume / non-peak periods of the day.

Data aggregation: Key variables such as average travel time will be aggregated / averaged for each key time period (AM peak, interpeak etc.) and multiplied by the overall traffic volumes for the respective time periods over the 12 months since the opening of TGP.

Data assumptions: The average travel time data from the TomTom dashboard is assumed to be inaccurate and will not be used for the purpose of the study. Instead, average travel speeds will be used in conjunction with the length of key routes to estimate travel times.

Data validation: The analysis will be underpinned by dashboard data from TomTom. Detailed road segment data will be used to validate the results from the dashboard (for example) to verify the location of any recorded travel speed / time reductions.

Key assumptions

It has been assumed for the purpose of this study that there is no induced demand for the road network; i.e., transport mode / demand for the road network is not assumed to change due to the opening of TGP, only the route selection of users.

The traffic composition across the study area is assumed to align with the assumptions provided in the table below.

No other road projects within or close to the respective key routes for commuters, freight and buses had a significant impact on the analysis. We were informed by Waka Kotahi that speed controls were in place between Linden and Porirua during the control of TGP. This has been treated for in our analysis by reducing the travel time by one minute for key routes that include this segment of road.

Table 12: Assumed traffic composition

Travel time / vehicle type	Car	LCV	MCV	HCV1	HCV2
Morning commuter peak	85	10	2	1	2
Daytime inter-peak	84	11	2	1	2
Afternoon commuter peak	84	11	2	2	1
Evening/night-time	85	9	2	1	3
Weekday all periods	85	10	2	1	2
Weekend/holiday	87	8	3	1	1
All periods	85	10	2	1	2

Economic procedures

This section outlines the economic procedures used to estimate the benefits of TGP during the first year of operations. A detailed economic workbook has also been provided that can be reviewed in conjunction with the content below.

Travel time savings (commuter and freight)

Equalised values of travel time as opposed to behavioural values of travel time have been adopted for the purpose of benefit calculations in line with guidance provided on p.64 of the Manual. The travel time savings were calculated based on the following procedure:

Step 1: Estimate the average travel time along the selected routes prior to the construction of TGP (March 2019) for the following time periods:

- Morning commuter peak
- Daytime inter-peak
- Afternoon commuter peak
- Evening / night-time, and
- Weekend all periods.

Step 2: Estimate the average travel time along the selected routes post the construction of TGP (March 2023) for the following time periods:

- Morning commuter peak
- Daytime inter-peak
- Afternoon commuter peak
- Evening / night-time, and
- Weekend all periods.

Step 3: Multiply the difference in the average travel times calculated in Step 1 and Step 2 above for each time period with the volume of traffic for the corresponding period recorded post the construction of TGP (March 2023).

Step 4: Assume the traffic composition remains constant for each respective time period in line with the traffic composition recommended by Waka Kotahi for an urban arterial road (Table 12).

Step 5: Apply the value of time per vehicle per hour recommended by Waka Kotahi in Table 13 below.

Step 6: Apply the benefit escalation factor in Table 13 below in order to convert the overall travel time saving estimate from FY22 to FY23 dollar terms.

Reliability savings (commuter and freight)

Step 1: Estimate the network variability (standard deviation of travel times) based on TomTom data during the baseline period (March 2019).

Step 2: Estimate the network variability (standard deviation of travel times) based on TomTom data post construction of TGP (March 2023).

Step 3: Calculate the impact of changes in trip reliability using following formula:

0.9 × travel time value ($/h) ×

(reduction in the network variability (in min)/60) ×

traffic volume for time period (veh/h) ×

correction factor.

Where the correction factor is based on Waka Kotahi advice for a corridor model with up to 75 per cent of the variation in travel times caused by factors outside the study area (Table 13).

Travel time savings (public transport)

Step 1: Estimate the average travel time of commuter vehicles for each bus route across key time periods (AM peak, inter-peak, PM peak) during the baseline period (March 2019).

Step 2: Estimate the average travel time of commuter vehicles for each bus route across key time periods (AM peak, inter-peak, PM peak) during the current period (March 2023).

Step 3: Multiply the difference in the average travel times calculated in Step 1 and Step 2 above for each time period with the number of passengers for the first year of TGP operations.

Step 4: Assume that passengers, on average, stay on each bus service for approximately one-third of the total journey.

Crash reduction savings

Step 1: Identify the number of crashes that led to fatalities, major and minor injuries during the five-year period to March 2022.

Step 2: Estimate the crash rate during the five-year period to March 2022 based on the volume of traffic recorded during this period.

Step 3: Identify the number of crashes that led to fatalities, major and minor injuries post the construction of TG (March 2023).

Step 4: Apply the crash cost and escalation factors outlined in Table 13 below to the crashes identified in Step 3 above.

Step 5: Estimate the number of crashes that have been expected to occur if TGP did not exist based on the crash rate estimated in Step 2 above i.e. if the volume of traffic on TG during its first year of operations was diverted to original routes (SH59 / SH58).

Step 6: Apply the crash cost and escalation factors outlined in Table 13 below to the crashes identified in Step 5 above.

Step 7: Subtract crash costs in Step 3 from the crash costs in Step 6.

Change in vehicle operating costs (commuters and freight)

Step 1: Estimate the number of kilometres travelled with TGP over the first 12 months.

Step 2: Estimate the number of kilometres travelled without TGP over the first 12 months.

Step 3: Estimate the gradient and average speed of routes with TGP and without TGP.

Step 4: Identify the vehicle operating costs per km along TGP based on guidance from the Manual and Step 3.

Step 5: Identify the vehicle operating costs per km for passenger and freight vehicles along alternative routes based on Step 3.

Step 6: Multiply Step 4 by Step 1.

Step 7: Multiply Step 2 by Step 5.

Step 8: Take the difference of Step 6 and Step 7.

Change in carbon emissions (commuters and freight)

Step 1: Estimate the number of kilometres travelled with TGP over first 12 months.

Step 2: Estimate the number of kilometres travelled without TGP over first 12 months.

Step 3: Estimate the average speed of routes with TGP and without TGP.

Step 4: Identify the carbon emission rates per km based on Step 3 for passenger and freight vehicles along alternative routes via the Waka Kotahi vehicle emissions prediction model.

Step 5: Multiply Step 4 by Step 1.

Step 6: Multiply Step 4 by Step 2.

Step 7: Take the difference of Step 5 and Step 6.

Improved resilience

Step 1: Identify the number of weeks that SH59 was closed due to landslides in the first 12 month of operations.

Step 2: Identify the expected travel time for commuters that took TGP as an alternative route.

Step 3: Identify the expected additional travel time on TGP due to additional volume of traffic.

Step 3: Estimate the expected additional travel time if commuters took SH2 as an alternative route (see Box 1).

Step 4: Estimate the proportion of people that would take the alternative route versus delay, avoid or alter trips.

Step 5: Estimate the change in total travel times under a scenario where there is a land slide that closes SH59 and TGP exists versus a scenario where TGP does not.

Step 5: Apply the value of time per vehicle per hour recommended by Waka Kotahi in Table 13 below.

Step 6: Apply the benefit escalation factor in Table 13 below in order to convert the overall travel time saving estimate from FY22 to FY23 dollar terms.

Economic parameters

The economic parameters used to develop the estimated economic benefits of TGP are outlined in Table 13 below.

Table 13: Economic parameters used in the economic evaluation

Travel time savings					
State Highway User Survey Jul-2022 to Mar-2023: Traffic composition (%)					
Private or company car or van	94				
Bus	3				
Commercial vehicle	2				
Other	2				
Assumed traffic composition across the study area (per cent)					
Travel time / vehicle type	Car	LCV	MCV	HCV1	HCV2
Morning commuter peak	85	10	2	1	2
Daytime inter-peak	84	11	2	1	2
Afternoon commuter peak	84	11	2	2	1
Evening/night-time	85	9	2	1	3
Weekday all periods	85	10	2	1	2
Weekend/holiday	87	8	3	1	1
All periods	85	10	2	1	2
Assumed value of time based on composition of traffic					
Vehicle occupants, pedestrians, cyclists					
	Values of time for uncongested traffic ($/h/person)		Maximum increments for congestion ($/h/person)		
Work travel purpose	37.92		26.34		
Commuting to/from work	19.53		16.65		
Other non-work travel purposes	18.91		14.83		

Vehicles used for work purposes		
	Vehicle and freight time, including occupants ($/h/vehicle)	Maximum increments for congestion for work travel purposes (CRV $/h/vehicle)
Light commercial vehicle	61.49	44.12
Medium commercial vehicle	61.22	46.17
Heavy commercial vehicle I	79.84	64.79
Heavy commercial vehicle II	98.68	83.63
Reliability		
Commuter and freight reliability		
The formula used to calculate the benefits associated with improved reliability is: 0.9 × travel time value ($/h) (Item X) × (reduction in the network variability (in min)/60) × traffic volume for time period (veh/h) × correction factor. The possible correction factor values are provided below. 50 per cent was used as the factor for benefit calculation.		
Percentage of variance outside of study area	Factor for benefit calculation	Indicative transport network coverage
<20%	100%	Regional model
20%	90%	Sub-regional model
50%	70%	Area model
75%	50%	Corridor model
90%	30%	Intersection model
Safety incidents		
Crash costs ($ July 2021)		
Fatality	12.5 million	
Serious injury	660 100	
Minor injury	68 000	
Factors for converting injury crashes reported to total injury crashes (motorway)		
Fatality	1.0	
Serious injury	1.9	
Minor injury	1.9	
Escalation factors		
Benefit parameter	Base date	Factor to update to July 2022
Travel time cost savings	July 2021	1.03
Vehicle operating costs	July 2015	1.43
Crash cost savings	July 2021	1.06
Comfort benefits	July 2021	1.03
Driver frustration	July 2021	1.03

Passenger transport user benefits	July 2021	1.03
Walking and cycling benefits	July 2021	1.03
Travel behaviour change benefits	July 2008	1.32
Emission reduction benefits	July 2021	1.06
Vehicle operating costs		
		cents/km (July 2015)
Passenger vehicles TGP (Average)		22.5
Passenger vehicles alternative routes (Average)		22.0
Passenger vehicles TGP (Average)		58.5
Passenger vehicles alternative routes (Average)		58.0

Appendix 4 - Early comparison against modelling prediction

In February 2020, Waka Kotahi commissioned FLOW Transportation (FLOW) to carry out Transport Assessment of Effects as part of the Wellington Network Operational Readiness for Transmission Gully. The report aims to focus on assessment of the likely effects of the opening of the Transmission Gully project, specifically around the following potential areas:

- The potential for effects between the merge of SH1 with Transmission Gully (south of Porirua) and Ngauranga
- The potential for effects on Porirua, between Mungavin and the new Kenepuru Interchange
- The potential for effects around the new interchanges along the Transmission Gully route
- The potential for effects along SH2
- The routing of trucks between north of Transmission Gully and Seaview
- The potential effects on public transport
- The sensitivity of various model forecasts. In other words, what is the risk if the model forecasts turn out to be incorrect.

The report also captured the predicted travel time savings for key routes, as well as the predicted vehicle demands splits along key state highways, based on the North Wellington SATURN traffic model.

Based on the information provided in the FLOW report, as well as through our discussion with them, Johnstaff understands that the following assumptions were applied when FLOW was developing the model:

- The modelling prediction and the output presented in the report were based on the assumption that the demand is "a fixed quantum of traffic". Sensitivity assessment was carried out however the detailed result were not captured in the report.
- The key performance information provided in the report was based on (validated) modelling output, rather than actual (including base travel time and traffic volume).

The following sections describes the outcome of the comparison between the modelled/predicted performance and the actual performance based on our monitoring.

<u>Travel Time</u>

Comparison of modelled and actual travel time savings						
AM (Southbound Direction)						
		Modelled pre-TG Travel Time (min)	Modelled with TG Travel Time (min)	Actual 2023 Travel Time** (min)	Difference between model & actual (min)	Comment
Kapiti to Wellington CBD	Along existing SH59	49.25	43.00	36.92	6.08	Actual better than modelled
	Along Transmission Gully route and existing SH1	-	37.42	36.23	1.19	Actual similar to modelled
Kapiti to Seaview	Along existing SH59, SH58, SH2, and local road to Seaview	50.33	47.75	35.25	12.50	Actual significantly better than modelled
	Along Transmission Gully, SH58, SH2, and local road to Seaview	-	39.00	42.11	-3.11	Actual similar to modelled

PM (Northbound direction59						
		Flow base model pre-TG Travel Time (min)	Flow model with TG Travel Time (min)	Actual 2023 (TomTom data)** Travel Time (min)	Difference between Flow model & actual (min)	Comment
Kapiti to Wellington CBD	Along existing SH59	43.25	33.00	35.39	-2.39	Actual similar to modelled
	Along Transmission Gully route and existing SH1	-	27.58	34.84	-7.26	Actual worse than modelled
Kapiti to Seaview	Along existing SH59, SH58, SH2, and local road to Seaview	53.58	46.08	35.66	10.42	Actual significantly better than modelled
	Along Transmission Gully, SH58, SH2, and local road to Seaview	-	36.08	39.22	-3.14	Actual similar to modelled
* Modelled travel time, based on May 2019 traffic data ** Obtained from May 2023 traffic data						

In conclusion:

- For the morning peak in the southbound direction:
  - the actual travel time is typically faster than the FLOW's modelling prediction using the old route along SH59
  - the actual travel time is similar to what FLOW's modelling prediction using the new Transmission Gully.
- For the afternoon peak in the northbound direction:
  - The actual travel time is similar to what FLOW's modelling prediction for the following two routes:
    - northbound trips from Wellington CBD to Kapiti via SH59, and
    - from Seaview Road, Hutt City to Kapiti via the new Transmission Gully.
  - The actual travel time is slower than the FLOW's modelling prediction for the northbound trip from Wellington CBD to Kapiti via the new Transmission Gully.
  - The actual travel time is faster than the FLOW's modelling prediction for the northbound trip from Seaview Road, Hutt City to Kapiti via SH59.

<u>Traffic Volume</u>

Based on the modelling output, FLOW focused and reported on the peak hour performance at a microscopic level. This is understandable as their focus was to identify where the potential bottlenecks would be after Transmission Gully opens. In comparison, as part of our performance monitoring and evaluation, we were focusing on the average daily traffic (AADT) information at a macroscopic level. Unfortunately, at the time when we are preparing this document, we did not have enough detailed hourly information to make the accurate comparison holistically for the wider network.

From the AADT we can however see that the traffic volumes on SH59 and SH58 have experienced significant reductions in traffic volumes since the opening of the Transmission Gully Project which provided an alternative route for commuters. These reductions in traffic volumes appear to be in line with the presumptions made in the Flow report and modelling.