Memorandum

To	South Wairarapa District Council
Copy	Stefan Corbett, Tim Langley, and Alexei Murashev (WSP)
From	Cindy Xiao
Office	Westhaven Office, Auckland
Date	13 February 2023
File/Ref	5-C4072.01 / Nerissa Harrison and Fariz Rahman
Subject	Hinekura Road Realignment Option - Economic Assessment

1 Basis of Economics

An economic evaluation has been carried out as part of the Hinekura Road realignment project. Hinekura Road is approximately 23.5 km long and runs from the intersection with Todds Road in the west (east of Martinborough) to the intersection with Moeraki Road and Bush Gully Road in the east, as shown in Figure 1-1.

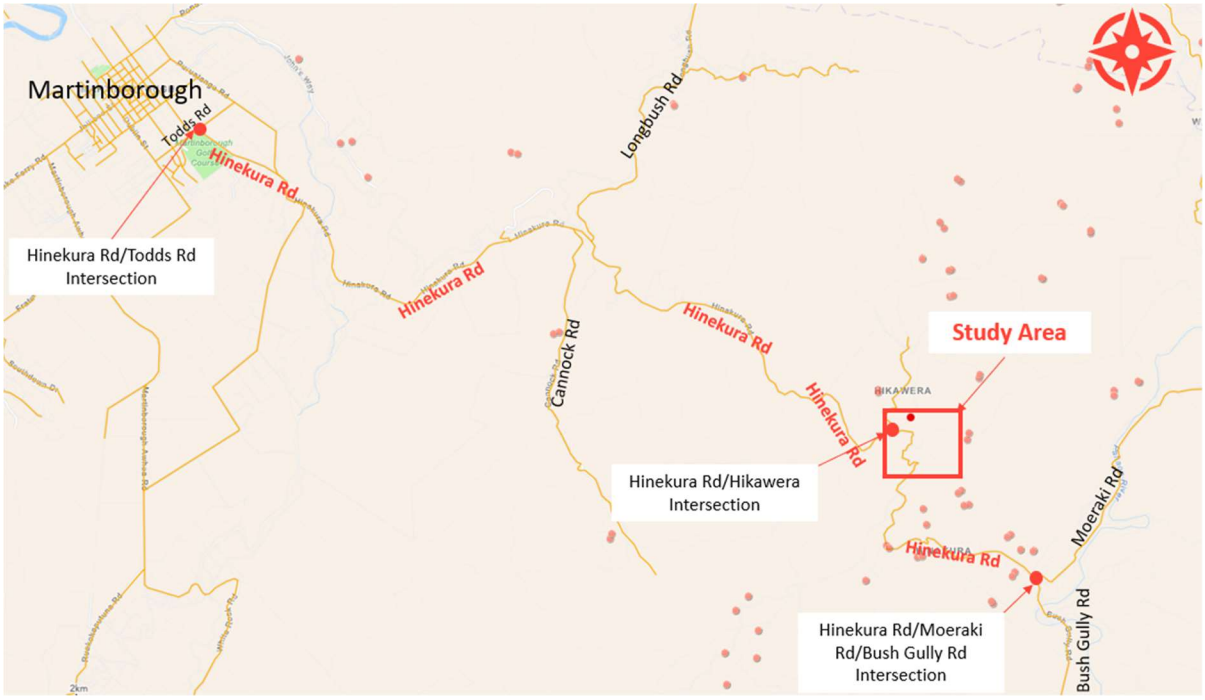

Figure 1-1: Hinekura Road

Following several severe weather events, Hinekura Road was impacted by a series of major slips that made the road impassable on several occasions in 2020 and 2021. The landslide had likely been active for many years and was prone to ongoing movement and instability following heavy rain. In June 2022, a significant landslide left a length of 1.3 km on Hinekura

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Road substantially damaged adjacent to the intersection with Hikawera Road, which was identified as the study area shown in Figure 1-2 in this memo.

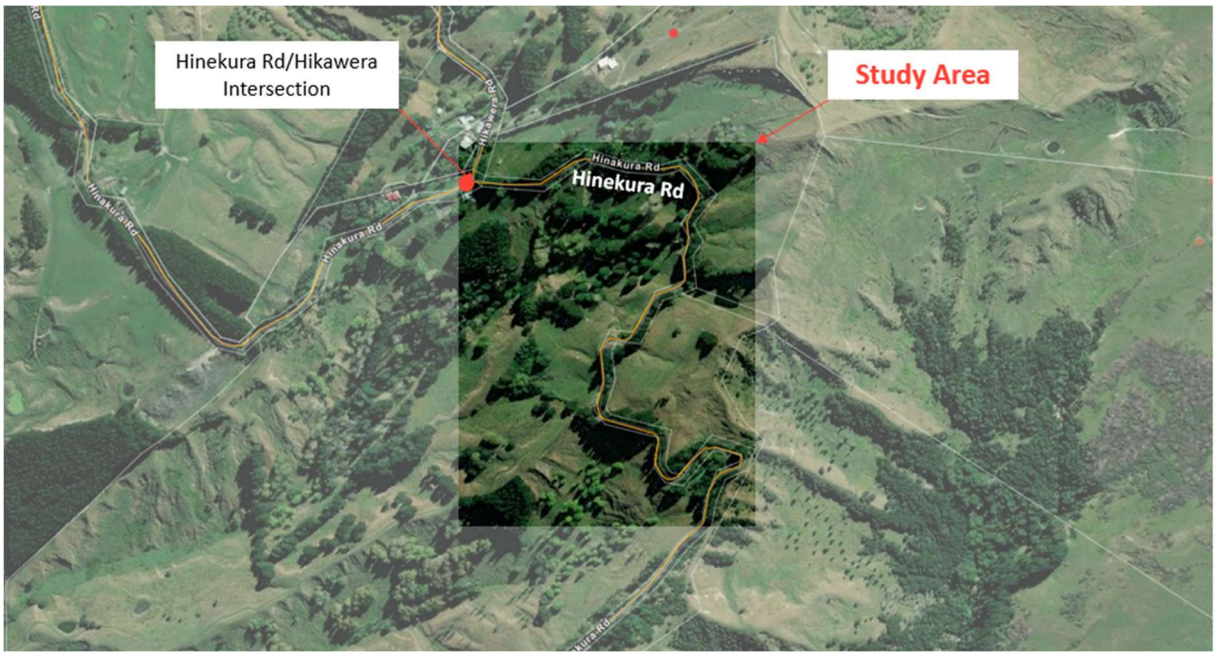


Figure 1-2: Hinekura Road Study Area

The project's main outcomes are to improve resilience through the Hinekura Road by mitigating the risk of long-term closures, reducing the frequency of all closures, and limiting the duration of all closures.

Natural events occurring through Hinekura Road cause a high number of road closures. The available detour routes are long and winding, resulting in significant delays and costs for users. Improving resilience (by reducing the frequency, duration, and risk for longer closures) through the Hinekura Road will have an economic benefit as it will reduce occurrences where users are forced to take long detours around the Hinekura.

The purpose of this memo is to detail the methodology, assumptions, and results of the economic evaluation for calculating the cost of the do-nothing scenario and new realignment scenario. Once this has been agreed upon, the project team can develop a resilience option that best aligns with the potential benefits.

In the assessment of benefits, one indicator of economic efficiency is the Benefit–Cost Ratio (BCR) which focuses on monetised benefits and costs. A BCR indicates whether a project generates more benefits than they cost, make it possible to compare activities (a do minimum and option), and to support a funding application.

2 Methodology

The economic evaluation for the Hinekura Road improvements is based on Waka Kotahi Monetised Benefits and Costs Manual (MBCM), using a purpose-built spreadsheet to calculate the benefits of the project. The resilience benefits associated with potential long-term earthquake or storm events have been based on a probability basis.

Hinekura Road is predominately a resilience project with benefits derived from the do-nothing cost and how much the options can reduce this cost. Accordingly, the methodology has been divided up into two steps:

- the first step is to establish the cost of the do-nothing (full closures). This will provide a useful guide on capital expenditure for potential investment in the corridor based on the alternative routes. For example, if an option can reduce the do-nothing cost by 50%, the project benefits will be half of the do-nothing cost; and

- the second step is to estimate the reduction in do-nothing cost. This has been undertaken by making a professional judgment (in a workshop format) of the residual risk after the preferred options have been implemented.

2.1 Assumptions

The following overall assumptions have been used:

- Base Date of 1 July 2021
- Time Zero of 1 July 2022
- Discount rate of 4% applied to all annual benefits and costs (Sensitivity Test on 3% and 6% discount rates)
- Analysis period of 25 years because of the short lifespan of most low-cost interventions proposed (24 years of benefits).
- Annual Traffic Growth of 1%
- AADT 250 (2021) with 8% Heavy Commercial Vehicles based on Mobile Road[1].
- Travel Time Values of $22.32/hr (2002 value) calculated based on traffic composition from Site and Table 13, 15 and A50 from the MCBM
- An average of 4% grade for Hinekura routes and 10% grade for detour routes based on Mobile Road.
- Weighted average speed of 50km/h for Hinekura Road open scenario (Sensitivity Test on 40km/hr and 65km/hr speed)
- Exclusive of crash Cost
- Weighted average speed of 35km/h to the north (Gladstone) and 45km/h to the west (Featherston) for detours based on Google Maps
- Option design and construction period to be staggered over a two-year period commencing 1 July 2023 (year 2). To simplify the economics the benefits have been calculated recognising a proportion of the benefits between years 3-6 (20%, 40% 60%, 80%) and 100% of the benefits from year 7

2.2 The Detours

The length and time of a detour depend on the origin/destination of the driver. The following distances and the travel time were assumed based on Google Maps.

- To the north (Gladstone)
  For a destination from Hinekura (-41.294823, 175.646647) to the north (Gladstone) shown in Figure 2-1, a detour is 36.4km by 59 mins via Moeraki Road - Ngakonui Road - Wainuioru Road -Clifton Grove Road - Admiral Road, which would be 7.7km longer and take 34 min longer than driving through Hinekura Road (28.7km by 25 min).

[1] https://mobileroad.org/desktop.html

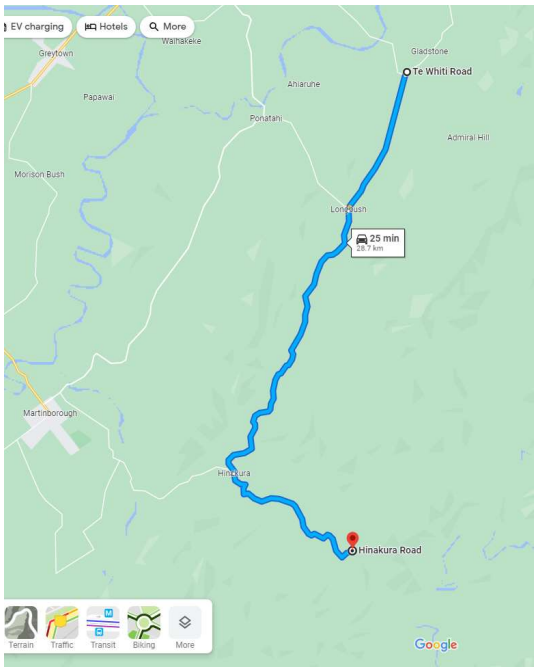
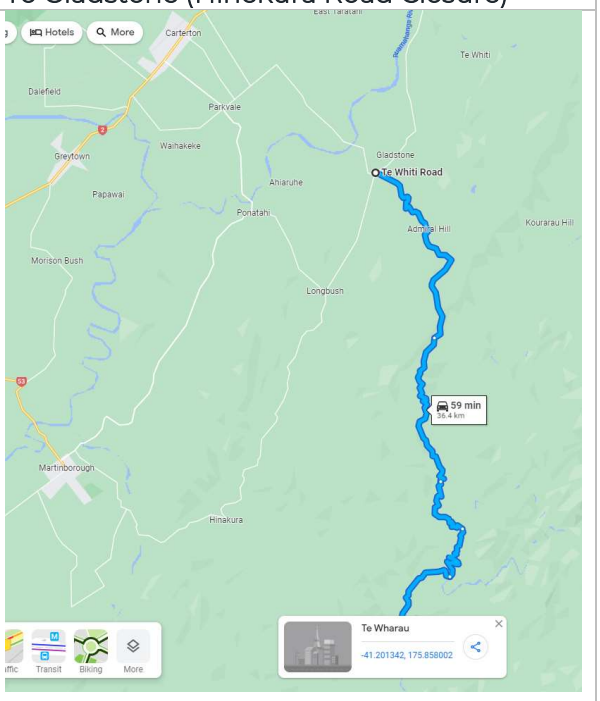
To Gladstone (Hinekura Road Open)	To Gladstone (Hinekura Road Closure)
	

Figure 2-1: Distance and Travel Time from Hinekura to Gladstone

- To the west (Featherston)
  For a destination from Hinekura (-41.294823, 175.646647) to the west (Featherston) shown in Figure 2-2, a detour is 71km by 85 mins via Moeraki Road - Ngakonui Road - Wainuioru Road -Clifton Grove Road - Admiral Road – Gladstone Road – Carters Line – Para Road – Waihakeke Road – SH2, which would be 28.5km longer and take 48 min longer than driving through the Hinekura Road (42.5km by 37 mins).

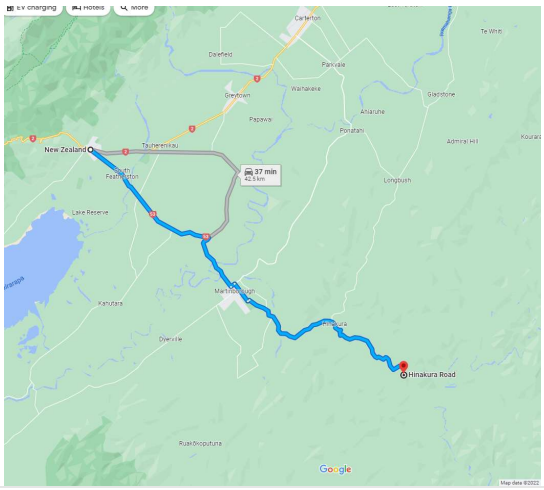
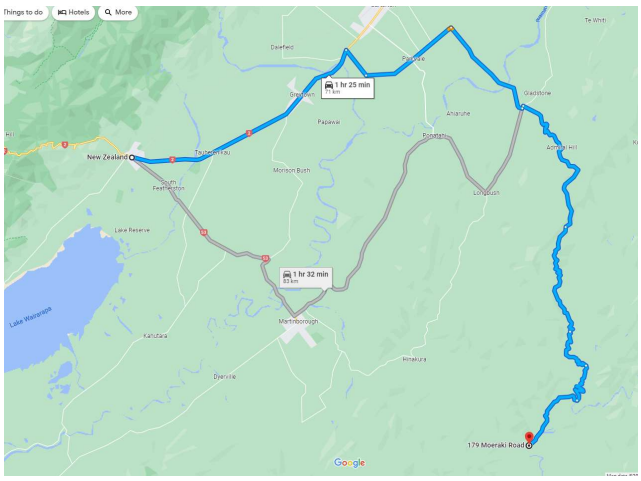
To Featherston (Hinekura Road Open)	To Featherston (Hinekura Road Closure)
	

Figure 2-2: Distance and Travel Time from Hinekura to Featherston

Currently, there is no origin and destination data available for vehicles driving through the Hinekura, however, both the town of Gladstone and Featherston are known commuter and freight destinations based on Commuter App[2]. For this assessment, the weighted average detour length has been calculated using the assumed percentage splits between the potential origins and destinations shown in Table 2-1.

[2] https://commuter.waka.app/

Table 2-1 - Assumed percentage Split between Origins and Destinations

Origin/Destination	North - Gladstone	West - Featherston	All
Hinekura	50%	50%	100%

The daily travel time (TT) cost of daily closures has been calculated by comparing the travel time cost between the scenario where Hinekura Road is open and the scenario where Hinekura Road is closed.

The daily vehicle operation cost (VOC) has been calculated by comparing the vehicle operation cost between the scenario where Hinekura Road is open and the scenario where Hinekura Road is closed.

3 Do-nothing - Step 1

As with all economic evaluations, it is important to define a do-nothing scenario. This is especially the case for resilience projects because the aim is to provide a more resilient route where the majority of benefits derive from minimising the disruption from full or partial closures.

For this assessment, the do-nothing is the damaged section will be fully closed without the normal operation of the Hinekura Road corridor to the public. A temporary track serving only locals was constructed through private properties as highlighted in yellow in Figure 3-1.

Figure 3-1: Temporary track to access Hinekura Road for Locals.

The temporary track is currently gated with locks with combinations known only to the locals of the area, impeding access for public road users. This temporary track has been constructed over two private farmland properties. An unofficial track has also been constructed by a farmer as shown by the red dotted line in Figure 3-1 above, which is used predominately by the landowner who uses a quad bike to traverse the path.

The detours for the public indicated in Section 2.2 will be chosen by vehicle users who will go to the north or west.

3.1 Do-nothing Costs

The do-nothing cost is made up of two main components:

- Minimum cost to Waka Kotahi (government) in the form of maintenance costs for farmers who have to go to the farms via the damaged section of Hinekura Road.
- Full closure (detour) cost for the public associated with detours for Hinekura Road closures, including:
    - Travel Time Cost (TTC),
    - Vehicle Operation Cost (VOC)
    - Carbon Dioxide Benefits (CDB)

Each of these components was discussed below to establish the do-nothing cost and benefit for the project. The upgrading costs for the potential improvement works along the alternative route were not considered in this base assessment.

3.1.1 Maintenance Cost

The normal cost associated with drainage, environment, pavement, shoulder, verge, and removing landslip debris has been obtained from SWDC data[3] over the last eight years and these costs do not include the reactive maintenance cost for particular large events that occurred over the period. Because the operation of the road is for private farmers only in the do-nothing scenario, the annual maintenance cost will be much lower than the normal annual maintenance cost. To be conservative, it was assumed to be 20 per cent of the normal annual maintenance cost, which is summarised in Table 3-1.

Table 3-1 – Annual Maintenance Cost in Do-nothing

Item	Value
Cost of Hinekura Road (2014-2022)	$686,418
Period (year)	8 years
Length of Hinekura Road (km)	23.34 km
Length of Damaged Hinekura Road (km)	1.3 km
Normal Annual Maintenance Cost on Damaged Alignment (NZ dollar)	$4,780 (686418/8/23.34*1.3)
Minimum Annual Maintenance Cost on Damaged Alignment (NZ dollar) (20% of Normal Annual Maintenance Cost)	**$956** (4780 *20%)

Table 3-1 above shows that over the last eight years, $686.4K has been spent along the 23.34km length of Hinekura Road. This averages to a minimum annual spend of $956 a year for the damaged segment which would have a Net Present Value of $14.3K over a 25-year period.

3.1.2 Full Closures Cost to Public (Annual)

The Travel Time, Vehicle Operation Cost and carbon dioxide cost for the do-nothing have been calculated based on an annual full closure assumption and therefore the closure days were 365 days.

[3] Data from South Wairarapa RAMM

The daily TTC of daily closures has been calculated by comparing the weighted travel time cost with the scenario where the new alignment of Hinekura Road is open and the scenario where Hinekura Road is closed.

The daily VOC has been calculated by comparing the weighted VOC between the scenario where the new alignment of Hinekura Road is open and the scenario where Hinekura Road is closed.

The carbon dioxide cost has been assumed as 5 per cent of VOC.

Table 3-2 – NPV for full closures benefits (365 days) over the analysis period

Detours	Do-nothing Cost
Travel Time	$28.90M
Vehicle Operation Cost	$8.82M
CO2 (5% of VOC)	$0.44M
Total	**$38.16M**

As Table 3-2 shows the Net Present Value (NPV) do-nothing cost associated with detours, assuming an average of 365 closure days/year, is $38.16M over the analysis period.

3.2 Summary Do-nothing Cost and Benefit

To summarise, the do-nothing cost includes both the cost to the government through minimum maintenance costs and the cost to the public associated with long-term (365 days/ year) closures. These costs are summarised in **Table 3-3** below:

Table 3-3 – Present Value for the do-nothing

	Do-nothing Cost
Minimum Maintenance Costs	$14,361
Total Costs	**$14,361**
Travel Time Costs Full Closures	$28,901,722
Vehicle Operation Cost Full Closures	$8,816,440
Carbon Dioxide Benefits (5%)	$440,822
Do-nothing Benefit Value	**$38,158,985**

As the table above shows, the do-nothing maintenance cost is $14K over the 40-year analysis period. The cost to the public in terms of travel time, vehicle operating costs, and CO2 related to full closures is $38.16M over the analysis period. This $38.2M value for the do-nothing is the most important as a reduction in this cost (through a realignment) would translate into tangible benefits.

4 Proposed Option

On 21-Oct-2022, Option 1 (B4+O+O1) was selected by SWDC as the preferred option, as shown in Figure 4-1. For further details of the options considered, refer to WSP's letter report titled Hinekura Road Realignment Options – Updated Summary dated 4-Oct-2022.

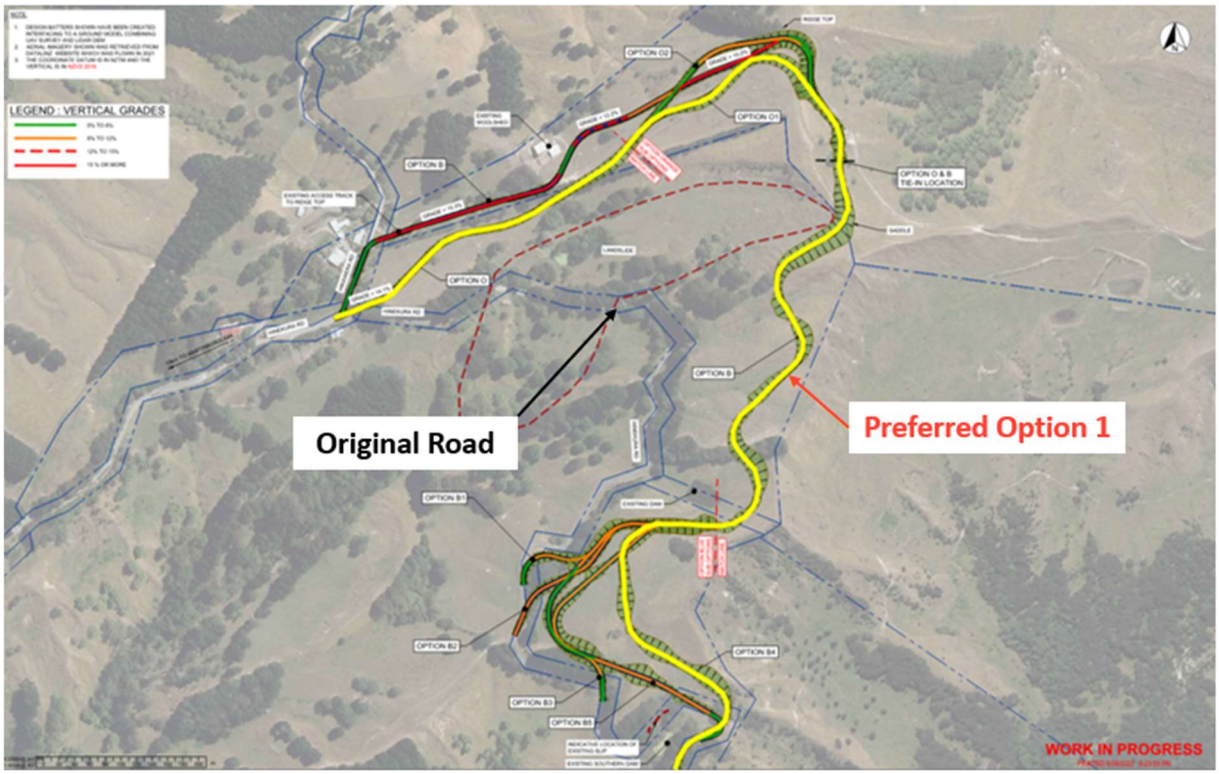


Figure 4-1: Realignment Preferred Option (Option 1)

4.1 Proposed Option Rough Order Cost

Option 1 order cost is made up of two main components:

- Design cost (12% construction fee)
- Capital cost (Construction fee mainly)

As Option 1 consists of O+O1 and B4, the rough order costs including design and construction have been estimated to be a range of $10M-$11M as shown in Table 4-1.

Table 4-1 – Rough Cost with Design and Construction

Options[4]	B	O+O1	O+O2
B1	$8M-9M	$ 8M-9M	$9M-10M
B2	$9M-10M	$9M-10M	$9M-10M
B3	$9M-10M	$9M-10M	$9M-10M
B4	$10M-11M	$10M-11M	$10M-11M
B5	$10M-11M	$10M-11M	$10M-11M

[4] WSP's letter report titled Hinekura Road Realignment Options – Updated Summary dated 4-Oct-2022.

Design Fee (combining Scheme Design + Detailed Design + Investigations) is usually in the range of 10% to 14% of Physical Works (construction). In this case, the design fee (present value) is approximately $1.3M as it has been assumed as 12% of the physical work (capital costs).

The physical work of construction has been estimated to be $10.5M, which represents a mid-range cost estimate.

5 Benefit for the Options – Step 2

5.1 Offsetting government reactive maintenance spending

As detailed in Section 3.1.1 above, over the last 8 years $ 686K has been spent on clearing landslip debris along the 23.34km length of road through the Hinekura. This averages to an annual spend of $956 a year for the damaged section of 1.3 km which would have a Net Present Value of $14.3K over a 25-year period.

The normal annual ad hoc maintenance cost for the realignment scenario would be similar to the existing maintenance cost from the last eight years of SWDC data. It should be noted these costs do not include the reactive maintenance cost for particular large events.

The routine maintenance cost for new structures was assumed to be $0 per year.

The cost estimates of the proposed option to the government were summarised in Table 5-1.

Table 5-1 Estimation Costs in Option 1

Realignment (Option 1)	Option 1 Cost
Design Costs (Discount value)	$1.2M
Capital Costs	$10M
Maintenance Costs (ad hoc)	$0.04M
Routine Maintenance	$0
Total Cost (to Government)	**$11.2M**

As shown above, it is important to note the design period and construction period were estimated for two years. As a result, the design costs (1.2M) in the chart is the discount value from the estimated design costs (1.3M). Similarly, the capital costs (10M) in the chart presents the discount value, which is lower than the estimated physical work costs (10.5M).

5.2 Option 1 Benefits

The tangible benefits are associated with reducing the do-nothing cost to the public in relation to TT, VOC, and CO2 emission. In other words, any improvement through the Hinekura reduces the frequency and duration of the full closures and will provide an economic benefit for the project. It should be noted that the crash risks and wider economic benefits are not considered in this case.

The reduction of frequency and duration of closures for the overall corridor has been calculated by using the following assumptions:

- The annual occurrence for full closures was assumed as 365 days per year for the do-nothing option.
- The average speed on Hinekura Road was conservatively assumed as 50km/hr while 65km/hr was indicated on Google maps.
- To be conservative, an average 90% reduction of the preferred option on short to medium closure compared to do-nothing scenario.

. An average 95% reduction of the preferred option on long term closure compared to the do-nothing scenario.

The cost estimates of the proposed option to the public were summarised in Table 5-2.

Table 5-2 Estimation Costs in Option 1

Detours	Option 1 Cost
Travel Time	$2.9M
Vehicle Operation Cost	$0.9M
CO2 (5% of VOC)	$0.04M
Total	**$3.8M**

A separate spreadsheet with the reduction calculation for the corridor is provided in Appendix A.

5.3 Results

Table 9 below provides a summary of the net present value for both the do-nothing and Option 1. The table also shows the calculated BCR for the recommended option.

Table 5-3 – BCR Result

	Costs		
	Do-nothing	Option 1	Net Cost of Option
Design Cost	$ -	$ 1,211,538	$ 1,211,538
Capital Costs	$ -	$ 9,901,997	$ 9,901,997
Maintenance Costs (ad hoc)	$ -	$ 42,200	$ 42,200
Routine Maintenance	$ 14,361	$ -	- $ 14,361
Total Costs	**$ 14,361**	**$ 11,155,735**	**$ 11,141,375**
Present Value Tangible Benefits	Do-nothing	Option 1	Net Benefits of Option
Travel Time Benefits Full Closures	$ 28,901,722	$ 2,890,172	$ 26,011,550
Vehicle Operation Cost Benefits Full Closures	$ 8,816,440	$ 881,644	$ 7,934,796
Carbon Dioxide Benefits (5%)	$ 440,822	$ 44,082	$ 396,740
Tangible Benefits	**$ 38,158,985**	**$ 3,815,898**	**$ 34,343,086**
Tangible B/C Ratio			3.1

Please note that according to the Waka Kotahi's manual, the MBCM, benefits are any positive or negative impacts that are attributable to an activity. The benefits within this manual have

been named impacts to explicitly account for the generation of both positive benefits and negative benefits (disbenefits).

5.4 Sensitivity Test

To provide an indication on how sensitive this economic evaluation is to the above assumptions, a number of sensitivity tests have been undertaken on the preferred option.

Table 5-4 – Sensitivity test based on Option 1

	Base	Lower Value	Upper value	BCR Range
Discount Factor	4%	3%	6%	2.4 - 3.5
Average speed	50km/hr	40km/hr	65km/hr	2.4 - 3.7
Reduction of full closure (%)	90% - short-medium closure 95% - long term closure	70% - short-medium closure 75% - long-term closure	100% - short-medium closure 100% - long-term closure	2.4 - 3.4
AADT	250	100	500	1.2 – 6.2

As Figure 4-1 shows the benefits are very sensitive in relation to the assumptions of the discount factor, average speed and the percentage of closure reduction that has a BCR range of between 2.4 and 3.7. Furthermore, the AADT sensitive test was undertaken as the range of AADT was 100-500, the lowest BCR would be 1.2 for AADT of 100.

No sensitivity test decreases the BCR to below 1.0.

Sensitivity Test – Property Costs

We have not included property costs in our base assessment because we at the very early stages of the design. However, if we applied a $3M Net Present Value (NPV) added to the capital costs, the BCR would be in the order of 2.4. Note that the capital costs are rough order costs thus in our view, the projects overall BCR will be between 1 and 3 taking into account property costs.

Sensitivity Test – Waka Kotahi's Research Report 670

Flow Transport Specialists in their peer review of Waka Kotahi's Research Report 670, suggested undertaking a sensitivity test of applying an unexpected delay time multiplier of 3.2 to the Travel Time values within the economics. This unexpected delay time multiplier is suggested in Waka Kotahi Research Report 670. As Table 5-3 shows, adding a 3.2 Unexpected Delay Time Multiplier would make the BCR much higher than 3.

6 Conclusion

The purpose of this memo is to detail the methodology, assumptions and results of the economic evaluation for calculating the cost of the do-nothing scenario and the tangible benefits of the recommended option.

The assessment above shows that the do-nothing cost associated with detours (Travel Time, Vehicle Operation Cost, and CO2) is $38.2M over the analysis period. The do-nothing also has an ad hoc maintenance cost of $14.3K over the analysis period.

The Net Present Value (NPV) cost of the recommended option is $11.3M including Design, Capital Cost of construction, and ad hoc maintenance of the proposed realignment. In

relation to tangible benefits, the recommended option has $34.3M of benefits. In summary and based on our assessment BCR of 3.1, the benefits of the Hinekura Road Realignment options outweigh the costs associated to divert users onto the alternative detour route.

We have also undertaken sensitivity tests considering the different discount factors, delay multipliers, average speeds, extents of closure, traffic volumes and property costs. These tests confirm that the BCRs under the different scenarios are greater than 1, i.e. the project benefits are still greater than its associated costs.

Appendix A

Appendix A

Assumption

Traffic Inputs						
AADT	250					
Growth rate	1.0%					
Traffic Composition						
Percent LCV 2021	92.00%	Car	81%	203	88%	PC
		LCV	11%	27	12%	LCV
Percent HCV 2021	8.0%	MCV	3%	7	38%	MCV
		HCV1	3%	8	38%	HCV1
		HCV2	2%	5	25%	HCV2
HCV growth rate	1.0%					

Project Timings			
Discount rate		4%	
Time zero	1-Jul	2022	
Base Date	1-Jul	2021	
Year of estimate		2022	
Construction period	Staggered over	2	years
Benefit period		40	years
Construction Start		7/01/2023	

	Rural Other	
Compsite TT value weekday	22.32	$/hr
CRV weekday	N/A	$/hr
CO2 of VOC	5%	

Update factors - base year 2021	
TT cost savings	1.59
VOC cost savings	1.15
Crash cost savings	1.10
Cost estimate (2021)	1.00

		Do nothing	**Option 1**
route travel time	North (mins)	59.00	25
	West (mins)	85.00	37
	Grade Rate	10%	4%
VOC component	Distance North (km)	36.40	29.00
	Distance North Speed (km/hr)	35	50
	Distance West (km)	71.00	42.50
	Distance North Speed (km/hr)	45	50
	Grade Rate	10%	4%
		North	West
	Split n	50%	50%

Costs					
	Do nothing		Option 1		Assumption
Design	0	$	1,260,000	12%	10%-14% Construction Fee
Construction	0	$	10,500,000	$10,500,000	Rang of 7.1m -10.5m
Ad-hoc maintenance	0	$	42,200		
Routine main	956	$	-		

Notice: The assumption of the maintenance fee is 0 for the option of doing nothing.

distance from intersection of Hinekura Rd with longbush Rd	14.5km
Between Todds Rd to Moeraki Road (Martinborough -	23.5km

TRANSPORT ECONOMICS ANALYSIS SUMMARY

		Costs		
		Do nothing	Option 1	Net Cost of Option
	Design Costs	$ -	$ 1,211,538	$ 1,211,538
	Capital Costs	$ -	$ 9,901,997	$ 9,901,997
	Maintenance Costs (ad hoc)		$ 42,200	$ 42,200
	Routine Maintenance	$ 14,361	$ -	-$ 14,361
1	**Total Costs**	**14,361**	**11,155,735**	**11,141,375**
	Net Present Value Tangible Benefits	Do nothing	Option 1	Tangible Benefits of Option
	Travel Time Benefits	$ 28,901,722	$ 2,890,172	$ 26,011,550
	Vehicle Operation Cost Benefits	$ 8,816,440	$ 881,644	$ 7,934,796
	Carbon Dioxide Benefits (5%)	$ 440,822	$ 44,082	$ 396,740
3	**Tangible Benefits**	**38,158,985**	**3,815,898**	**34,343,086**
4	Tangible B/C Ratio			**3**

Do Nothing	$	956.01
Option 1	$	4,780.00

Discount F 4%

Do-nothing Cost

Hinakura Road Cost of Closures

Calendar Year	Time Stream Year	'ercentage recognise	Discount	Cost Present Value	Cost Discounted
2022	0	0%	1	$956	$0
2023	1	0%	0.961538462	$956	$0
2024	2	100%	0.924556213	$956	$884
2025	3	100%	0.888996359	$956	$850
2026	4	100%	0.854804191	$956	$817
2027	5	100%	0.821927107	$956	$786
2028	6	100%	0.790314526	$956	$756
2029	7	100%	0.759917813	$956	$726
2030	8	100%	0.730690205	$956	$699
2031	9	100%	0.702586736	$956	$672
2032	10	100%	0.675564169	$956	$646
2033	11	100%	0.649580932	$956	$621
2034	12	100%	0.62459705	$956	$597
2035	13	100%	0.600574086	$956	$574
2036	14	100%	0.577475083	$956	$552
2037	15	100%	0.555264503	$956	$531
2038	16	100%	0.533908176	$956	$510
2039	17	100%	0.513373246	$956	$491
2040	18	100%	0.493628121	$956	$472
2041	19	100%	0.474642424	$956	$454
2042	20	100%	0.456386946	$956	$436
2043	21	100%	0.438833602	$956	$420
2044	22	100%	0.421955387	$956	$403
2045	23	100%	0.405726333	$956	$388
2046	24	100%	0.390121474	$956	$373
2047	25	100%	0.375116802	$956	$359
2048	26	100%	0.360689233	$956	$345
2049	27	0%	0.34681657	$956	$0
2050	28	0%	0.333477471	$956	$0
2051	29	0%	0.320651415	$956	$0
2052	30	0%	0.308318668	$956	$0
2053	31	0%	0.296460258	$956	$0
2054	32	0%	0.28505794	$956	$0
2055	33	0%	0.274094173	$956	$0
2056	34	0%	0.26355209	$956	$0
2057	35	0%	0.253415471	$956	$0
2058	36	0%	0.243668722	$956	$0
2059	37	0%	0.234296848	$956	$0
2060	38	0%	0.225285431	$956	$0
2061	39	0%	0.216620606	$956	$0
2062	40	0%	0.208289045	$956	$0
			1	**Total**	$14,361
				Update factor	1
				Total 2020 Dollars	**$ 14,361**

Option 1
(ad hoc Maintainance)

Hinakura Road Cost of Closures

Calendar Year	Time Stream Year	Percentage recognised	% Reduction from Do min	Discount	Cost Present Value	Cost Discounted
2022	0	0%		1	$4,780	$0
2023	1	0%	0%	0.961538462	$0	$0
2024	2	100%	0%	0.924556213	$4,780	$4,419
2025	3	100%	10%	0.888996359	$4,302	$3,824
2026	4	100%	20%	0.854804191	$3,824	$3,269
2027	5	100%	30%	0.821927107	$3,346	$2,750
2028	6	100%	40%	0.790314526	$2,868	$2,267
2029	7	100%	50%	0.759917813	$2,390	$1,816
2030	8	100%	50%	0.730690205	$2,390	$1,746
2031	9	100%	50%	0.702586736	$2,390	$1,679
2032	10	100%	50%	0.675564169	$2,390	$1,615
2033	11	100%	50%	0.649580932	$2,390	$1,552
2034	12	100%	50%	0.62459705	$2,390	$1,493
2035	13	100%	50%	0.600574086	$2,390	$1,435
2036	14	100%	50%	0.577475083	$2,390	$1,380
2037	15	100%	50%	0.555264503	$2,390	$1,327
2038	16	100%	50%	0.533908176	$2,390	$1,276
2039	17	100%	50%	0.513373246	$2,390	$1,227
2040	18	100%	50%	0.493628121	$2,390	$1,180
2041	19	100%	50%	0.474642424	$2,390	$1,134
2042	20	100%	50%	0.456386946	$2,390	$1,091
2043	21	100%	50%	0.438833602	$2,390	$1,049
2044	22	100%	50%	0.421955387	$2,390	$1,008
2045	23	100%	50%	0.405726333	$2,390	$970
2046	24	100%	50%	0.390121474	$2,390	$932
2047	25	100%	50%	0.375116802	$2,390	$897
2048	26	100%	50%	0.360689233	$2,390	$862
2049	27	0%	50%	0.34681657	$0	$0
2050	28	0%	50%	0.333477471	$0	$0
2051	29	0%	50%	0.320651415	$0	$0
2052	30	0%	50%	0.308318668	$0	$0
2053	31	0%	50%	0.296460258	$0	$0
2054	32	0%	50%	0.28505794	$0	$0
2055	33	0%	50%	0.274094173	$0	$0
2056	34	0%	50%	0.26355209	$0	$0
2057	35	0%	50%	0.253415471	$0	$0
2058	36	0%	50%	0.243668722	$0	$0
2059	37	0%	50%	0.234296848	$0	$0
2060	38	0%	50%	0.225285431	$0	$0
2061	39	0%	50%	0.216620606	$0	$0
2062	40	0%	50%	0.208289045	$0	$0
				1	**Total**	$42,200
					Update factor	1
					Total 2020 Dolla	**$ 42,200**

	Do Min	$ 956.01
Discount F	4%	

Oprtion 1 Design Cost

Hinakura Road Cost of Open

Calendar Year	Time Stream Year	ercentage recognise	Discount	Cost Present Value	TT Discounted
2022	0	100%	1		$0
2023	1	100%	0.961538462	$1,260,000	$1,211,538
			1	**Total**	$1,211,538
				Update factor	1
				Total 2020 Dollars	**$ 1,211,538**

Oprtion 1 Construction Cost

Hinakura Road Cost of Open

Calendar Year	Time Stream Year	ntage recog	Discount	Cost Present Value	TT Discounted
2022	0	100%	1		$0
2023	1	100%	0.961538462	$5,250,000	$5,048,077
2024	2	100%	0.924556213	$5,250,000	$4,853,920
1	1	0%	0.961538462		$0
			1	**Total**	$9,901,997
				Update factor	1
				Total 2020 Dolla	**$ 9,901,997**

Full closure		
	TT (2002 Dollar	VOC (2015 dollar value)
Do Nothing	1277770	543686

Traffic Growth 1.00%
Discount Factor 4%

DO-nothing Travel Time (Full Closures)

Hinekura Road Cost of Closures

Calendar Year	Time Stream Year	Benfit recognised	Discount	Closures Cost TT	Travel Time Cost TT Total
2022	0	0%	1	$1,277,770	$0
2023	1	0%	0.961538462	$1,290,548	$0
2024	2	0%	0.924556213	$1,303,326	$0
2025	3	20%	0.888996359	$1,316,231	$234,025
2026	4	40%	0.854804191	$1,329,264	$454,504
2027	5	60%	0.821927107	$1,342,427	$662,026
2028	6	80%	0.790314526	$1,355,719	$857,156
2029	7	100%	0.759917813	$1,369,144	$1,040,437
2030	8	100%	0.730690205	$1,382,701	$1,010,326
2031	9	100%	0.702586736	$1,396,392	$981,087
2032	10	100%	0.675564169	$1,410,219	$952,694
2033	11	100%	0.649580932	$1,424,183	$925,122
2034	12	100%	0.62459705	$1,438,285	$898,349
2035	13	100%	0.600574086	$1,452,527	$872,350
2036	14	100%	0.577475083	$1,466,910	$847,104
2037	15	100%	0.555264503	$1,481,435	$822,588
2038	16	100%	0.533908176	$1,496,104	$798,782
2039	17	100%	0.513373246	$1,510,919	$775,665
2040	18	100%	0.493628121	$1,525,880	$753,217
2041	19	100%	0.474642424	$1,540,989	$731,419
2042	20	100%	0.456386946	$1,556,248	$710,251
2043	21	100%	0.438833602	$1,571,658	$689,696
2044	22	100%	0.421955387	$1,587,220	$669,736
2045	23	100%	0.405726333	$1,602,937	$650,354
2046	24	100%	0.390121474	$1,618,809	$631,532
2047	25	100%	0.375116802	$1,634,838	$613,255
2048	26	100%	0.360689233	$1,651,026	$595,507
2049	27	0%	0.34681657	$1,667,375	$0
2050	28	0%	0.333477471	$1,683,885	$0
2051	29	0%	0.320651415	$1,700,559	$0
2052	30	0%	0.308318668	$1,717,398	$0
2053	31	0%	0.296460258	$1,734,403	$0
2054	32	0%	0.28505794	$1,751,577	$0
2055	33	0%	0.274094173	$1,768,921	$0
2056	34	0%	0.26355209	$1,786,437	$0
2057	35	0%	0.253415471	$1,804,126	$0
2058	36	0%	0.243668722	$1,821,991	$0
2059	37	0%	0.234296848	$1,840,032	$0
2060	38	0%	0.225285431	$1,858,252	$0
2061	39	0%	0.216620606	$1,876,652	$0
2062	40	0%	0.208289045	$1,895,235	$0
			1	**Total**	$18,177,184
			Update factor		$1.59
			Total 2020 Dollars	**$**	**28,901,722**

DO-nothing VOC Full Closures

Hinekura Road Cost of Closures

Calendar Year	Time Stream Year	Discount	Closures Cost VOC	'ehicle Operation Cos VOC Total
2022	0	1	$ 543,686	$0.00
2023	1	0.961538462	$549,123	$0.00
2024	2	0.924556213	$554,559	$0.00
2025	3	0.888996359	$559,996	$99,566.94
2026	4	0.854804191	$565,433	$193,333.86
2027	5	0.821927107	$570,870	$281,528.13
2028	6	0.790314526	$576,307	$364,370.97
2029	7	0.759917813	$581,744	$442,077.44
2030	8	0.730690205	$587,181	$429,047.12
2031	9	0.702586736	$592,617	$416,365.17
2032	10	0.675564169	$598,054	$404,024.07
2033	11	0.649580932	$603,491	$392,016.36
2034	12	0.62459705	$608,928	$380,334.66
2035	13	0.600574086	$614,365	$368,971.64
2036	14	0.577475083	$619,802	$357,920.07
2037	15	0.555264503	$625,239	$347,172.81
2038	16	0.533908176	$630,675	$336,722.79
2039	17	0.513373246	$636,112	$326,563.05
2040	18	0.493628121	$641,549	$316,686.72
2041	19	0.474642424	$646,986	$307,087.02
2042	20	0.456386946	$652,423	$297,757.29
2043	21	0.438833602	$657,860	$288,690.97
2044	22	0.421955387	$663,297	$279,881.58
2045	23	0.405726333	$668,733	$271,322.78
2046	24	0.390121474	$674,170	$263,008.32
2047	25	0.375116802	$679,607	$254,932.07
2048	26	0.360689233	$685,044	$247,088.01
2049	27	0.34681657	$690,481	$0.00
2050	28	0.333477471	$695,918	$0.00
2051	29	0.320651415	$701,355	$0.00
2052	30	0.308318668	$706,791	$0.00
2053	31	0.296460258	$712,228	$0.00
2054	32	0.28505794	$717,665	$0.00
2055	33	0.274094173	$723,102	$0.00
2056	34	0.26355209	$728,539	$0.00
2057	35	0.253415471	$733,976	$0.00
2058	36	0.243668722	$739,413	$0.00
2059	37	0.234296848	$744,849	$0.00
2060	38	0.225285431	$750,286	$0.00
2061	39	0.216620606	$755,723	$0.00
2062	40	0.208289045	$761,160	$0.00
		1	**Total**	$7,666,470
		Update factor		$1.15
		Total 2020 Dollars	**$**	**8,816,440**

Summary Hinekura Road Cost of Closures

	TT	VOC
Do Nothing	$ 28,901,722	$ 8,816,440

Option 1 Reduction (from seperate spreadsheet)

Assumption 90.00% short medium Closures
95.00% Long Term Closures

Summary		Do Nothing	Option 1
Hinekura Road	TT	$ 28,901,722	$ 2,890,172
Cost of Closures	VOC	$ 8,816,440	$ 881,644

Hinekura Road

Full Closures

		Cars	*HCVs*
Traffic Demands	vpd	230	20
	Vehicles affected over 8hrs	230	20

Full Closure over 8 hours

					Travel Time					Vehicle Operating Costs											
Description	Option	Weighted Length (km)	Grade (%)	Average Speed (kph)	Travel Time (hrs)	Light Veh TT (veh.hrs)	HCV TT (veh.hrs)	Rural Other TT ($/hr)	Total TTC ($)	Lights Dist (veh.km)	HCV Dist (veh.km)	Grade (%)	Speed (kph)	User Class	RO ($/km)	Total VOC (Day)	Total Cost TT/Day (2002$)	Total Cost VOC/Day (2015$)	Annual Occurance (Days)	Total Cost TT/Year (2002$)	Total Cost VOC/year (2015$)
Kinekura Road Normal	Option 1	35.75	4	50	0.72	164	14	22.32	3989	8223	715	4	50	Rural other	30.8	2753	3989	2753	365.00	1455945	1004754
Kinekura Road Closure	Do nothing	53.7	10	40	1.34	309	27	22.32	7490	12351	1074	10	40	Rural other	31.6	4242	7490	4242	365.00	2733716	1548440
					0.63												**$ 3,501**	**$ 1,490**		**$ 1,277,770**	**$ 543,686**

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