
SH1 Cambridge to Piarere & SH29 Piarere to Tauriko Re-evaluation Summary

New Zealand Transport Agency
V0.3 OCTOBER 2018



LINKING
STRATEGY
TO DELIVERY

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Table of Contents

Table of Contents.....	2
Executive Summary.....	3
Overview.....	Error! Bookmark not defined.
SH1 Cambridge to Piarere	3
SH29 Piarere to Tauriko.....	4
Re-evaluation findings.....	Error! Bookmark not defined.
SH1 Cambridge to Piarere	4
SH29 Piarere to Tauriko.....	4
Introduction & Context.....	6
Regional Context	6
Project History.....	6
SH1 Cambridge to Piarere	6
SH29 Piarere to Tauriko.....	8
Overview of re-evaluation findings	10
SH1 Cambridge to Piarere.....	10
Problems to be addressed & investment objectives.....	10
Integrated land use and transport planning & mode neutrality.....	12
SH29 Piarere to Tauriko	14
Problems to be addressed & investment objectives.....	14
Options development, integrated land use & mode neutrality	18
Proposed direction & programme.....	19
Programme, costs & outcomes.....	22
Appendix 1 – SH1 Cambridge to Piarere Strategic Options.....	25

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Executive Summary

This paper presents the findings of the re-evaluation of both the SH1 Cambridge to Piarere project and the SH29 Piarere to Tauriko project. These projects have been considered together given their proximity to each other as part of the SH1/29 key journey which links Auckland and Hamilton with Tauranga, as well as the central and lower North island via SH1.

The corridor between Cambridge and Piarere presently carries approximately 18,000 vehicles per day (with 11% Heavy Commercial Vehicles). Following completion of the Waikato Expressway it is expected that there will be an increase in traffic volumes by up to 2000-3000 vehicles a day.

The key problem currently experienced on this stretch of SH1 and SH29 is related to road safety and the numbers of deaths and serious injuries which take place in this corridor. Closures of the road due to crashes is also negatively affecting the reliability of the route. As a national high-volume route and an important artery for freight and general traffic, SH1 caters for a mix of local and strategic long-distance traffic, which presently operates at a generally acceptable level of service.

SH1 Cambridge to Piarere

Overview

A \$7.5m programme of short-term safety improvements has been approved and is made up of roadside safety barriers in high-risk areas to stop vehicles running off the road and a wide centreline to keep vehicles apart. Minor improvements will also be made to some intersections along the route.

This work is envisaged to reduce overall DSIs by approximately 30% and upgrade 30% of the corridor to have a KiwiRAP star rating above 4.

In parallel, the NZ Transport Agency has been investigating long term improvements and, commensurate with the Waikato Expressway, the recommended option is delivery of a new 16km four lane expressway commencing in 2020. The key investment outcomes for this option are:

- Around a 3.5-minute travel time saving for users;
- Enhanced journey time predictability;
- 90% reduction in unplanned road disruptions (from one unplanned event every 14 days to every 138 days), and always having a suitable alternative route available for State highway users
- Improved access to local community features and maximising the opportunity for future growth in the community and increased local tourism.
- 15.4 fewer deaths and serious injuries over a 5 years period, based on 2013-2017 data

The option has an expected cost of \$561M (cost range of \$475M to \$659M), and a BCR of 0.7.

Re-evaluation findings

Re-evaluation has concluded that there is an operational and level of service justification for providing a consistent customer journey experience on SH1 south of Auckland to Piarere (SH29) where the mix and type of traffic using the transport system transitions from a mix of regional and national to longer distance travel on SH1. Providing separation of national strategic traffic and local movements on this final section of National (High Volume) Strategic State Highway 1 would enhance resilience, local access and support economic prosperity.

However, the current scope and timing of investment has been strongly influenced by an overarching strategic driver to proactively extend the levels of service provided by the Waikato Expressway to a natural point in the transport system where traffic flows drop off, at Piarere. However, on inspection of those levels of service, except for safety, there is reasonable uncertainty about the nature and timing of the level of service reduction to bring into question the timing of need and the value for money of pursuing an off-line alignment in the short to medium term. There appears to be no real driver for significant investment to improve customers travel experiences required for some time and possibly not before 2045.

There is a safety issue within the corridor which, of itself, creates a significant portion of the resilience impacts and needs to be addressed in the short-term beyond the already committed safety measures.

Further analysis is required on how to effectively address residual safety issues following delivery of the short-term enhancements coupled with the consideration of the appropriate timing for delivery of a long-term strategic solution. This work needs to be undertaken with urgency as it is necessary to inform the long-term placement and safety solution for the SH1/29 intersection which is a key safety risk on the network.

SH29 Piarere to Tauriko

Overview

A PBC for SH29 Piarere to Tauriko was completed in October 2016 within the context of a Strategic Case for improvements to the Hamilton to Tauranga corridor (SH1 and SH29 and the East Coast Main Trunk railway between the two cities). The PBC identified three problems in the SH29 Piarere to Tauriko corridor:

- Disruption to freight movement to and from the Port of Tauranga results in an economic loss to New Zealand;
- Because of the steep and winding nature of the road over the Kaimai Range, people are exposed to an unacceptable risk of death and serious injury; and
- If the route does not support the efficient movement of freight, traffic will move to alternative local routes, increasing maintenance costs and risk to safety across the network.

Following consideration of options, a recommended programme comprising a \$330m to \$530m package of operational and capital improvements was proposed and supported by the NZ Transport Agency Board with implementation to be carried out over 20 years. In broad terms the programme seeks to improve route continuity and consistency in treatment with key features of the programme including:

- Additional 2+1 passing lane opportunities;
- Key intersection upgrades;
- 'Kaimai Loop' dual-carriageway re-alignment over the Kaimai Summit section;
- Customer service facilities (rest stops, wayfinding improvements).

A Detailed Business Case for the corridor commenced in August 2017 with some limited initial assessment being undertaken prior to re-evaluation.

Re-evaluation findings

Safety is a key concern within the corridor. Between 2012 and 2017, 328 crashes occurred on SH29 between Piarere and Tauriko, with 10 fatal and 32 serious injury crashes. These crashes resulted in 11 deaths and 54 serious injuries. The total cost to society resulting from the crashes along SH29 over the five-year period was \$88.5 million.

The evidence continues to support addressing safety particularly on the Te Poi to Tauriko section of the corridor. However, it is questionable whether substantial investment is required in the Piarere to Te Poi section of the corridor given the lower risk rating in this section of the corridor.

There is little evidence that route disruption markedly disrupts freight efficiency in a way that is undermining the economic productivity of the freight task, further, by addressing the safety issue, freight reliability would also improve.

Whilst investigations to date have sought to include the provision of long-term capacity improvements in advance of when required as part of the safety works, investigation should now look to decouple (as far as reasonably practicable) capacity enhancements as a means of facilitating a safer journey. Further, the scale of issues between SH29 Piarere and Te Poi do not warrant investment in capacity enhancements or a significant safety spend given the scale of safety issues relative to other parts of the transport network.

The Detailed Business Case for SH29 Piarere to Tauriko should continue but with a focus on safety improvements with capacity enhancements only where necessary to contribute to an optimal safety outcome (which balances safety benefit with cost). Any consideration of long-term capacity enhancements as part of the business case should be deferred as there is no apparent land-use risk within the corridor and the requirement for additional capacity is long term. This could allow the DBC to be completed expediently and safety enhancements to be considered for delivery as part of the 2022-25 NLTP.

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Introduction & Context

Regional Context

SH1 between Cambridge and Piarere and SH29 Piarere to Tauriko are part of a key journey which links Auckland and Hamilton with Tauranga, specifically the Port of Tauranga via SH29, as well as the central and lower North island via SH1.

The corridor between Cambridge and Piarere presently carries approximately 18,000 vehicles per day (with 11% Heavy Commercial Vehicles). This is similar to the traffic volumes expected along much of the Waikato Expressway corridor. At the SH29 intersection, the vehicle flows split with approximately 60% travelling south on SH1 and 40% on SH29 to Tauranga. Completion of the expressway sees this split approach closer to 55/45. This section of SH1 is the linkage to the recently completed Cambridge Section of the Waikato Expressway where drivers travelling south will transition from the high standard expressway to a single lane rural road with passing lanes. Traffic demand is predicted to increase, not only because of growth in traffic volumes but also as a result of how customers are anticipated to use the state highway network following the opening of the Waikato Expressway. Following completion of the Waikato Expressway it is expected that there will be an increase in traffic volumes by up to 2000-3000 vehicles a day.

The key problem currently experienced on this stretch of SH1/29 is related to road safety and the numbers of deaths and serious injuries which take place in this corridor. Closures of the road due to crashes is also negatively affecting the reliability of the route.

As a national high-volume route and an important artery for freight and general traffic, SH1/29 caters for a mix of local and strategic long-distance traffic, which presently operates at a generally acceptable level of service.

Project History

SH1 Cambridge to Piarere

The SH1 corridor was identified as a high-risk corridor in the Safer Journey: Delivering Safe Roads and Roadside National Programme Business Case (NPBC) (2014) and in July 2015 a Programme Business Case (PBC) was completed and approved by the NZ Transport Agency Board. The PBC recommended short-term online safety improvements as one of three measures. Also recommended were improvements to the high risk SH1/29 Intersection (6 to 10 years) and longer-term efficiency and safety improvements (10 years+). A business case has commenced and is considering the longer-term efficiency recommendation.

A \$7.5m programme of short-term safety improvements has been approved and is made up of roadside safety barriers in high-risk areas to stop vehicles running off the road and a wide centreline to keep vehicles apart. Minor improvements will also be made to some intersections along the route.

This work is envisaged to reduce overall DSIs by approximately 30% and upgrade 30% of the corridor to have a KiwiRAP star rating above 4.

SH1 Cambridge to Piarere – Short term safety improvements



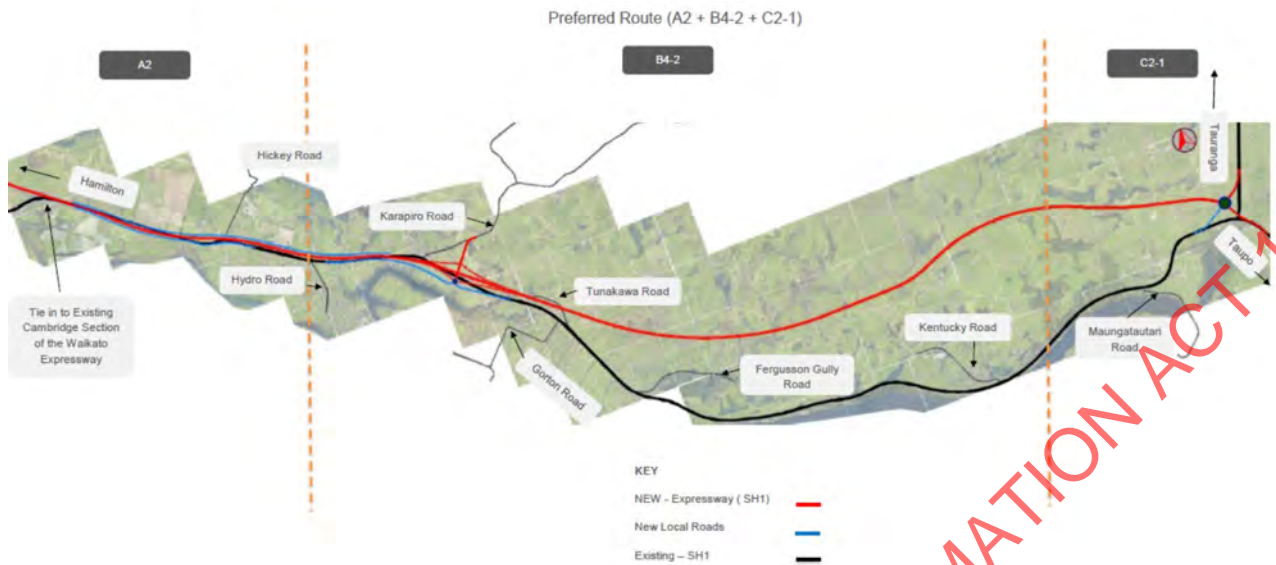
In parallel, the NZ Transport Agency has been investigating long term improvements. Six options have been considered with four of the six corridor options comprised on-line improvements to the existing highway corridor (ranging from minor improvements to a four-lane expressway). Two offline corridors have been considered, which were 4-lane expressway standard options with grade separation and no local access.

Commensurate with the Waikato Expressway, the recommended option is a new 16km four lane expressway. Whilst partly following the existing corridor from the end of the Waikato Expressway to Karapiro Rd, it incorporates parallel roads on both sides of the highway to provide connections to local roads and access. A grade separated interchange is proposed near Karapiro Road to provide safe and convenient access across the highway for the adjacent community. East of Karapiro Road the alignment runs north of the existing SH1. A large diameter two lane rural roundabout is provided where the alignment re-joins SH1 and SH29. This provides a safe interchange, which clearly signals the end of an expressway standard highway, with adequate capacity for the future. The key investment outcomes for this option are:

- Around a 3.5-minute travel time saving for users;
- Enhanced journey time predictability;
- 90% reduction in unplanned road disruptions (from one unplanned event every 14 days to every 138 days), and always having a suitable alternative route available for State highway users
- Improved access to local community features and maximising the opportunity for future growth in the community and increased local tourism.
- 15.4 fewer deaths and serious injuries over a 5 years period, based on 2013-2017 data

The recommended long-term option has an expected cost of \$561M (cost range of \$475M to \$659M), and a BCR of 0.7.

SH1 Cambridge to Piarere long term improvements – recommended option



SH29 Piarere to Tauriko

A PBC for SH29 Piarere to Tauriko was completed in October 2016 within the context of a Strategic Case for improvements to the Hamilton to Tauranga corridor (SH1 and SH29 and the East Coast Main Trunk railway between the two cities). The strategic case identified that there are safety and efficiency problems worthy of further investigation, particularly given the national importance of the corridor (including the ECMT railway) for freight to and from the Port of Tauranga and as the primary transport link between Hamilton and Tauranga.

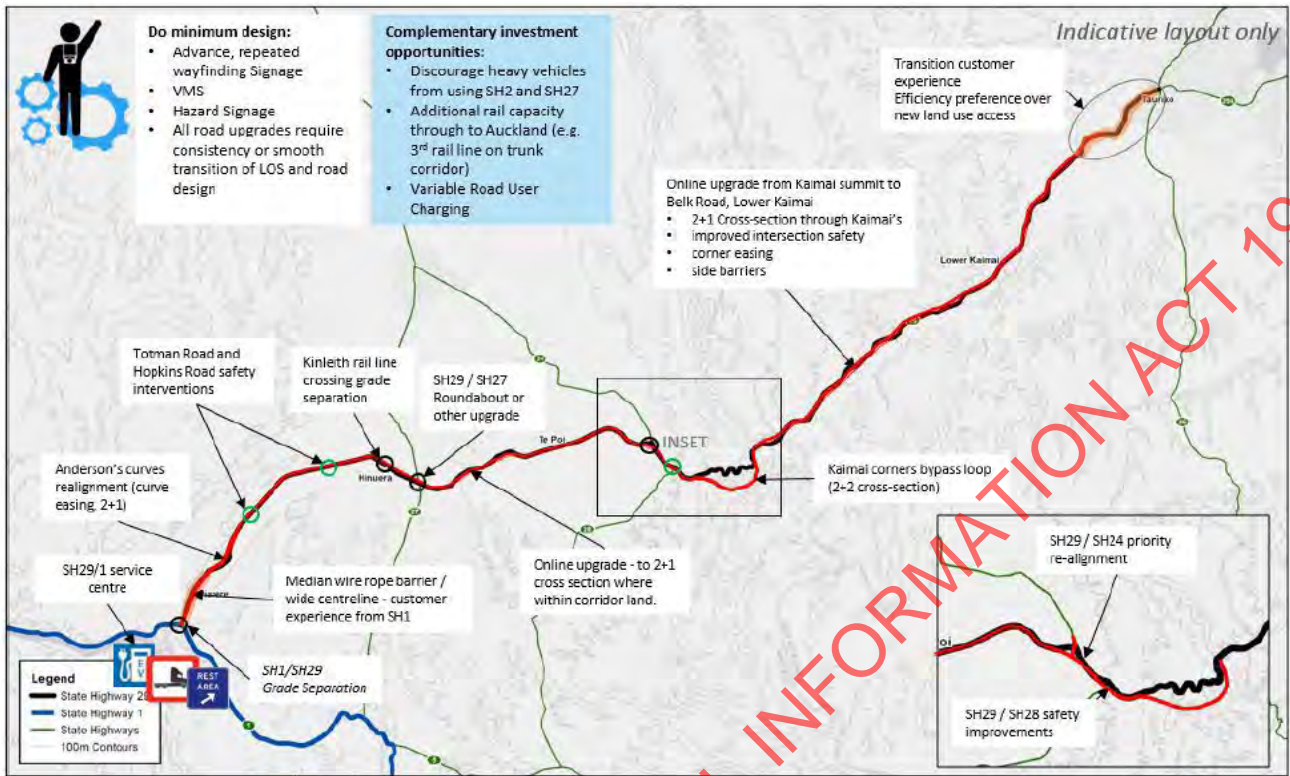
The PBC identified three problems in the SH29 Piarere to Tauriko corridor:

- Disruption to freight movement to and from the Port of Tauranga results in an economic loss to New Zealand;
- Because of the steep and winding nature of the road over the Kaimai Range, people are exposed to an unacceptable risk of death and serious injury; and
- If the route does not support the efficient movement of freight, traffic will move to alternative local routes, increasing maintenance costs and risk to safety across the network.

Following consideration of options, a recommended programme comprising a \$330m to \$530m package of operational and capital improvements was proposed and supported by the NZ Transport Agency Board with implementation to be carried out over 20 years. In broad terms the programme seeks to improve route continuity and consistency in treatment with key features of the programme including:

- Additional 2+1 passing lane opportunities;
- Key intersection upgrades;
- ‘Kaimai Loop’ dual-carriageway re-alignment over the Kaimai Summit section;
- Customer service facilities (rest stops, wayfinding improvements).

SH29 Piarere to Tauriko PBC recommended programme.



A Detailed Business Case for the corridor commenced in August 2017 with a stakeholder workshop to confirm the strategic context, problems, benefits and investment objectives. The project team then undertook some initial assessment including constraint mapping before the DBC was placed on hold at the end of 2017, pending the new GPS and TAIP re-evaluation, although some initial work has commenced on a long-list option exercise.

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

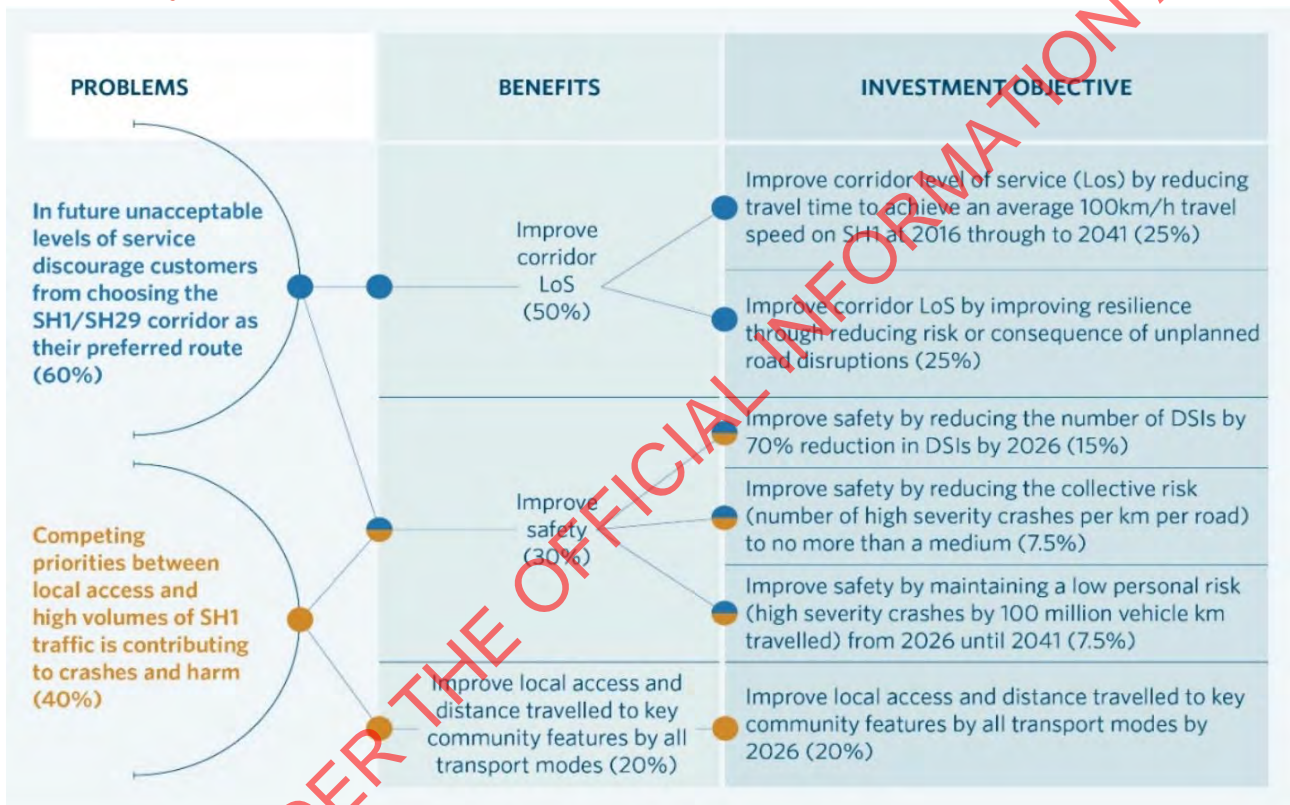
Overview of re-evaluation findings

SH1 Cambridge to Piarere

Problems to be addressed & investment objectives

The investment objectives (shown below) have a significant focus on proactively enhancing all customer levels of service with the aim of further promoting the strategic function of the SH1/29 corridor over alternative parallel routes, such as SH2/27 and to build on the NZ Transport Agency's investment in the Waikato Expressway.

Investment objectives



The DBC has explored current and future levels of service as shown in the tables below. What can be concluded from this is the scope and timing of investment has been strongly influenced by an overarching strategic driver to extend the levels of service provided by the Waikato Expressway to a natural point in the transport system where traffic flows drop off, at Piarere. However, on inspection of those levels of service, except for safety, there is reasonable uncertainty about the nature and timing of the level of service reduction to bring into question the timing of need and the value for money of pursuing an off-line alignment in the short to medium term.

SH1 Cambridge to Piarere DBC analysis of levels of service

Theme	Output
Speed, travel time & traffic growth	
2017 average speed during all periods	89km/h
Projected (2046) peak average speed	78 km/h
ONRC recommended level of service	Currently represents an acceptable level of service (mostly LoS C) which will slowly degrade to increasing occurrences of LoS D over periods of the day by 2041
Travel time variability average for all periods	Current journey time variability is +/- 1 min against an ORNC level of service of +/- 5 mins
Traffic growth	Assumed 2% growth per annum. 19,000 vehicles per day in 2017 growing to 22,500 in 2026, 30,000 in 2044 and 37,500 by 2066.
Resilience	
Unplanned events resulting in delays or inconvenience	44 unplanned events including road closures, caution or congestion per annum
Recorded incidence that result in road closures	4 – all related to crashes
Duration of road closures	2 – 9.4 hours
Detour route	10-50km with no alternative for HPMV.
Safety	
Crashes	There have been 121 crashes from 2013 to 2017 64% of all crashes (and 71% of high severity crashes) are either head-on, run off road or intersection crashes with intersection crashes significantly higher than the national average.
Deaths and serious injury	22 DSIs (2013-2017). High collective risk & low personal risk corridor 3.2-star rating on the route

It is important to understand the true impact that traffic growth will have on customers' journeys beyond technical levels of service as set out above, and to understand the customer experience based on the underlying assumptions supporting the business case.

Based on the analysis undertaken by the DBC customers could expect to experience:

- By 2040, 28% of all days in the year will experience some reduction in travel speed and associated level of service due to capacity being exceeded for part of the day. This is equivalent to an average of two days out of seven experiencing reduced LoS.
- By 2045, excluding public holidays, a similar experience with some reduction in travel speed and associated level of service due to capacity being exceeded for part of the day could be expected.

- By 2045, users will experience reduced speeds and LoS on half the Friday's afternoons of the year – the busiest time of the week.

What this suggest is that, strategic considerations aside, there is no real driver for significant investment to improve customers travel experiences required for some time and possibly not before 2045. Albeit there is some risk around growth assumptions of 2% per annum if the actual levels of growth are higher (requiring a response sooner) or lower (resulting in over-investment too early).

There is a safety issue within the corridor which, of itself, creates a significant portion of the resilience impacts and needs to be addressed beyond the short-term safety measures currently being implemented.

Integrated land use and transport planning & mode neutrality

As a predominantly rural corridor which is a small sub-section of a wider inter-regional journey the role of land use and scope for alternative modes is relatively small within the context of a DBC for Cambridge to Piarere. Currently 50% of freight travelling to the Port of Tauranga is carried by rail, with more expected with the development of inland freight hubs.

The project has acknowledged the communities adjacent to the existing corridor and factored access and severance considerations into the multi-criteria assessment of options, although there are no explicit land-use proposals put forward as part of the DBC.

Bay of Plenty Regional Council is proposing a rail study within the 2018 NLTP period which the NZ Transport Agency may wish to see accelerated to inform future options for inter-regional travel choice within the SH1/29 corridor linking Hamilton and Tauranga.

Strategically, the NZ Transport Agency with KiwiRail and freight partners may also wish to further consider the national freight task and options for supporting mode choice to inform a national position on freight growth for future planning activities.

Recommended option and option selection

The recommended option as proposed (Option E2) is for an offline 4-lane expressway, built to a four-star safety standard, with construction recommended to commence in 2020 subject to statutory processes. This represents a tripling of capacity in this corridor at a cost of of \$561M (cost range of \$475M to \$659M), and a return on investment of 70 cents for every dollar spent. Given considerations around the timing of growth and the negligible impact on customers journey experience in the medium term this would no longer seem a value for money investment although there are good strategic reasons for providing a consistent journey experience to Piarere in the long term as demand warrants it. Further work is required to enhance safety in the corridor beyond the current short-term investment.

On revisiting the optioneering process (see Appendix 1) there are online options which offer substantial safety benefits (with associated resilience improvements) coupled with modest journey improvements for less cost. Option C (an online improvement) provides alternating passing lanes and central and roadside barriers through the entire route with parallel local roads and turn around facilities. There would be no direct access for properties onto SH1 except at discrete positions with the provision of turn around facilities at at-grade intersections. This option has a similar safety outcome to the recommended for \$90-160m, approximately a quarter of the cost of the recommended option. Whilst at this point the forecast reduction in DSIs saved is fewer (8.6 fewer with Option C versus 10.2 under the recommended) the DSI reduction per \$ spent is significantly greater and their remains the potential to reduce predicted DSIs further through design and pre-implementation to optimise the safety outcome.

Summary of short-listed options

Criteria	Measures	Base (Do Nothing)	Option A	Option B	Option C	Option D	Option E1	Option E2
Outcome:								
Safety (Approx) (at opening)	DSIs	14	9.2	5.8	5.4	3.8	3.8	3.8
	Collective Risk	MH	MH	M	LM	LM	LM	LM
	Personal Risk	L	L	L	L	L	L	L
	Star Rating (estimate)	3.22	3.3-3.4	3.4-3.5	3.4-3.6	4.6-4.8	4.6-4.8	4.6-4.8
Access	No. of Property Accesses	-	-5-10%	-5-10%	-20%	100%	-100%	-100%
Travel time and speed (2041)	Travel Time (mins)	12.9	12.9	11.6	11.3	10.2	11.4 (SH 1 Sth) 8.2 (SH 29)	9.7 (SH 1 Sth) 9.1 (SH 29)
	Speed (km/h)	79	79	88	90	100	100	100
Network resilience	Number of Closures	Annual Closures	- 25%	-55%	-80%	- 90%	- 90%	- 90%
	Alternative routes	Alternatives up to 50 km detour, not for HPMVs	No improvement to alternatives	No improvement to alternatives	Potential to use new parallel routes as alternatives	Potential to use new parallel routes as alternatives	Potential to use new parallel routes as alternatives	Potential to use new parallel routes as alternatives
Corridor Characteristics								
Total Journey	SH1 - South						19 km (2.4 km longer)	16.2 km (0.4 km shorter)
	SH 29	16.6 km	16.6 km	16.6 km	16.6 km	16.6 km	13.6km (3 km shorter)	15.2 km (1.4 km shorter)
Barriers	Barrier	At high risk roadside locations (short term works)	Central and side barrier based on risk.	Central and side (full corridor)	Central and side (full corridor)	Central and side (full corridor)	Central and side (full corridor)	Central and side (full corridor)
No of lanes (SH only)	Number and Passing	2, with 2 passing lanes each direction	2, with 2 passing lanes each direction	2+1 passing lane alternates - corridor	2+1; passing lane alternates - corridor	4 lanes	4 lanes	4 lanes
Intersections	Number of Intersections and Type	10 ⁵² - at grade	10 ⁵² - at grade	10 ⁵² - at grade	10 ⁵² - at grade	3 - Grade Separated	3 - Grade Separated	3 - Grade Separated
Road geometry	Alignment	Straight-curved alignment	No change	No change	No major changes but could be some minor re-alignment	Major modification to online alignment	Major partial online modification and new offline alignment	Major partial online modification and new off line alignment
Active road users	Cyclists	Limited sealed shoulder	Some shoulder improvements	Some shoulder improvements	Some shoulder improvements & local road alternative	Full shoulder provided online and local road alternative	Full shoulder provided online and local road alternative	Full shoulder provided online and local road alternative
Major structures	Bridges	-	None	None	None	>5	>5	3 - 5
Earthworks	Approx. scale (m3)	-	Minor	< 200,000	< 200,000	<2,000,000	< 3,000,000	>3,000,000
Cost	Million (\$)		25-40	80-135	90-160	440-780	330-610	360-660
Construction timeframe	Years		2	2.5	3	4.5	3.5	3.5

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

In the long-term, there is an operational and level of service justification for providing a consistent customer journey experience on SH1 south of Auckland to Piarere (SH29) where the mix and type of traffic using the transport system transitions from a mix of regional and national to longer distance travel on SH1. Providing separation of national strategic traffic and local movements on this final section of National (High Volume) Strategic State Highway 1 would enhance resilience, local access and support economic prosperity.

At this time, insufficient analysis has been undertaken of the optimal timing of need for an offline Expressway however with analysis predicated on delivering a long-term solution in the immediate (2020) term. Further analysis is required to clearly understand the trade-offs between outcomes, impacts, value for money and timing of delivery of a long-term solution along with an enhanced short-term safety package. This analysis is necessary to make an informed decision on the most appropriate timing of a long-term solution.

SH29 Piarere to Tauriko

Problems to be addressed & investment objectives

The problem statements under-pinning the business case presently focus on three issues:

- Safety;
- The impacts of route disruption on freight efficiency; and
- The level of service on the route being sub-optimal to supporting the NZ Transport Agency's strategy of promoting SH1/29 as the preferred strategic route linking Auckland, Hamilton and Tauranga.

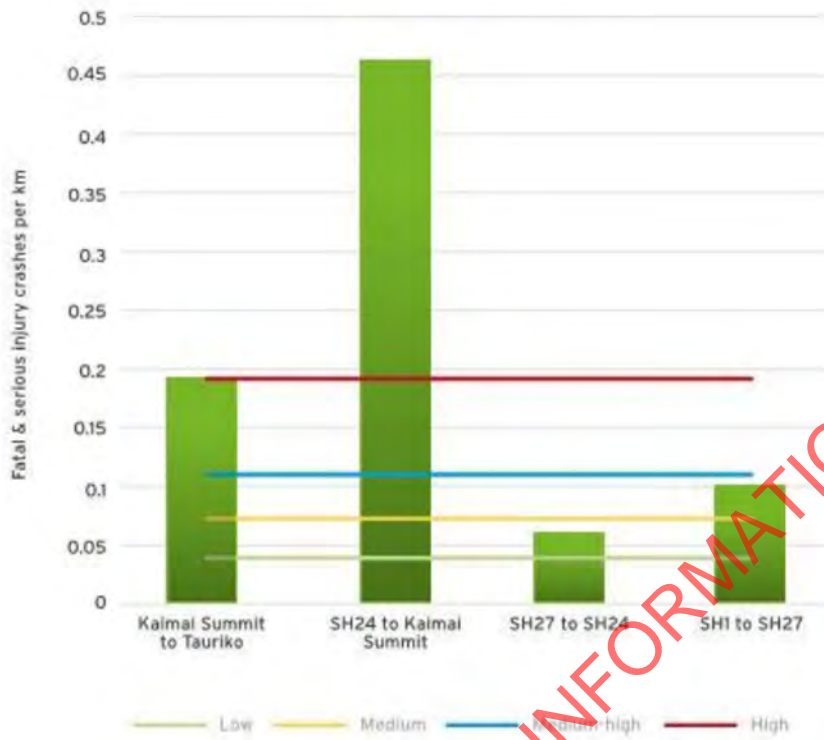
Safety is a key concern within the corridor. Between 2012 and 2017, 328 crashes occurred on SH29 between Piarere and Tauriko, with 10 fatal and 32 serious injury crashes. These crashes resulted in 11 deaths and 54 serious injuries. The total cost to society resulting from the crashes along SH29 over the five-year period was \$88.5 million.

Most crashes occur within the section between the SH24 intersection and the summit of the Kaimai Range. The Kaimai Range section has tight horizontal and steep vertical alignments as a direct result of the geometric constraints of the road corridor. A review of the predominant crash causes along SH29 revealed that the largest crash type resulted from losing control or from a head-on crash on a bend, forming 52% of all crashes.

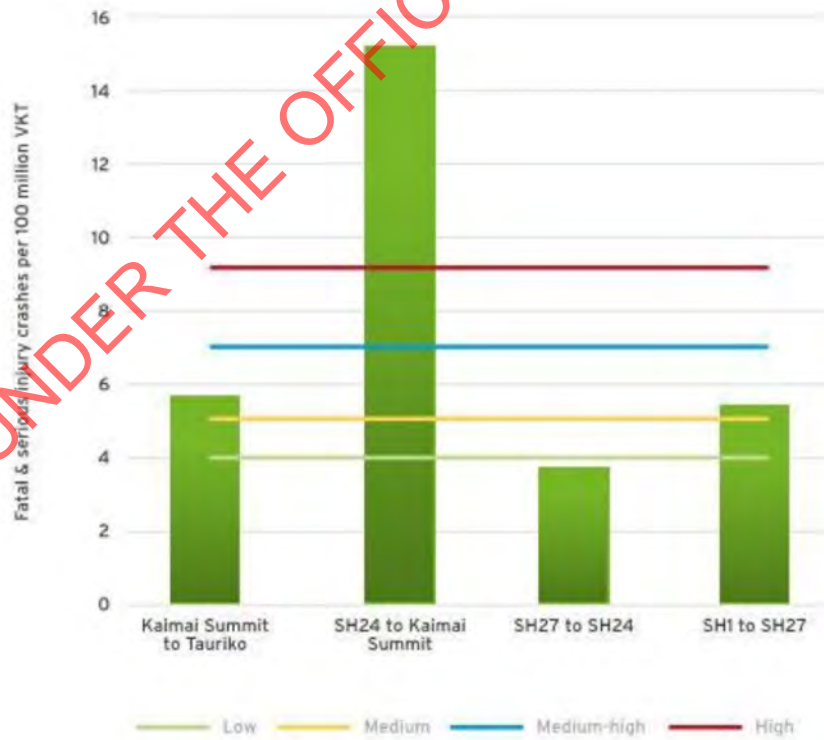
Of the total 328 crashes along SH29, 59 crashes involved heavy vehicles or 16% of the total crashes, resulting in four deaths. The proportion of crashes involving trucks is equivalent to the average daily flow of trucks on SH29 at 15%, therefore illustrating the safety issues for freight travelling on this corridor, as well as other customers who are in much smaller vehicles.

The Kiwi RAP collective and personal risk rating for SH29 has been defined by its crash history. The figures below show the risk ratings split for the different sections along the road corridor. It is evident that the section between SH24 to the Kaimai Summit has the highest crash rate and ratings for both collective and personal risks well over the "High" KiwiRAP rating threshold. This section of SH29 also has the seventh highest collective and personal risk rating in New Zealand.

KiwiRAP collective risk rating



KiwiRAP personal risk rating



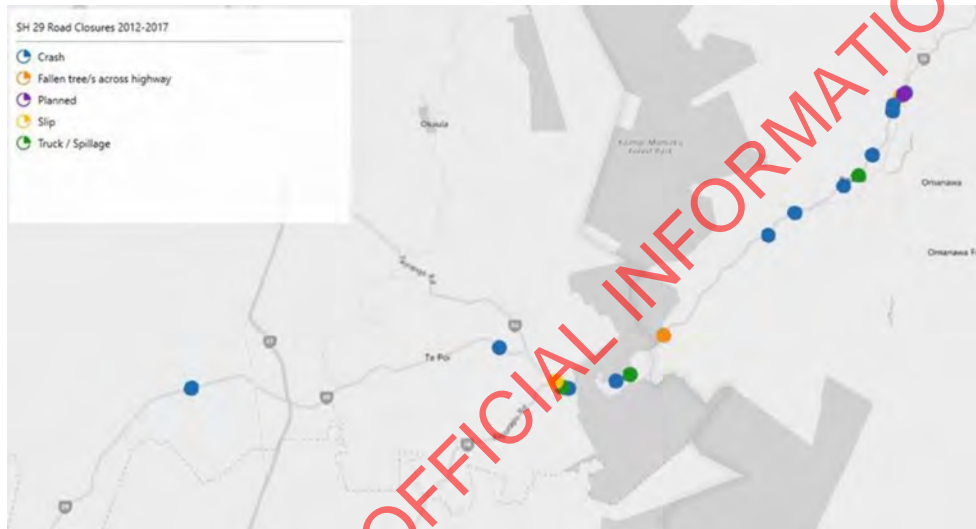
RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

The evidence continues to support addressing safety particularly on the Te Poi to Tauriko section of the corridor. However, it is questionable whether substantial investment is required in the Piarere to Te Poi section of the corridor given the low risk rating in this section of the corridor.

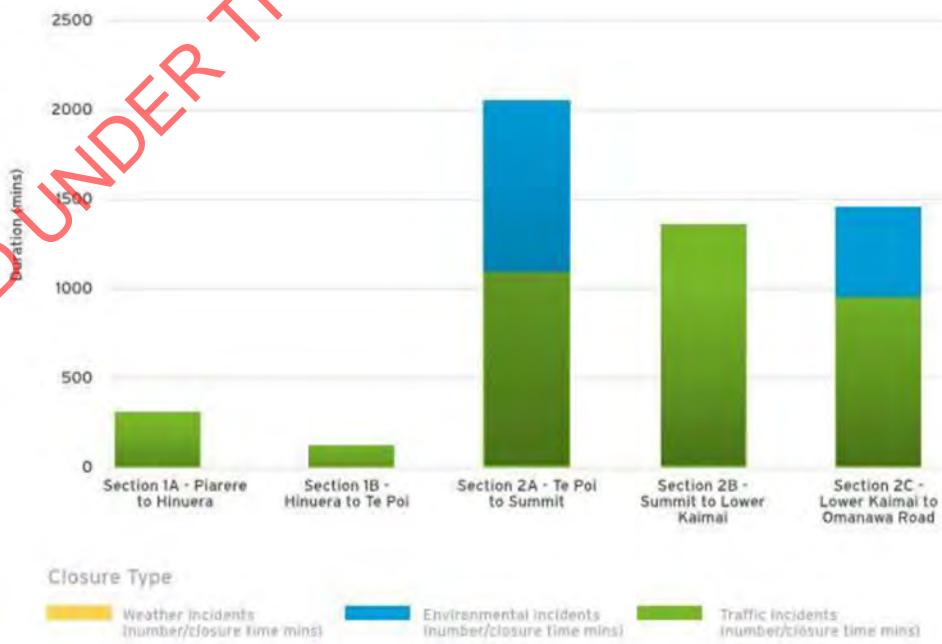
In relation to the second problem statement, there is little evidence that route disruption markedly disrupts freight efficiency in a way that is undermining the economic productivity of the freight task. By addressing the safety issue, freight reliability would also improve.

The figures below show the five-year history of closures and the duration of those closures. What can be concluded is that around 75% of closures are due to crashes and many closures are located on the Te Poi to Tauriko section of the corridor. Were the crashes sufficiently addressed it is likely that this would also provide an acceptable level of service for resilience without the need for explicit additional investment.

Road closures on SH29 (2012-2017)



Total duration of closures on each section of SH29 (2012-2017)



The final project objective is one of investing to support the NZ Transport Agency's strategy of promoting SH1/29 as the preferred route for travel between Auckland, Hamilton and Tauranga.

Most commercial trucks currently choose to travel along SH2 between Tauranga and Auckland, rather than SH29. The SH2 option is the shorter, quicker and lower cost option with more favourable road grades. One reason the SH1 to SH29 route is avoided by commercial drivers' is due to the number of roundabouts and the need to travel through Hamilton. Roundabouts and travelling through Hamilton via SH1 increase the cost of travel, reduce the travel time reliability and ease of drive with the need to regularly stop. However, these trends will be reduced when the WEX is completed in 2020 significantly upgrading the SH1 segment of the route.

In terms of the cost of travel, the current base vehicle operating costs (VOCB) are shown in the table below, based on road elevation gradients from 2012 (prior to completion of WEX which is discussed further below) and an assumed operating speed profile. It is evident the SH29 route option is more expensive in terms of operating costs. There is roughly 18% increase in operating cost when taking SH29 over SH2, which is mainly attributed to the difference in distance and gradient profile through the Kaimai Range.

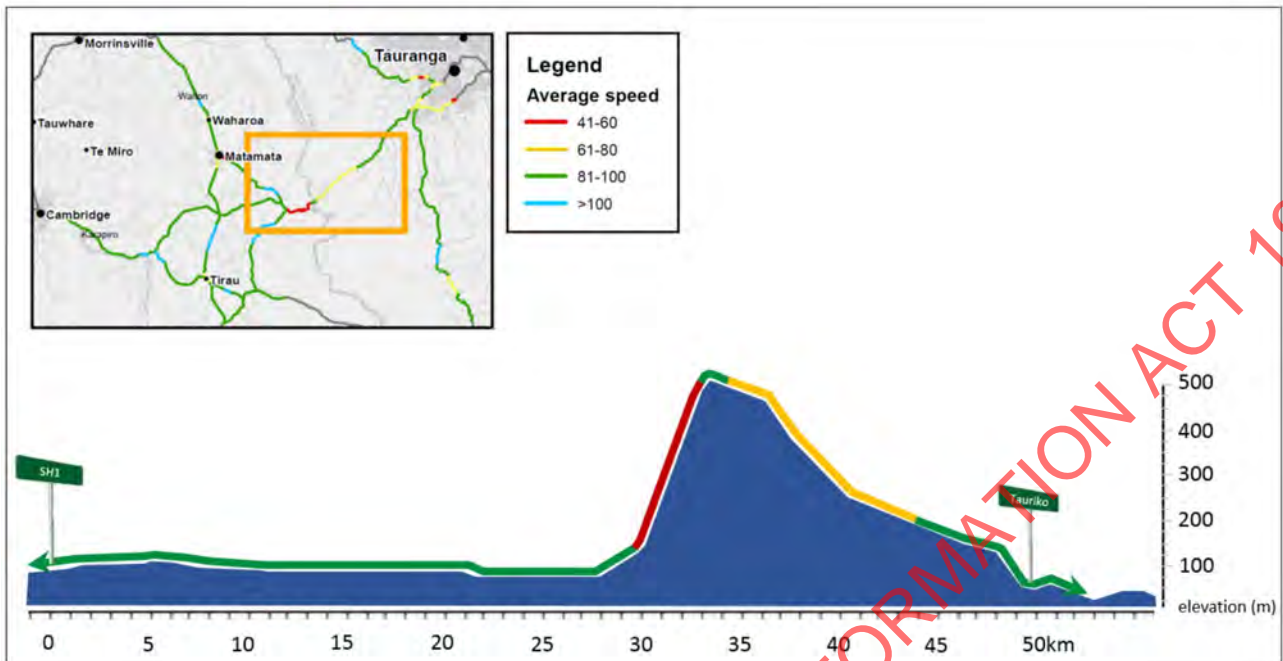
Base vehicle operating costs for key routes between Auckland (Pokeno) and Tauranga

Route	Length (km)	Vehicle Class					
		PC	LCV	MCV	HCV 1	HCV 2	Bus
SH1-SH2 VOCB \$	151.88	\$34.80	\$45.92	\$93.06	\$170.88	\$290.13	\$128.03
SH1-SH2- SH27 VOCB \$	157.85	\$36.05	\$47.52	\$97.01	\$178.34	\$301.47	\$133.13
SH1-SH29 VOCB \$	176.38	\$40.94	\$54.22	\$110.04	\$202.07	\$342.45	\$152.11

When completed in 2020, the provision of the full WEX will provide comparable travel times (around 2 hours) between the two centres of Auckland and Tauranga, with only a slightly longer distance of 10km. Freight customers travelling between Auckland and Tauranga may avoid the currently favoured SH2 and SH27 routes.

Despite the future reduction in travel time, customer insights point to the ease of the drive and the quality of the road as key considerations of route choice. As shown below, the road elevation and speed profile over the Kaimai Ranges is a significant disincentive to use, particularly for freight. Freight customers have advised that, when given the option, they would travel along SH2 when laden and on SH29 when unladen. It is unlikely to ever be cost effective to address the trip cost disparity between the SH2 and the SH1/29 route through infrastructure investment in SH29. Rather, as identified in the Programme Business Case, pricing mechanisms, such as variable Road User Charges, should be explored by the NZ Transport Agency, as a national initiative, to support appropriate safe and efficient route choice.

SH29 speed and elevation profile



Options development, integrated land use & mode neutrality

The Detailed Business Case is at an early stage of development with only provisional option long-listing being undertaken prior to the re-evaluation process commencing. As such, there is scope through the re-evaluation to shape the consideration of options in advance.

By reconsidering the problems and objectives of the DBC there is scope to refine the direction of the option development process away from significant capacity improvements along the corridor in support of a route choice strategy to instead, focusing predominantly on safety interventions where required. This would provide a better value, affordable package of measures which provides for both the immediate safety issues and the medium to long term levels of demand in the corridor.

The strategic outcomes sought for the Auckland to Tauranga journey would be better served through the national / regional consideration of options for the use of pricing mechanisms and technology.

At the activity level, there is little evidence of a clear exploration of alternative modes, however, given the inter-regional, strategic nature of the corridor coupled with a very clear safety driver this is not considered a fatal flaw when considered in conjunction with other pieces of work being undertaken (or programmed to commence) by regional partners. Examples include the proposal by the Bay of Plenty Regional Council to commence an inter-regional rail study during the 2018-22 NLTP period.

Proposed direction & programme

The re-evaluation has examined the strategic context and subsequent optioneering process which has been undertaken or scheduled to commence. With respect to the current investment strategy the key consideration has been to consider:

1. to what degree the current state highway improvement options have responded to the key issues of safety and to what extent additional investment is proactively seeking to support the long-term strategic journey choice of SH1/29;
2. whether staging of delivery has been adequately considered; and
3. whether alternatives to state highway improvements have been adequately considered, and if not, could alternative approaches reasonably be considered to potentially contribute to the objectives of the corridor or wider social and economic outcomes.

The conclusions and recommendations for each section of the corridor are presented in the table below.

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

SH1/29 Cambridge to Tauriko Findings and Recommendations

Current preferred Option	Re-evaluation finding	Re-evaluation recommendation
SH1 Cambridge to Piarere		
<p>A \$7.5m programme of short-term safety improvements made up of roadside safety barriers in high-risk areas and a wide centreline. Minor improvements will also be made to some intersections along the route. (in delivery)</p> <p>A \$561m offline grade separated 4-lane expressway with delivery to commence in 2020.</p>	<p>There remains a significant crash risk in the corridor following delivery of the short-term improvements which should be addressed in the short to medium term.</p> <p>The early delivery of a long-term option has been heavily influenced by a desire to continue to deliver the form and function of the WEX immediately on completion of construction of the WEX. However, the evidence suggests that capacity improvements are not required for some time and potentially not until 2060, however, insufficient analysis has been undertaken to understand these triggers given the focus on early delivery.</p> <p>As such, significant investment in capacity improvements through early delivery of an offline expressway is not warranted.</p> <p>Further analysis is required on how to effectively address residual safety issues following delivery of the short-term enhancements coupled with the consideration of the appropriate timing for delivery of a long-term strategic solution.</p> <p>This work needs to be undertaken with urgency as it is necessary to inform the long-term placement and safety solution for the SH1/29 intersection which is a key safety risk on the network.</p>	<ul style="list-style-type: none"> • Re-visit the options analysis to: <ul style="list-style-type: none"> ○ Further reduce the crash risk in the corridor in the short/medium term; ○ Assesses the timing of need for a long-term off-line option against the enhanced safety investment to identify the optimal value for money long term delivery option • Based on the above, the NZ Transport Agency should continue to invest in additional safety improvements (including the SH1/29 intersection) and continue with route protection for a long-term off-line option.
SH29 Piarere to Te Poi		
<p>Grade separation of SH1/29, median wire rope barriers or wide centre lines with sections of 2+1 capacity enhancements and multiple intersection upgrades (\$100m-\$200m)</p>	<p>The scale of issues between SH29 Piarere and Te Poi do not warrant investment in capacity enhancements or a significant safety spend given the scale of safety issues relative to other parts of the transport network.</p>	<ul style="list-style-type: none"> • SH29 Piarere to Te Poi should be withdrawn from the DBC and SafeRoads requested to propose a safety investment package commensurate with the corridors risk relative to the rest of the state highway network • The safety package should be put forward for consideration for inclusion in the 2022-25 NLTP subject to value for money considerations

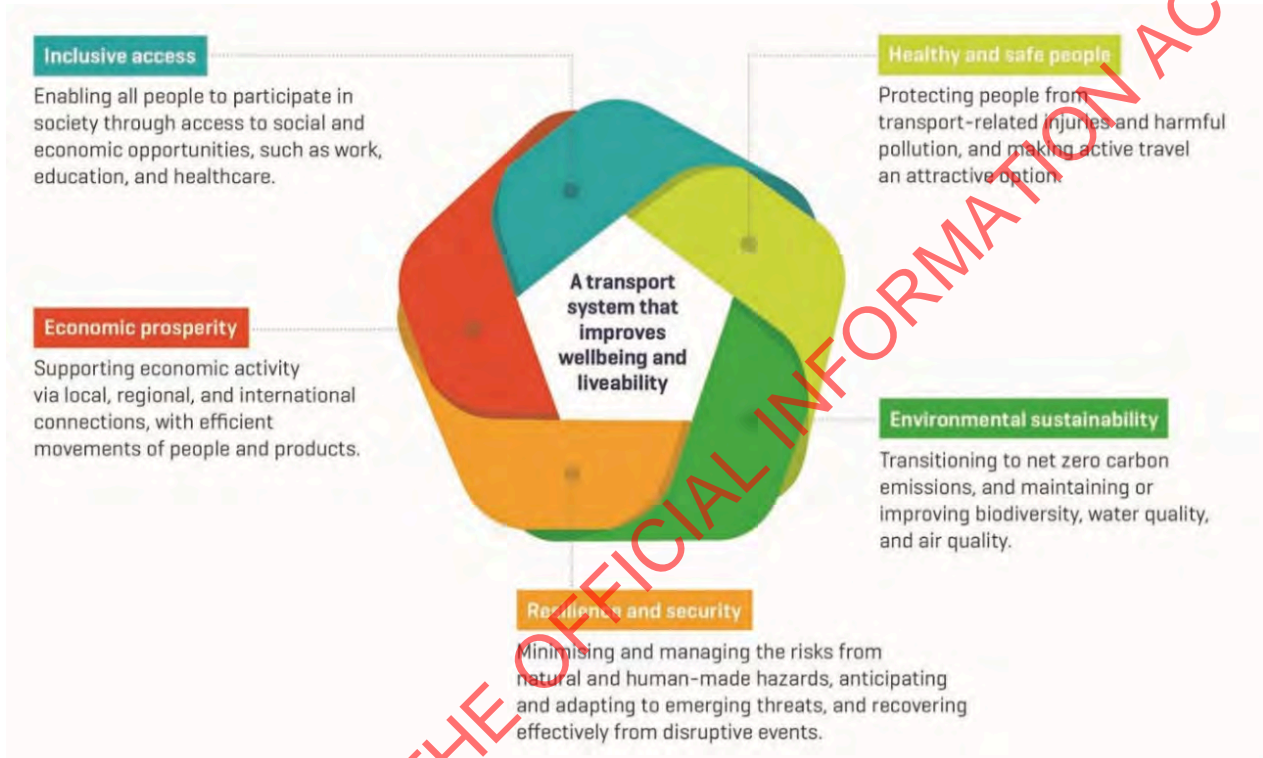
RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Current preferred Option	Re-evaluation finding	Re-evaluation recommendation
SH 29 Te Poi to Taurkio		
<p>Online safety improvements and capacity enhancements including 2+2 Kaimai corners bypass loop and 2+1 through Kaimais. Intersection upgrades and side barriers coupled with corner easing and realignment of the SH29/SH24 intersection (\$260m-\$400m).</p>	<p>There is a significant crash history and safety risk in this section of SH29. Tackling the safety issues would make a significant contribution to addressing the reliability issues in this section of the corridor.</p> <p>Investigations to date have sought to include the provision of long-term capacity improvements in advance of when required as part of the safety works and further investigation should look to decouple (as far as reasonably practicable) capacity enhancements to facilitate a safer journey.</p>	<ul style="list-style-type: none"> Continue with the DBC with a focus on safety improvements with capacity enhancements only where necessary to contribute to an optimal safety outcome (which balances safety benefit with cost) Defer any consideration of long-term capacity enhancements as part of the business case as there is no apparent land-use risk within the corridor and the requirement for additional capacity is in the longer term. This could allow the DBC to be completed expediently and safety enhancements to be considered for delivery as part of the 2021-24 NLTP.
System Recommendations		
<p>None</p>	<p>Several the future investment proposals in both the SH1 & SH29 corridor and the SH2 corridor have taken, as an active investment objective, the desire to invest in infrastructure to proactively support the NZ Transport Agency's preferred strategy for journeys linking Auckland, Hamilton and Tauranga which is that SH1/29 is the preferred route over SH2.</p> <p>All the PBCs which have preceded the re-evaluation have recommended alternatives to infrastructure investment be considered as a likely more successful alternative to supporting the strategy over infrastructure investment. Variable RUC on key routes is a key example where a fiscal measure would likely have a greater influence on implementing the strategy. However, such an option cannot be pursued at a corridor or activity level and needs to be driven at a system level.</p>	<ul style="list-style-type: none"> The NZ Transport Agency incorporate consideration of future travel demand management through Variable RUC and complementary technological solutions within its 19/20 Business Plan.

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Programme, costs & outcomes

The table below outlines the proposed programme of work, timescales and current estimate of costs and key benefits. In addition, an assessment of the proposals against the Government's recently published Outcomes Framework is presented. The framework states that the purpose of the transport system is to "improve people's wellbeing and liveability of places". The Framework gives broad direction about how the transport system can achieve this, by contributing to five inter-related outcomes as shown.



RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Activity	Timing			Key Benefits	Cost (\$m)	A transport system that improves wellbeing and liveability				
	Short (2018-21)	Medium (2021-27)	Long (2028+)			Inclusive access	Healthy & safe people	Economic prosperity	Resilience & security	Environmental sustainability
Land-Use & Transport Integration										
Work with Environment Waikato/Bay of Plenty Regional Councils to investigate inter-regional public transport choices.	✓			<ul style="list-style-type: none"> Supports mode shift & travel choice Reduces single occupancy vehicles 	~\$0.5m PBC/DBC	M	L	M	M	L
Implement the findings of the above work		✓	✓		Imp unknown					
System Interventions										
Speed management & enforcement	✓			<ul style="list-style-type: none"> DSI reduction (included in online safety benefits) 	unknown	L	VH	L	L	L
Investigate the role of variable RUC in supporting strategic route choice and network utilisation	✓			<ul style="list-style-type: none"> Supports mode shift & travel choice Value for money asset management 	~\$0.5m scoping and initial policy work	M	H	H	H	H
SH Investment										
SH1 Cambridge to Piarere (short term improvements) <ul style="list-style-type: none"> Continue with Implementation of short-term safety improvements on SH1 Cambridge to Piarere 	✓			<ul style="list-style-type: none"> reduce overall DSIs by approximately 30% improve 30% of the corridor to a KiwiRAP star rating above 4 	~\$7.5m	L	H	L	L	L
SH1 Cambridge to Piarere (DBC & medium/long term measures) <ul style="list-style-type: none"> Complete the DBC however, revisit the options analysis with a focus on: <ul style="list-style-type: none"> reducing further the crash risk in the corridor in the short/medium term; proposing a clear programme of triggers and timing for a long term off-line strategic route against the enhanced safety package to identify the optimal value for money timing for delivery 	✓			<ul style="list-style-type: none"> Reduction in five-year DSIs by ~8-9 in the medium term to 10+ in the long term Collective risk reduced from Medium/High to Low/Medium in the short term Increase in KiwiRap safety rating of from 2 to 3.5 	~\$50m-\$150m (short/med term)	M	H	M	L	L

Activity	Timing			Key Benefits	Cost (\$m)	A transport system that improves wellbeing and liveability				
	Short (2018-21)	Medium (2021-27)	Long (2028+)			Inclusive access	Healthy & safe people	Economic prosperity	Resilience & security	Environmental sustainability
<ul style="list-style-type: none"> Based on the above, the NZ Transport Agency should continue to invest in additional safety improvements and route protect any necessary corridors for the long-term option. Deliver the SH1/29 intersection improvement Deliver the long-term solution 	✓	✓			Long term - TBC through DBC					
SH29 Piarere to Te Poi <ul style="list-style-type: none"> Safe Roads develop the case for investment in a programme of safety interventions appropriate to the corridors crash risk relative to the rest of the state highway network Implement package of measures (timing dependent upon safety merit) 	✓		✓	<ul style="list-style-type: none"> Improved safety 	TBC through BC	L	M	L	M	L
SH29 Te Poi to Tauriko <ul style="list-style-type: none"> Complete the DBC with a focus on safety improvements Implement safety improvements (timing dependent upon safety merit) 	✓	✓	✓	<ul style="list-style-type: none"> improved safety 	\$150-\$200m	L	VH	L	M	L

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix 1 – SH1 Cambridge to Piarere Strategic Options



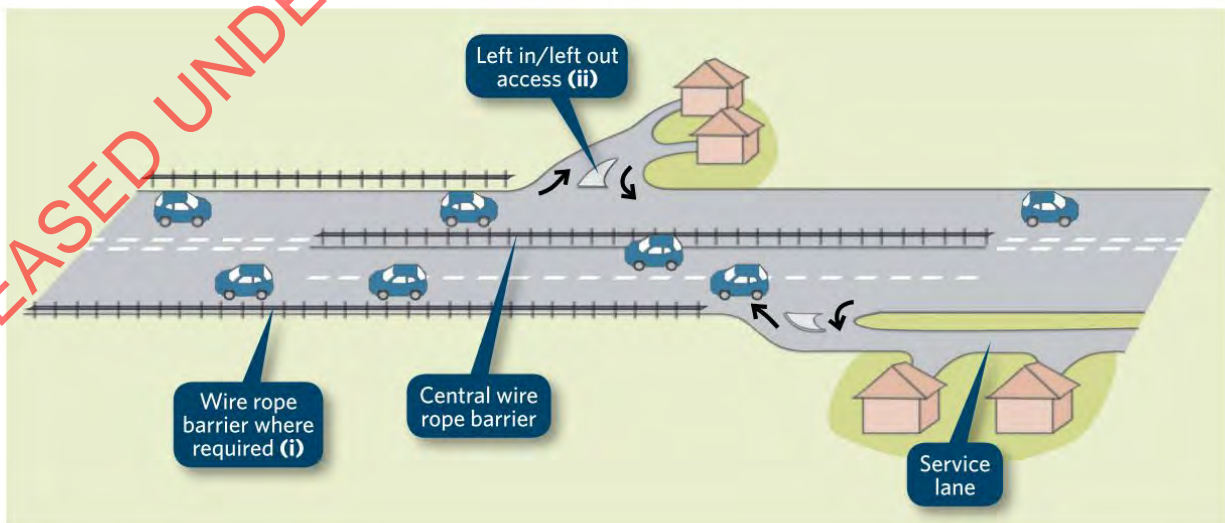
Improvements - safety only

- Central and side of road barriers located in high risk locations. **(i)**
- Minimise conflict with existing private and public accesses on to SH1 by rationalising and reducing overall number of accesses where practicable, and in some cases restricting such accesses to left-in/left-out vehicle manoeuvres. **(ii)**
- Provision of larger intersections where necessary.

Land requirements	Minimal
Safety i.e. reducing crashes	OK
Improving travel time	Poor
Improving access	OK
Improving network resilience*	OK
Complexity**	Comparatively low
Indicative cost	\$50-100 million
Alignment with top 3 community expectations from 1 st online survey	
1. Traffic flow/congestion	Poor
2. Safety at intersections	OK
3. Safety along road corridor	OK

* Reducing unplanned road closures caused by crashes, slips and general maintenance

** Covers the difficulty in attainment of consents, construction, operations and maintenance





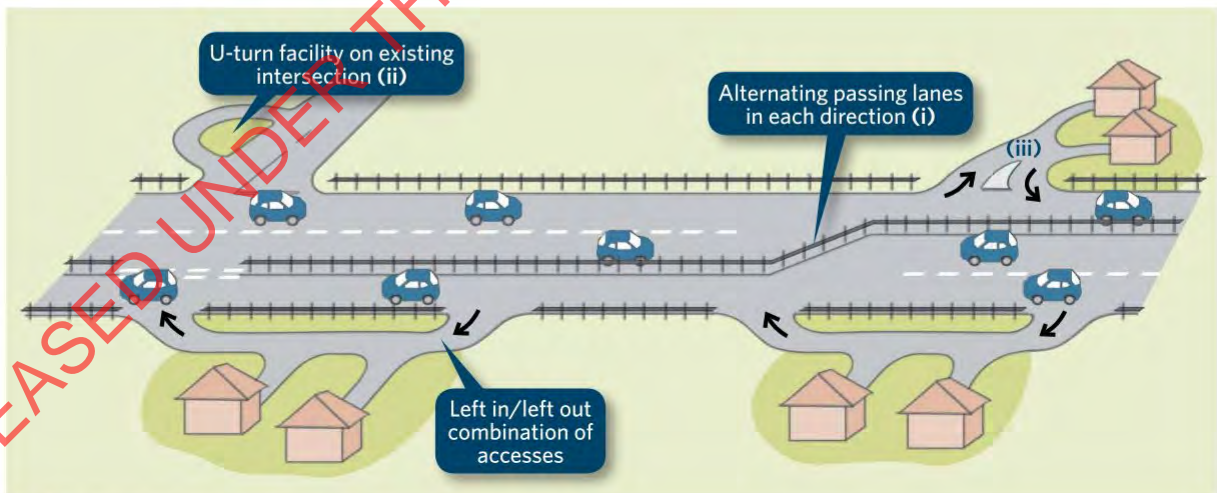
Improvements - safety, passing lanes & turnarounds

- 3 lanes for the entire length of road between the Cambridge Section and SH1/29 intersection.
- Access to middle lane (passing lane) will alternate along the length of the route. **(i)**
- Central and side of road barriers along entire corridor with breaks at yet to be determined intersections. Turnaround facilities to be provided at such intersections. **(ii)**
- Minimise conflict with existing private and public accesses on to SH1 by rationalising and reducing overall number of accesses where practicable, and in some cases restricting such accesses to left-in/left-out vehicle manoeuvres. **(iii)**

Land requirements	Minor
Safety i.e. reducing crashes	Very good
Improving travel time	OK
Improving access	OK
Improving network resilience*	Very good
Complexity**	Medium Complexity
Indicative cost	\$50-100 million
Alignment with top 3 community expectations from 1 st online survey	
1. Traffic flow/congestion	OK
2. Safety at intersections	Very good
3. Safety along road corridor	Very good

* Reducing unplanned road closures caused by crashes, slips and general maintenance

** Covers the difficulty in attainment of consents, construction, operations and maintenance



NOTE: This plan differs from that shown in Newsletter No.2



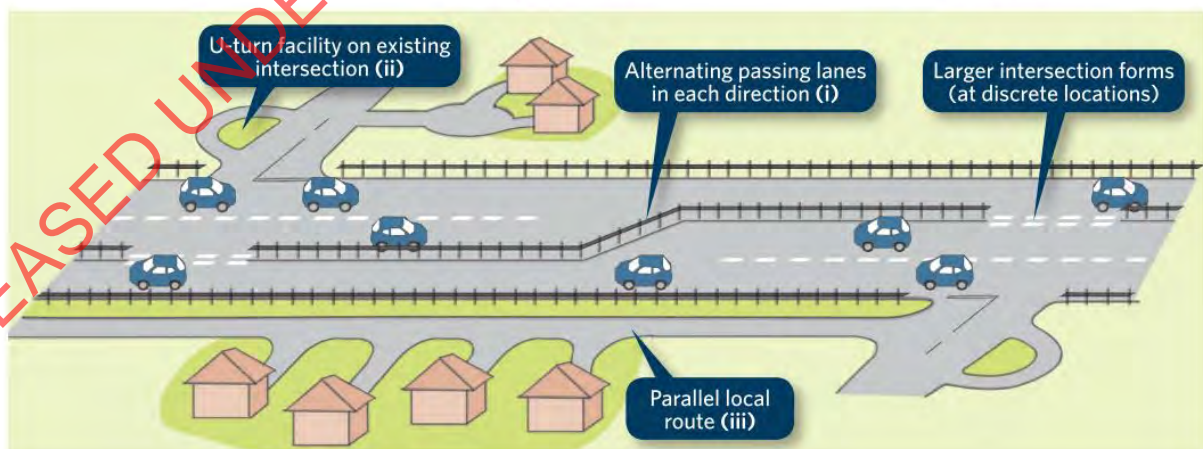
Improvements - safety, passing lanes & parallel local roads

- 3 lanes for the entire length of road between the Cambridge Section and SH1/29 intersection.
- Access to middle lane (passing lane) will alternate along the length of the route. **(i)**
- Central and side of road barriers along entire corridor with breaks at yet to be determined intersections. Turnaround facilities to be provided at such intersections. **(ii)**
- Parallel local roads so no direct access for properties onto SH1 except at discrete positions. **(iii)**

Land requirements	Considerable but restricted to areas next to existing road corridor
Safety i.e. reducing crashes	Very good
Improving travel time	Very good
Improving access	Very good
Improving network resilience	Very good
Complexity**	Highly complex in terms of construction and being disruptive to both SH1 users and residents, physical limitations in some places due to both Lake Karapiro and bluffs
Indicative cost	\$100-300 million
Alignment with top 3 community expectations from 1 st online survey	
1. Traffic flow/congestion	Very good
2. Safety at intersections	Very good
3. Safety along road corridor	Very good

* Reducing unplanned road closures caused by crashes, slips and general maintenance

** Covers the difficulty in attainment of consents, construction, operations and maintenance





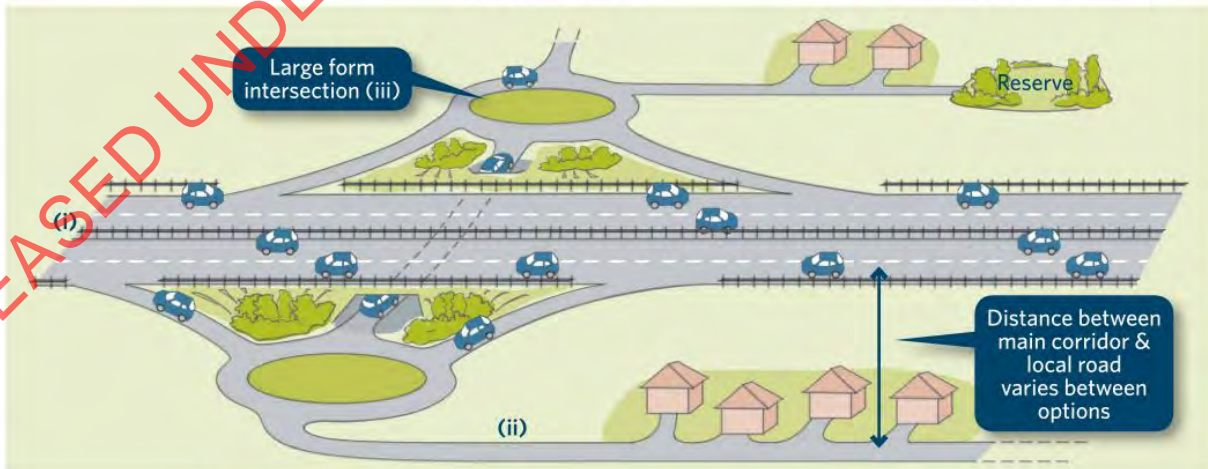
Four-lane expressway on existing highway alignment

- 4 lanes entire length - road width and cross section consistent with an Expressway standard road - similar to the Cambridge Section (i.e. adequate shoulders and lane widths, median barrier separation from on-coming traffic; and full corridor roadside barriers). **(i)**
- Parallel local roads so no direct access for properties onto SH1. **(ii)**
- Interchange style intersections (e.g. Waikato Expressway/Victoria Rd intersection) at 2 - 3 (yet to be confirmed) key locations along the route. **(iii)**

Land requirements	Significant but restricted to areas next to existing road corridor
Safety i.e. reducing crashes	Excellent
Improving travel time	Excellent
Improving access	Excellent
Improving network resilience	Excellent
Complexity**	Highly complex in terms of disturbing known archaeological sites, physical limitations in some places due to both Lake Karapiro and bluffs, construction and being disruptive to both SH1 users and residents
Indicative cost	\$300-500 million
Alignment with top 3 community expectations from 1 st online survey	
1. Traffic flow/congestion	Excellent
2. Safety at intersections	Excellent
3. Safety along road corridor	Excellent

* Reducing unplanned road closures caused by crashes, slips and general maintenance

** Covers the difficulty in attainment of consents, construction, operations and maintenance





Four-lane expressway on new alignment (E1 & E2)

- Complete offline route from the end of the Cambridge Section through to a point within 5 km of existing SH29 intersection. **(i)**
- 4 lanes entire length - road width and cross section consistent with an Expressway standard road - similar to the Cambridge Section. **(ii)**
- No direct access to the Expressway for properties located adjacent to it. Alternative routes would need to be provided. **(iii)**
- Interchange style intersections (e.g. Waikato Expressway/Victoria Rd intersection) at 2 - 3 (yet to be confirmed) key locations along the route. **(iii)**

Land requirements	Significant - away from the existing road corridor, although potentially affecting fewer individual landowners than an online solution
Safety i.e. reducing crashes	Excellent
Improving travel time	Excellent
Improving access	Excellent - The majority of accesses on SH1 east of Karapiro Road would be largely unaffected. Opportunity to use the existing SH1 corridor to improve local access to properties and community features. Reduction in road traffic effects to large number of properties adjoining SH1. Minimal disruption during construction for users and residents of SH1 compared to an online solution.
Improving network resilience*	Excellent
Complexity**	Highly complex in terms of discovering unknown technical and environmental constraints. New and increased road traffic effects for adjoining landowners and potential severance of large rural properties.
Indicative cost	\$300-500 million
Alignment with top 3 community expectations from 1 st online survey	
1. Traffic flow/congestion	Excellent
2. Safety at intersections	Excellent
3. Safety along road corridor	Excellent

* Reducing unplanned road closures caused by crashes, slips and general maintenance

** Covers the difficulty in attainment of consents, construction, operations and maintenance

