Safe Speeds Phase 1
24 Month Interim Evaluation

Executive Summary

On 30 June 2020, Auckland Transport implemented the majority of Phase 1 of the Safe Speeds Programme. Phase 1 set safe and appropriate speed limits on just over 880km of Auckland's local road network.

To assess the effectiveness of the Phase 1 changes, help determine what is working well and where further road safety measures are required, Auckland Transport has engaged Abley Limited (Abley) to undertake monitoring and evaluation of the first 24 months since the changes came into effect. In this report, the term Phase 1 refers to Phase 1 changes implemented on 30 June 2020.

Reported death and serious injury results

This report addresses the Safe Speeds Monitoring and Evaluation Plan's objective to measure change in deaths and serious injuries (DSI). Reported deaths and serious injury results are sourced from the Waka Kotahi Crash Analysis System (CAS).

In the 24 months following the June 2020 Auckland speed limit reduction, Phase 1 roads have seen a 30% reduction in fatalities. In comparison, over this same period, the rest of the network has seen a 9% increase in fatalities.

For the same period, Phase 1 roads have seen a 21.3% reduction in serious injuries. In comparison, over this same period, the rest of the network has seen a 11.8% reduction in serious injuries.

Overall, the difference between the control sites and the Phase 1 sites showed:

- 38.8% reduction in fatalities compared to what would have been expected if no changes to speed limits was made;
- 11.8% reduction in DSI;
- 19.8% reduction in Minor injuries; and
- 18.4% reduction in all injuries.

Estimated death and serious injury results using scaling factors to adjust for under reporting

There is a significant level of under reporting in CAS data, to account for this, and get estimates of DSI changes, the following scaling factors were used:

Reduced scaling factors table (VIASTRADA 2022)[1]

		Total Mode Scaling Factor
Pedestrian	Pedestrian vs Vehicle	2.51
Bicycles	Cycle vs Vehicle	2.19
Motorcycles	*Total motorcycle*	*2.90*
Total other motor vehicles		**1.96**

From the injury CAS data analysis, taking account of under reporting, it is estimated that, the speed limit reduction implemented in Auckland on 30 June 2020 have reduced DSIs by 20.4 annually or over

[1] VIASTRADA 2021 Safety of people travelling outside vehicles report, Deep dive review: First and second phase

100 DSI saved over a 5-year period. Overall, this is seen as a significant safety result; noting that it is important that AT continue to monitor and evaluate the programme.

Reported fatal and serious crash results

Fatal and serious crash results are another way to measure road safety interventions. This is different to death and serious injuries as one crash may involve a number of deaths and serious injuries.

A crash analysis has been conducted to inform the effectiveness of the Phase 1 changes. Due to the Waka Kotahi Crash Analysis System (CAS) data entry delays, it is not certain that all crashes occurring in the after period are included in the CAS data extracted. Due to these crash data entry delays, Abley waited two months after the end of the 24-months after period before extracting CAS data.

It is important to note that road trauma does fluctuate over time, therefore changes in road trauma between years are expected and continued programme monitoring will be required. Additionally, fatal crashes had a reasonably low sample size.

After the first 24 months, the Phase 1 roads have experienced a reduction in DSI crashes of 22.3%, a decrease in fatal crashes of 27.4% and a reduction in serious injuries crashes of 21.8%.

Rural roads have seen the most significant reduction in road trauma, with a reduction in rural road DSIs crashes of 26.9%. Urban roads have seen a DSI crashes reduction of 18.1%.

When taking into account control sites, consisting of the balance of the Auckland Road network not subject to a speed limit change, the analysis was able to determine a more accurate representation of the change in crash risk.

The difference between the control sites and the Phase 1 sites showed:

- 33.7% reduction in fatal crashes compared to what would have been expected if no changes to speed limits was made;
- 12.6% reduction in DSI crashes;
- 19.1% reduction in Minor injury crashes; and
- 17.8% reduction in all injury crashes.

Conclusions

Evidence shows the Safe Speed Programme is reducing Auckland's road trauma. While, the level of DSI reduction is currently tracking below the target 30% reduction[2], most likely due to vehicle speeds not decreasing as much as expected, more action on the other parts of the Safe System to reduce speeds would be expected to translate directly into further reductions in deaths and serious injuries. This includes both, safer road design to encourage lower speeds and additional speed enforcement.

[2] MONITORING AND EVALUATION PLAN (https://at.govt.nz/media/1988396/99-monitoring-and-evaluation-plan_2022.pdf)

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Quality Assurance Information

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1. Background

Safe Speeds Phase 1

On 30 June 2020, Auckland Transport implemented Phase 1 of the Safe Speeds Programme. This included the delivery of speed changes on approximately 11% (over 800km) of Auckland's local road network to achieve safe and appropriate speed limits.

Phase 1 roads were a mixture of high-risk roads and those operating at lower speeds than the existing speed limit. It included roads from high-risk rural areas, the city centre, several town centres, residential areas and urban roads. The overall objective of the speed limit changes was to reduce the number of death and serious injury (DSI) crashes on those roads subject to a speed limit change by at least 30% within five years of implementation.

Figure 1.1 shows a map of the roads included as part of Phase 1 of the Safe Speeds Programme, including the proposed new speed limit. While some of the town centre speed limit changes were implemented later in the year, most changes occurred on 30 June 2020. All speed limit changes that took place on 30 June 2020 were included as part of this evaluation.

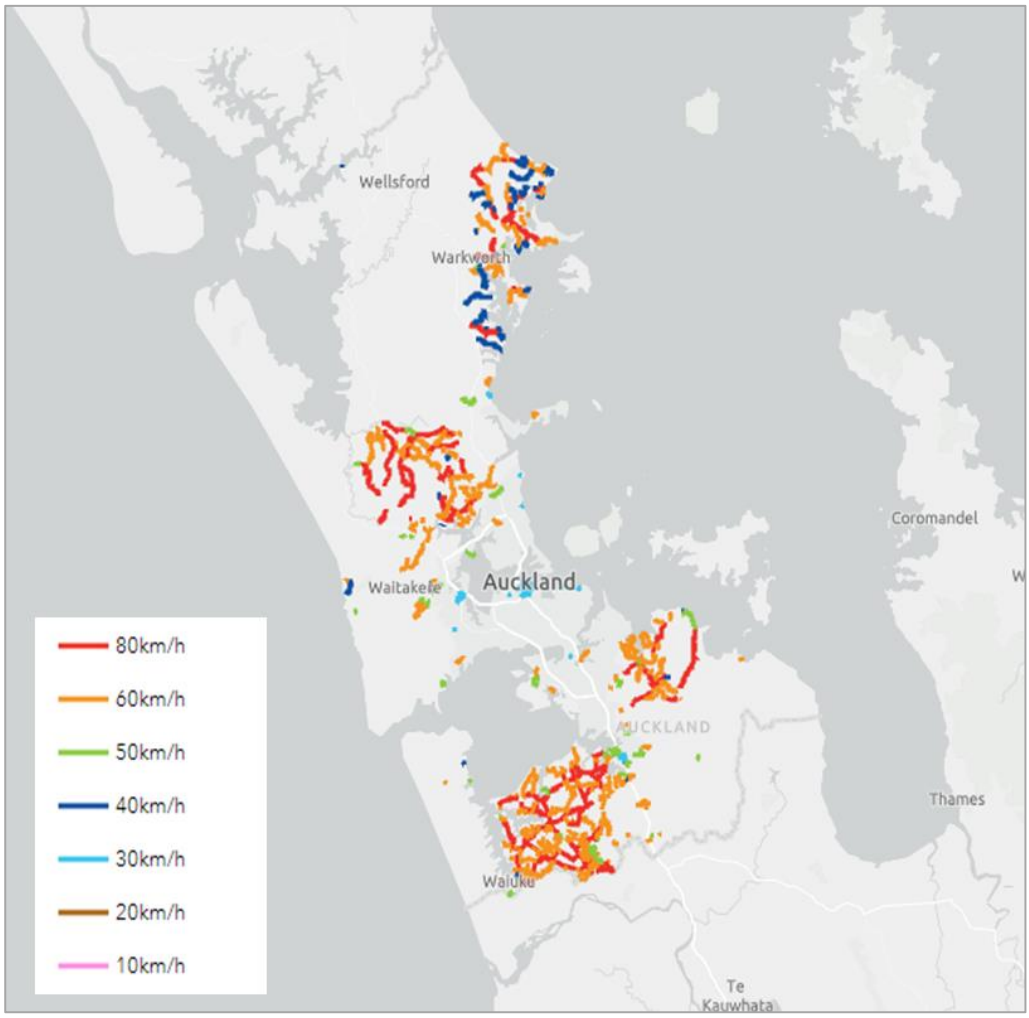

Figure 1.1 Phase 1 Speed limit changes in Auckland (2020)

2. Introduction

2.1 Monitoring and Evaluation Plan

Prior to the implementation of these changes, Auckland Transport created a Monitoring and Evaluation Plan (2019). The monitoring and evaluation of roads where speed changes have been implemented helps Auckland Transport determine the effectiveness of these changes and the benefits achieved. Additionally, monitoring and evaluation also demonstrates how the performance of these roads are contributing to the 'safe and appropriate' requirements, informing better decision making for future speed limit reviews and determining locations where additional interventions may be required to achieve the safe and appropriate travel speeds.

This analysis covers the 24-month period following implementation of the Phase 1 speed limit changes. It is important to appreciate that this analysis is an interim evaluation of Phase 1 of the Safe Speeds Programme. It is the first stage of a multistage evaluation process, which will continue to be updated as the 'after' period increases. In addition to the crash analysis provided in this report, an injury breakdown analysis is provided in Appendix A. It is important to note that these results differ from the results of the crash analysis as, in a crash, more than one person can sustain injuries.

This full evaluation process specified by Auckland Transport includes:

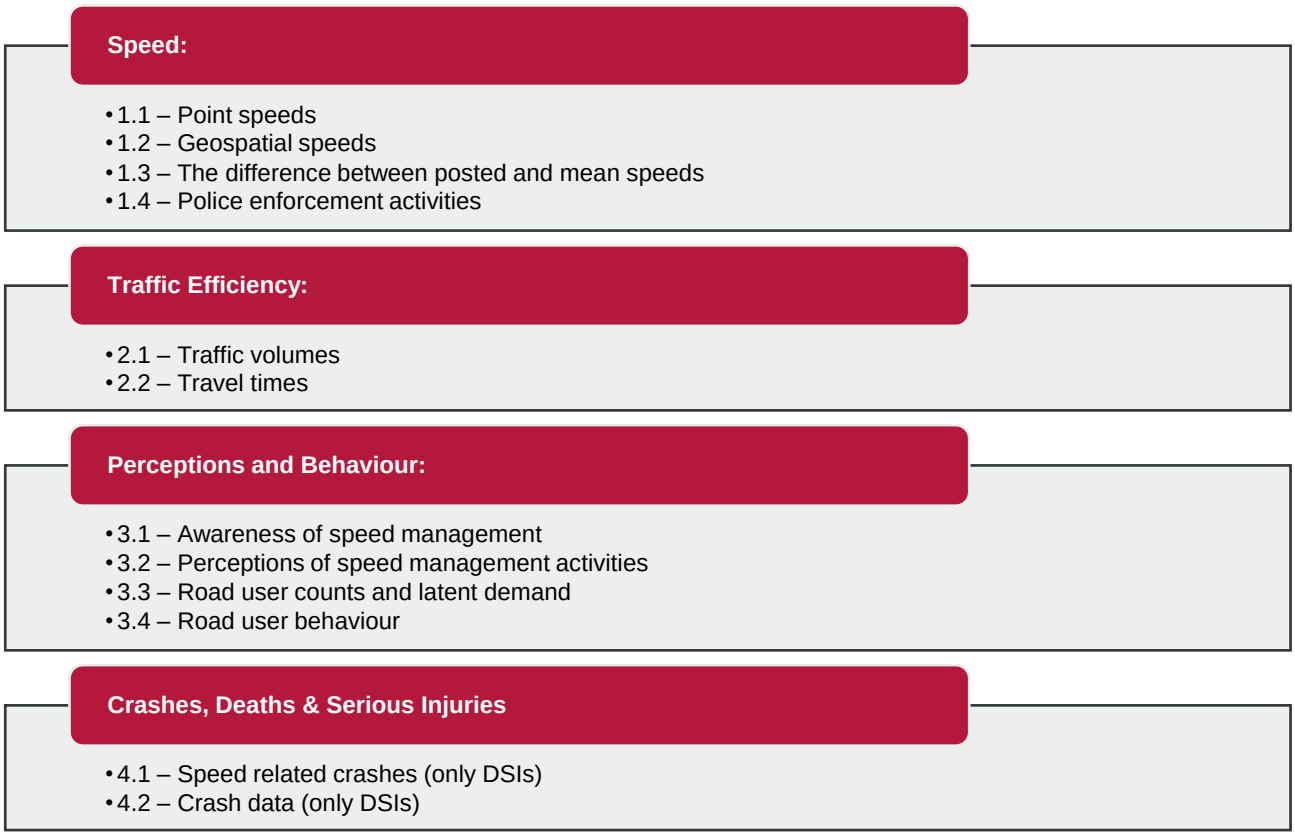

Figure 2.1 Evaluation plan measures

For the 24-month after period, Abley has been commissioned to evaluate the following aspects of Phase 1 of the Safe Speeds Programme:

Figure 2.2 Evaluation measures included in this analysis

Crash data has been analysed from the CAS to gain insight into the crash trends following the speed limit implementation. A 2-month buffer period has been used between the end of the crash data analysis period and the analysis itself. Due to the CAS's data entry delays, it is not certain that all crashes occurring in the after period are included in the CAS data extracted. This could affect the results of the analysis.

These data sources are explained in greater detail in the Methodology section of this report.

2.2 Evaluation Considerations

Vision Zero and the Safe Speeds Programme

There are several considerations that are made while undertaking the evaluation to indicate the impact of Phase 1 of the Safe Speed Programme on Auckland Transport achieving its safety goals. These considerations primarily focus on the Safe System and Vision Zero.

This evaluation considers Safe System and Vision Zero by undertaking the evaluations through both a Safe System lens and Vision Zero lens. To address the current road safety crisis, Auckland Transport has adopted Vision Zero, which sets a goal of achieving zero deaths and serious injuries on Auckland Roads by 2050. The Safe System approach has been implemented to aid achievement of this goal.

The Safe System approach is a holistic approach to the road system and the interactions among roads and roadsides, travel speeds, vehicles, and road users. It is an inclusive approach catering for road users, including drivers, motorcyclists, passengers, pedestrians, cyclists, and commercial and heavy vehicle drivers.

The Safe System approach operates on the following guiding principles:

People make mistakes: Humans will continue to make mistakes, and the transport system must accommodate these. The transport system should not result in death or serious injury because of errors on the roads.

People are vulnerable, and the system should be managed within human biomechanical injury limit: Our bodies have a limited ability to withstand crash forces without being killed or seriously injured. A Safe System ensures that the forces in collisions do not exceed the limits of human tolerance. Speeds must be managed so that humans are not exposed to impact forces beyond their physical tolerance. System designers and operators need to consider the limits of the human body when designing and maintaining roads, vehicles and speeds.

Shared responsibility: The burden of road safety responsibility no longer rests solely with the individual road user. System managers have a primary responsibility to provide a safe operating environment for road users and ensuring that the system is forgiving when people make mistakes.

Strengthening all parts of the system: All pillars of the road system need to be strengthened so that if one part fails, other parts will protect the people involved from serious harm.

Central to the Safe System approach is human tolerance to crash impacts and the management of kinetic energy transfer so these are within survivable limits. The Safe System approach is based on the following four Safe System pillars:

Safe Roads – roads and roadsides are designed and maintained to reduce the risk of crashes occurring, and to lessen the severity of injury if a crash does occur.

Safe Speeds – speeds are managed to complement the road environment and ensure crash impact forces are within human tolerances.

Safe Vehicles – vehicles lessen the likelihood of a crash and protect occupants and other road users.

Safe People – road users are skilled, competent, alert, and unimpaired.

Speed management is the key method for managing kinetic energy transfer and is the most practical way for addressing the safety of the most vulnerable road users, such as pedestrians, cyclists and motorcyclists. Research shows that even small changes in travel speeds can significantly reduce both deaths and serious injuries.

While the Safe Speeds Programme focuses predominantly on the Safe Speeds pillars of the Safe System, all elements are interlinked to providing a safe road environment.

3. External Factors

There are several external factors that can impact the analysis that are not directly related to the effectiveness of the programme. It is important that readers of the report understand the role these factors can play in the evaluation of the before and after data. The key external factors are summarised here and discussed in more detail in Appendix A.

3.1 COVID-19

During COVID-19 lockdowns traffic volumes on Auckland's road network decreased significantly. Traffic volumes during April 2020 were approximately 10-15% of pre-pandemic levels. Decreases were seen during Auckland's subsequent lockdowns but not to the same extent.

A significant impact of the pandemic is the effect of changing work behaviours on traffic volumes. It is now far more common for people to work from home. This has resulted in a decrease in traffic volumes in non-lockdown periods, with traffic volumes in 2021 being approximately 5% lower than the traffic volumes in the 6 months prior to the pandemic (except for the standard Christmas trough). A small decrease in traffic volume can have significant effects on traffic congestion and improve the flow of traffic. Therefore, whilst it is not exactly quantifiable, it can be expected that the COVID-19 pandemic has affected the free-flow and operating speeds on Auckland's road network.

3.2 Regression to the Mean

Regression to the mean is a concept that is associated with extreme observations in a sample period and different observations of the same variable in a subsequent period that is much closer to the mean.

In terms of this analysis, regression to the mean occurs where there is an unusually high (or low) number of crashes in the before period data. If no changes are made to the transport network, chances are that locations with crash numbers significantly above their mean will reduce in the next sampling period and increase where the crash numbers are significantly below the mean.

In road safety, the regression to the mean effect often occurs due to a selection bias. This often comes about from selecting locations with high crash numbers in recent years. This phenomenon is worse when targeting a short section of the road network with a high density of crashes in recent years, but little crash history in the years before that.

In the case of the Phase 1 analysis, regression to the mean is not expected to play a significant role because, in general, roads were selected on an area-wide basis rather than an individual road basis based on crash history. As such, regression to the mean is not accounted for in this interim analysis.

3.3 Weather

During a 7-day tube count period, the weather can play a role in the number of vehicles on the road and their travel speeds. It is expected that the large sample size (7 days) will help address the impacts of individual weather events; however, sustained periods of poor weather could impact the data. Given the uncertainty around this, no adjustment for weather has been allowed for in this analysis.

4. Crash Evaluation

Injury crash data was extracted from the Waka Kotahi Crash Analysis System from 1 July 2015 until 31 December 2021. For analysis and comparison purposes, the yearly average of the 5-year period prior to the speed limit changes (1 July 2015 – 30 June 2020) was calculated, and then compared with the crashes in the 24 months following the change in speed limit (1 July 2020 – 30 June 2022).

4.1 Overall Change in Crashes

Comparison of the average annual number of crashes for the Phase 1 sites before and after speed limit changes is shown in Table 4.1. This shows a significant decrease in the annual rate of crashes across all injury categories.

Table 4.1 Focus group summary of before and after injury crash comparison (24 month after period)

Workstream	Fatal Crashes per year - Before	Fatal Crashes per year - After	Serious Crashes per year - Before	Serious Crashes per year - After	Minor Crashes per year - Before	Minor Crashes per year - After
Total	6.2	4.5	58.8	46	242.2	176

Table 4.1 shows that (not taking into account control sites):

1. Fatal crashes have decreased by 27.4%
2. Serious crashes have decreased 21.8%
3. Fatal and serious injury crashes have decreased by 22.3%
4. Minor injury crashes have decreased by 27.3%
5. All injury crashes have decreased by 26.3%

Whilst these reductions are very encouraging, it is important to note that the post-analysis period of 24-months is still a relatively short post-implementation period and there were extended periods in which Auckland was in 'COVID lockdown' in the after period.

Overseas research on COVID related traffic flows[3] indicated that, generally, crashes dropped during lockdowns with less cars on the roads, but the severity of collisions (and resultant fatalities) increased as fewer cars resulted in more free flowing traffic conditions and higher vehicle speeds.

The impact of the lockdown periods on the reliability of the before and after crash analysis has been evaluated by conducting a similar analysis with crash data from the lockdown periods excluded. This analysis found that removing the lockdown periods from the analysis did not have a significant impact on the base analysis. Given the results of this analysis, the assumption going forward will be that lockdown periods do not need to be removed from the data to get an accurate reflection of the changes in crashes that have occurred between the before and after periods.

4.2 Change in Crashes by Land Use

Analysis of the change in the average annual number of crashes by workstream has also been undertaken to provide insight to any differential change in performance across Auckland.

The different safety performance in rural and urban workstreams is shown in Table 4.2.

[3] https://www.nhtsa.gov/sites/nhtsa.gov/files/2021-10/Traffic-Safety-During-COVID-19_Jan-June2021-102621-v3-tag.pdf

Table 4.2 Rural and Urban summary of before and after injury crash comparison for Phase 1 (24 month after period)

Workstream	Fatal Crashes per year - Before	Fatal Crashes per year - After	Serious Crashes per year - Before	Serious Crashes per year - After	Minor Crashes per year - Before	Minor Crashes per year - After
Rural	4.6	2.5	26.2	20	93.4	80.5
Urban	1.6	2	32.6	26	148.8	95.5
Total	6.2	4.5	58.8	46	242.2	176

Rural Roads have seen a significant reduction in the seriousness of road trauma, reflected by a 45.7% decrease in fatal crashes and a 26.9% decrease in death and serious injury collisions. All injury crashes on Rural Roads have also decreased by 17.1%. The changes in the different level of severity crashes for rural roads aligns with research which indicates that changes in speeds are likely to have a greater effect on higher severity crashes rather than lower severity crashes.

Urban roads have not experienced the same significant reduction in the higher severity crash outcomes. There has been a 25% increase in fatal crashes and a 18.1% decrease in death and serious injury collisions. All injury crashes on Urban Roads have decreased by 32.5%, which is far more pronounced than on Rural Roads. The smaller reduction in death and serious injury collisions on Urban Roads is consistent with the modified form of Nilsson's Power Model, where a smaller exponent is applied on urban roads compared to rural roads. The modified form of Nilsson's Power Model used in New Zealand to predict the change in deaths and serious injuries (DSi) following a speed limit change is:

$$Estimated\ DSi\ After = Estimated\ DSi\ Before\ x\ (\frac{Speed\ After}{Speed\ Before})^{exponent}$$

Equation 4.1 Where the exponent is 3.5 on rural corridors and 2.0 on urban corridors.

4.3 Wider Auckland Safety Performance

The change in the average annual number of crashes and injuries across the wider Auckland region (excluding the Phase 1 locations) has also been analysed. The purpose of this analysis is to understand the change in crash and injury trends across the wider Auckland region and contrast them to the changes observed at the Phase 1 locations. If the changes observed at the control sites (rest of Auckland) are similar to the Phase 1 sites, then we can conclude that the speed limit changes have had little impact on crashes and injuries; however, where the changes are different, we can more confidently conclude that the speed limit changes are likely to have played a major role in driving the change in performance.

Table 4.3 Control group summary of before and after injury crash comparison (24 month after period)

Workstream	Fatal Crashes per year - Before	Fatal Crashes per year - After	Serious Crashes per year - Before	Serious Crashes per year - After	Minor Crashes per year - Before	Minor Crashes per year - After
Total	**40**	**42.5**	**484.2**	**431**	**2484.6**	**2280**

Table 4.3 shows that, in the control group:

1. Fatal crashes have increased by 6.3%
2. Serious injury crashes have decreased by 11.0%
3. Fatal and serious injury crashes have decreased by 9.7%
4. Minor injury crashes have decreased by 8.2%

5. All injury crashes have decreased by 8.5%

A comparison of the control sites against the Phase 1 sites is shown in Table 4.4 for crashes. The 'Difference' column shows the performance of Phase 1 sites relative to the control sites.

Table 4.4 Change in Crashes when accounting for control sites

Change in Crashes	Control Sites	Phase 1 Sites	Difference
Fatal Crashes	+6.3%	-27.4%	-33.7%
Serious Crashes	-11.0%	-21.8%	-10.8%
Fatal and Serious Crashes	-9.7%	-22.3%	-12.6%
Minor Injury Crashes	-8.2%	-27.3%	-19.1%
All Injury Crashes	-8.5%	-26.3%	-17.8%

Table 4.4 shows that the average annual number of crashes at Phase 1 sites has reduced more than the control sites across all injury categories. The most significant change is for fatal crashes, where Phase 1 sites show a 33.7% reduction compared with the Control sites; however, the number of fatal crashes in the before and after periods at the Phase 1 sites is small so limited confidence can be placed on the actual change in crash risk at these locations.

In contrast, more confidence can be placed on the changes observed in fatal and serious crashes combined, and for injury crashes overall. Fatal and serious crashes at Phase 1 sites decreased 12.6% compared to the control sites and injury crashes overall decreased by 17.8%. This suggests we can conclude the speed limit changes have been successful in reducing injury crashes at Phase 1 locations, although the scale of change remains significantly lower than the 30% reduction in fatal and serious crashes that is sought by Auckland Transport.

Whilst the reductions are generally encouraging, it is important to note that the post-analysis period of 24 months is still a relatively short post-implementation period compared with the preceding 5 year period and there were extended periods in which Auckland was in 'lockdown' in the after period, which will have impacted travel patterns. The ongoing impacts of COVID have likely influenced the level of congestion, the speed of vehicles traversing the network, and road user exposure to multi-vehicle collisions; however, the overall influence of COVID-related changes on injury crashes in both the before and after period, is still not currently quantifiable.

5. 24-Month Comparison Against DSI Target

Priority Target
The overall target of the speed limit changes is to reduce the mean number of DSI crashes on the roads with speed limit changes by at least 30% within five years of implementing all the approved changes while balancing this with the effectiveness and efficiency of the roading network for all road users.
Discussion: The crashes reported in the 24 months after period since the speed limits have been implemented have resulted in a decrease in DSI (death and serious injury) crashes of 22.3%.
Secondary Target
There is a reduction in the number of injury crashes on the roads where speed limits have been changed.
Discussion: Injury crashes per year have decreased by 26.3%.
Secondary Target
There is a reduction in the proportion of crashes where the police consider excessive speed or going too fast for the conditions as a contributory factor.
Discussion: There has been a 16.1% decrease in speed related injury crashes.

6. Conclusions

Injury crashes

While there has not been enough time in the after-crash period to get an accurate reflection of the actual change in crash risk, the crashes reported in the “24-month” after period since the speed limits have been implemented have resulted in an annual decrease in death and serious injury crashes of 22.3% and an annual decrease in fatal crashes of 27.4%. In addition, injury crashes per year have decreased by 26.3% decrease.

When taking into account the control sites, the analysis was able to determine a more accurate representation of the change in crash risk. Compared to what would have been expected if no changes to speed limits were made, the difference between the control sites and the Phase 1 sites showed:

1. 33.7% reduction in fatal crashes;
2. 12.6% reduction in Deaths and Serious injury crashes;
3. 19.1% reduction in minor injuries crashes; and
4. 17.8% reduction in all injury crashes.

The most significant change is for fatal crashes, where Phase 1 sites show a 33.7% reduction compared with the control sites; however, the number of fatal crashes in the before and after periods at the Phase 1 sites is small so limited confidence can be placed on the actual change in crash risk at these locations.

Whilst these reductions are generally encouraging, it is important to note that the post-analysis period of 24 months is still a relatively short post-implementation period and there were extended periods in which Auckland was in ‘lockdown’ in the after period, which will have impacted travel patterns. The ongoing impacts of COVID have likely influenced the level of congestion, the speed of vehicles traversing the network, and road user exposure to multi-vehicle collisions; therefore, the overall influence of COVID-related changes on injury crashes in both the before and after period is still not currently quantifiable.

Additionally, other Safe System Pillars are still needed reduce speeds further. This includes both, safer road design to encourage lower speeds and enforcement focused on improving speed limit compliance.

Appendix A.
Local Board Crash Breakdown 24 month after analysis

A1. Local Board Crash Breakdown 24 month after analysis

Table A1.1 Local Boards and Speeds Breakdown

Local Board	Roads with post-implementation speed limit of:	Fatal Crashes per year - Before	Fatal Crashes per year - After	Serious Crashes per year - Before	Serious Crashes per year - After	Minor Crashes per year - Before	Minor Crashes per year - After
Franklin	40	0	0	0	0	0	0
Franklin	50	0.2	0	0.8	0.5	4	2.5
Franklin	60	0.4	1	5.6	6.5	24.2	16
Franklin	80	2.8	1.5	13.8	7.5	44.2	41
Henderson-Massey	30	0	0	0.8	0.5	3.8	2
Henderson-Massey	50	0	0	0	0	0	0
Hibiscus and Bays	30	0	0	0	0	0	0
Hibiscus and Bays	50	0	0	0	0	0	0
Hibiscus and Bays	60	0	0	0	0	0.2	0
Howick	50	0	0	0	0	0.2	1
Howick	60	0.2	0.5	1.8	0.5	4.4	4.5
Howick	80	0	0	0.4	0	0.8	0.5
Mangere-Ōtāhuhu	30	0	0	0.8	0.5	2.4	2
Mangere-Ōtāhuhu	50	0	0	0.4	0.5	2	1
Mangere-Ōtāhuhu	60	0	0	0.4	1	0.6	1
Ōtara-Papatoetoe	60	0	0.5	0.4	0	1.6	1.5

Local Board	Roads with post-implementation speed limit of:	Fatal Crashes per year - Before	Fatal Crashes per year - After	Serious Crashes per year - Before	Serious Crashes per year - After	Minor Crashes per year - Before	Minor Crashes per year - After
Papakura	30	0	0	0.6	1	2	0.5
Papakura	40	0	0	0.2	0	0.4	1
Papakura	50	0.2	0	1.6	0.5	9.2	7.5
Papakura	60	0	0	0.4	1.5	2.2	1.5
Rodney	40	0	0	0.6	0.5	0.2	0.5
Rodney	50	0	0	0.4	0	1.6	0
Rodney	60	0.4	0.5	3.8	2.5	16.2	12.5
Rodney	80	0.8	0	4.6	4.5	15.6	16
Upper Harbour	40	0	0	0	0	0	0
Upper Harbour	50	0.4	0	0.8	1.5	4.6	6.5
Upper Harbour	60	0	0	0.8	0.5	3.4	3.5
Upper Harbour	80	0	0	0	0	0.4	0
Waitākere Ranges	30	0	0	0	0.5	0.6	0.5
Waitākere Ranges	40	0	0	0	0	0	0
Waitākere Ranges	50	0	0	0.6	0	0	0
Waitākere Ranges	60	0	0	0	0	0.6	0
Waitematā	10	0	0	0	0	1.2	1
Waitematā	20	0	0	0	0	0.4	0.5
Waitematā	30	0.6	0.5	16	13.5	80.6	45.5
Waitematā	40	0.2	0	3.2	2	14.6	6

Table A1.2 Local Boards Crash Breakdown

Local Board	Fatal Crashes per year - Before	Fatal Crashes per year - After	Serious Crashes per year - Before	Serious Crashes per year - After	Minor Crashes per year - Before	Minor Crashes per year - After
Franklin	3.4	2.5	20.2	14.5	72.4	59.5
Henderson-Massey	0	0	0.8	0.5	3.8	2
Waitākere Ranges	0	0	0.6	0.5	1.2	0.5
Rodney	1.2	0.5	9.4	7.5	33.6	29
Ōtara-Papatoetoe	0	0.5	0.4	0	1.6	1.5
Papakura	0.2	0	2.8	3	13.8	10.5
Howick	0.2	0.5	2.2	0.5	5.4	6
Waitematā	0.8	0.5	19.2	15.5	96.8	53
Hibiscus and Bays	0	0	0	0	0.2	0
Upper Harbour	0.4	0	1.6	2	8.4	10
Mangere-Ōtāhuhu	0	0	1.6	2	5	4

A2. Injury Analysis

A2.1 Injury analysis (excluding under reporting factors)

The Table below shows the CAS injury breakdown analysis for both the focus group (roads where the speed limits were changes as part of the 30 June 2020 implementation) and the control roads (the rest of the roads network in Auckland not affected by the 30 June 2020 speed limit changes). This analysis uses a 5-year before period from 30 June 2015 to 30 June 2020 and a 2 year after period from 30 June 2020 to 30 June 2022. Noting that there is a significant amount of under reporting in CAS.

Table A2.3 Injury analysis, excluding under reporting factors.

Focus Group				
Injury Level	**Focus group - Before**	**Focus group - After**	**Focus group - Change in Injuries**	**Focus group - Change in Injuries %**
Fatalities	6.4	4.5	-1.9	-29.7%
Serious Injuries	68	53.5	-14.5	-21.3%
Minor Injuries	311	227.5	-83.5	-26.8%
Deaths and Serious Injuries	74.4	58	-16.4	-22.0%
All injuries	385.4	285.5	-99.9	-25.9%
Control Group				
Injury Level	**Control group - Before**	**Control group - After**	**Control group - Change in Injuries**	**Control group - Change in Injuries %**
Fatalities	42.6	46.5	3.9 (increase)	9.2% (increase)
Serious Injuries	545.4	481	-64.4	-11.8%
Minor Injuries	3,163.2	2,941	-222.2	-7.0%
Deaths and Serious Injuries	588	527.5	-60.5	-10.3%
All injuries	3,751.2	3,468.5	-282.7	-7.5%

As shown in tables above, in the 24 months following the June 2020 Auckland speed limit reductions, the Phase 1 roads changed on the 30 June 2020 (focus roads) have seen a 29.7% reduction in fatalities. In comparison, over this same period, the rest of the network (control roads) has seen a 9.2% increase in fatalities. In addition, serious injuries have decreased 21.3% on the focus roads while serious injuries on the control roads have only decreased by 11.8% and minor injuries have decreased by 26.8% on the focus roads while only decreasing by 7% on the control roads. When considering deaths and serious injuries (DSIs), these have decreased by 22% in the focus group, while they have only decreased by 10.3% in the control group. While the 2-year after period is not considered sufficient to give a full picture of the road trauma reduction achieved, these values do show the results of the implementation look promising.

When considering both the differences between the change in the focus group and the control group, the table below shows an estimated 38.8% reduction in fatalities and a 11.8% reduction in deaths and serious injuries has been achieved so far by the implementation.

Table A2.4 Injury analysis results, excluding under reporting factors.

Focus Group compared to Control Group	
Injury Level	**Achieved change when considering controls**
Fatalities	-38.8%
Serious Injuries	-9.5%
Minor Injuries	-19.8%
Deaths and Serious Injuries	-11.8%
All injuries	-18.4%

A2.2 Injury analysis - taking into account under reporting

As discussed, a limitation of the Crash Analysis System is the under-reporting rate of crashes. This in turn leads to an under-reporting rate for injuries. To account for this limitation, scaling factors, derived from an hospital and CAS data analysis, will be used scale up the CAS reported DSI estimate overall DSI. The scaling factors are from the Safety of people travelling outside vehicles report (VIASTRADA 2021) as per the table below:

Table A2.5 Scaling factors Table (VIASTRADA 2022)[4]

Category	Road User	Total Mode Scaling Factor
Pedestrians	Pedestrians only	5.06
	Pedestrians vs Vehicles	2.51
	TOTAL Pedestrians	*7.57*
Bicycles	Cycle only	4.91
	Cycle vs Vehicles	2.19
	TOTAL CYCLES	*7.10*
Transport Devices	TOTAL Transport DEVICES+	13.1
Cycles & Wheeled Transport Devices		**7.52**
TOTAL ACTIVE Transport MODES	User-only	4.89
	User vs Vehicles	2.66
	TOTAL	***7.55***
Motorcycles	Motorcycle only	1.57
	Motorcycle vs Vehicles	1.33
	TOTAL Motorcycles	*2.90*
	User-only	3.26

[4] VIASTRADA 2021 Safety of people travelling outside vehicles report, Deep dive review: First and second phase

Category	Road User	Total Mode Scaling Factor
TOTAL VULNERABLE Transport MODES	User vs Vehicles	2.02
	TOTAL	***5.27***
TOTAL OTHER MOTOR Vehicles		**1.96**
ALL TRANSPORT MODES	User-only	1.88
	User vs Vehicles	1.56
	TOTAL	**3.44**

The scaling factors used for the analysis were as per the table below. These values were found to be relevant to the current analysis and have been expected from the previous table.

Table A2.6 Reduced scaling factors table (VIASTRADA 2022)[5]

		Total Mode Scaling Factor
Pedestrian	Pedestrian vs Vehicle	2.51
Bicycles	Cycle vs Vehicle	2.19
Motorcycles	*Total motorcycle*	*2.90*
Total other motor vehicles		**1.96**

The process can be seen in the Figure 2.1. Reported crashes were extracted and for each the number of DSI sustained were extracted. These were allocated to different categories depending on the road user defined in the crash. The scaling factor was applied as per the table above. These were then aggregated into the before and after period. This gave the number of estimated DSI per year after implementation compared to the number of DSI per year before the implementation. The results of this analysis can be seen in Table A2.7 Injury analysis (taking into account under reporting).

[5] VIASTRADA 2021 Safety of people travelling outside vehicles report, Deep dive review: First and second phase

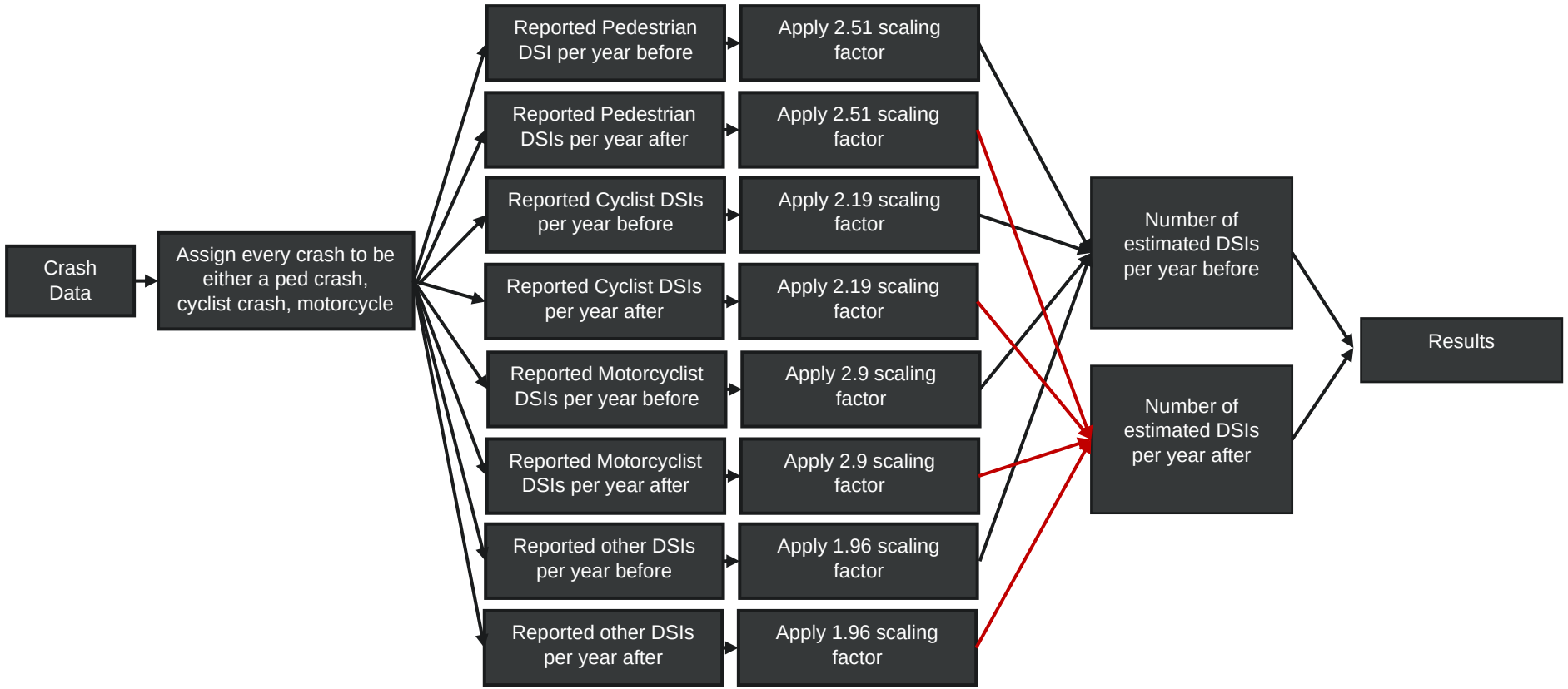

Figure A2.1 Under-reporting CAS data analysis

Table A2.7 Injury analysis (taking into account under reporting)

Crash type	Focus – annual reported DSi before (unscaled)	Focus - annual estimated DSi before (scaled)	Focus - annual reported DSi after (unscaled)	Focus - annual estimated DSi after (scaled)
Cycle	5	10.9	6	13.1
Motorcycle	13.6	39.4	10	29
Other	44.2	86.6	33.5	65.7
Ped	11.6	29.1	8.5	21.3
Total	74.4	166	58	129.1
Crash type	**Control - annual reported DSi before (unscaled)**	**Control - annual estimated DSi before (scaled)**	**Control - annual reported DSi after (unscaled)**	**Control - annual estimated DSi after (scaled)**
Cycle	42.8	93.7	31.5	69
Motorcycle	126.4	366.6	116	336.4
Other	327.8	642.5	291.5	571.3
Ped	91	228.4	88.5	222.1
Total	588	1331.2	527.5	1198.8

Table A2.8 Injury analysis (taking into account under reporting)

Crash type	Focus - Change in estimated DSIs	Focus - % Change in estimated DSIs	Control - % Change in estimated DSIs	Difference	Estimated annual change in estimated DSI	Change
Cycle	2.2	20.2%	-26.4%	46.4%	5.1	Increase
Motorcycle	-10.4	-26.4%	-8.2%	-18.2%	-7.2	Decrease
Other	-20.9	-24.1%	-11.1%	-13.1%	-11.3	Decrease
Ped	-7.8	-26.8%	-2.8%	-24.0%	-7.0	Decrease
Total	-36.9	-22.2%	-9.9%	-12.3%	-20.4	Decrease

From the injury CAS data analysis, taking account under reporting, it is estimated that, the speed limit reductions implemented in Auckland on 30 June 2020 have reduced DSIs by 20.4 annually or over 100 DSI saved over a 5-year period. Overall, this is seen as a significant safety result; noting that it is important that AT continue to monitor and evaluate the programme.

It is recommended that AT investigate the increase in estimated cyclist DSIs.

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