AA Research Foundation

HAVE NEW ZEALAND'S HIGHEST RISK HIGHWAYS IMPROVED?

14 FEBRUARY 2025

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TABLE OF CONTENTS

1 INTRODUCTION

Introduced in 2008, the New Zealand Road Assessment Programme (KiwiRAP)[1] was a partnership between the NZ Automobile Association, NZ Transport Agency, Ministry of Transport, ACC and NZ Police, that analysed safety on the state highway network. The purpose of this work was to help the sector better understand high-risk sections of road so that safety efforts and investment could be better targeted to risk.

To allow comparison between sections, the state highway network was broken up into a series of "links" that:

- Were long enough to have had at least 20 fatal or serious injury crashes over the 5-year period from 2002 to 2006.
- Were meaningful and distinct to drivers and riders (often stretching between towns).
- Had broadly similar road characteristics along their length.

For each link, the Collective Risk (Crash Density), Personal Risk (Crash Rate) and Star Rating (Level of Safety Infrastructure) were calculated and then updated in 2012 (using the same links where possible).

Given that the intent of this work was to help focus safety efforts and investment to those sections of state highway where it was most needed, the NZ Automobile Association would now like to know if the initiative has been effective. On the 32 High Collective Risk links identified in 2008, what safety improvements that have been made to date and the corresponding change in Collective and Personal Risk.

The findings of this study will be used to:

- Encourage current and future governments to invest in transformational infrastructure improvements that will minimise deaths and serious injuries by:
    - Identifying links where investment in infrastructure has significantly reduced the Collective and/or Personal Risk.
    - Identifying links where no investment (or minimal investment) has been made resulting in a consistently High Collective and/or Personal Risk.
    - Highlight the value of the KiwiRAP programme to encourage the ongoing collection and reporting of data.

[1] KIWIRAP Magazine final new.pdf

2 METHODOLOGY

Using the network video (Argonaut Roadrunner), changes that had occurred to each of the 32 High Collective Risk links between the 2008/09 video (taken approximately January 2009) and the 2023/24 video (taken approximately January 2024) were identified. Note that the 2008/09 video is the earliest resource available via this platform.

The changes were categorised into:

a. Minor Works (minimal impact on traffic with or without temporary speed limits in place for a period of up to 3 months).

b. Block Projects (moderate impact on traffic likely with a temporary speed limit in place for more than 3 but less than 12 months).

c. Major Capital Improvements (significant impact on traffic with temporary speed limits in place for more than 12 months).

It was important to make this distinction as sites that have long term traffic management in place could see a reduction in Collective Risk simply due to the nature of being a controlled worksite.

Where a link referred to multiple state highways (i.e. SH29 and SH2 within Tauranga and SH20 Wiri to Mt Roskill, SH20A and SH20B to Auckland Airport), the link was split into individual state highways and analysed separately. This resulted in a total of 35 links being considered in this study.

Refer to Appendix A – KiwiRAP 2008 High Collective Risk Routes - Maps of Improvements for an annotated map of improvements for each link.

As there was no information available that would identify the exact start/end point of each link used in the KiwiRAP 2008 assessment, the links were reestablished as accurately as possible using the regional crash risk maps provided in KiwiRAP 2008. These changes although small did resulted in 9 links that were High Collective Risk in KiwiRAP 2008 being reassessed as being Medium-High Collective Risk for the same observation period (2002-2006).

Refer to Appendix B – Link Definitions for the latitude/longitude information defining the reestablished links.

Crash data from the NZ Transport Agency Waka Kotahi Crash Analysis System (CAS) was used to identify the number of fatal and serious crashes that occurred during two observation periods – 2002-2006 being the crash period reported in the 2008 KiwiRAP assessment and 2017-2023 being the latest five years (excluding COVID years 2020-2021).

Vehicle kilometers travelled for the 2002-2006 observation period was established by back calculating from the reported personal risk in KiwiRAP 2008. Vehicle kilometers travelled for the 2017-2023 (excluding 2020-2021) period was established using the latest traffic volumes reported by Mobile Roads. This was done for each of the 35 links in this study.

The Collective and Personal risk for each of the reestablished links was then calculated using Eq. 1 and Eq. 2 and compared for the two observation periods.

$$Collective\ Risk = ((Fatal\ crashes + serious\ injury\ crashes)/number\ of\ years\ of\ data)/(Length\ of\ road\ section) \quad \text{Eq. 1}$$

$$Personal\ Risk = ((Fatal\ crashes + serious\ injury\ crashes)/number\ of\ years\ of\ data)/ (Vehicle\ kilometres\ traveled/Number\ of\ years\ of\ data)$$ Eq. 2

3 RESULTS

			2002-2006							2017-2023 (excluding 2020-2021)							
Link	Name	Length (km)	Serious crashes	Fatal crashes	AADT	Collective Risk	Collective Risk Band	Personal Risk	Personal Risk Band	Serious crashes	Fatal crashes	AADT	Collective Risk	Collective Risk Band	Personal Risk	Personal Risk Band	Crash Reduction
1	Napier to Hastings	15.2	19	6	13,084	0.33	High	6.89	Medium	8	2	11,714	0.13	Medium-high	3.08	Low	60.0%
2	Mount Maunganui to Paengaroa	24.1	23	11	12,941	0.28	High	5.97	Medium	14	3	13,327	0.14	Medium-high	2.90	Low	50.0%
3	Bay View to Napier	9.0	5	2	8,065	0.16	Medium-high	5.28	Medium	1	2	10,247	0.07	Low-medium	1.78	Low	57.1%
4	Drury to Pukekohe	9.4	10	2	14,050	0.26	High	4.98	Medium	8	3	21,241	0.23	High	3.02	Low	8.3%
5	Paraparaumu to Levin	39.3	40	14	14,803	0.27	High	5.09	Medium	30	8	14,340	0.19	High	3.69	Low	29.6%
6	Upper Harbour Highway	13.4	7	0	6,187	0.10	Medium-high	4.63	Low-medium	6	0	55,433	0.09	Medium	0.44	Low	14.3%
7	Warkworth to Wellsford	15.3	12	10	10,655	0.29	High	7.39	Medium-high	14	2	10,217	0.21	High	5.61	Medium	27.3%
8	Pokeno to Mangatarata	30.3	22	13	11,440	0.23	High	5.53	Medium	11	6	10,474	0.11	Medium-high	2.94	Low	51.4%
9	Orewa to Warkworth	22.2	23	10	13,780	0.30	High	5.91	Medium	17	5	4,496	0.20	High	12.08	High	33.3%
10	Porirua to Upper Hutt	13.4	12	5	12,209	0.25	High	5.69	Medium	16	1	22,003	0.25	High	3.16	Low	0.0%
11	1A and 1 through Orewa	9.3	4	1	9,256	0.11	Medium-high	3.18	Low	0	0	14,208	0.00	Low	0.00	Low	100.0%
12	Auckland to Takanini	28.0	55	15	61,243	0.50	High	2.24	Low	71	8	68,020	0.56	High	2.27	Low	-12.9%
13 (1)	SH29/Tauriko to City	15.4	11	3	11,592	0.18	Medium-high	4.30	Low-medium	9	2	20,173	0.14	Medium-high	1.94	Low	21.4%
13 (2)	SH2 Bethlehem to Mount Maunganui	15.6	6	3	27,129	0.12	Medium-high	1.17	Low	1	1	28,485	0.03	Low	0.25	Low	77.8%
14	Meremere to Rangiriri	15.8	11	8	15,221	0.24	High	4.33	Low-medium	10	3	24,860	0.16	Medium-high	1.81	Low	31.6%
15	MacKays Crossing to Paraparaumu	10.3	9	2	15,862	0.21	High	3.69	Low	6	0	22,674	0.12	Medium-high	1.41	Low	45.5%
16	Paeroa to Katikati	40.9	41	8	6,553	0.24	High	10.02	High	22	5	8,822	0.13	Medium-high	4.10	Low-medium	44.9%
17	Parnell to Hobsonville	18.3	32	6	37,951	0.42	High	3.00	Low	34	3	50,637	0.40	High	2.19	Low	2.6%
18	Pukerua Bay to MacKays Crossing	15.6	12	8	16,568	0.26	High	4.24	Low-medium	8	1	5,558	0.12	Medium-high	5.69	Medium	55.0%
19	Helensville to West Harbour	24.0	16	7	10,935	0.19	High	4.80	Low-medium	14	2	21,521	0.13	Medium-high	1.70	Low	30.4%
20	Marsden Point (SH15A) to Whangarei	23.2	18	8	12,274	0.22	High	5.00	Medium	24	8	16,605	0.28	High	4.55	Low-medium	-23.1%
21	Huntly to Hamilton	26.7	18	11	13,714	0.22	High	4.34	Low-medium	19	2	15,798	0.16	Medium-high	2.73	Low	27.6%
22	Wellington to Upper Hutt	32.1	44	12	20,621	0.35	High	4.64	Low-medium	56	2	37,008	0.36	High	2.68	Low	-3.6%
23	Ruakaka to Wellsford	49.4	40	9	8,552	0.20	High	6.36	Medium	29	12	11,244	0.17	Medium-high	4.04	Low-medium	16.3%
24	Fielding to Palmerston North	11.9	13	4	6,853	0.29	High	11.42	High	8	1	9,261	0.15	Medium-high	4.47	Low-medium	47.1%
25	Albany to Silverdale	17.50	16	3	9,103	0.22	High	6.54	Medium	15	5	12,394	0.23	High	5.05	Medium	-5.3%
26	Katikati to Tauranga	27.6	21	6	11,660	0.20	High	4.60	Low-medium	30	9	14,928	0.28	High	5.19	Medium	-44.4%
27	SH1 from SH74 to SH73 Christchurch	11.9	9	2	18,895	0.18	Medium-high	2.68	Low	4	0	33,569	0.07	Low-medium	0.55	Low	63.6%
28	Dunedin to Mosgiel	12.2	14	2	13,003	0.26	High	5.53	Medium	4	2	27,588	0.10	Medium	0.98	Low	62.5%
29 (1)	SH20 Wiri to Mt Roskill	13.8	15	1	43,076	0.23	High	1.47	Low	14	1	88,721	0.22	High	0.67	Low	6.3%
29 (2)	SH20A to Auckland Airport	3.9	4	1	34,867	0.26	High	2.01	Low	4	0	49,391	0.21	High	1.14	Low	20.0%
29 (3)	SH20B to Auckland Airport	2.2	7	0	19,058	0.64	High	9.15	High	1	0	27,749	0.09	Medium	0.90	Low	85.7%
30	Hamilton to Cambridge	15.0	9	1	14,402	0.13	Medium-high	2.54	Low	8	0	27,699	0.11	Medium-high	1.06	Low	20.0%
31	Cambridge to Piarere	19.4	13	3	12,419	0.16	Medium-high	3.64	Low	23	5	17,819	0.29	High	4.44	Low-medium	-75.0%
32	SH50 and SH50A Taradale Road to Pakipaki	23.0	12	7	9,698	0.17	Medium-high	4.67	Low-medium	11	4	17,976	0.13	Medium-high	1.99	Low	21.1%

Legend:

Significant Safety Improvements (Including bypasses, partial bypasses and/or extended lengths of median and shoulder barriers).

Sections that have not had significant safety improvements as they were already motorways with extended lengths of median and side barriers.

Sections that have not had significant safety improvements but are identified in the 2024-34 GPS as Roads of National or Regional Significance .

Sections that have seen increases in fatal and serious crashes or the crash reduction was less than 10%.

4 DISCUSSION / OBSERVATIONS

From 2002-2006, there were a total of 827 fatal and serious crashes within the 35 links reported in this study. In 2017-2023 (excluding 2020-2021), this reduced to 658 equating to an overall reduction in fatal and serious crashes of 20.4%. For the same observation periods, there was a 4.6% decrease in rural road fatal and serious crashes outside the 35 links identified in this study[2].

Contributing to this result, of the 35 links reported in this study:

- 26 have had significant safety improvements that have included bypasses, partial bypasses and/or significant lengths of median and side barrier installation to address the collective risk. The fatal and serious injury crash reduction for these links was 28.4%. This aligns well with the 37.3% reduction in deaths and serious injuries from new bypasses constructed in New Zealand from 2009 to 2016 [3].
- 9 have had minor safety improvements. The fatal and serious injury crash reduction for these links was 4.3%. It should be noted that 3 of these links are listed in the Government Policy Statement for Land Transport 2024-34 as Roads of National or Regional Significance going forward. A further 4 were already motorways with extended lengths of median and side barriers installed[4].
- Of the 26 sections for which significant safety improvements were recorded 19 have had bypasses or new sections of road constructed. These included:
    - SH2 from Mount Maunganui to Paengaroa – 50.0% decrease.
    - SH1 from Paraparaumu to Levin – 29.6% decrease.
    - SH18 Upper Harbour Highway (partial bypass at West Harbour) – 14.3% decrease.
    - SH2 from Pokeno to Mangatarata (partial bypass at Mangatawhiri) – 51.4% decrease.
    - SH1 from Orewa to Warkworth – 33.3% decrease.
    - SH1A and SH1 through Orewa – 100.0% decrease.
    - SH2 from Bethlehem to Mount Maunganui (partial bypass at Tauranga City Centre) – 77.8% decrease.
    - SH1 from MacKays Crossing to Paraparaumu (partial bypass at Paraparaumu) – 45.5% decrease.
    - SH1 from Pukerua Bay to MacKays Crossing – 55.0% decrease.
    - SH16 from Helensville to West Harbour (partial bypass at West Harbour) – 30.4% decrease.
    - SH1 from Huntly to Hamilton – 27.6% decrease.

[2] From 2002-2006 there were 5,772 fatal and serious crashes on New Zealand's rural road network (excluding the 35 high collective risk links). From 2017-2023 (excluding 2020-2021) there were 5,504.

[3] AARF-report-Safety-Benefits-of-New-Roads.pdf

[4] Government-Policy-Statement-on-land-transport-2024-FINAL.pdf

    - SH1 from Ruakaka to Wellsford (partial realignment south of the Brynderwyns) – 16.3% decrease.
    - SH17 from Albany to Silverdale – 5.3% increase.
    - SH1 from SH74 to SH73 Christchurch – 63.6% decrease.
    - SH20 from Wiri to Mt Roskill (Motorway extensions at Wiri and Mt Roskill) – 6.3% increase.
    - SH20B to Auckland Airport (New road construction to provide additional transit lanes) – 85.7% decrease.
    - SH1 from Hamilton to Cambridge – 20.0% decrease.
    - SH1 from Cambridge to Piarere (partial bypass at Cambridge) – 75.0% increase.
    - SH50 and SH50A Taradale Road to Pakapaki (partial bypass of Maraekakaho Road) – 21.1% decrease.
- There were 6 links where the number of fatal and serious crashes increased and a further 4 links where the decrease in fatal and serious crashes was less than 10%. These links were as follows:
    - SH22 from Drury to Pukekohe – 8.3% decrease.
    - SH58 from Porirua to Upper Hutt – No change.
    - SH1 from Auckland to Takanini – 12.9% increase.
    - SH16 from Parnell to Hobsonville – 2.6% decrease.
    - SH1 from Marsden Point (SH15A) to Whangarei – 23.1% increase.
    - SH2 from Wellington to Upper Hutt – 3.6% increase.
    - SH17 from Albany to Silverdale – 5.3% increase.
    - SH2 from Katikati to Tauranga – 44.4% increase.
    - SH20 from Wiri to Mt Roskill – 6.3% decrease.
    - SH1 from Cambridge to Piarere – 75.0% increase.
- Except for SH17 from Albany to Silverdale and SH1 from Cambridge to Piarere[5], there have been no significant safety improvements between the two observation periods or (in the case of SH58 from Porirua to Upper Hutt and SH2 from Katikati to Tauranga) the improvements are either currently being undertaken or have been completed too recently to observe any effect on the long-term crash rates. This has meant that the collective risk has remained high for all these corridors.
- In the case of SH17 from Albany to Silverdale, it is noted that although it was bypassed, significant residential development has occurred north of Auckland over the last 20 years. This has contributed to a consistently high traffic volume in this location which may have resulted in the consistently high collective risk.

[5] SH17 from Albany to Silverdale was bypassed by a new motorway. SH1 from Cambridge to Piarere has had significant median barrier improvements opening in 2024

The personal risk reduced or remained the same between the two observation periods with the following exceptions:

- SH1 from Orewa to Warkworth
- SH1 from Pukerua Bay to MacKays Crossing
- SH2 from Katikati to Tauranga
- SH1 from Cambridge to Piarere

In all cases, there have been recent significant safety improvements that may not be reflected by the 2017-2023 (excluding 2020-2021) crash observation period.

In the case of SH1 from Orewa to Warkworth and SH1 from Pukerua Bay to MacKays Crossing, due to the provision of recently completed bypasses, these links have seen a substantial reduction in traffic volumes. It is not clear whether the reduced volumes after the bypass opening have led to higher operating speeds and a consequent increase in personal risk. The personal risk should be monitored for these links.

5 CONCLUSIONS

This study can conclude that:

- Fatal and serious crashes have reduced on average by 20.4% on the high collective risk links reported in KiwiRAP 2008. This compares with a baseline 4.6% reduction for rural roads (excluding the high collective risk links).
- Those links where significant safety improvements have been completed (including bypasses, partial bypasses and/or significant lengths of median and shoulder barrier installations have resulted in higher fatal and serious injury crash reductions (28.4%) than those links with only minor improvements (4.3%).
- Of the 35 links reported in this study, 26 have had significant safety improvements carried out over the last 20 years and a further 3 have been identified in the Government Policy Statement for Land Transport as Roads of National or Regional Significance. A further 4 of these links were already motorways with extensive lengths of median barriers installed.
- Of the 35 links reported in this study, 4 have had an increase in personal risk. Given that significant safety improvements have been carried out on these links in recent years, it is too early to say whether reduced traffic volumes leading to higher operating speeds has contributed to this finding.
- The KiwiRAP programme has been effective at:
    - Identifying links where investment in infrastructure can significantly reduce the Collective Risk.
    - Focusing improvement strategies on these sections to reduce deaths and serious injuries by around 30% on targeted sections
    - Identifying links where no investment (or minimal investment) has resulted in a consistently High Collective Risk.

6 DISCLAIMER

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for AA Research Foundation ('Client') in relation to a study of high collective risk corridors published in KiwiRAP 2008 ('Purpose') and in accordance with the Short form Agreement with the Client dated 13/09/2024 ('Agreement'). The findings in this Report are based on and are subject to the assumptions specified in the Report and the Offer of Service dated 27/06/2024. WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.

In preparing this Report, WSP has relied upon data published in KiwiRAP 2008. Except as otherwise stated in this Report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on KiwiRAP 2008, those conclusions are contingent upon the accuracy and completeness of the KiwiRAP 2008. WSP will not be liable for any incorrect conclusions or findings in the Report should KiwiRAP 2008 be incorrect.

APPENDIX A – KIWIRAP 2008 HIGH COLLECTIVE RISK ROUTES - MAPS OF IMPROVEMENTS

APPENDIX B – LINK DEFINITIONS

Link	Name	Start (Latitude, Longitude)	End (Latitude, Longitude)
1	SH2 from Napier to Hastings	(-39.50933, 176.917896)	(-39.62932, 176.875064)
2	SH2 from Mount Maunganui to Paengaroa	(-37.682729, 176.22618)	(-37.800718, 176.39889)
3	SH2 from Bay View to Napier	(-39.395977, 176.875729)	(-39.4742, 176.877182)
4	SH22 from Drury to Pukekohe	(-37.109285, 174.943512)	(-37.161029, 174.892139)
5	SH1 from Paraparaumu to Levin	(-40.909692, 175.017778)	(-40.637512, 175.271283)
6	SH18 Upper Harbour Highway	(-36.750946, 174.725716)	(-36.818497, 174.614644)
7	SH1 from Warkworth to Wellsford	(-36.387206, 174.641603)	(-36.306318, 174.529055)
8	SH2 from Pokeno to Mangatarata	(-37.228653, 175.020863)	(-37.275972, 175.342256)
9	SH1 from Orewa to Warkworth	(-36.560589, 174.696703)	(-36.40741, 174.65828)
10	SH58 from Porirua to Upper Hutt	(-41.159351, 174.971682)	(-41.106073, 174.883032)
11	SH1A and SH1 through Orewa	(-36.625932, 174.660935)	(-36.561448, 174.696444)
12	SH1 from Auckland to Takanini	(-36.843713, 174.750458)	(-37.043224, 174.912104)
13 (1)	SH29 from Tauriko to Tauranga City	(-37.682873, 176.22561)	(-37.744586, 176.093088)
13 (2)	SH2 from Bethlehem to Mount Maunganui	(-37.696446, 176.099321)	(-37.68278, 176.225554)
14	SH1 from Meremere to Rangiriri	(-37.308259, 175.067264)	(-37.430723, 175.130632)
15	SH1 from MacKays Crossing to Paraparaumu	(-40.982216, 174.963523)	(-40.908879, 175.018641)
16	SH2 from Paeroa to Katikati	(-37.387325, 175.680737)	(-37.547951, 175.911202)
17	SH16 from Parnell to Hobsonville	(-36.851422, 174.774964)	(-36.818911, 174.614363)
18	SH1 from Pukerua Bay to MacKays Crossing	(-40.981855, 174.969252)	(-41.08535, 174.868694)
19	SH16 from Helensville to West Harbour	(-36.81836, 174.614251)	(-36.673752, 174.441791)
20	SH1 from Marsden Point (SH15A) to Whangarei	(-35.892525, 174.434278)	(-35.757842, 174.31145)
21	SH1 from Huntly to Hamilton	(-37.585465, 175.159489)	(-37.769024, 175.239331)
22	SH2 from Wellington to Upper Hutt	(-41.250338, 174.809222)	(-41.095898, 175.11613)
23	SH1 from Ruakaka to Wellsford	(-35.892589, 174.43435)	(-36.282146, 174.5192)
24	SH54 from Fielding to Palmerston North	(-40.238013, 175.576917)	(-40.319017, 175.574794)
25	SH17 from Albany to Silverdale	(-36.73771, 174.718845)	(-36.629175, 174.66272)
26	SH2 from Katikati to Tauranga	(-37.56189, 175.914592)	(-37.696456, 176.0993)
27	SH1 from SH74 to SH73 Christchurch	(-43.451177, 172.628316)	(-43.520248, 172.534239)
28	SH1 from Dunedin to Mosgiel	(-45.888754, 170.499763)	(-45.890146, 170.355603)
29 (1)	SH20 from Wiri to Mt Roskill	(-37.002155, 174.865308)	(-36.92175, 174.767437)
29 (2)	SH20A to Auckland Airport	(-36.957674, 174.797405)	(-36.987852, 174.785787)
29 (3)	SH20B to Auckland Airport	(-36.993259, 174.84386)	(-37.001272, 174.820764)
30	SH1 from Hamilton to Cambridge	(-37.805178, 175.326752)	(-37.889495, 175.449993)
31	SH1 from Cambridge to Piarere	(-37.895109, 175.476711)	(-37.94303, 175.666928)
32	SH50 and SH50A Taradale Road to Pakipaki	(-39.511025, 176.87686)	(-39.691239, 176.792818)