



# Summary Business Case

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# Introduction

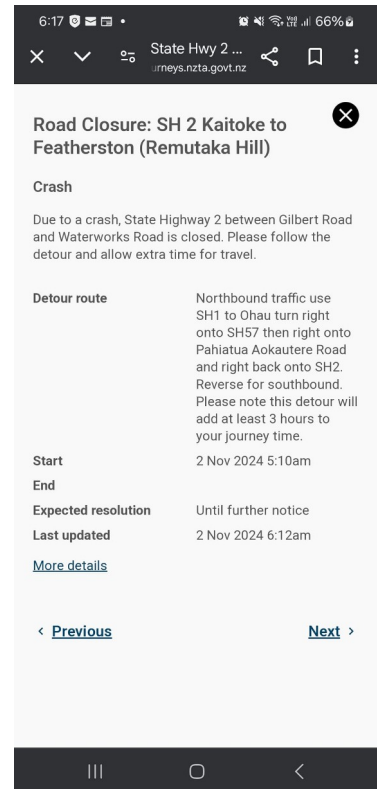
The Remutaka Road Action Group (RRAG) supports the construction of a new high-quality highway between the upper Hutt Valley and the Wairarapa. The new road will be safe to drive at 100 km/hour, with gentle slopes, sweeping curves, and safe overtaking opportunities on uphill stretches. The Remutaka Highway will be far more drivable than the existing Remutaka Hill Road, which we believe should be kept as an emergency alternative route.

We expect a high-quality Remutaka Highway to permanently increase productivity in the Wairarapa by at least five percent. Over sixty years this amounts to about \$10 billion. Building the new highway will cost less than 1.5 billion dollars: Only a fraction of the economic benefit it will generate.

## The Existing Remutaka Hill Road

The Wairarapa is home to a community of 52,000 people and contributes \$3 billion to New Zealand’s GDP. The community depends critically upon the Remutaka Pass section of State Highway 2, a narrow, winding, dangerous road between the upper Hutt Valley and Featherston.

This situation is unique: No other large community in New Zealand is so critically dependent on a single, fragile road. The existing Remutaka Hill Road is the only road connection linking the Wairarapa community with the outside world, including the Port of Wellington and Wellington International Airport. The road traverses steep sloping mountainsides. A major slope failure would isolate the community for many months, probably years. The shortest alternative route to Wellington involves a 200+ kilometre detour via Palmerston North.



The existing road imposes severe restrictions on the Wairarapa’s social, cultural, commercial, and economic development. It is one of New Zealand’s most dangerous highways, with severely restricted capacity, frequency closures, and difficult driving conditions. Signs erected by NZTA Waka Kotahi warn that this road is a high-risk route, especially for motorcycles. Traffic volume over this section of State Highway 2 is comparable with the traffic that formerly used the Manawātū Gorge, which is being replaced by a four-lane highway<sup>1</sup>. In spite of its severe limitations, the existing Remutaka Hill Road is by far the dominant freight and passenger corridor linking the Wairarapa with the Hutt Valley, Wellington, and the rest of the world.

### Wairarapa: Key Information

	Population <sup>2</sup>	Area (km <sup>2</sup> ) <sup>3</sup>	GDP (million \$) <sup>4</sup>
<b>Masterton</b>	29,700	2,300 km <sup>2</sup>	1,702
<b>Carterton</b>	10,250	1,180 km <sup>2</sup>	614
<b>South Wairarapa</b>	12,050	2,388 km <sup>2</sup>	701
<b>Total Wairarapa</b>	52,000	5,868 km <sup>2</sup>	3,017
Wairarapa has 73 percent of the Greater Wellington Regional Council’s land area, 9 percent of the population, and 6 percent of the GDP.			

## A New Highway: Benefits, Cost and BCR

We have identified three possible routes for the new highway (details in Appendix II). We have estimated costs and benefits for one candidate route, identified as “Route Option 1”. This route connects with the existing line of State Highway 2 near the Pakuratahi River Bridge at Kaitoke, and near the Abbots Creek “Twin Bridges” on the Wairarapa side.

We estimate the construction cost for Route Option 1 at \$1,235 million (2023 NZ dollars). The following table summarises the quantified benefits of Route Option 1 in 2023 NZ dollars<sup>5</sup>.

Item	Initial Benefit (\$,000/year)	40-Year Total (\$,000)	60-Year Total (\$,000)	% Total (60-Year)
Road Safety: Social Cost of Crashes	\$8,739	\$376,957	\$576,330	6.1%
Light Vehicles: Transit Time	\$18,079	\$779,838	\$1,192,295	151.7%
Light Vehicles: Fuel Savings	\$1,443	\$62,244	\$95,165	12.1%
Light Vehicles: Running Cost	\$1,443	\$62,244	\$95,165	12.1%
Social & Cultural: Extra Activity	\$4,725	\$203,813	\$311,610	3.3%
Heavy Vehicles: Transit Time	\$1,677	\$72,337	\$110,597	1.2%
Property Values	\$64,560	\$2,259,600	\$2,259,600	23.7%
Additional Regional Activity	\$60,336	\$2,602,594	\$3,979,109	41.8%
Toll Revenue	\$11,920	\$514,169	\$786,114	8.3%
Revenue from Sales of Rock	\$2,886	\$115,440	\$115,440	1.2%
<b>Total Quantified Benefits</b>	<b>\$175,808</b>	<b>\$7,049,236</b>	<b>\$9,521,424</b>	
<b>Benefit to Cost Ratio</b>		<b>5.72</b>	<b>7.73</b>	

We assess quantifiable benefits in terms of their direct or indirect contribution to productivity, as reflected in national or local per-capita GDP. Our projections are based on the following assumptions:

- The new highway will capture 80% of existing light vehicle traffic and 90% of existing heavy vehicle traffic.
- The new highway will trigger a light vehicle traffic increase due to “pent-up” socio-cultural demand, equivalent to at least ten percent of existing light vehicle traffic.
- Traffic over the new highway will increase in proportion to population growth in the Wairarapa<sup>6</sup>.

For the purpose of this analysis, we consider the “Wairarapa” to include the districts of South Wairarapa, Carterton, and Masterton. The southern Tararua district is not included. However, it is likely that businesses and residents around Eketahuna other parts of the southern Tararua district depend on the existing Remutaka Hill Road. Therefore, the economic benefit-cost analysis is highly conservative.

### **Additional Benefits**

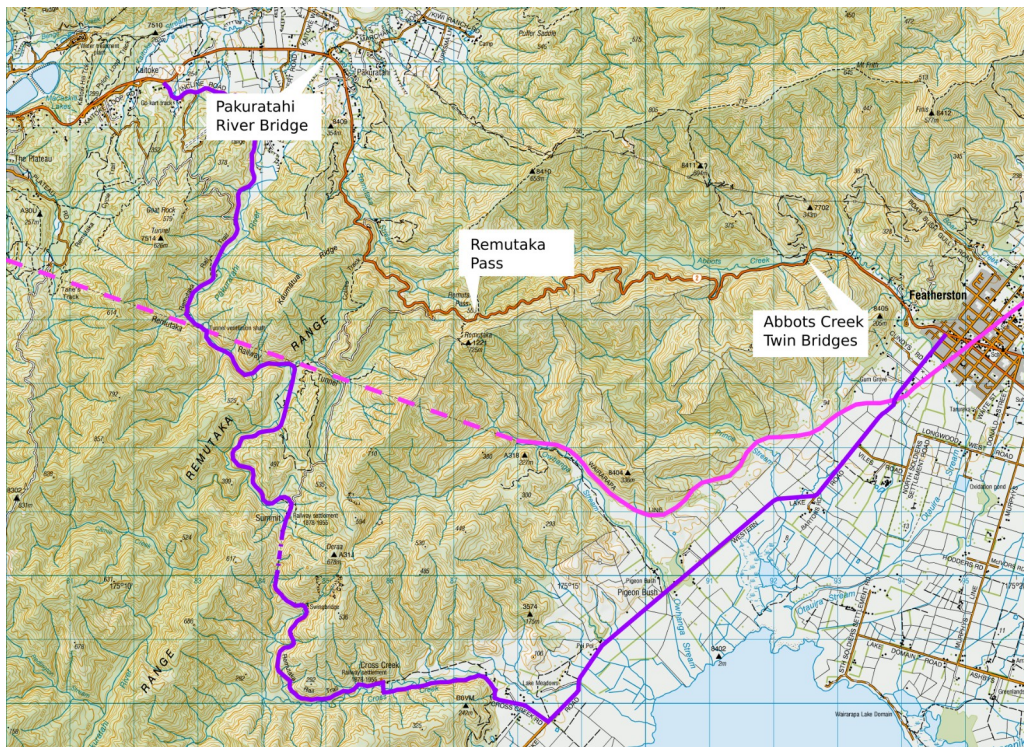
A significant list of benefits have not been quantified in dollar terms. The new highway can realistically be expected to deliver significant additional benefits including better resilience, increased commercial activity, and reduced capital and operating costs for transport companies. In addition, the highway will improve community health, security, and public safety, and it will reduce environmental impacts.

# Resilience

The existing Remutaka Hill Road is not fit for purpose.

Road users expect to be able to travel between the Wairarapa and upper Hutt Valley at any time of day or night, in practically any weather conditions. This is not happening.

The Remutaka Hill Road is frequently closed due to unexpected damage (such as slips), accidents, and for planned maintenance. A consultant to NZTA Waka Kotahi observed in 2008 that, “the highway is not functioning as intended 50% of the time.”<sup>7</sup>



**Fig 1:** Existing walking, cycling, rail, and highway routes between Kaitoke (upper left) and Featherston (right). Purple: Remutaka Rail Trail (walking/cycling); Pink: Wairarapa Railway; Orange: Existing Remutaka Hill Road (S. H. 2)<sup>8</sup>.

## Short term threats

The existing Remutaka Hill Road suffers regular closures due to weather (mainly high wind and/or snow), landslides, rock falls, fires, road accidents, vehicle breakdowns, and other interruptions.

With narrow traffic lanes and no continuous stopping shoulder, the road is vulnerable to events that would trigger only lane closures and temporary speed restrictions on other highways. The only available alternative route involves a 213 kilometre detour north to Palmerston North. This is not practical for most road users.

The road has several very tight curves that large trucks can not negotiate without crossing the centreline. Experienced drivers use CB radio to warn other truck-drivers when approaching these “pinch points”. One truck will stop, holding up traffic, while the other negotiates the narrow section.

Inexperienced truck-drivers sometimes have trouble. A driver who accurately allows for the tendency of their rear wheels to cut the corner may collide head-on with a truck or bus coming the other way. A driver who

fails to allow for cut-in may end up with their vehicle jammed against the hill-side. In either case, there is no room for emergency vehicles to clear the road. Only the next truck in the queue can help. Truck-drivers who regularly use Remutaka Hill Road are prepared to clear stuck vehicles by towing them out of the way.

The lack of space has prompted NZTA Waka Kotahi and maintenance contractors to adopt a policy of doing roadworks at night, closing the road to general traffic. Road users are able to book escorted crossings during some of these planned closures, however, for many people in the Wairarapa, planned maintenance imposes a curfew on travel over the hill.

## Long term threats

A major earthquake is the most serious long-term threat. At least twelve kilometres of the existing road traverses steep mountain-sides. A significant earthquake could trigger a severe landslide that would destroy the road. Given the extreme difficulty of access, such an (albeit unlikely) event would put the existing Remutaka Hill Road out of service for many months, and probably several years.

Unusually severe weather could also trigger a major slope failure that would take months or years to rectify.

## Impact of Road Closure

The impact of closures depends their timing and duration, and whether or not a closure is planned in advance. Regular Remutaka Hill Road users are familiar with the electronic road signs advising the timing and duration of closures.

- Unplanned closures due to accidents, fires, weather events and so on usually strand motorists and trucks on both sides of the Remutaka Hill Road. Victims are faced with a choice of waiting for the road to re-open, or embarking on a 3-4 hour detour.
- Planned closures discourage people from travelling over the Remutaka Hill Road.

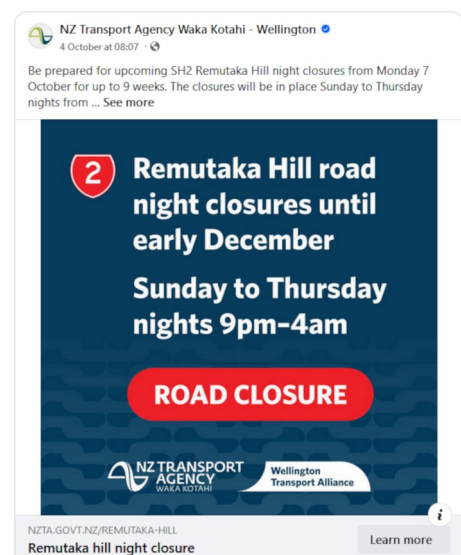
A major slope failure can be expected to close the road for many months or perhaps years. A long-term closure would have a wide range of negative impacts on the Wairarapa community, including business closures, job losses, loss of property values, increased cost of goods and services, and loss of population.

Although it is clear that a long-term road closure would be extremely destructive for the entire Wairarapa community, it is difficult to qualitatively assess many of the impacts. However, there are two aspects that are easily quantified:

- Reduced GDP, and
- Reduced property values.

### **Reduced GDP**

The Wairarapa's share of NZ national GDP amounts to approximately \$3 billion. Almost all economic activity in the Wairarapa depends upon either the existing Remutaka Road, or upon other activities which depend upon the road. A long-term closure of the Remutaka Hill Road would severely curtail economic



activity throughout the Wairarapa District. Very conservatively, we estimate a twelve-month closure to reduce GDP by \$300 million per year. The longer the road is closed, the more serious the impact on economic activity.

### ***Reduced Property Values***

During a long-term road closure Wairarapa property prices would plummet. Most privately-owned land in the Wairarapa is used for productive activities such as farming, horticulture, industry, and commerce. Widespread business failure across all sectors would dramatically reduce demand for productive land. Residential property prices would also go into free-fall as Wairarapa residents moved to other districts in search of business opportunities or employment.

We conservatively estimate that property values would fall by about ten percent. This amounts to \$2.3 billion. Much of this loss would be realised during the first year or two of the closure.

Property prices would be slow to recover. A long-term road closure would highlight the vulnerability of the Wairarapa's economy to road transport disruption, and its dependence on a single route. This would inspire caution among many potential investors.

Taken together, the loss of GDP and property values outweigh the projected cost of the new Remutaka Highway.

### **Improved Resilience due to the New Highway**

The new highway is expected to have continuous stopping shoulders, allowing motorists, roadside service providers and emergency services to deal with most break-downs, minor accidents, and vehicle fires without closing the road.

In case of a major incident forcing a closure of the new highway, the existing Remutaka Hill Road provides a tolerable alternative, adding about two or three kilometres and 10 or 15 minutes to the journey.

Although the existing road will remain vulnerable to closure, the new Remutaka Highway provides an excellent alternative. It is very unlikely that both roads would be impacted simultaneously.

In addition, it is expected that large sections of the new highway will be carried on eco-bridges. Eco-bridges are far less vulnerable to the effects of slope failure than the existing road's cut-and-fill construction. Well-designed eco-bridges allow even large landslides to pass harmlessly beneath the roadway.

# Health & Safety

## Road Accidents

The existing Remutaka Hill Road is one of New Zealand's most dangerous highways. The Remutaka Pass section of State Highway 2 is only about 14 kilometres long. It has been the location of five fatal and 29 serious injury accidents in the last ten years. Fatal and serious injury crashes impose financial and social costs including loss of life and life quality, loss of productivity, medical and legal resources, and property damage.

Based NZ Ministry of Transport estimates for the average cost of road crash injuries and fatalities, the social cost of accidents on the existing Remutaka Hill Road over the last ten years amounts to:<sup>9</sup>

- Serious injuries: \$26,909,100
- Fatalities: \$82,323,000
- Total, serious injuries and fatalities: \$109,232,100 over ten years (\$10,923,210 per year)

Road accidents are less common on high-quality roads than they are on twisting, steep, difficult roads such as the existing Remutaka Hill Road. In addition, crash rates are affected by traffic density: A traffic density reduction will disproportionately reduce the crash rate. The social cost of serious injury and fatal crashes can be expected to fall by at least 80 percent when the new highway opens for traffic.

The new highway would reduce the social cost of serious injuries and fatal injuries by about \$8.74 million per year.

## Health, Security & Public Safety

The new highway will allow better collaboration between emergency services on each side of the Remutakas. Police, fire, and ambulance services from the Hutt Valley will be better able to help with major incidents in the Wairarapa, while Wairarapa-based emergency services will provide better support for incidents originating in the Hutt Valley or Wellington.

The new highway will reduce the need for air ambulance transfers between Masterton and Wellington Hospital. Patients travelling over the new highway will be far more comfortable than if they travelled over the existing road, reducing or eliminating pain management issues for ambulance patients and health shuttle bus passengers. In addition, ambulance officers will be more productive due to the 11 minute transit time reduction.

Wairarapa residents depend for some health services on providers in Wellington or the Hutt Valley. For example, patients needing certain radiographic services need to go to Hutt Hospital. Orthopaedic specialists from Lower Hutt spend part of their work-week in the Wairarapa. The new highway will improve the speed and safety of this type of travel.

## Social and Economic Benefits

Some social and economic benefits of the new highway are difficult to quantify. However, it is clear that the new road will reduce travel time, and it will encourage increased travel.

Time savings due to reduced travel time are assessed as opportunity cost benefits. The reduced travel time allows drivers and passengers to do other things which may contribute to national GDP. This opportunity cost-benefit is assessed at rate equivalent to per-capita GDP.

Additional trips triggered by new highway's superior quality and driving experience are assessed as direct contributions to GDP, based on the NZ Inland Revenue Department's assessment of mileage cost (excluding fixed cost of vehicle ownership).

## Heavy Vehicles

The new Remutaka Highway will reduce freight costs to and from the Wairarapa, by reducing the risk of accidents, and by reducing direct operating costs including travel time, fuel, and general wear and tear.

### ***Accident risk & insurance expense***

Insurance premiums account for a large fraction of a carrier's fixed costs. Insurance premiums increase in proportion to the company's historical accident rate. The high accident rate on the existing Remutaka Hill Road represents a constant threat to the sustainability of transport operators using that road. Carriers have no choice but to include insurance costs in their freight rates.

It is very likely that a new high-quality Remutaka Highway would allow transport companies to operate sustainably with lower freight rates, due to the lower accident risk. We have not tried to estimate the economic impact.

### ***Transit time***

A truck using the existing Remutaka Hill Road spends at least 25 minutes crossing the winding 14.7 kilometre Remutaka Pass section of State Highway 2<sup>10</sup>. The new highway is expected to be at least 2.5 kilometres shorter, with an average driving speed for trucks of 85 km/h. The travel time over the new highway would be less than 8.5 minutes, a time saving of 16.5 minutes per trip.

An average of 473 trucks use the existing road per day, of which we expect 426 (90%) to switch to the new highway. These vehicles would enjoy an initial annual saving of about 42,760 hours, equivalent to \$1.68 million per year based on 2023 GDP per capita<sup>11</sup>.

### ***Fuel cost***

Two characteristics of the new highway tend to reduce fuel consumption: The new highway has a flatter gradient with far fewer curves, and the road is shorter. Against these benefits, trucks will travel at higher speed, facing increased air resistance.

Significant fuel savings for heavy vehicles can be expected. However, this has not been quantified.



### ***Vehicle wear and tear<sup>12</sup>***

Carriers will experience reduced vehicle depreciation due to the new highway's gentle gradient and sweeping curves, which reduce the load on engines, transmission systems, braking systems, and suspension.

Transport operators may choose less powerful trucks, or they may find it more sustainable to use the same trucks they have traditionally used on the existing Remutaka Hill Road, with reduced wear and tear allowing an increase in truck service life.

### **Light Vehicles**

Private cars remain the preferred mode of passenger transport over the Remutaka Pass section of State Highway 2. Public transport between the Wairarapa and Wellington has been heavily subsidised for many decades, however, this has not materially affected the consumer preference for private motor vehicles.

People prefer cars. The new highway will provide faster, more economical passenger transport.

### ***Transit time***

As for freight transport, there will be a significant time saving due to the shorter, less arduous route. Transit time for light vehicles over the existing Remutaka Hill Road averages 19 minutes. At an average 90 km/h, transit time over the new highway will be less than 8 minutes. This is equivalent to an annual benefit of about \$18.08 million<sup>13</sup>.

### ***Fuel and running costs***

As for freight transport, the new highway is expected to reduce fuel consumption and depreciation for passenger vehicles.

Light vehicles on the new highway can be expected to cover the entire distance between Kaitoke and Featherston in cruise control, with the engine management computer optimising fuel economy. At 100 km/h, air resistance dominates a vehicle's power requirement, including downhill on gentle gradients. On the new highway, with a gradient of less than five percent, increased fuel consumption travelling uphill will tend to be offset by reduced fuel consumption travelling downhill.

The existing Remutaka Hill Road presents a more complex challenge. Frequent sharp curves demand short bursts of power, often followed by unavoidable intermittent braking. All this driver activity increases fuel consumption, especially uphill. The road's complex geometry rules out any fuel saving on the downhill side. In addition, frequent downhill braking increases wear and tear on brake linings.

To estimate the new highway's potential fuel cost savings, assume light vehicles burn twice their normal fuel diet on the uphill side of the existing road, compared with driving the same distance on the flat. Also assume fuel consumption downhill is identical to driving the same distance on the flat. A medium-sized car burns about six litres per 100 km. Driving over the existing road therefore requires about 0.38 litres of extra fuel. The new highway would deliver about \$1.4 million worth of annual fuel cost savings for light vehicles<sup>14</sup>.

Fuel accounts for about half of light vehicle running cost. It is reasonable to expect the new highway to deliver an additional \$1.4 million annual savings for motorists.

## **Commerce<sup>15</sup>**

Better access to distant markets and suppliers makes it easier for Wairarapa businesses to trade with a larger pool of suppliers and customers. This leads to the following effects:

- Some businesses that currently serve only customers within the Wairarapa will find it profitable to serve customers in other regions.
- Businesses currently based in Wellington or the Hutt Valley will relocate to the Wairarapa.

An important goal for the new Remutaka Highway is to improve the sustainability of Wairarapa and Wellington businesses by increasing their revenue, profits, or ideally both. This includes export and non-export businesses. The new highway is intended to increase productivity on both sides of the Remutaka and southern Tararua Ranges.

## **Property Values**

Better physical connectivity will make the Wairarapa a more attractive place to live, work, do business, socialise, and play. This will increase demand for residential and business properties in the Wairarapa.

We estimate a minimum ten percent increase in average capital values across the Wairarapa, which yields total capital appreciation of \$2.26 billion. Increased property values increase national GDP because many property-related expenses are related to the relevant property values.

The following table summarises existing property values.

	<b>South Wairarapa<sup>16</sup></b>	<b>Carterton<sup>17</sup></b>	<b>Masterton<sup>18</sup></b>	<b>Total</b>
<b>Land Value (\$millions)</b>	4,929	2,094	5,762	12,785
<b>Capital Value (\$millions)</b>	8,109	3,897	10,590	22,596
<b>Increased CV due to new highway (\$millions)</b>	811	390	1,059	2,260

Property value increases become real when property is sold. We assume increased property values are realised in about 35 years, equivalent to an annual economic benefit of about \$65 million.

## **Social & Cultural Benefits**

The existing Remutaka Hill Road is a psychological and economic barrier inhibiting social and cultural exchange between the Wairarapa and other areas. People cross the Remutakas only for special occasions and large, highly attractive events.

The poor quality of the existing road divides families and communities and inhibits a wide range of activities such as:

- Family gatherings,
- Live entertainment, concerts, etc.,
- Social events,
- Sporting events,
- Recruiting staff for Wairarapa professional practices,
- Support services for disadvantaged groups, such as activities for disabled folk,
- Community events, especially for minority or special interest groups,

- Hospital visits for patients receiving specialised care at Wellington Hospital, Lower Hutt Hospital, Manor Park Private Hospital (geriatric care), and probably others.

It is reasonable to expect better physical connectivity to encourage greater use of the highway to facilitate social and cultural activities. Assuming that ten percent of potential demand for socio-cultural travel (excluding tourism) is “pent-up” due to the psychological barrier of the existing road, the new highway would trigger approximately 260,000 additional trips per year, worth \$4.725 million of additional GDP in the first year<sup>19</sup> due to increased direct travel expense.

Better physical connectivity is also critical to attracting and retaining staff for Wairarapa professional practices. One Wairarapa medical practice, for example, regularly has potential recruits turn down job offers after a trip over the existing Remutaka Hill Road. These professionals want to be able to take in events such as concerts, social functions and sporting fixtures in the wider Wellington Region. They do not want to chance the Remutaka Hill Road.

Improved socio-cultural contact across the Remutaka and Tararua Ranges would generate significant additional economic activity and community well-being improvements. We have not tried to quantify these additional benefits.

### ***Domestic Tourism***

The Wairarapa, Hutt Valley and Wellington offer a wide variety of attractions and events targetting domestic and international tourism. A new highway eliminates a significant constraint on tourism sales on both sides of the Remutaka/Tararua Ranges.

The effect of the new highway will be especially noticeable for Wairarapa tourist businesses because of the Wairarapa’s small population compared with that of the Greater Wellington Region. According to Wairarapa tourism promoter Destination Wairarapa, reliability of road transport is: “One of the major factors holding back tourism in the Wairarapa...”<sup>20</sup>.

There is little doubt that the new road will encourage more domestic tourism, which will boost economic activity in the Wairarapa. We have included domestic tourism in our estimated additional regional economic activity.

# Environmental

## Reduction of Local Pollution

In Europe and the USA, progressive tightening of exhaust emission regulations have significantly reduced air pollution from tailpipe emissions. In those countries, “non-exhaust emissions” (that is, tyre and brake wear) already dominate particle emissions from road traffic. It is expected that regulations in New Zealand will follow those in Europe, the UK, and the USA, which are regularly tightened to address emerging concerns. It is fair to say that by 2030, tailpipe emissions from road vehicles will no longer be significant, even if internal combustion vehicles (with “kinetic energy recovery” braking systems) continue to dominate the vehicle fleet<sup>21</sup>.

Driving over the existing road requires frequent braking, acceleration, and cornering, maximising tyre and brake wear even for the gentlest of drivers.

Vehicles traversing the new Remutaka Highway will seldom need to use their brakes. Brake emissions from vehicles using the new road will be practically zero. With sweeping curves and easy gradients the new road also minimises tyre wear.

Most “non-exhaust” particle material settles on the road surface and is washed off by rain. The new highway is expected to include a storm-water system which captures direct run-off in treatment facilities at the bottom of each side of the hill.

It is difficult to retrofit the existing Remutaka Hill Road with a rainwater collection and treatment system.

Even with increased traffic, the new highway will greatly reduce emissions of local pollutants.

## Ecological Continuity

As mentioned above (under “Resilience”), large sections of the highway will likely be carried on eco-bridges, with the roadway well above ground level, often at or above the tree-tops. This type of road cannot inhibit the free movement of birds and animals, and prevents major change to existing habitat.

The ecological impact of the existing road will also be significantly reduced. We anticipate the new highway will take at least 80 percent of the existing traffic away from the existing Remutaka Hill Road, reducing average daily traffic to about 1480 vehicles per day (62 vehicles per hour). This will allow greater movement of birds and animals across the existing road, especially at night.

## Construction Cost and Operating Revenue

This analysis is based on Route Option 1 (see Appendix II). This route connects with the existing line of State Highway 2 near the Pakuratahi River Bridge at Kaitoke, and near the Abbots Creek “Twin Bridges” on the Wairarapa side.

We expect highway construction to be partly supported by non-government funding partners. Revenue directly attributable to the construction or operation of the new highway offers funding partners a potential return on investment. Therefore, revenue from tolls, or from the sale of construction by-products, is assessed as a benefit.

Route Option 1 has a cut-through at its highest point. A cut-through is preferred because it supports an important objective. It is important that the new highway improves the resilience of Wairarapa’s road transport connections. Highway tunnels suffer operational constraints that thwart this objective.

Today’s highway tunnels have complex, fragile built-in services such as CCTV, fire detection, fire evacuation, ventilation, and fire suppression systems. Tunnels such as the WestConnex complex in Sydney, and Auckland’s Waterview Tunnel (between Pt Chevalier and Mt Roskill on S.H. 20), suffer regular closures for planned maintenance. For example, the Waterview Tunnel’s routine maintenance plan requires two or three overnight closures per month<sup>22</sup>. Additional closures will be required for upgrading tunnel services, most of which need to be replaced every ten to twenty years.

Some traffic is not allowed in highway tunnels. For example, freight vehicles carrying dangerous goods, vehicles over 4.3m high, and vehicles with uncovered loose or bulk loads are banned from the Waterview Tunnel.

A tunnel would create difficulties for emergency services dealing with traffic incidents such as spillages, fires or crashes. An open cut does not need mechanical ventilation, and injured people can be easily evacuated by helicopter.

The constraints imposed by a tunnel are not acceptable for an intercity highway which is central to the Wairarapa’s economic, cultural, and social well-being.

The cut-through on Route Option 1 (Appendix II) eliminates the need for a tunnel. Excavating this cut-through yields a large amount of marketable rock which would mitigate a shortage of locally-sourced quarry products in the Wellington and Wairarapa regions. We note that in the long-term (>50 years) it would become desirable to reduce the slopes alongside the cut-through to mitigate the impact of rock weathering. We recommend that the affected areas be designated for quarrying, with the long-term objective of lowering the slope angles to approximately thirty degrees above horizontal.

Route Option 3 includes a similar, but smaller, summit cut-through.

### Toll Revenue<sup>23</sup>

The new highway will be significantly more attractive to private motorists than the existing hill road.

A toll of \$4.30 per light vehicle and \$8.60 per heavy vehicle will be acceptable to a large majority of road users. During the first year of operation, we estimate the new highway would attract 80% of existing light vehicle traffic (5740 vehicles per day) and 90% of heavy vehicle traffic (426 vehicles per day). In addition, the road will attract additional traffic due to pent-up socio-cultural demand (say 718 vehicles per day) and extra domestic tourism (say 274 vehicles per day).

## **Sale of Rock**

The cut-through on Route Option 1 requires excavating approximately 12 million cubic metres of rock<sup>24</sup>.

The rock is understood to be high-grade greywacke, a readily marketable product. The Hutt Valley and Wellington currently import quarried products including crushed greywacke. These are bulky, low-value products, and the cost to end-users is very sensitive to transport cost. Importing gravel and crushed rock significantly increases costs in the Wellington region.

During highway construction, a temporary conveyor would transport excavated rock to a stockpile at the bottom of the hill. Stockpiled rock would be available to quarry operators in “as-excavated” condition, at a nominal price of \$5 per cubic metre. Our benefit cost analysis assumes the rock would be sold over a period of forty years.

## **Construction Cost**

Route Option 1 is about 11.4 kilometres long, including the one kilometre summit cut-through. The cut-through requires the removal of about 32 million tonnes of rock. Allowing \$660 million for the cut-through<sup>25</sup>, and \$55 million per kilometre<sup>26</sup> for the rest of the highway, we estimate the construction cost at \$1,232 million.

## Conclusions

The construction of a new high-quality highway between Featherston and Kaitoke provides wide-ranging benefits to the Wairarapa, Wellington, and wider New Zealand communities.

This Summary Business Case has identified and described many of these benefits. A large list of benefits have been quantified.

Readily quantifiable benefits significantly outweigh the cost of building the proposed highway. The sixty year Benefit to Cost Ratio is 7.7 to one.

It is strongly recommended that the Remutaka Pass section of State Highway 2 be included in the Government's list of Roads of Regional Significance.

# Appendix I

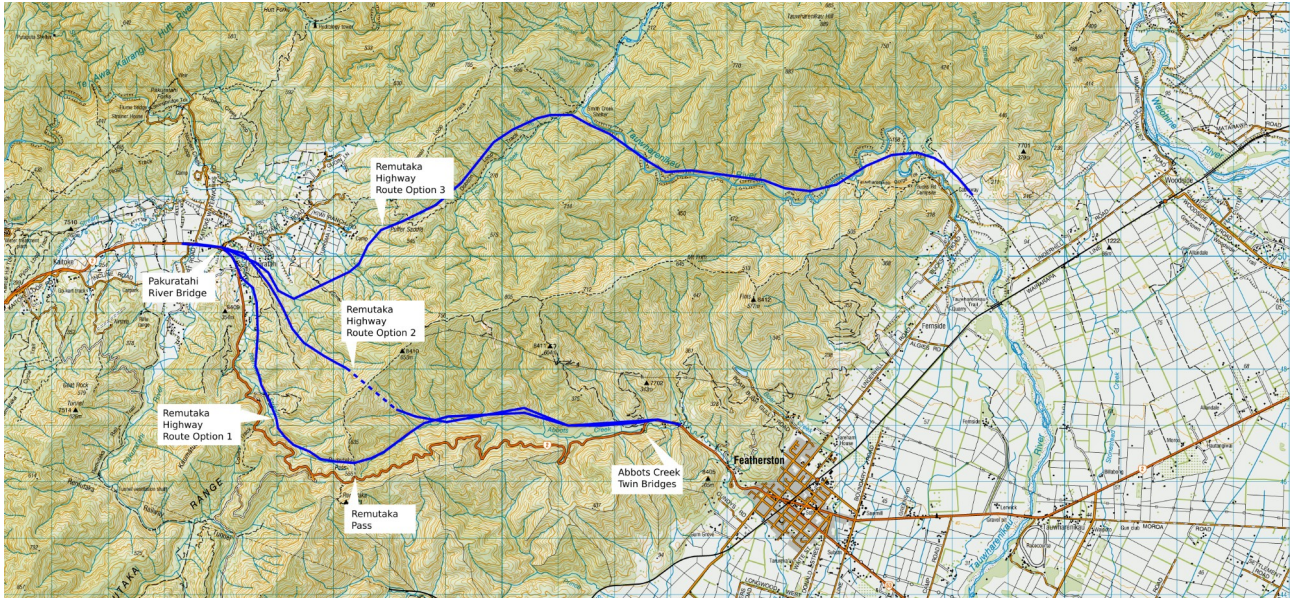
## Facts: Existing Remutaka Hill Road

Fatal accidents 2014 – 2024	5
Serious accidents	29
Planned closures Sep 21 to current 89	8
Unplanned closures Jan 2020 to May 24	34
Average speed	46 Km/h
Average daily traffic (total)	7,648
Average daily traffic (heavy)	473
Maximum daily traffic	12,730



# Appendix II

## Suggested Routes for the new Remutaka Highway



**Fig A.II.1:** Suggested routes for the Remutaka Highway (blue). The existing Remutaka Hill Road is shown in orange<sup>27</sup>.

	<b>Remutaka Highway Route Option 1</b>	<b>Remutaka Highway Route Option 2</b>	<b>Remutaka Highway Route Option 3</b>
<b>Length</b>	11.4 km	9.6 km	18 km
<b>Summit Elevation</b>	400 m	340 m	400 m
<b>Summit Type</b>	Open Cut-Through	Tunnel	Open Cut-Through
<b>Est. Construction Cost</b>	\$1,232 million	1,400 million	\$1,050 million <sup>28</sup>

# Appendix III

## Projected Traffic and Toll Revenue

Year	Annual Traffic Light Vehicles (BAU)	Additional Traffic Light Vehicles (Pent-Up Socio-Cultural Demand)	Additional Traffic Light Vehicles (Domestic Tourism) <sup>29</sup>	Annual Traffic Heavy Vehicles	Toll Revenue 2023 \$
1	2,095,100	262,070	104,000	155,490	\$11,920,245
2	2,109,029	263,812	104,691	156,524	\$11,999,494
3	2,123,050	265,566	105,387	157,564	\$12,079,263
4	2,137,165	267,332	106,088	158,612	\$12,159,579
5	2,151,373	269,109	106,793	159,666	\$12,240,410
6	2,165,676	270,898	107,503	160,728	\$12,321,792
7	2,176,852	272,296	108,058	161,557	\$12,385,376
8	2,188,086	273,701	108,616	162,391	\$12,449,296
9	2,199,378	275,114	109,176	163,229	\$12,513,542
10	2,210,728	276,534	109,740	164,071	\$12,578,119
11	2,222,137	277,961	110,306	164,918	\$12,643,032
12	2,228,951	278,813	110,644	165,424	\$12,681,801
13	2,235,786	279,668	110,984	165,931	\$12,720,690
14	2,242,642	280,526	111,324	166,440	\$12,759,700
15	2,249,519	281,386	111,665	166,950	\$12,798,821
16	2,256,417	282,249	112,008	167,462	\$12,838,071
17	2,261,236	282,851	112,247	167,820	\$12,865,488
18	2,266,065	283,455	112,487	168,178	\$12,892,961
19	2,270,904	284,061	112,727	168,537	\$12,920,494
20	2,275,754	284,667	112,968	168,897	\$12,948,087
21	2,280,614	285,275	113,209	169,258	\$12,975,740
22	2,284,232	285,728	113,388	169,527	\$12,996,329
23	2,287,856	286,181	113,568	169,796	\$13,016,947
24	2,291,486	286,635	113,749	170,065	\$13,037,600
25	2,295,121	287,090	113,929	170,335	\$13,058,283
26	2,298,762	287,546	114,110	170,605	\$13,079,000
27	2,302,409	288,002	114,291	170,876	\$13,099,752
28	2,306,062	288,459	114,472	171,147	\$13,120,534
29	2,309,720	288,916	114,654	171,418	\$13,141,342
30	2,313,385	289,375	114,836	171,690	\$13,162,197
31	2,317,055	289,834	115,018	171,963	\$13,183,082
32	2,320,731	290,293	115,200	172,235	\$13,203,984
33	2,324,413	290,754	115,383	172,509	\$13,224,942
34	2,328,100	291,215	115,566	172,782	\$13,245,914
35	2,331,794	291,677	115,749	173,056	\$13,266,928

<b>Year</b>	<b>Annual Traffic Light Vehicles (BAU)</b>	<b>Additional Traffic Light Vehicles (Pent-Up Socio-Cultural Demand)</b>	<b>Additional Traffic Light Vehicles (Domestic Tourism)</b>	<b>Annual Traffic Heavy Vehicles</b>	<b>Toll Revenue 2023 \$</b>
36	2,335,493	292,140	115,933	173,331	\$13,287,980
37	2,339,198	292,604	116,117	173,606	\$13,309,063
38	2,342,909	293,068	116,301	173,881	\$13,330,172
39	2,346,626	293,533	116,486	174,157	\$13,351,324
40	2,350,349	293,998	116,670	174,434	\$13,372,506
41	2,354,078	294,465	116,856	174,710	\$13,393,722
42	2,357,812	294,932	117,041	174,987	\$13,414,964
43	2,361,553	295,400	117,227	175,265	\$13,436,253
44	2,365,300	295,868	117,413	175,543	\$13,457,568
45	2,369,052	296,338	117,599	175,822	\$13,478,922
46	2,372,810	296,808	117,785	176,101	\$13,500,302
47	2,376,575	297,279	117,972	176,380	\$13,521,720
48	2,380,345	297,750	118,159	176,660	\$13,543,168
49	2,384,122	298,223	118,347	176,940	\$13,564,660
50	2,387,904	298,696	118,535	177,221	\$13,586,181
51	2,391,692	299,170	118,723	177,502	\$13,607,733
52	2,395,487	299,644	118,911	177,783	\$13,629,314
53	2,399,287	300,120	119,100	178,066	\$13,650,948
54	2,403,093	300,596	119,289	178,348	\$13,672,598
55	2,406,906	301,073	119,478	178,631	\$13,694,292
56	2,410,724	301,551	119,667	178,914	\$13,716,011
57	2,414,549	302,029	119,857	179,198	\$13,737,773
58	2,418,379	302,508	120,047	179,483	\$13,759,570
59	2,422,216	302,988	120,238	179,767	\$13,781,397
60	2,426,059	303,469	120,429	180,052	\$13,803,262

# Notes

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- 1 NZTA, 2018, p. 70.
- 2 Population data from Aotearoa Stats Explorer via Wikipedia, Accessed 1 November 2024.
- 3 <https://statsnz.maps.arcgis.com/apps/webappviewer/index.html?id=6f49867abe464f86ac7526552fe19787> Accessed 1 November 2024.
- 4 Masterton and Carterton GDP figures from Infometrics. Data for South Wairarapa is not publicly available. We have estimated South Wairarapa GDP by assuming GDP/capita is uniform across the Wairarapa <https://rep.infometrics.co.nz/carterton-district/economy/growth> Accessed 18 Oct 2024
- 5 This analysis uses 2023 NZ dollars unless noted otherwise. NZTA Waka Kotahi use a discount rate of four percent per annum, however, no discounting has been necessary for the present analysis (NZTA, 2024, page 19).
- 6 Population projection to 2048 was obtained from “Subnational population projections, by age and sex, 2018(base)-2048 update”, Stats NZ: [https://explore.data.stats.govt.nz/?fs\[0\]=Society%2C0%7CPopulation%20projections%23CAT\\_POPULATION\\_PROJECTIONS%23&fs\[1\]=Society%2C1%7CPopulation%20projections%23CAT\\_POPULATION\\_PROJECTIONS%23%7CSubnational%20population%20projections%23CAT\\_SUBNATIONAL\\_POPULATION\\_PROJECTIONS%23&fs\[2\]=Area%2C0%7CWellington%20region%2309%23&pg=0&fc=Area&snb=6](https://explore.data.stats.govt.nz/?fs[0]=Society%2C0%7CPopulation%20projections%23CAT_POPULATION_PROJECTIONS%23&fs[1]=Society%2C1%7CPopulation%20projections%23CAT_POPULATION_PROJECTIONS%23%7CSubnational%20population%20projections%23CAT_SUBNATIONAL_POPULATION_PROJECTIONS%23&fs[2]=Area%2C0%7CWellington%20region%2309%23&pg=0&fc=Area&snb=6) Accessed 2 Oct 2024.  
After 2048, population growth was extrapolated at constant exponential rate.
- 7 NZTA, 2008, p. 62.
- 8 Based on Toitū Te Whenua Land Information New Zealand data licensed for re-use under the Creative Commons Attribution 4.0 International licence (<http://creativecommons.org/licenses/by/4.0/>).
- 9 MoT, 2023: Average cost per accident for rural roads, 2023: Fatal, \$16,464,600; Serious injury: \$927,900.
- 10 The route is 14.7 kilometres from Kaitoke to Abbot’s Creek. Trucks are assumed to average 35 km/h over this section, giving a travel time of 25 minutes.
- 11 GDP per capita for the year to March 2023: \$75,311.  
<https://webrear.mbie.govt.nz/theme/gdp-per-capita/map/timeseries/2023/new-zealand?right-transform=absolute> visited 24 Sep 2024. Note that many line-haul truck-drivers earn above-average income, therefore this calculation probably under-estimates the benefit of the new highway.
- 12 The cost savings due to reduced vehicle depreciation are not quantified in this document
- 13 Average light-vehicle daily traffic (“AADT”) = 80% of 7175 = 5740 vehicles/day; at 11 minutes per vehicle, average occupancy 1.2: 460.922 person-hours per year. At 1920 person-hours per year: \$18.08 million per year.
- 14 Expected average light-vehicle daily traffic (“AADT”) = 5740 vehicles/day. At 0.38 litres per vehicle, annual fuel saving = 796,138 litres. Fuel prices during 2023 were driven above the long-term trend by the Russian invasion of Ukraine (MBIE, 2024, pg. 37.). For this analysis the price of fuel (excluding excise tax) is taken as \$1.80 per litre. The initial estimated annual fuel saving due to the new highway is therefore \$1.433 million.
- 15 GDP increase triggered by better connectivity has not been quantified in this document
- 16 Email from the South Wairarapa District Council, 9 October 2024.
- 17 CDC, 2023: p. 79.
- 18 Email from the Masterton District Council, 18 September 2024.
- 19 Assume an average 75 km per individual vehicle trip, 300,000 trips, 22.5 million km. Additional GDP due to extra travel expense = 22.5 x \$0.21 = \$4.725 million per year. <https://www.ird.govt.nz/income-tax/income-tax-for-businesses-and-organisations/types-of-business-expenses/claiming-vehicle-expenses/kilometre-rates-2023-2024> Accessed 25 Sep 2024.
- 20 Destination Wairarapa, 2021: p. 40.
- 21 AQEP, 2019, pg. 25; Krzyzanowski et al., 2005, esp. pg. 24.
- 22 <https://www.nzta.govt.nz/projects/the-western-ring-route/waterview-tunnel/faq/> Accessed 21 October 2024.
- 23 NZTA, 2024, p. 20 recommends excluding toll revenue from benefit calculations. However, the construction of the new Remutaka Highway is likely to require private investment. Toll revenue may help attract potential investors. Therefore it offers a significant benefit to affected communities.
- 24 This is well within the capability of contemporary earthmoving equipment. 12 million cubic metres of greywacke has a mass of about 32 million tonnes. Conveyor systems used in the mining industry are capable of transporting at least 10,000 tonnes per hour. <https://www.beumergroup.com/app/uploads/2019/03/BEUMER-Belt-Conveyors.pdf> Accessed 19 October 2024. A 5,000 t/h conveyor system, working two 8-hour shifts per day, 5 days per week, is capable of transporting 32 million tonnes of excavated rock in about 20 months. Three Caterpillar 6015B or 6020B hydraulic shovels of these machines working together match the capacity of this conveyor system. These machines are capable of moving 1640 tonnes per hour (Cat 6015B) and 2320 t/h (Cat 6020B) in real-world conditions (Caterpillar, 2017).
- 25 Cut-through cost is estimated by comparison with quarrying operations in New Zealand. The NZ Aggregate & Quarry Association reports revenue of \$642 million on 31 million tonnes output. <https://aqa.org.nz/fact-files/> Accessed 21 October 2024.

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- 26 Existing four lane highway construction projects in New Zealand are typically costing between \$38 million and \$50 million per kilometre. The new Remutaka has a narrower roadway, with three lanes and stopping shoulders. Construction cost can be expected to be less than a four-lane highway. The allowance of \$60 million per kilometre includes a large margin for contingencies.
  - 27 Based on Toitū Te Whenua Land Information New Zealand data licensed for re-use under the Creative Commons Attribution 4.0 International licence (<http://creativecommons.org/licenses/by/4.0/>).
  - 28 Cost estimates exclude local road upgrading.
  - 29 We assume 1,000 return trips per week due to increased domestic tourism. This includes people visiting the Wairarapa, and Wairarapa people travelling to other places.

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