Safety Infrastructure Framework

Part of the Safety Plan, Vision Zero

2026

Read me first: what it means that this document has been approved for retention by Auckland Council

Status of this document

On 6 May 2026, the New Zealand Government passed the Local Government (Auckland Council) (Transport Governance) Amendment Act. This legislation changed transport decision-making and responsibility for Auckland.

As part of this legislation, Auckland Council was required to review all transport-related and in-force Auckland Transport policies and plans to decide whether to retain, amend or revoke the policy or plan.

On 21 September 2026, Auckland Council approved the retention and transfer of this document to the council. In accordance with the Act, the document continues in effect until it is reviewed, replaced, or revoked.

This document remains in effect but should be considered alongside Auckland Council's current strategic direction and statutory transport planning requirements.

Alignment with Auckland Council group strategic direction and transport planning requirements

Auckland Council current strategic direction provides the wider context for how this document should now be interpreted and applied. This includes relevant Auckland Council strategies, policies, plans, investment decisions, regulatory settings, and local board direction.

Transport planning is also guided by legislation and related planning documents introduced through the reforms. This includes the Auckland Council Transport Policy Statement, the Auckland Regional Transport Committee, the 30-year Transport Plan for Auckland, the Regional Land Transport Plan, and related transport governance and planning requirements.

The Auckland Council Group Strategic Framework (Transport view), shown below, provides context for how transport-related strategies, plans and frameworks fit together. It is intended as an evolving guide and will continue to be refined as documents are reviewed and updated. The Safety Infrastructure Framework was prepared under previous governance arrangements. While it remains in effect, the way it should be interpreted and applied, and its relationship with the broader framework today may differ from how it was originally intended. To ensure accurate interpretation, advice should be sought jointly from Auckland Council's Group Strategy and Transport Policy functions.

Auckland Council Group Strategic Framework

(Transport view)

Simplified view only. Documents often span multiple layers and relationships. Higher-order direction takes precedence. Seek guidance where interpretation is required. Subject to ongoing refinement.

	What it's for	Who are the decision-makers: Auckland Council (Governing Body & Local Boards)	Joint Auckland Council and Central Government	Central Government
Aspirations for Tāmaki Makaurau	Setting out the community's aspirations for Auckland and its transport system	Auckland Plan		
Group Direction	Council-wide direction for all aspects of the transport system	Transport Policy Statement Other key documents	Auckland 30-year Transport Plan Rapid Transit Pathway	GPS on Land Transport
Decisions on investment & regulation	Investment decisions and agreed priorities for the transport system and funding shares.	Long Term Plan (and Annual Plan) Local board plans Auckland Unitary Plan Regulation policy and bylaws	Regional Land Transport Plan Develop: Auckland Regional Transport Committee Approve: Auckland Council	National Land Transport Plan

	What it's for	Who are the decision-makers: Auckland Council	AT CCO
Organisation Integration	How transport priorities and expectations will be delivered across the Council group through governance and organisational arrangements	**Group 3-year Plan** (Transport section) — Developed with AT CCO * To be adopted alongside LTP2027-2037 Auckland Roading Classification Framework	
Delivery	Plans for the networks, assets and interventions needed over the next decade	The Network Plan (Future Connect) The Regional Public Transport Plan (RPTP) — Developed with AT CCO The Parking and Kerbside Plan (Room to Move) The Safety Plan (Vision Zero) The Regional Freight Transport Plan (Delivering the Goods) The Transport Asset Management Plan The Regional General Traffic Plan The Regional Active Modes Plan *may be required	
Operational guidance	Supporting plans and frameworks that guide implementation	• Asset class management plans • Accessibility Action Plan • Auckland Network Operation Plan • Waiheke Transport Plan • Park and Ride Framework • Roads and Streets Framework • Transport Equity Framework • Local board road safety plans • Safety infrastructure Framework • Comprehensive Parking Management Framework • Kerb Zone Management Framework • Car Share Framework	• City Centre Bus Plan • PT Safety Action Plan • Low Emission Bus Action Plan

Application within Auckland Council's shared governance model

Auckland Council's shared governance model allocates decision-making responsibilities between the Governing Body and local boards. The transport reform legislation changed how this model applies to transport by assigning additional responsibilities to local boards for local and collector roads, while arterial roads and specific precincts are wholly under the decision-making responsibility of the Governing Body.

The Auckland Roading Classification Framework determines the split in road type and therefore decision making, and shows individual road categories.

By retaining this document, the Governing Body confirmed that it remains part of Auckland Council's approach to transport planning and decision-making. It should be taken into account when Auckland Council plans, funds, regulates, and delivers transport services and infrastructure.

The Allocation of Decision-Making Framework sets out the respective responsibilities of the Governing Body and local boards. Local board decision-making responsibilities for local and collector roads include:

- **Parking and stopping controls:** Such as no stopping restrictions (broken yellow lines), angle parking, time restricted parking, parking zones,
- **Traffic Controls:** Such as community streets (community led play streets), pedestrian crossings, speed humps, speed limits,
- **Road corridor and network access permissions and conditions:** Corridor access approvals for events (excluding Eden Park events that impact arterial roads),
- **Property and landowner (road reserve) decisions:** Such as removal of hazardous encroachments affecting road safety, airspace and subsoil leases,
- **Infrastructure:** Such as footpaths and cycle paths (new or modified), installing monuments, removal of third-party structures.

Where local boards are responsible for decisions covered by this document, they should take it into account when making those decisions. The document does not change or limit local board decision-making powers.

SAFETY INFRASTRUCTURE FRAMEWORK

(Part A)

Infrastructure and Speed Management Programme Intervention Selection Framework

Version: 1
Date: 08/09/2026

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Executive Summary

The Safety Infrastructure Framework (the Framework) provides Auckland Council with an interim, evidence-based approach for selecting safety infrastructure and speed management interventions during organisational and strategic transition. It connects Vision Zero and its Road Safety Management System, network risk analysis and intervention selection, and is grounded in the Safe System principle that deaths and serious injuries are preventable.

The Framework directs investment to the locations, corridors, user groups and crash types where the greatest reduction in harm can be achieved. It brings together crash history, network and infrastructure risk, exposure, Safe System boundary conditions and treatment effectiveness evidence to support consistent, transparent and defensible decisions.

The Framework is presented in two complementary parts. Part A, the Infrastructure and Speed Management Programme Intervention Selection Framework, sets out the strategic context, Safe System logic, investment approach and intervention selection principles. Part B – Supporting Tools and Treatment Selection Guidance Compendium - provides the practical tools, treatment menus, assessment processes and technical guidance needed to apply the Framework.

Auckland's road safety challenge is concentrated on the local road network, particularly in urban environments where people walking, cycling, riding motorcycles and accessing everyday destinations face higher risk. Key considerations include young adults, older road users, motorcyclists, intersections, loss-of-control crashes, speed-related risk and increasing network complexity.

Auckland has made road safety gains, but progress has plateaued while population, travel demand, vehicle numbers and vehicle kilometres travelled continue to grow. Tāmaki Makaurau recorded 626 DSIs over the last 12 months, comprising 36 deaths and 590 serious injuries. As of 7 August 2026, FY2025/26 recorded 622 DSIs — six fewer than the previous year, but 46 DSIs, or 8 per cent, above the SOI target of 576. Local roads (excluding State Highways) accounted for 546 DSIs, or 88 per cent of the total.

The Road Safety Engineering Programme is the main delivery mechanism for safety-led improvements on Auckland's local road network. It identifies high-risk locations, assesses options, prioritises investment based on expected DSI reduction, value for money and deliverability, and supports decisions with clear evidence and programme logic.

Together, Part A and Part B support consistent decision-making across intersection, corridor, pedestrian, cycling, motorcycling and speed management interventions, while allowing responses to reflect statutory requirements, local context and community expectations. Part B remains a living compendium aligned with relevant Council, NZTA and international guidance.

Vision Zero and Safe System principles define Auckland's long-term safety outcomes, while local analysis, feasibility testing and staged programme planning determine how interventions are delivered in practice.

Where the full Safe System outcome cannot be achieved immediately because of funding, statutory, operational, governance or place-based constraints, staged treatments should reduce short-term risk while preserving a pathway to stronger long-term outcomes.

Monitoring and evaluation will measure effectiveness, identify residual risk and feed lessons into future investment decisions. Future development of a Network Safety Programme will further strengthen Auckland's systematic approach to managing road safety risk.

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1 Introduction

1.1 What is this Framework?

The Safety Infrastructure Framework, (the Framework) provides Auckland Council with a consistent, transparent and evidence-based methodology for identifying, prioritising and selecting road safety infrastructure and speed management interventions across the transport network.

The Framework translates Auckland's Vision Zero ambition and Safe System principles into a practical process for programme development and investment, so decisions are driven by DSI reduction and directed to locations where the greatest safety benefit can be achieved.

It recognises funding constraints, competing transport objectives, statutory requirements, community expectations and evolving governance arrangements, and provides a structured way to balance these considerations while maintaining a clear focus on safety outcomes.

This document does not replace Auckland's broader road safety strategy and Road Safety Management System or future Network Safety Programme. Instead, it provides the operational link between those strategic documents and the day-to-day decisions required to develop and deliver the Road Safety Infrastructure and Speed Management Programmes.

It serves as the primary reference for determining where intervention is required, what should be considered, and how competing investment opportunities should be prioritised. The supporting tools, assessment steps and treatment guidance are provided in Part B – Supporting Tools and Treatment Selection Guidance Compendium.

1.2 Why this Framework is Needed?

Auckland Council continues to have a responsibility to reduce deaths and serious injuries on Auckland’s transport network while the wider strategic, governance and organisational environment is changing. The safety challenge remains immediate, and decisions still need to be evidence-based, transparent and focused on achieving the greatest reduction in harm.

During this transition, Council needs a practical bridge between current programme delivery and the longer-term Council-led transport and road safety direction. This Framework provides that bridge by setting out a consistent method for identifying safety risks, selecting infrastructure and speed management interventions, and prioritising investment.

It consolidates evidence on network risk, crash history, treatment effectiveness and programme logic so that investment can be directed to high-risk areas and effective engineering responses with a clear line of sight to DSI reduction, value for money and Safe System outcomes.

It also gives Auckland Council and local boards a shared basis for understanding why interventions is proposed, how funding priorities are set, and how decisions can remain consistent, transparent and defensible during transition.

Together, these elements support consistent, transparent and defensible investment decisions during transition.

1.3 How to use this Framework?

The Framework is organised into two linked documents: Part A and Part B.

Part A – Main Framework Document

Part A sets out the core document structure and narrative. It contains the introduction, governance context, programme scope, safety challenge, Safe System philosophy, assessment and intervention selection process, investment approach, delivery constraints, monitoring requirements and future pathway.

Part B – Supporting Tools and Treatment Selection Guidance Compendium

Part B contains the practical material used to apply Part A. It includes assessment tools, treatment selection guidance, treatment menus, supporting evidence, technical references and appendices, including Appendix A for detailed treatment options.

2. Road Safety Governance Framework

Auckland's Road Safety Governance Framework connects strategic direction with the systems, plans and delivery mechanisms used to manage safety risk across the network.

Each component has a distinct role: strategy defines the ambition, safety management governs risk, network planning identifies priorities, this Framework guides intervention selection, the programme delivers projects, and monitoring supports continuous improvement.

Auckland's Vision Zero programme is overseen by the Tāmaki-Makaurau Road Safety Governance Group, a partnership between various agencies Auckland Council (AC), NZ Transport Agency (NZTA), NZ Police, Auckland Regional Public Health Service (ARPHS), Accident Compensation Corporation (ACC) and the Ministry of Cities, Environment, Regions and Transport (MCERT).

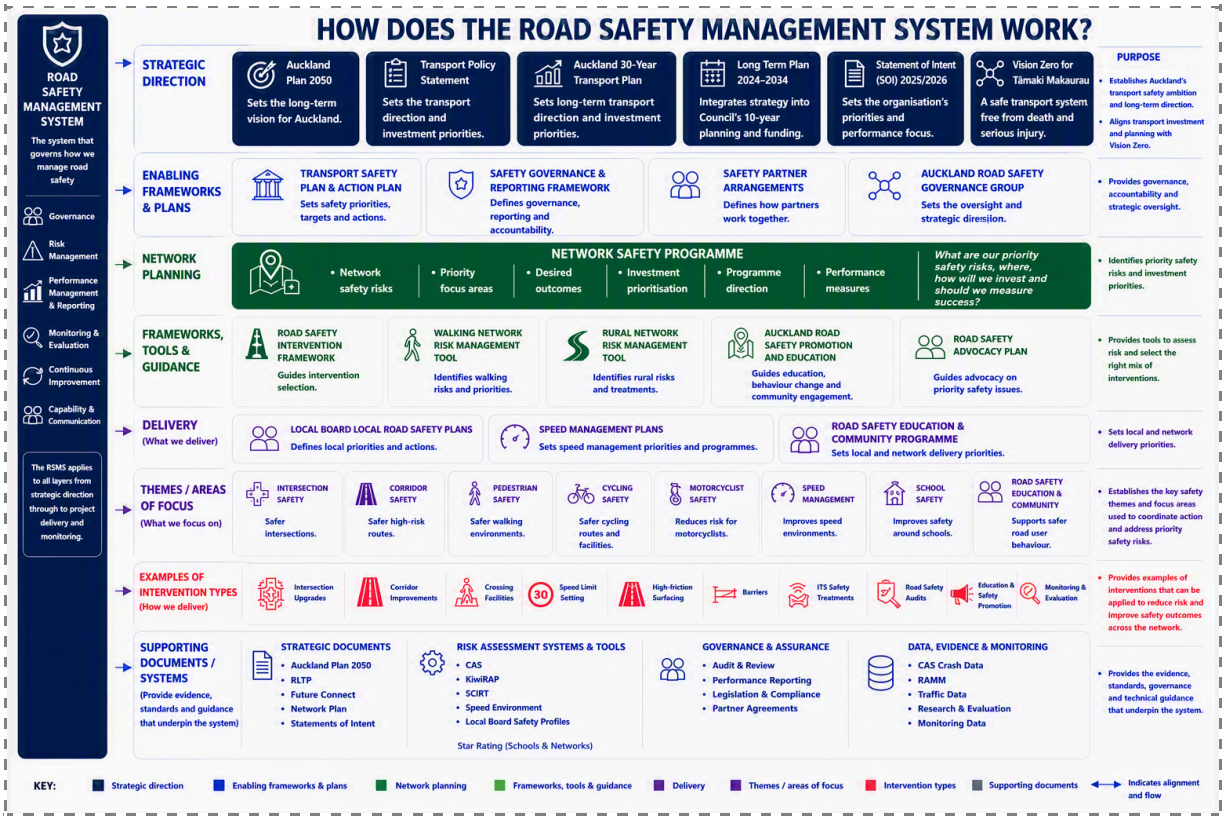


Figure 1: Auckland road safety management system and document relationship overview

2.1 A System-Wide Approach to Road Safety

Road safety outcomes cannot be achieved through infrastructure projects, speed management initiatives, or any single programme alone. Deaths and serious injuries occur because of the interaction between road design, travel speeds, vehicle safety, road user behaviour, network operating conditions, and broader system factors. As a result, road safety issues must be understood and addressed as system-wide challenges rather than isolated infrastructure or engineering problems.

The Safe System approach recognises that people make mistakes and that the human body has limited tolerance to crash forces. It accepts that no single intervention can eliminate risk on its own. Sustainable reductions in deaths and serious injuries are achieved when multiple layers of protection work together across the transport system. These layers include safer roads and roadsides, safe and appropriate speeds, safer vehicles, safer road use, effective enforcement, education, post-crash response, and strong organisational leadership.

2.1 Vison Zero for Tamaki Makaurau

Vision Zero provides Auckland's long-term road safety vision and establishes the fundamental Safe System principles that underpin all road safety activities.

Vision Zero recognises that people make mistakes and that the transport system must be designed to ensure those mistakes do not result in death or life-changing injury. It establishes the long-term outcomes sought for Auckland's transport network and provides the strategic direction for future safety investment and decision-making.

2.2 Road Safety Management System (RSMS)

The RSMS provides the governance and assurance approach for managing road safety risk across Auckland’s transport network. It translates strategic safety direction into clear processes for identifying, assessing, prioritising, controlling and reporting risk over time.

Auckland’s Vision Zero programme is overseen by the Tāmaki-Makaurau Road Safety Governance Group, which provides the multi-agency setting for developing and maturing Auckland’s RSMS. Working with this governance group will help define a coordinated and responsive way to address safety issues. The RSMS should set out responsibilities, decision points, escalation pathways, performance measures and assurance activities across planning, design, operations, maintenance, investment and programme delivery.

A mature RSMS should use crash data, network and infrastructure risk, speed environment, exposure, user vulnerability and operational insight to inform decisions on which risks are accepted, reduced or monitored. It should also identify the controls needed to reduce the likelihood or severity of death and serious injury outcomes.

Where full Safe System outcomes cannot be achieved immediately, the RSMS should require residual risk to be explicitly identified, assessed and documented. This ensures decision-makers understand what remains, what interim controls are needed, and when escalation or a pathway to a stronger long-term response is required.

2.3 Network Safety Programme

The Network Safety Programme is network-level planning that identifies and prioritises Auckland’s road safety risks. It provides a structured view of where serious harm is most likely to occur, the factors contributing to that risk, and the locations, corridors or themes that require further investigation or programme development.

It draws on crash analysis, network and infrastructure risk, exposure, operating speed, road function, place context, maintenance intelligence, local board profiles and operational knowledge to build a complete picture of priority safety issues.

The Network Safety Programme sits between the RSMS and this Framework. The RSMS sets the risk governance approach, the Network Safety Programme identifies the priority risks to be addressed, and this Framework guides how appropriate infrastructure and speed management responses are selected.

Key outputs should include risk maps, local board safety profiles, high-risk site lists, vulnerable road user risk areas, rural route priorities, speed-risk locations and emerging issues requiring further investigation.

These outputs provide the evidence base for programme planning, investment prioritisation and treatment assessment.

2.4 Strategic and Operational Planning

Strategic planning sets the long-term direction for road safety, while operational planning turns confirmed priorities into deliverable programmes and projects.

Operational planning starts with the risks and priorities identified through the Network Safety Programme. It then tests practical responses against Safe System outcomes, value for money, deliverability, statutory requirements, local context and programme dependencies.

This approach keeps programme development focused on the agreed safety problem before a preferred treatment is selected. It helps ensure that projects are practical, defensible and aligned with the intended reduction in deaths and serious injuries.

This Framework provides the method for moving from operational planning to intervention selection by setting out how infrastructure and speed management options are assessed, compared and prioritised before entering the Road Safety Infrastructure and Speed Management Programmes.

Part B – Supporting Tools and Treatment Selection Guidance Compendium supports this step by providing the assessment tools, treatment menus and application guidance needed to translate operational planning into consistent programme decisions.

3. Road Safety Infrastructure and Speed Management Programme

3.1 Programme objective

The Road Safety Programme is responsible for delivering infrastructure, speed management and supporting safety interventions where the primary purpose is to reduce deaths and serious injuries. It is the core delivery programme for safety-led changes on Auckland's local road network and provides the contributing infrastructure changes required to support Council's safety targets.

The programme is delivered by the Road Safety Engineering Team within the Transport and Infrastructure Directorate, and the team is responsible for:

- Identifying high-risk corridors, intersections and user groups using analysis tools such as crash history, network risk, infrastructure risk and exposure data.
- Selecting interventions that align with Safe System principles and are appropriate to the road function, speed environment and user mix.
- Developing programmes that combine infrastructure, speed management, technology, enforcement support and minor safety improvements where needed.
- Prioritising fit-for-purpose treatments for investment based on expected DSI reduction, value for money, deliverability and governance requirements.
- Supporting local board and Council-led decision-making with clear evidence, options and programme logic.

3.2 Programme scope

The programme scope includes the following safety-led intervention areas. Detailed treatment types and application guidance are provided in **Part B – Supporting Tools and Treatment Selection Guidance Compendium**, Appendix A.

Table 3-1: Example user-based safety interventions by road user group

Pedestrians	Cyclist	Motorcyclist
• Install new crossing facilities • Upgrade existing sub-standard facility • Minor safety improvements	• Signs and road markings • ITS & active signage • Minor Safety improvements	• Focused surfacing improvements • Hazard mitigation • ITS & active signage • Minor safety improvements

Example of Existing Infrastructure based Interventions

Intersection Improvements	Corridor Improvements
• Transformational changes • Minor safety improvements • ITS & active signage	• Focused surfacing improvements • ITS & active signage • Road markings (ATPs and wider centrelines) • Speed management (improve compliance) • Barriers

Example of Speed Based Interventions

Speed management – focused on speed limit changes

- Introduce or upgrade variable speed zones for schools.
- Correct existing speed limits or set new limits through the Speed Management Plan process and approved community requests.
- Use school star ratings to inform speed management priorities.
- Support compliance through safety cameras at priority locations.
- Apply targeted supporting measures where needed to reinforce safe operating speeds.

3.3 Programme Delivery and Monitoring

The Road Safety Infrastructure and Speed Management Programme delivers interventions identified through this Framework, using its principles and decision-making methodology across Auckland's transport network.

Monitoring and evaluation activities are then used to assess the effectiveness of interventions and inform future programme development, creating a continuous cycle of learning and improvement.

4 The Safety Challenge in Auckland

While significant progress has been made in reducing deaths and serious injuries, achieving Auckland's Vision Zero ambition will require continued investment, strong governance and a coordinated Safe System approach. Understanding current constraints, actively managing residual risks and developing more mature safety planning tools will be critical to improving safety outcomes over the coming decade. The transition to Local Board led decisions requires careful consideration as the transition continues. While there is change, we must never lose sight of the objectives and must ensure that during the transition period we keep striving to make Auckland a safer place to live and work.

This Framework provides a practical pathway for selecting and delivering interventions that move the network toward safer, more survivable outcomes.

4.1 Current state of play

Auckland Council's target states no greater than 250 DSI targets by 2030. Analysis of the crash data for Auckland City for actual DSI (Financial Year) vs the target set is outlined in figure 4.1 below.

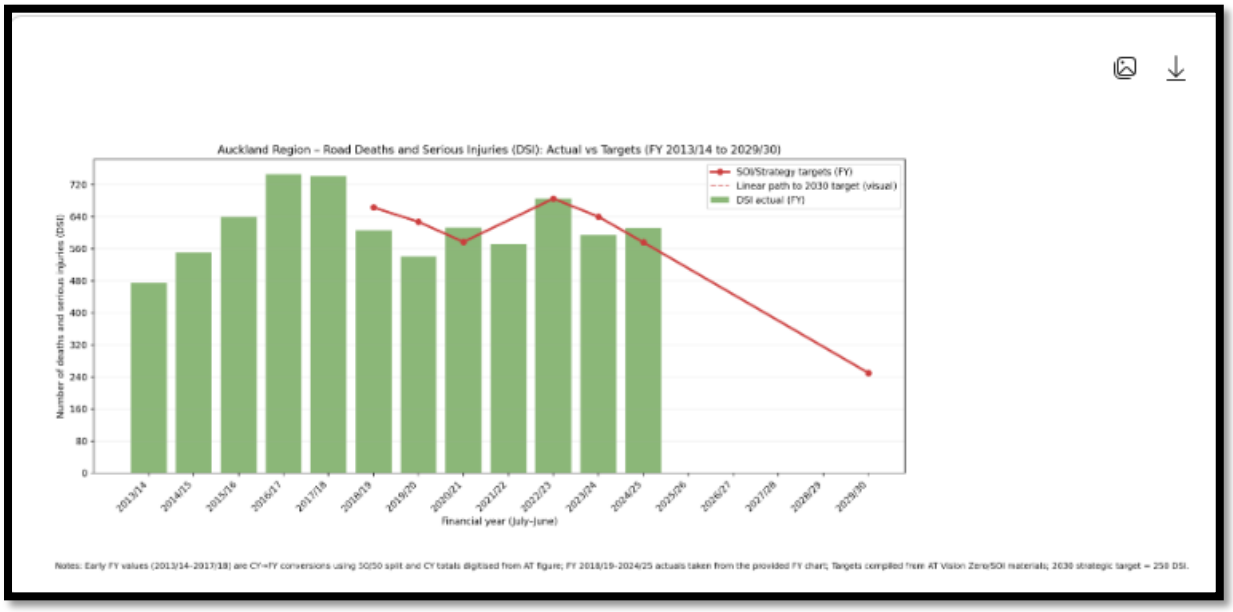


Figure 4.1-1: DSI performance summary (2013 – 2025) with forecast to 2030

Auckland has made road safety gains, but progress has plateaued while population, travel demand, vehicle numbers and vehicle kilometres travelled continue to grow. Tāmaki Makaurau recorded 626 DSIs over the last 12 months, comprising 36 deaths and 590 serious injuries. As of 7 August 2026, FY2025/26 recorded 622 DSIs — six fewer than the previous year, but 46 DSIs, or 8 per cent, above the SOI target of 576. Local roads accounted for 546 DSIs, or 88 per cent of the total. Overall DSI has remained broadly static and continues to sit above the SOI target, while serious injuries remain high.

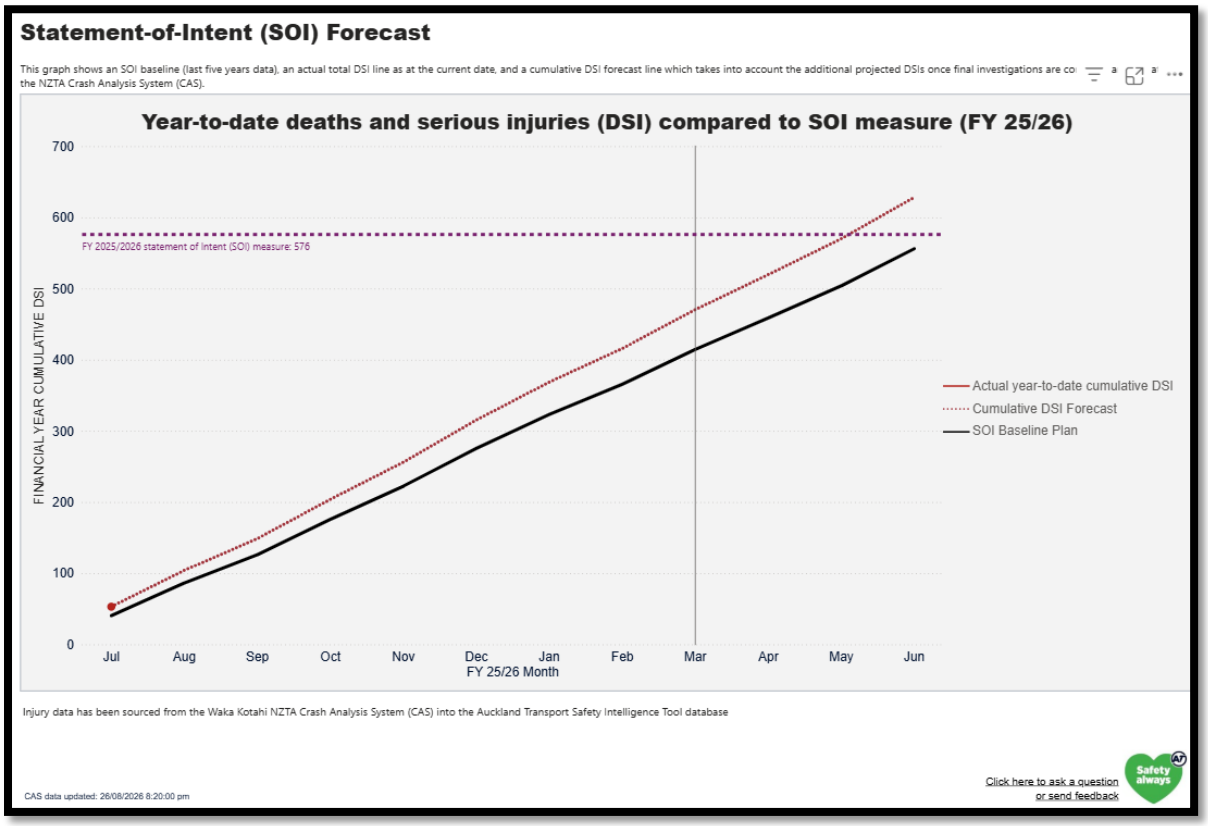


Figure 4.1-2: 2025/26 actual DSI vs SOI baseline target

4.2 Urban KiwiRap Network Risk Assessment (2024)

The 2024 Urban KiwiRAP network risk assessment provides a consistent method for identifying where fatal and serious injury risk is concentrated across Auckland's urban road network. It assesses road risk using both crash history and exposure, helping identify locations and corridors where intervention is most likely to reduce deaths and serious injuries.

Urban KiwiRAP uses two complementary risk measures: collective risk and personal risk. Collective risk describes the concentration of crashes along a road section or at an intersection. It is effectively a measure of crash density and helps identify places where the greatest total number of serious crashes is occurring. Personal risk describes the risk faced by an individual user travelling along a road section or through an intersection, taking account of exposure. It helps identify roads or locations that may have fewer crashes overall but are still relatively risky for each person using them.

Risk bands are used to group locations by relative level of risk. Roads or intersections assessed as High or Medium-High risk sit in the upper risk bands and are therefore priority areas for further investigation. A High-risk band indicates locations where risk is clearly elevated and where safety intervention is likely to be strongly justified. A Medium-High risk band indicates locations where risk is also above typical network levels and should be considered for intervention, particularly where there is a pattern of fatal and serious injury crashes, vulnerable road user exposure, high operating speeds or a known infrastructure deficiency.

The 2024 Urban KiwiRAP update (crash data between 2019 and 2023) identified 646 Auckland intersections as high-risk, based on high or medium-high personal risk and high or medium-high collective risk. It also identified 192 kilometres, or 2.3 per cent, of Auckland's

transport network as having High personal risk, and 1,302 kilometres, or 16 per cent, as having High or Medium-High collective risk. These results show that Auckland's safety challenge is not limited to locations with the highest crash numbers. Some parts of the network have high crash density, while others expose individual road users to a higher level of risk. Both measures are therefore important for selecting and prioritising interventions.

Intervention prioritisation should therefore reflect the risk profile identified through the Urban KiwiRAP rating, considering both collective risk, which shows where serious crash concentrations are greatest, and personal risk, which shows where individual road users face higher exposure to harm.

4.3 Crash Trends (An Overview)

The 2021–2025 crash trend analysis provides an overview of how road trauma is changing across Auckland's network. It compares recent fatal and serious injury patterns by road user group, contributing factor and crash movement type, and helps identify where this Framework should focus intervention selection.

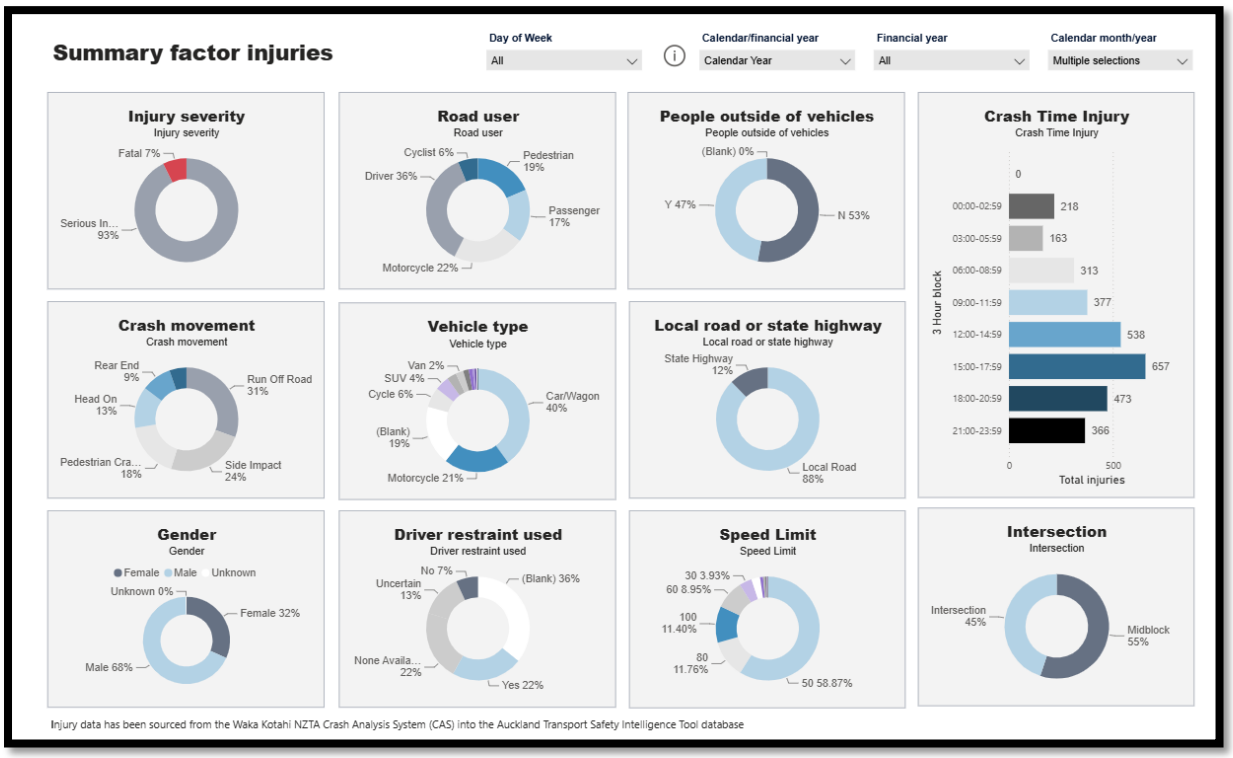


Figure 4-3: Auckland network-wide road safety key issues summary

Summarising the key findings, the key Auckland Road Safety issues include:

Local roads	**Local roads are where most serious harm occurs** Nearly nine in ten deaths and serious injuries occur on Auckland's local road network, highlighting the need for safer streets in neighbourhoods, town centres and residential areas.
Outside vehicles	**People outside vehicles remain at greatest risk** More than half of all deaths and serious injuries involve vulnerable road users, including people walking, cycling and riding motorcycles.
	Young adults are disproportionately affected by road trauma

Young adults	People aged **15-29 years account for approximately one-third of all fatal and serious injuries**, making them one of Auckland's most over-represented age groups relative to their share of the population.
20–24 yo **Highest DSI**	**People aged 20-24 experience the highest number of deaths and serious injuries** This age group consistently records the greatest number of casualties and remains a key priority for road safety investment and behaviour-change initiatives.
 **Motorcyclists**	**Motorcyclists continue to be over-represented in serious crashes** Motorcyclists account for a disproportionately high share of deaths and serious injuries and remain a priority road user group for safety improvements, with the majority of the injuries are in the urban area.
 **Loss of control**	**Loss-of-control crashes remain a major cause of serious harm** Run-off-road crashes are the most common crash type, indicating a need for safer roadsides, lower speeds and improved road layouts. This is both an urban and rural issues.
 **Intersections**	**Turning and crossing crashes continue to generate serious harm** Side-impact crashes represent almost one-quarter of deaths and serious injuries, highlighting the importance of safer intersection design and operation.
 **Urban roads**	**Urban roads remain Auckland's highest-risk environment** Most deaths and serious injuries occur on roads with speed limits of 50 km/h or lower, where people live, work, learn and travel every day.
70+ **Older users**	**Older Aucklanders are becoming an emerging safety concern** Several age groups over 70 years have experienced recent increases in fatal and serious injuries. As Auckland's population ages, protecting older road users will become an increasingly important safety priority
 **Afternoon peak**	**The afternoon peak period records the highest number of serious crashes** Road trauma is concentrated during periods of higher travel demand and increased interaction between different road users.

An analysis has been undertaken on road safety matters that are indicating a growing trend and must be considered in interventions going forward. These include:

- Young adults (15-29 years) remain persistently over-represented in road trauma.
- People aged 20-24 continue to record the highest number of deaths and serious injuries.
- Older road users, particularly those aged 70 years and over, show signs of increasing vulnerability.
- Micromobility user incident is emerging, and while starting from a low base compared to other road users, are an emerging issue.
- Most serious harm occurs on local urban roads where people live and access everyday destinations.
- Motorcyclists remain significantly over-represented in fatal and serious injury crashes, particularly on urban multi-lane roads and intersections. The table below shows that crash risk rates during the six-hour SVL operating period are higher than during the remaining 18 non-operating hours.

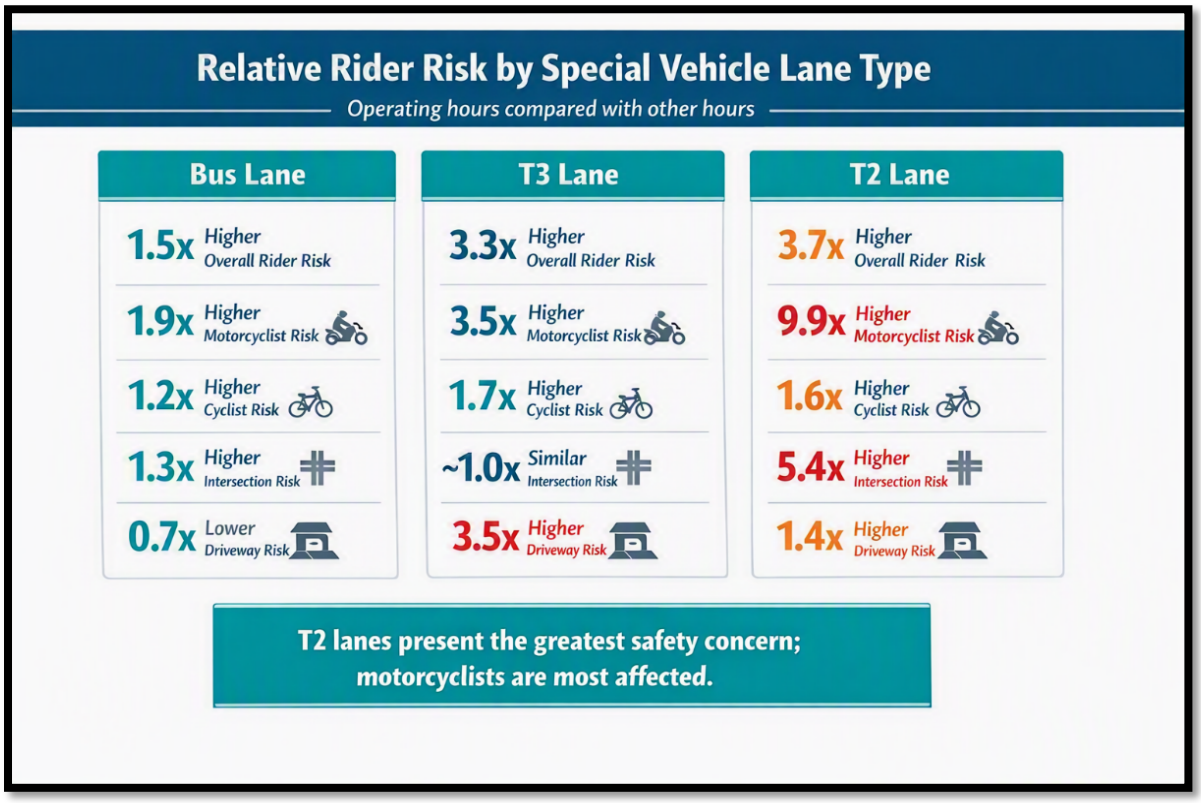


Figure 4-4: Crash risks on bus lane and special vehicle lane during operating hours (6 hours) and other hours (18 hours of non-operating hours)

4.4 Geographical Analysis

Current analysis (2026) of the Auckland network has been undertaken, at a network wide view, and also considering Urban and Rural Local Boards. The following figures provide a summary of the key road safety issues over the past 5 years (2021 – 2025), with 80% of the crashes were in urban areas / local boards, and 20% of the crashes in the rural areas / local boards.

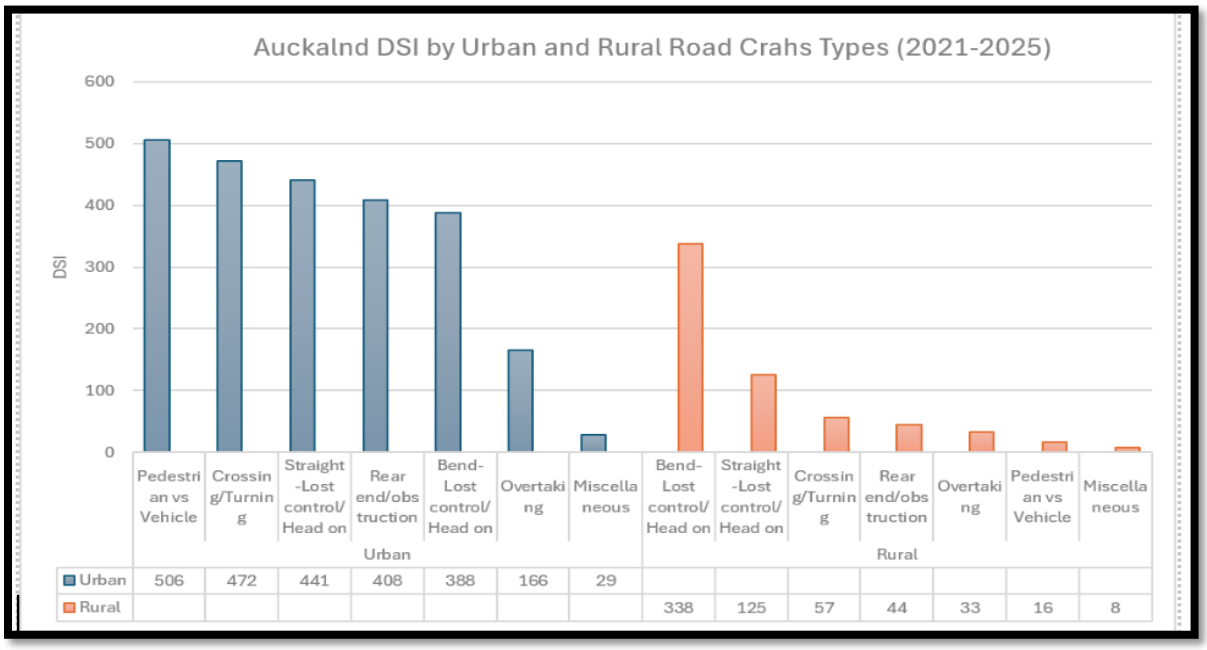


Figure 4-5: Death and Serious Crashes split between urban and rural network

Figure 4.5 show that Auckland's urban and rural road safety issues have different profiles and therefore require different programme responses. Urban DSIs are more strongly associated with local streets, intersections, turning and crossing movements, and higher exposure for pedestrians, cyclists and motorcyclists. Rural DSIs are more strongly associated with midblock environments, higher-speed corridors, loss-of-control and run-off-road movements, and motorcyclist risk. In simple terms, the urban challenge is concentrated around conflict between many users in complex street environments, while the rural challenge is more about speed, roadside unforgiveness and corridor risk.

4.5 Road User Crashes

The infographic also shows different trends by user group: driver and passenger harm are gradually improving, but vulnerable road user harm is rising, particularly for motorcyclists, pedestrians and emerging e-device users. This highlights the need for this Framework to give greater weight to people outside vehicles when selecting and prioritising interventions.

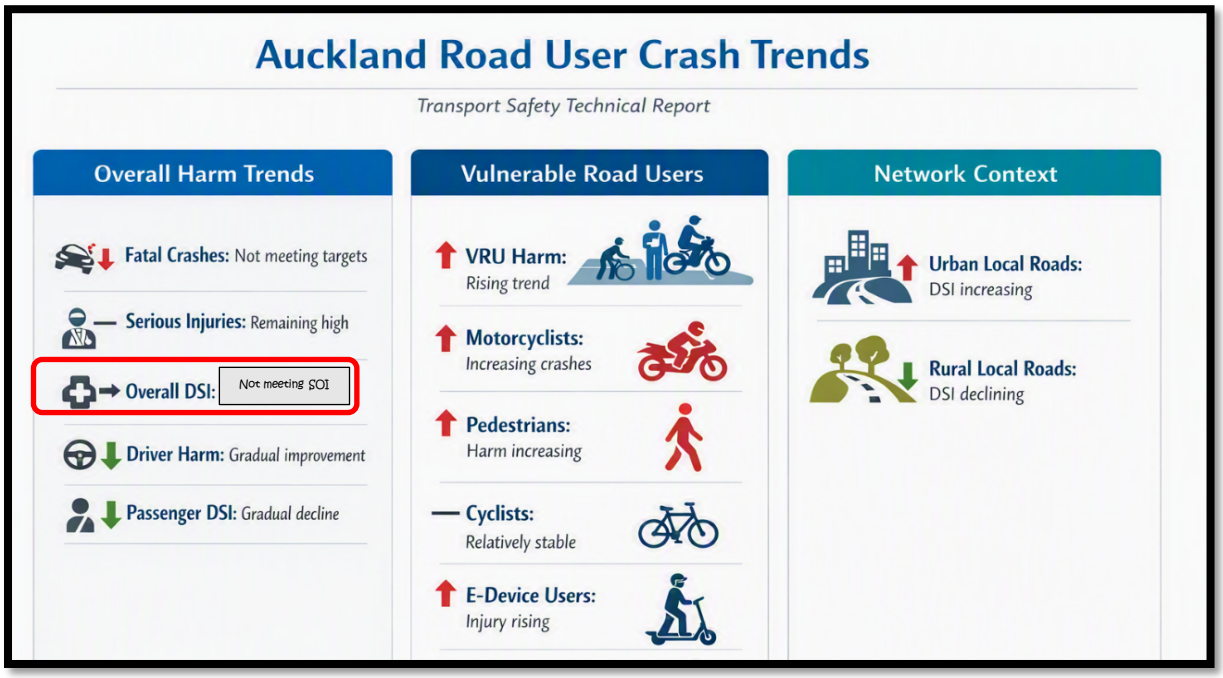


Figure 4.6: Overall Road User Crash Trends

4.6 Speed and Safe Road Use related crashes

Figure 4.7 below shows how speed and safe road use factors contribute to fatal and serious injury outcomes. It reinforces that speed management, infrastructure design, enforcement support and road user behaviour need to be considered together rather than as separate responses.

Key points of this analysis include:

Figure 4.7: Speed and Safe Road Use Crashes

4.7 Key crash movement types

Figure 4.8 below summarises the crash movement types most associated with fatal and serious injury risk across the network. Understanding these movement patterns is important because each crash type points to a different intervention logic. Turning and crossing crashes generally require safer intersection design, speed control and conflict management; run-off-road and loss-of-control crashes point to roadside protection, curve treatments, surfacing, delineation and speed management; and head-on or high-energy conflicts require separation, lower speeds or stronger corridor controls.

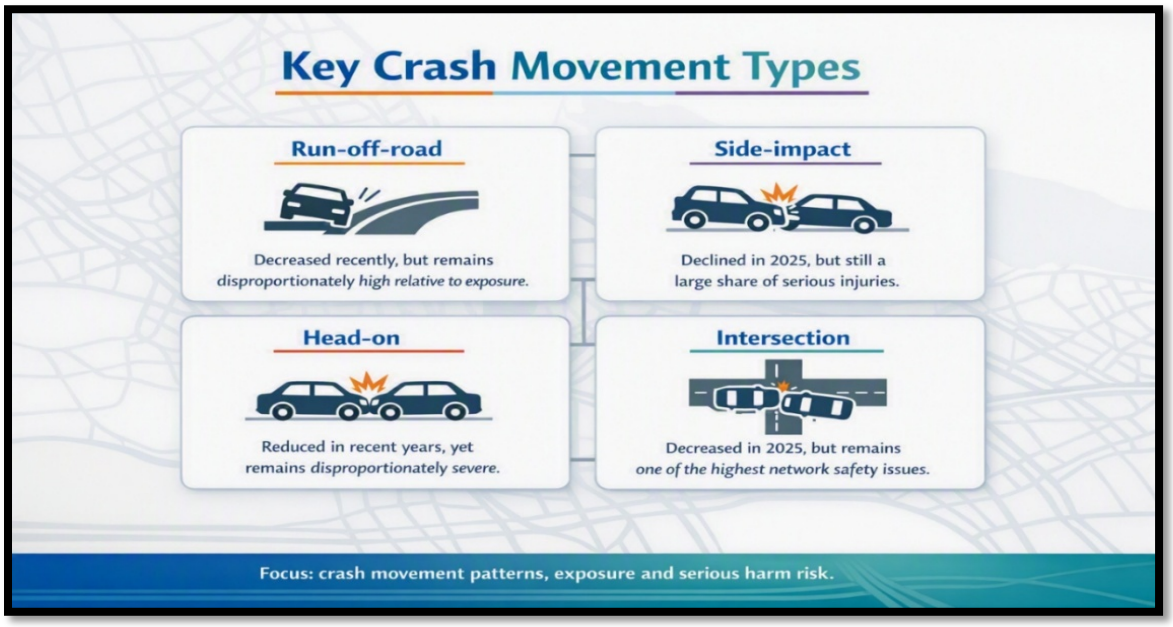


Figure 4.8: Key Crash Movement Types

4.8 Priority Safety Risk Issues

Auckland's key areas of concern reflect where serious harm is most concentrated, where risk is increasing, and where the current transport system still exposes people to crash forces beyond survivable levels. The common theme is the mismatch between human vulnerability, operating speed and the level of protection provided by the road environment.

4.8.1 Vulnerable Road Users (Pedestrians, Cyclists, Motorcyclists)

Vulnerable road users experience a disproportionate share of severe harm because they have limited physical protection in a crash. Pedestrians, cyclists and motorcyclists are strongly represented in urban and intersection crashes, particularly where they interact with turning vehicles, higher operating speeds, poor visibility or limited protection.

4.8.2 Unsafe Speed Environment

Unsafe speed environments remain a major contributor to both crash likelihood and injury severity. Risk is highest where operating speeds are not aligned with the road function, user mix or level of protection available, particularly on urban streets with high pedestrian and cycling activity and on rural corridors with unforgiving roadsides.

4.8.3 High-Risk Intersections

Intersections concentrate many movements within a small and complex space, making them one of Auckland's most significant sources of serious harm. Key issues include side-impact crashes, turning conflicts, failed give-way or stop-control movements, red-light running, pedestrian and cyclist exposure, approach speeds, visibility and decision-making pressure.

4.8.4 Run-off-Road and Loss-of-Control Crashes

Run-off-road and loss-of-control crashes are a persistent source of severe harm, particularly on higher-speed rural corridors, curves, downhill sections and roadsides with limited recovery space. These crashes often reflect a combination of speed, road geometry, surface condition, visibility, night-time conditions and unforgiving roadside hazards.

4.8.5 Head-On Crashes

Head-on crashes remain among the most severe crash types because they involve high closing speeds and are often unsurvivable without separation or much lower operating speeds. The greatest risk is on undivided two-lane roads where curves, poor visibility, fatigue, impairment or speed increase the chance of lane departure.

4.8.6 Growth in Travel and Network Complexity

Growth in population, travel demand and network complexity increases exposure and creates more interactions between people walking, cycling, riding motorcycles, using public transport, driving and accessing local destinations. This is most evident on urban local roads and activity streets, where movement, place, parking, side roads, property access and public transport activity overlap.

The central issue is not crash frequency alone, but the mismatch between human vulnerability, operating speed and a road environment that can still permit fatal or serious injury crash forces. A Safe System response must therefore combine safer speeds, safer infrastructure and systemic risk reduction.

5 Safe System Philosophy

The Safe System philosophy recognises that no death or serious injury is acceptable on the transport network, and that the responsibility for road safety does not sit with road users alone. People will make mistakes, misjudge gaps, travel at inappropriate speeds or be exposed to unexpected conflicts, but the transport system should be designed and managed so those mistakes do not result in fatal or life-changing harm. This means infrastructure, speed management, road operation, enforcement and user behaviour need to work together to reduce crash likelihood, manage crash energy and keep impact forces within survivable limits for all road users, especially those with limited physical protection.

This philosophy is supported by the following key principles:

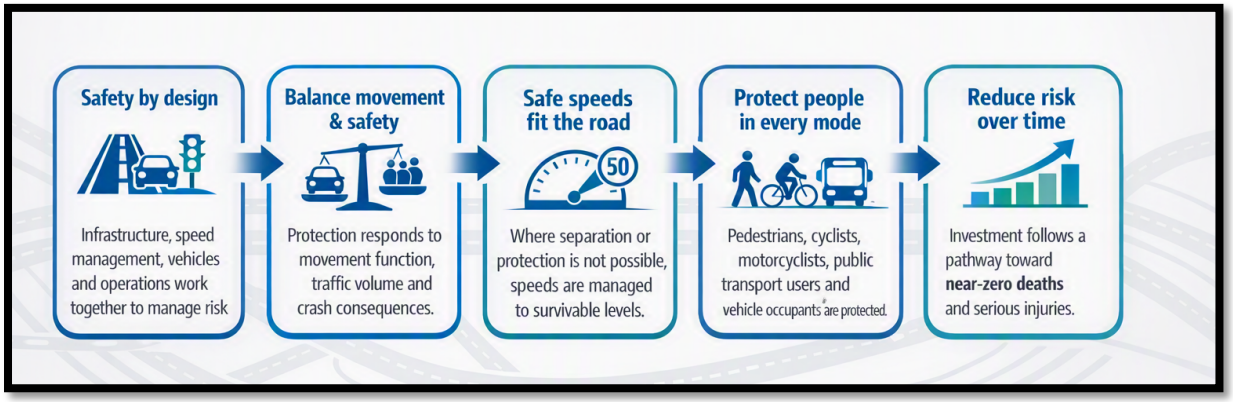


Figure 5-1: Core Safe System pillars and shared responsibility across the transport system

This diagram shows that road safety outcomes depend on all parts of the transport system working together, rather than relying on road users to behave perfectly. Safer roads and roadsides, safe and appropriate speeds, safer vehicles and safer road use each provide a layer of protection. For this Framework, the key message is that intervention selection should consider how these layers combine to reduce crash likelihood, manage crash energy and protect people when mistakes occur.

5.1 Safe System Design approach

The Safe System approach recognises that people make mistakes and that the human body has limited tolerance to crash forces. The role of the transport system is therefore to reduce the likelihood that mistakes result in death or serious injury.

For Auckland Council, this means intervention selection should ask whether the road environment is forgiving enough when something goes wrong. The most effective interventions reduce exposure to high-risk conflicts, manage impact speeds, separate incompatible movements and protect people who are least protected in a crash.

The Safe System is commonly described through four core pillars: safe roads and roadsides, safe speeds, safe vehicles and safe road use. These pillars are interdependent and need to work together as one system.

The diagram below illustrates the core Safe System pillars and reinforces that safer outcomes depend on coordinated action across the whole transport system.

Figure 5.2: Safe System Principles

Figure 5-3 (below) illustrates the relationship between vehicle speed and the likelihood of death or injury. The key message is that relatively small changes in impact speed can significantly affect crash outcomes. Lower speeds reduce the probability of death, but serious injury can still occur even at speeds generally considered low.

This matters because the objective is to reduce deaths and serious injuries, not simply prevent fatal crashes. Speed and infrastructure decisions must therefore consider whether crash forces are likely to remain within survivable limits for the relevant users and crash types.

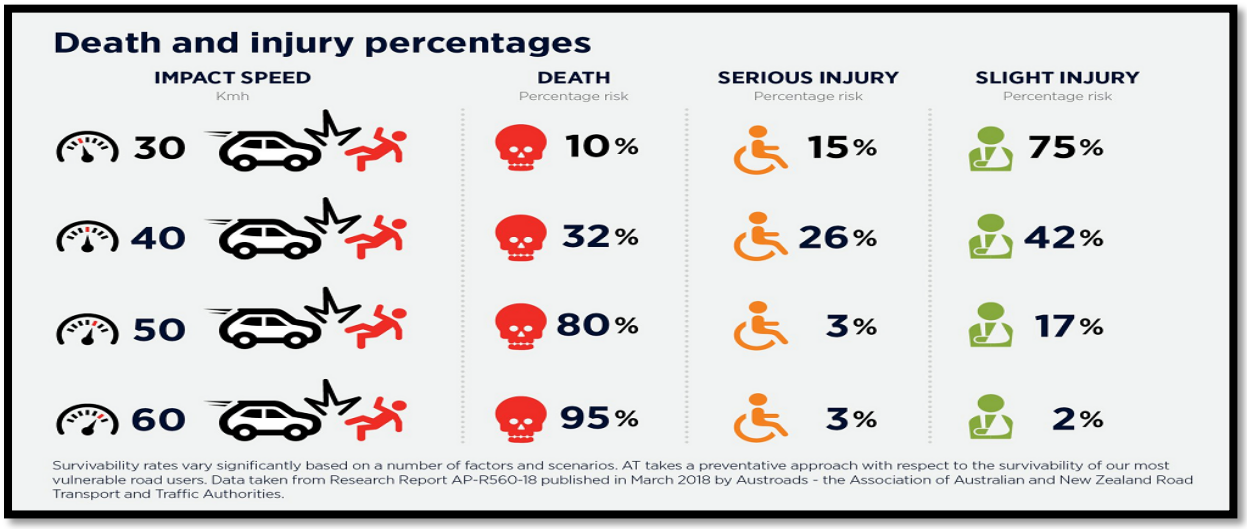


Figure 5-3: Death and Injury Relationship

Crash survivability is also influenced by the person involved. Age, health, physical frailty and recovery capacity can affect whether the same impact speed results in minor injury, serious injury or death.

Intervention selection should not be based on an average road user. Locations with higher exposure for pedestrians, cyclists, motorcyclists, older people, children or people with mobility limitations may require lower speeds, better crossing protection, clearer priority, improved visibility and more forgiving infrastructure.

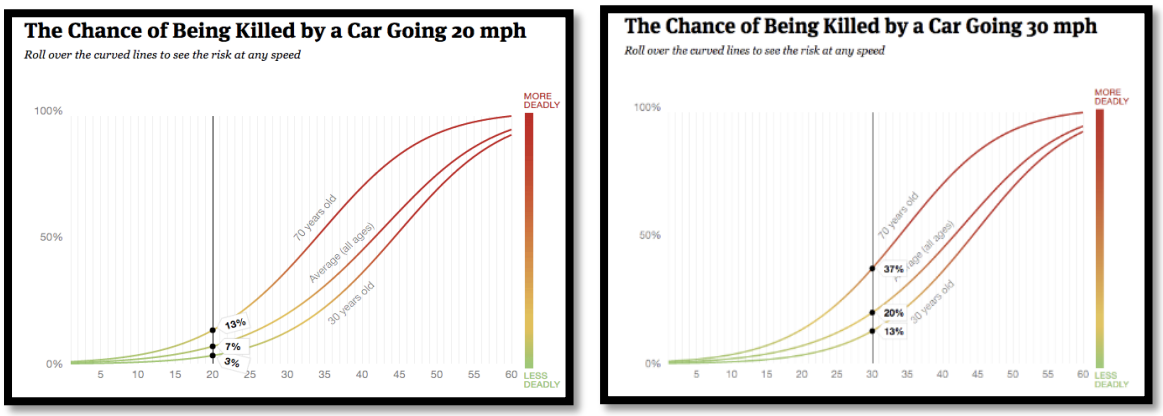


Figure 5-4: The Chances of being killed by a car for various road users at 20 mph (30 km/h) and 30 mph (50 km/h)

The above two graphs highlight how quickly the risk of death or serious injury increases as impact speed rises, particularly for pedestrians and other people outside vehicles. A pedestrian struck by a car at around 20 mph (30km/h) has a much lower chance of being killed than a pedestrian struck at around 30 mph (50 km/h); the increase from 20 mph to 30 mph may appear modest in traffic terms, but it represents a substantial increase in crash energy and fatality risk. The key message for this Framework is that small reductions in operating speed can make a significant difference to survivability, especially in streets with high pedestrian activity, crossings, schools, town centres or other locations where vulnerable road users are exposed.

Human vulnerability is not only physical. People's ability to perceive risk, judge gaps, react to unexpected events and recover from mistakes varies across the population and changes across a person's life.

Children and young adults are still developing some decision-making and risk-perception skills, while older adults may experience changes in reaction time, visual processing, mobility or cognitive function. These factors can make complex traffic environments more difficult to navigate.

This diagram shows that road users do not all have the same capability to perceive risk, process information, judge gaps, react to unexpected events or recover from mistakes. Capability changes across the life course: children and young adults are still developing some decision-making skills, while older adults may experience changes in reaction time, vision, mobility or cognitive processing. For this Framework, the key message is that treatments should reduce both crash forces and task complexity, rather than relying on perfect judgement, fast reactions or individual resilience.

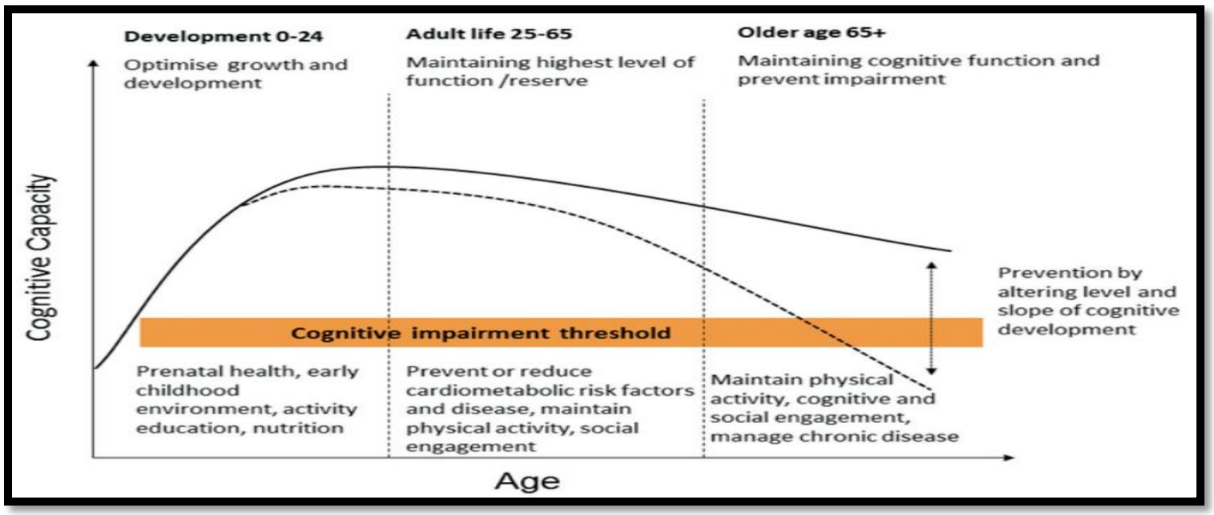


Figure 5-5: Cognitive development and road user capability over the life course

As Auckland's population changes, the network will need to work safely for a wider range of ages, abilities and travel needs. Safer speeds, simpler layouts, clearer priority, shorter crossing distances, better sight lines, protected movements and forgiving roadsides all help create a system that is easier and safer to use.

Full Safe System intervention may be warranted at many high-risk locations, but may not always be immediately deliverable because of funding, statutory, operational, physical or community constraints.

Where the preferred Safe System end state cannot be delivered immediately, intervention selection must assess the residual risk associated with any interim or lower-level treatment. That residual risk should be clearly identified as acceptable, tolerable with controls, or requiring escalation to a stronger intervention response or a defined pathway toward the full Safe System outcome.

5.2 Safe System Boundary Conditions

Safe System condition boundaries define the maximum speeds at which crashes are likely to remain survivable for different road users and crash types. They provide a clear basis for when speed management must be combined with infrastructure treatments, rather than relying on speed limits alone.

Safe System boundary conditions are critical because they turn Safe System philosophy into a practical engineering test: whether the likely crash forces at a location are survivable for the people involved. They shift the focus from crash numbers to injury severity, link speed with infrastructure and road user vulnerability, and help determine when speed management must be supported by physical treatments such as separation, protection, speed reduction or conflict control.

Considering the risk of death alone, international literature has determined threshold speed values for various crash types. While this provides a clear upper threshold, it fails to identify the threshold for serious injury, a key component when evaluating DSI and likely treatments.

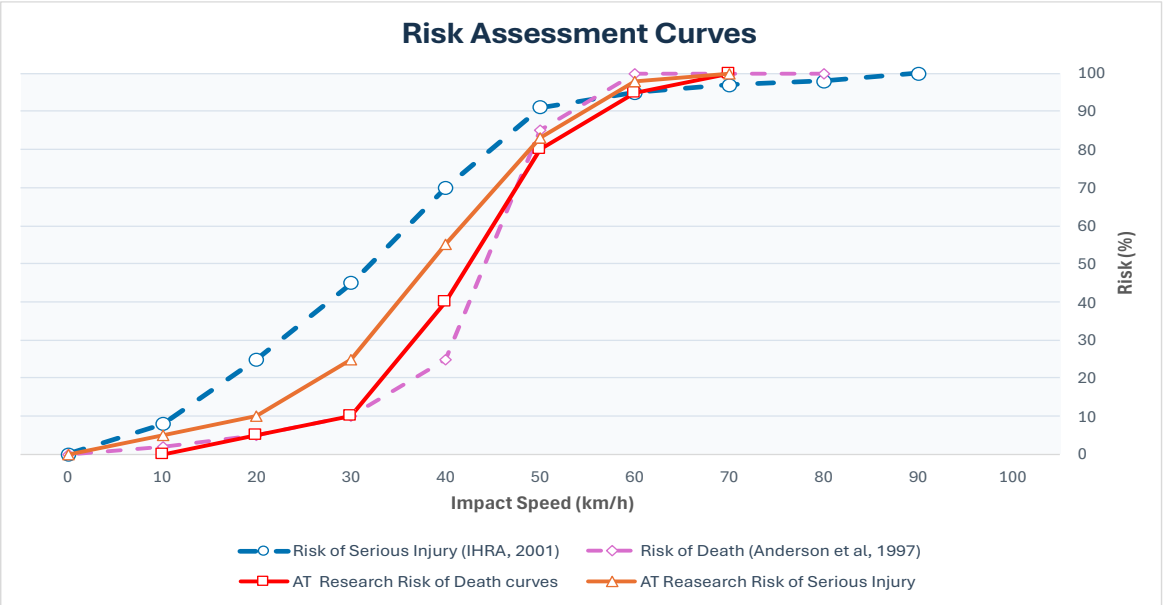


Figure 5-6: Relationship between impact speed and risk of fatal or serious injury by crash type

The constraints outlined above show why intervention selection cannot rely on a single preferred treatment or assume that the ideal Safe System response will always be immediately deliverable. They create the need for a structured pathway approach that can compare different levels of ambition, identify the trade-offs involved, and clarify how Council can continue reducing risk while moving progressively toward stronger Safe System outcomes.

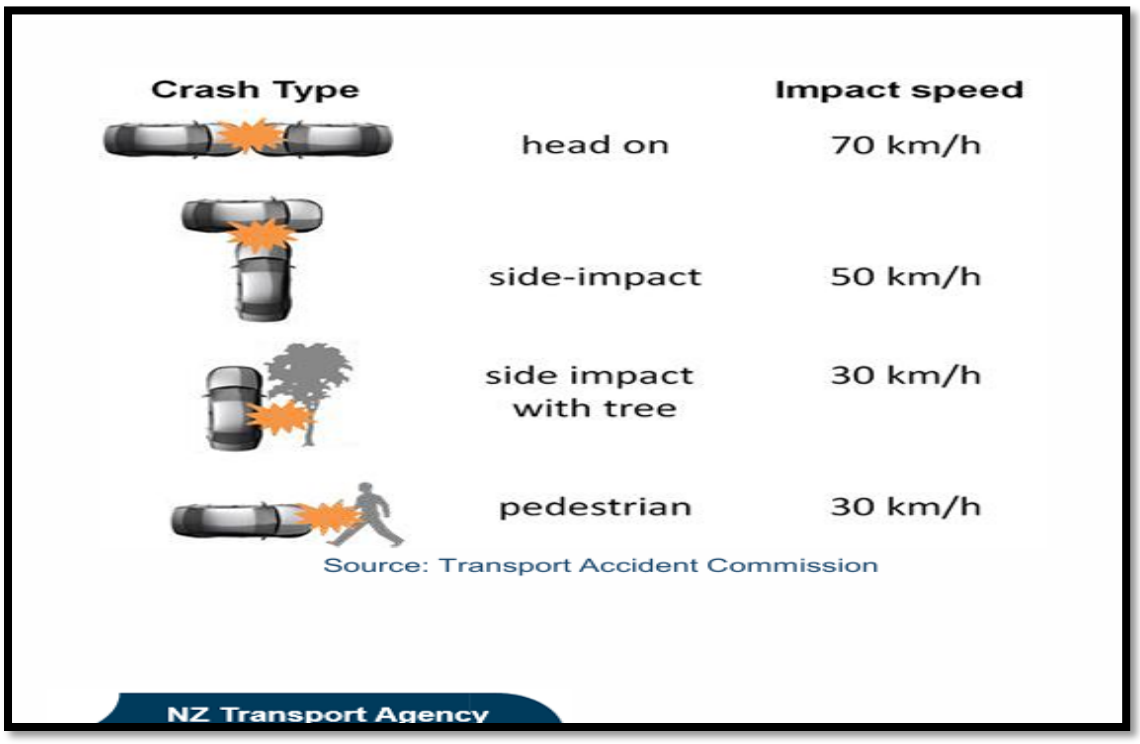


Figure 5-7: Safe System boundary conditions for survivable speeds and impact forces

This figure above illustrates the Safe System boundary conditions that define when crash forces are more likely to remain within survivable limits. It shows that different crash types have different speed thresholds, with vulnerable road users and side-impact conflicts requiring much lower speeds than better-protected vehicle occupants. For this Framework, the key implication is that treatment selection should assess whether the current speed environment and level of protection are sufficient for the likely crash type. Where they are not, stronger measures such as lower operating speeds, physical separation, safer intersection forms, protected crossings, barriers or other self-explaining design features may be required.

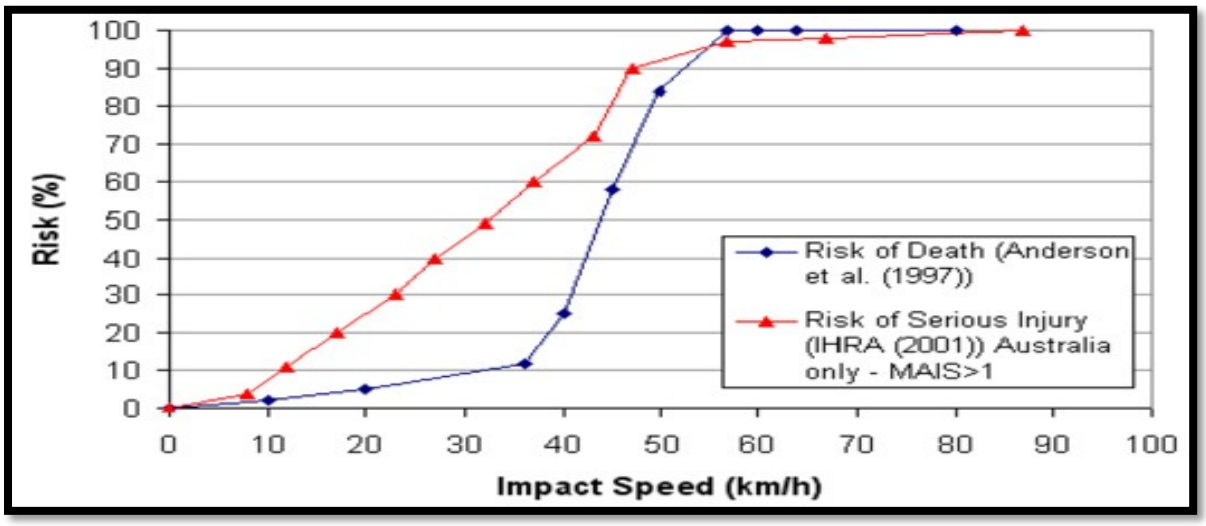


Figure 5.8: Impact Speed vs Risks (%) - Victoria Department of Transport and Planning

The graph shows that injury severity increases rapidly as impact speed rises, and that survivable speeds vary depending on the crash type and the level of protection available to the road user. This is important for this Framework because it reinforces that speed management and infrastructure cannot be considered separately. Where the likely impact speed exceeds Safe System boundary conditions, the response should not rely only on signs or compliance; it should also consider physical measures such as separation, speed-reducing design, safer intersection forms, crossing protection or roadside protection to reduce crash energy and keep people within survivable limits.

A practical Safe System boundary-condition approach should therefore consider both death and serious injury risk, in both current operating conditions and the future state. This reinforces the need for this Framework to treat speed and infrastructure as an integrated package rather than separate workstreams. Recent work by Victoria Department of Transport and Planning has been undertaken to determine appropriate speeds and impact forces under certain crash types. These are presented in the table below:

Systemic crash risk	Safe System boundary conditions (speed)[7]			
	Fatal injury		Serious injury (MAIS3+[8])	
	Impact speed	*Delta-V*[9]	*Impact speed*	*Delta-V*
Head-on (vehicle-vehicle)		70 km/h		50 km/h
Frontal impact (with non-frangible object)			50 km/h	
Side Impact (with non-frangible object)			30 km/h	
Side Impact (vehicle-vehicle)	80 km/h	40 km/h	60 km/h	30 km/h
Motorcyclist: impact with wide object	60 km/h		50 km/h	
Motorcyclist: impact with narrow object	30 km/h		30 km/h	
Vehicle collision with pedestrian or cyclist	50 km/h		20 km/h	

The detailed application of Safe System boundary conditions, including how they inform treatment selection for different crash types, road users and speed environments, is supported by Part B – Supporting Tools and Treatment Selection Guidance Compendium. Part B should be used to test whether a proposed treatment is sufficient to manage crash forces to a survivable level, or whether a stronger Safe System intervention or staged pathway is required.

The results suggest that further work is required to identify and implement suitable treatments to address these issues. With the intent to deploy additional special vehicle lanes in the near future, urgent research and solution development is required now.

6 Network Safety Assessment and Intervention Selection Process

The Network Safety Assessment and Intervention Selection Process provides the practical method for moving from evidence to treatment selection. It sets out how Council should identify safety problems, assess the level and type of risk, determine the relevant Safe System response, and select interventions that are appropriate to the road context, user exposure, crash type and delivery environment.

The process is intended to create a clear and repeatable line of sight between the safety challenge identified in the network analysis and the interventions progressed through the Road Safety Infrastructure and Speed Management Programme. It helps ensure that decisions are not based only on crash numbers or local requests, but on a structured assessment of fatal and serious injury risk, infrastructure risk, operating speed, exposure, road function, user vulnerability and treatment effectiveness.

A flow process has been developed to summarise the main steps required when undertaking network safety assessment and intervention selection. The process is shown in Figure 6-1 below:

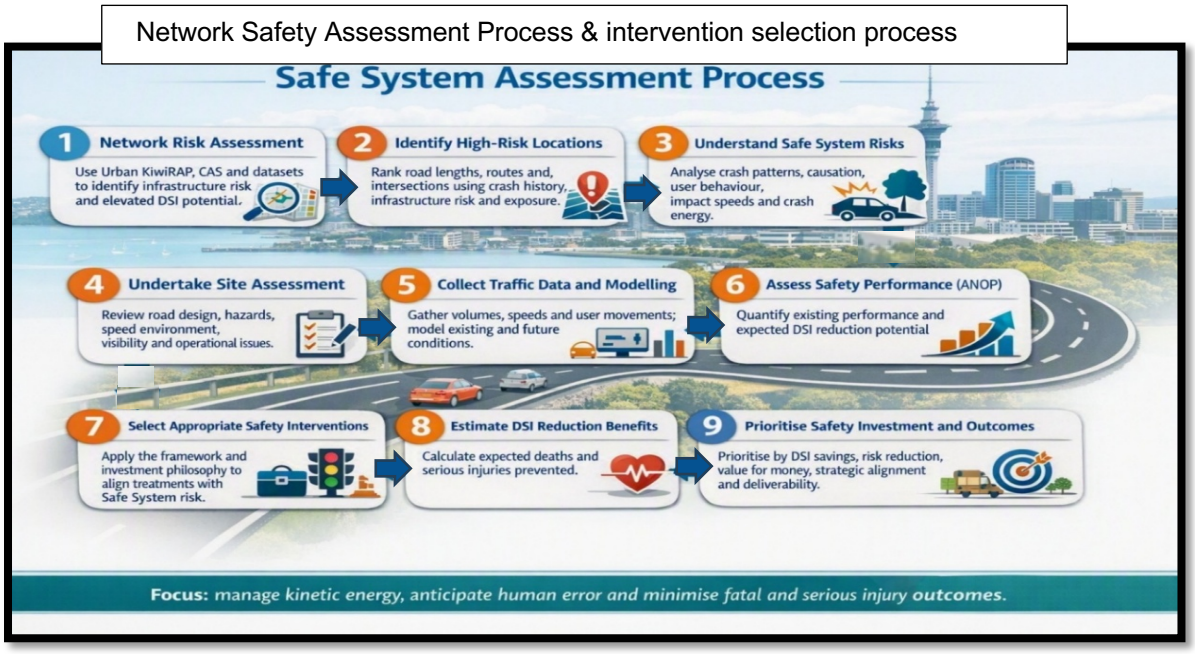


Figure 6-1: Network Safety assessment & intervention selection process

6.1 Network Risk Assessment and Identification of high risk locations

The process begins with a clear definition of the safety problem. This includes identifying where harm is occurring, which road users are affected, what crash movements are involved, whether the issue is concentrated at a specific site or spread across a corridor, and whether the road environment allows crash forces that exceed survivable limits. The assessment should use available evidence, including DSI and injury crash history, Urban KiwiRAP risk bands, collective and personal risk, infrastructure risk, exposure data, speed information, local board profiles, operational observations and community or stakeholder input.

6.2 Understand the Safe System risks

Once the safety problem is understood, the next step is to identify the relevant Safe System boundary condition. This helps determine whether the existing speed environment, crash

type and level of protection are likely to keep road users within survivable limits. Where the current environment sits outside these limits, the assessment should identify whether the risk is best managed through speed management, physical infrastructure, separation, intersection redesign, crossing protection, roadside protection, compliance support or a combination of treatments.

6.3 Undertake Site Assessment

The process should then consider the road and street context. A treatment that is appropriate on a rural high-speed corridor may not be suitable on an urban connector, main street, activity street or local road. Engineers should consider the movement and place function of the corridor, public transport and freight needs, walking and cycling demand, access requirements, school or town centre activity, operating speed, road geometry, network role and adjacent land use. This ensures that the selected intervention responds to both the safety risk and the way the road environment is used.

6.4 Treatment Selection Process

Treatment selection should identify the preferred Safe System end-state first. This is the intervention package that would most effectively remove, control or protect people from fatal and serious injury risk if there were no significant delivery constraints. In some locations this may involve transformational infrastructure, such as roundabouts, protected intersections, median or roadside barriers, separated facilities, raised platforms, formal crossings, access management or substantial speed reduction.

Where the preferred Safe System end-state cannot be delivered immediately, the process should identify a step-towards treatment package. Step-towards treatments should still deliver a measurable safety benefit, address the most important risk factors and preserve the ability to deliver the stronger end-state treatment later. They should not lock in a layout or operating condition that makes future Safe System improvement more difficult.

A residual risk assessment is required where interim, lower-cost or partial treatments are selected. The assessment should explicitly identify the risk that remains after the proposed intervention is delivered and determine whether that residual risk is acceptable, tolerable with supporting controls, or too high to justify the proposed treatment as a standalone response. Where residual risk remains material, additional controls, monitoring requirements or an escalation pathway should be identified.

6.5 Project Prioritisation

Prioritisation should consider both safety benefit and deliverability. Expected DSI reduction remains the primary driver, but value for money, urgency, feasibility, statutory requirements, local context, stakeholder considerations, construction complexity, maintenance implications and alignment with other programmes should also be considered. This supports a balanced programme that can deliver immediate safety benefits while progressing longer-term Safe System outcomes.

6.6 Monitoring and Evaluation

Monitoring and evaluation complete the process. Delivered interventions should be reviewed to determine whether they have reduced crash risk, improved operating speeds, addressed the target crash movements, improved safety for the intended road users and avoided unintended consequences. Lessons from this monitoring should feed back into future programme prioritisation, treatment selection and updates to Part B – Supporting Tools and Treatment Selection Guidance Compendium.

Throughout the process, the focus is not simply on reducing crash numbers. The assessment seeks to understand the factors that lead to deaths and serious injuries, manage crash energy to survivable levels, and design a forgiving road system that anticipates human mistakes while minimising the likelihood of fatal or serious injury outcomes.

6.7 Investment Philosophy

The updated network risk assessment method, together with the treatment philosophy, provides a comprehensive basis for developing the Road Safety Infrastructure and Speed Management Programme both for the current year and future years. The programme is typically updated annually. The investment philosophy framework enables staged, low- to medium-cost improvements across a larger number of high-risk sites, rather than focusing only on high-cost, complex transformational projects. It will also guide the broader organisation in determining appropriate safety interventions within major capital projects.

This approach aligns with the New Zealand Transport Agency (NZTA's) previous treatment philosophy but has since been updated to meet the 2024 Government Policy Statement on Land Transport expectations and Council's targets. Refer to Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A.

6.8 Current Programme Prioritisation

Programme prioritisation is informed by both safety impact and cost effectiveness. Projects are assessed against their expected reduction in deaths and serious injuries (DSI), so investment is directed toward locations and interventions with the greatest potential to reduce harm.

Value for money is assessed using DSI savings per $100 million invested, alongside deliverability and programme fit. This recognises that projects with the highest DSI reduction are not always the most efficient, and the most cost-effective projects may not deliver the greatest total harm reduction on their own. A balanced programme view is therefore needed.

Local board feedback, community views and consultation also inform prioritisation. These inputs help test local context, acceptability and delivery risks, while ensuring safety decisions remain anchored in evidence and focused on reducing deaths and serious injuries. Prioritisation should be supported by the assessment methodology and treatment evidence contained in Part B – Supporting Tools and Treatment Selection Guidance Compendium, so that programme decisions are consistently linked to risk, treatment effectiveness and deliverability.

6.9 RLTP Funding Application Overview

Increased delivery funding is required because Auckland's safety challenge cannot be addressed through strategy, prioritisation and planning alone. Deaths and serious injuries remain high, progress has plateaued, and most serious harm occurs on local roads, particularly at high-risk intersections, corridors, pedestrian environments, rural curves and locations used by vulnerable road users.

The current programme has a strong evidence base for identifying where risk is concentrated. Additional delivery budget is needed to convert that evidence into physical improvements at scale, including safer crossings, intersection improvements, corridor treatments, speed management, rural curve treatments, high-friction surfacing, safety cameras, targeted signs and road marking improvements.

A larger delivery budget would also support a more systematic and efficient programme. It would allow Auckland to treat more high-risk locations, apply low- and medium-cost treatments across more of the network, align safety works with renewals and maintenance, and embed safety improvements within wider transport programmes.

This would make every transport dollar work harder by reducing duplication, improving coordination, minimising repeated disruption and ensuring safety deficiencies are addressed when roads are already being resurfaced, renewed or upgraded.

Without sufficient delivery capacity, Auckland risks creating a growing pipeline of known safety issues without the ability to resolve them at pace. Increased funding would help respond to known and emerging risks, accelerate local board safety priorities, improve outcomes for people walking, cycling, riding motorcycles and accessing schools or public transport, and strengthen alignment between safety outcomes and wider transport investment.

Overall, the RLTP/NLTP funding case is not simply a request for more road safety funding. It is a request for the delivery capacity needed to treat the highest-risk parts of the network sooner, embed safety across everyday transport delivery and make measurable progress towards reducing deaths and serious injuries.

7 How We Select the Right Intervention

7.1 Intervention Selection Principles

This section outlines the process for selecting the right intervention. The starting point is not a preferred treatment list, but a clear definition of the safety problem to be solved, including DSI and injury crash history, infrastructure risk, exposure, operating speed, crash movement, road user type, movement and place function, network role, current control type and likely delivery constraints.

The intervention selection should then test which treatment, or package of treatments, will best reduce DSI while moving the site or corridor toward its Safe System outcome objectives. A typical sequence is detailed below.

Decision sequence

1. Define the safety problem using DSI and injury crash history, infrastructure risk, exposure, operating speed, crash movement, road user type, road function, place function and local constraints.
2. Identify the relevant Safe System boundary condition for the crash type, road user and impact speed, and determine whether the current environment allows crash forces beyond survivable levels.
3. Confirm the road or street function, including movement, place, freight, public transport, walking, cycling and access needs.
4. Identify the preferred future state outcome objective treatment package that would fully align with Safe System principles.
5. Test feasibility, cost, deliverability, community acceptance, statutory requirements and governance constraints.
6. If the future-state treatment is not immediately deliverable, identify a step-towards package that reduces DSI now while preserving a pathway to the end state.
7. Prioritise the option that provides the best combination of expected DSI reduction, value for money, deliverability and strategic fit.
8. Monitor the delivered intervention, evaluate its safety performance and feed lessons back into future programme planning and treatment selection.

7.2 Treatment hierarchy

To assist the decision-making process a Treatment hierarchy is deployed.

This generally follows:

Tier 1 interventions are the preferred response where fatal and serious injury risk is high and a Safe System outcome is feasible. They physically eliminate, separate or control high-energy conflicts, reduce operating speed at the conflict point, or provide protection when a crash occurs.

Tier 2 interventions are supporting or interim measures used where Tier 1 delivery is constrained or staged. They should reduce risk now, improve compliance, visibility, friction, warning, delineation or operational performance, and preserve the pathway to the future-state Safe System outcome.

- Support or enhance the safety performance of intersections, especially where Tier 1 solutions are not feasible or as interim measures.
- Improve compliance, visibility, and operational safety.

- Target specific risk factors or user behaviours through upgrades or operational changes.

For each priority intervention area listed below, this document explains the risk problem and the intervention logic. Detailed treatment lists are retained in Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A so that this section remains focused on decision-making rather than becoming a treatment catalogue.

7.3 Applying the Framework to Priority Intervention Areas

This section applies the intervention selection framework to the main priority risk areas. It focuses on the risk problem, Safe System logic and decision considerations for each area. Detailed Tier 1 and Tier 2 treatment lists, including intersection, corridor, speed management, pedestrian, cyclist and motorcyclist treatments, are retained in Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A as the treatment menu.

7.4 Intervention Principles by Street Context

Street context is an important part of intervention selection because the same treatment may not be appropriate in every road environment. The Framework therefore considers both the risk problem and the function of the street. This helps ensure that interventions respond to how the corridor or street is used, who is exposed to risk, and the relative importance of movement and place activity.

The two broad street contexts used in this section are urban connectors, and activity streets, main streets and local roads. For both contexts, intervention selection should identify the preferred Safe System outcome first, then assess what can be delivered now, what residual risk remains, and whether a staged pathway is required.

7.4.1 Urban Connectors

Urban connectors are movement-priority corridors, but they are not only traffic routes. They often pass through town centres, neighbourhoods or activity areas and include competing demands from buses, freight, general traffic, pedestrians, cyclists, motorcyclists, property access and side-road movements. The safety task is to maintain the corridor's movement function while reducing the high-risk conflicts that lead to deaths and serious injuries.

- **Apply movement and place thinking.** The corridor should continue to support people and goods movement, while recognising that specific parts of the route may also have important place, access or public transport functions. Treatments should respond to both the movement role of the corridor and the local safety context.
- **Reduce unsafe turning and crossing exposure.** High-risk conflicts should be managed through measures such as medians, turn controls, access management, safer side-road treatments and more formal crossing provision. This is particularly important on multi-lane, bus-priority or transit-lane corridors where turning movements, pedestrian exposure and motorcycle risk can contribute to serious harm.
- **Provide formal and protected crossings where people need them.** On movement-priority corridors, informal crossing opportunities are often not sufficient. Crossing treatments should be located at key desire lines and supported by protection, visibility and speed management appropriate to the level of demand and risk.
- **Make intersections and public transport nodes slower, simpler and more legible.** Intersections, bus stops, transfer points and station areas are often the highest-risk locations on urban connectors. Treatments should reduce approach

speeds, simplify decisions, improve visibility and provide safer access for people walking, cycling and using public transport.

- **Use staged speed and infrastructure responses where full change is not immediately deliverable.** Where a permanent speed limit change or major corridor upgrade is not currently feasible, targeted engineering measures should still be considered at intersections, crossings, bus stops and midblock conflict points to reduce operating speeds and exposure.
- **Take a systematic corridor approach.** Safety outcomes are generally stronger when interventions are delivered as coordinated corridor packages rather than isolated spot treatments. Corridor packages should combine intersection improvements, crossing upgrades, access management, targeted speed management, public transport access improvements and protection for vulnerable road users.

7.4.2 Activity Streets, Main Streets and local Roads

Activity streets, main streets and local roads have a stronger place and access function. These are the streets where people walk, cycle, drive, catch public transport, access schools, shops and services, and move between local destinations. They often include higher pedestrian activity, parking, side-road access, short trips, local deliveries and community uses. The safety task is to create slower, simpler and more forgiving street environments that support everyday access while reducing the likelihood and severity of crashes.

7.5 Intersections

Intersections are among the most hazardous parts of the road network because they concentrate turning, crossing and through movements in a small area. The key Safe System task is to reduce the likelihood and severity of high-energy side-impact, turning, pedestrian, cyclist and motorcyclist crashes. Intervention selection should therefore start by identifying the dominant conflict type, user exposure, operating speed, control type and place function, then selecting the most effective package to reduce conflict speed, simplify movements and protect vulnerable road users.

Key principle:

Intersection safety must be planned around conflict elimination, conflict reduction, and the control of impact speeds to Safe System survivable thresholds. Intersection forms or layouts that allow high-energy manoeuvres, complex decision environments, or uncontrolled turning movements cannot guarantee Safe System outcomes.

Safe System outcomes depend on **fundamentally changing the form and function of intersections** so that human errors do not result in death or serious injury. **Permanent, self-explaining and self-enforcing infrastructure treatments—such as roundabouts, simplified layouts, raised platforms, protected turn phasing, or movement restrictions—are preferred.**

Where these treatments are constrained by footprint, cost, network function, or operational requirements, a **layered package of supporting measures**—including visibility improvements, high-friction surfacing, dynamic speed management, signal optimisation, and enforcement—must be applied to achieve the closest practicable Safe System outcome.

Intervention logic: Preferred end-state treatments should physically control or remove high-risk conflicts, reduce speeds at conflict points, and provide safe crossing opportunities for

pedestrians and cyclists. Where this is not immediately deliverable, step-towards treatments should improve compliance, visibility, approach speed and conflict management while preserving a pathway to the end state. The detailed intersection treatment menu is provided in Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A.

7.6 Corridors

Corridors carry a high share of serious harm because they combine movement function, speed, access, roadside hazards and varying levels of exposure. Urban corridors often facilitate movement of pedestrian and cyclist and have large numbers of turning conflicts at accessways.

In contrast, rural corridors are more strongly associated with run-off-road, head-on, loss-of-control and high-speed intersection crashes.

Key principle:

Both urban and rural corridor safety must be planned around Safe System design principles that limit crash forces to survivable levels. Infrastructure that does not actively manage conflict exposure, roadside hazards, or separation of high-energy movements cannot guarantee Safe System outcomes.

Safe System outcomes depend on **designing corridors that inherently reduce crash likelihood and injury severity**—not only through speed but through the physical form and operation of the corridor. **Permanent, self-explaining, and self-enforcing infrastructure treatments are preferred.** Where these are constrained by space, cost, or operational requirements, a **layered package of supporting measures**—including access management, geometric upgrades, delineation, and roadside protection—must be applied to achieve the closest practicable Safe System outcome.

Intervention logic: Corridor intervention selection should consider whether the main risk is exposure, speed, roadside severity, conflict density, vulnerable road user protection or route consistency. End-state treatments should manage speed and separation at a corridor level, while step-towards treatments should address the highest-risk sections first and avoid locking in designs that make future Safe System upgrades harder. The detailed corridor treatment menu is provided in Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A.

7.7 Speed management

Speed management is a core Safe System intervention because impact speed determines whether the crash forces are survivable. Speed should therefore be considered with every infrastructure decision, not as a separate workstream. The appropriate intervention depends on whether the safety problem requires a regulatory speed change, physical speed reduction, self-explaining design, enforcement support, or a combination of these measures.

Key principle:

Both intersection and corridor safety must be planned around impact speed boundary conditions. Treatments that do not control operating speed at conflict points cannot guarantee Safe System outcomes

Safe System outcomes depend on holding operating speeds to survivable levels. Permanent, self-enforcing measures are preferred; where these are constrained, a layered package of enforcement, dynamic speed management, and supportive design treatments must be applied to achieve the closest practicable Safe System outcome.

Safe System boundaries show that speed limits alone aren't enough for safety. Combining speed management with targeted infrastructure improvements, chosen based on crash risk and user vulnerability, is the most effective way to reduce fatalities and serious injuries.

Intervention logic: End-state speed management should achieve speeds that are consistent with the road function, crash type and Safe System boundary conditions. Where self-enforcing treatments are not immediately feasible, step-towards measures should improve compliance and progressively move the location toward survivable operating speeds. The detailed speed management treatment menu is provided in Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A.

7.8 Pedestrians

Pedestrian safety depends on matching crossing provision, operating speed and walking demand to the function of the street. Pedestrian DSI often occurs where the system permits impact speeds resulting in crash forces beyond human tolerance, or where crossing opportunities do not reflect actual desire lines, land use, public transport access, school travel or centre activity.

Key Principle:
Pedestrian crossing provision must be planned as part of corridor design, not as isolated treatments.
Decisions on crossing frequency, type, and priority must explicitly consider:
Pedestrian demand and vulnerability; Pedestrian Level of Service outcomes, and
The movement hierarchy and function of the corridor.

Where conflicts arise, the designer must seek design solutions that rebalance corridor operation rather than accepting unsafe pedestrian delay or exposure.

Tier 1 interventions are to be prioritised and protected through project development, with Tier 2 used to manage risk where delivery is staged or constrained.

Intervention logic: Future-state pedestrian treatments should provide safe, legible and accessible crossing opportunities at locations where people need to cross, with impact speeds managed to survivable levels. Step-towards treatments should address visibility, crossing distance, demand, lighting and speed compliance while preserving a pathway to raised, signalised or otherwise Safe System-aligned facilities. The detailed pedestrian treatment menu is provided in Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A.

7.9 Cyclists and Motorcyclists

Cyclist and motorcyclist safety should be assessed by context. In urban areas, the primary issue is exposure to frequent intersection conflicts, including turning, crossing and lane-

changing movements. In rural areas, motorcyclist risk is dominated by loss-of-control and run-off-road crashes on curves, downhill sections and higher-speed corridors, with a secondary risk at rural intersections.

Intervention logic: End-state treatments should reduce conflict exposure, control operating speed, improve visibility and provide protection where crashes still occur. Step-towards treatments should focus on the highest-risk conflict points, curve environments, surface conditions and visibility issues while preserving a pathway to stronger Safe System-aligned infrastructure. The detailed cyclist and motorcyclist treatment menus are provided in Part B – Supporting Tools and Treatment Selection Guidance Compendium, Appendix A.

Urban cyclists and motorcyclists — intersection focused Safe System interventions

Risk context and design imperative

In urban environments with a strong Place function, cyclists and motorcyclists are exposed to frequent and complex intersection conflicts, particularly:

- Turning and crossing movements at Give Way and Stop-controlled intersections, and
- Right-turn and lane-change conflicts at signalised intersections on multi-lane corridors.

Safe System design recognises that these crashes occur not solely due to user behaviour, but because the intersection environment permits high-energy conflicts and creates visibility and decision-making pressures. For urban cyclists and motorcyclists, effective safety treatment must therefore reduce conflict exposure, improve mutual visibility, and control approach and turning speeds.

Key principle:

For urban cyclists and motorcyclists, Safe System outcomes at intersections depend on reducing conflict exposure, improving visibility, and controlling speeds by design. Where redesign is constrained, ITS warning systems, dynamic speed management, and targeted markings are critical to reduce turning and crossing collision risk and prevent everyday human errors from resulting in death or serious injury.

Rural cyclists and motorcyclist – Corridor focused Safe System Interventions -

Risk context and design imperative. On rural corridors, motorcyclist deaths and serious injuries are primarily driven by loss-of-control crashes, particularly on curves, downhill grades, and higher-speed sections. These crashes frequently result in run-off-road impacts with unforgiving roadsides. A secondary—but still significant—risk occurs at rural intersections, where priority-controlled crossing and turning movements expose motorcyclists to high-energy impacts due to speed and limited conspicuity.

Safe System design requires that rural corridors and intersections be designed to anticipate rider error, limit crash energy, and reduce injury severity when loss of control occurs, rather than relying on rider skill or compliance alone.

Key principle:

For rural motorcyclists, Safe System outcomes depend on road geometry, surface condition, and roadside design that tolerate errors at speed. Loss-of-control risk must be treated as a system issue, with rural intersections addressed through speed management and simplified layouts. Education and enforcement support the system but cannot replace Safe System design.

7.10 Rural Road Safety Intervention

For rural areas, the overall intervention direction remains largely unchanged: the focus is on higher-speed corridors where crash outcomes are severe and roadside environments are less forgiving. The key shift is a stronger emphasis on undivided high-speed rural roads where loss-of-control, run-off-road and head-on crashes create the greatest fatal and serious injury risk.

Rural interventions should therefore prioritise median and roadside barriers, curve treatments, high-friction surfacing, audio-tactile markings, improved delineation, targeted speed management and localised shoulder widening where it supports recovery, barrier installation, motorcycle safety or safer road edge conditions.

Speed management should be applied as part of the rural treatment package, particularly where operating speeds are not consistent with Safe System boundary conditions, road geometry, roadside risk or the level of protection provided. This may include targeted speed limit changes, self-explaining road design, gateway treatments and enforcement support to help manage crash energy on high-risk rural corridors.

This approach recognises that the main rural task is to manage crash energy and prevent high-severity outcomes when vehicles or motorcyclists leave their lane or the roadway. Where continuous corridor upgrades are not immediately feasible, the programme should target the highest-risk curves, sections with repeated loss-of-control crashes, and undivided high-speed lengths where separation or protection would deliver the greatest safety benefit.

8 Constraints, Risks and Future Pathways

During this period of transition, it is essential to recognise that there are constraints, and risks that must be considered when moving towards the desired future state.

These include:

8.1 Strategic Constraints and Risks

- Factors that currently limit the ability to fully implement Safe System outcomes.
- Changes to the regulatory environment have reduced flexibility in some speed management and infrastructure decisions.
- Funding availability does not currently match the scale of investment required to eliminate fatal and serious injury risk.
- Some high-risk routes have competing transport, freight, public transport, and place-making objectives – limiting the use of safe system features that could achieve safe system outcomes for people travelling outside vehicles
- Safety improvements must be balanced alongside network efficiency, resilience, and growth demands. (Special Vehicle Lane [SVL] issues, and the introduction of shared path)
- The lack of ability to expand and delivery safety camera programme within Auckland as that is now the responsibility of NZTA. This includes red light cameras etc.
- Pressure on Local Boards highlights the needs to balance the user against efficiency and growth demands, yet retain a consistent level of safety intervention

8.2 Delivery Constraints and Risk Controls

This section explains the key delivery constraints that affect Safe System outcomes in the current operating environment. These constraints do not remove the need to reduce deaths and serious injuries, but they do affect the range, timing and scale of interventions that can be delivered.

8.3 Speed Management Rule (2024)

Speed management remains essential to the Safe System, but posted limits alone do not deliver safe operating speeds. Effective speed management requires a coordinated approach that includes appropriate infrastructure, credible limits, enforcement, and consistent processes.

The 2022 Speed Rule enabled network-wide Speed Management Plans that aligned operating speeds with road function and user vulnerability, contributing to measurable reductions in deaths and serious injuries (DSI), especially where supported by infrastructure.

The 2024 Speed Limit Setting Rule's stronger focus on efficiency, cost–benefit tests, and procedural compliance has reduced the flexibility road controlling authorities once had to set or retain lower limits in areas requiring Safe System alignment. Mandatory reversals of some post-2020 limits and tighter certification requirements constrain the ability to maintain consistent safe speeds. Where limits increase without corresponding physical improvements, road users are exposed to higher impact forces, increasing residual DSI risk and eroding previous safety gains.

Council internal analysis indicates that a significant proportion of 50 km/h and 100 km/h roads are not aligned with safe and appropriate speed settings.

In this regulatory environment, safety cameras become a critical risk-management tool. They provide a scalable, evidence-based way to influence operating speeds on high-risk routes.

Although cameras cannot substitute for Safe System-aligned road design or speed limits, they play an important enabling role where infrastructure upgrades will take time and speed-setting tools are constrained. This supports the Safety Camera Programme as a key component of the broader Safety Network Programme, helping maintain DSI reductions while longer-term engineering solutions are delivered.

Speed enforcement helps manage speed-related risk by improving compliance and reducing excessive or inappropriate speeds at targeted locations. This includes average speed cameras, static cameras, and combined red-light/speed cameras.

However, from a Safe System perspective, enforcement does not directly control kinetic energy or exposure, nor does it ensure consistent speed management across time, vehicle types, or network conditions. Behavioural effects are strongest near enforcement locations and weaken outside those areas or when drivers do not perceive enforcement.

Relying on enforcement alone to achieve Safe System-aligned speeds would require a very high density of cameras to approximate continuous deterrence. This scale presents significant practical and financial challenges and still cannot replicate the crash-injury mitigation benefits of physical treatments such as raised platforms, lane narrowing, or alignment changes.

Therefore, while enforcement is an effective risk-reduction tool, it functions mainly as a supplementary or interim control. Achieving Safe System outcomes—particularly preventing death and serious injury—ultimately depends on infrastructure and system design that inherently limit speeds to survivable levels, regardless of driver behaviour.

8.4 Expansion of the Automated Speed Enforcement Programme

Under current GPS direction and government policy, RCAs are limited in how they deliver speed management to reduce DSIs through speed limit setting and infrastructure improvements. This means that safety cameras can’t be used to their full potential to reduce mean speeds as a supporting safe system intervention. Council understands that to achieve road safety outcomes, safety cameras must be used through a whole-of-system approach (for both speeding and red-light running). DSI reduction will not be achieved through compliance alone.

NZTA’s new nationwide Safety Camera System, which is required to process infringements and manage evidence, will not be operational until the second half of 2026. Until this system is live, no enforcement can take place at the existing sites. This represents a substantial issue because it delays activation of one of the only high-impact interventions available for addressing the severe and persistent risk of red-light running and inappropriate speed at Auckland’s most dangerous intersections.

The GPS and NLTP 2024–2027 currently do not allocate funding for NZTA to expand the red-light camera network nationally, should this occur, Council may face a prolonged period during which no additional cameras can be delivered, despite the well-documented harm occurring at priority intersections. This would directly undermine Council’s ability to achieve its safety targets and widen the gap between identified high-risk locations and the interventions required to address them.

The ability to expand the camera programme also depends on specialised technical expertise. The same skills required for camera expansion—design, integration with backend systems, operational policy alignment, and cross-agency governance—are currently mobilised as part of NZTA’s national transition programme. Whie Council is co-funding this transition, meaning these capabilities, structures, and relationships are already established and operating effectively, but we are yet to receive confirmation that Council can expand the red light camera programme. Once the national transition is completed, these teams and suppliers will demobilise, and remobilising them later would increase costs, extend timelines, and introduce higher programme risks. As such, it is strategically prudent for Council to collaborate with NZTA during this transition period to progress additional installations while

the necessary capability remains active and available. Council's red-light camera programme remains a key intervention for high-risk intersections given the other safety features are unlikely to be suitable for high volume high percentage of heavies and commercial vehicles, but future expansion is uncertain because it may not be a priority within NZTA's national safety camera programme.

Safety cameras are an effective deterrent and compliance tool, but they are not a complete Safe System measure because they do not physically manage crash energy or reduce impact forces to survivable levels.

8.5 Change to Raised Safety Platform Practices

Raised devices (2024 PN-02) can still be used but now must adhere to stricter design standards to ensure consistent safe speeds and safer crossings or intersections. The program response is to invest more heavily in core Safe System infrastructure and common safety interventions—such as roundabouts, median or side barriers, entry raised safety platforms, and Intersection Speed Zones / Rural Intersection Active Warning Signs — to maintain appropriate operating speeds and mitigate injury risks when regulatory tools are limited or processes become more complex. NZTA's High Risk Intersection Guide and the Standard Safety Intervention Toolkit should be used to identify high-risk intersections and measure DSI benefits. However, reduced budgets, waning public support for costly projects, and a lack of dedicated NZTA funding for the national safety camera rollout present significant challenges to achieving the safety outcomes Council has targeted. PN-02 Ed 2 Use of raised devices on the AT Network published.pdf.

8.6 Delivery Scenarios

8.6.1 Scenario 1: Full Safe System End State

(Vision Zero – full steam ahead)

This scenario adopts a Safe System approach by defining the desired end state for the network, where impact speeds are survivable (≤30 km/h for vulnerable users, physical separation for head-on crashes, and intersection forms that cap side-impact speeds at ≈30 km/h). A gap analysis is undertaken to identify where the network does not meet these standards, and a programme of primary Safe System interventions is delivered at scale, including roundabouts, raised safety platforms (RSPs) on arterials, median and side barriers, and protected crossings. Speed limits are set to safe and appropriate levels consistent with the 2022 Speed Management Framework, supported by legislation. Engagement and education to build public understanding and acceptance of speed changes and infrastructure upgrades are required. Expected DSI reduction: High (≈40–50%).

8.6.2 Scenario 2: Staged Safe System Progression

Standard Infrastructure Programme with 2022 Speed Management Framework with current RSP practices (Practice Note 2: 2024)

This scenario also applies safe and appropriate speed limits aligned with the 2022 Speed Management Framework, using Speed Management Plans as part of a suite of safety interventions. Infrastructure treatments include standard improvements and some RSPs; however, Practice Note 02 (2024) introduces constraints that restrict RSPs to low-volume roads without bus routes, limiting application on key corridors. As a result, this scenario relies more on supporting measures such as safety cameras and compliance tools to manage speed-related risks where physical interventions cannot be implemented. In addition to the engagement and education, promoting compliance and influencing behaviour, particularly where infrastructure options are limited. Expected DSI reduction: Moderate (≈20–30%). However, this is not an option unless there is a change legislation for speed management.

8.6.3 Scenario 3: Current Policy and Future Delivery Scenarios

Standard Infrastructure Programme with 2024 Speed Management Framework, with current RSP practices (Practice Note 2: 2024)

This scenario reflects the current operating environment under the Land Transport Rule: Setting of Speed Limits 2024, which changes how RCAs propose, consult on, certify, and sometimes reverse speed limits, and introduces requirements such as variable school speed zones. Achieving Safe System speeds is challenging because lowering speed limits often results in a low benefit-cost ratio due to travel time impacts outweighing safety benefits. Practice Note 02 (2024) further restricts RSPs to low-volume roads without bus routes, removing a key engineering tool for speed reduction.

Given these constraints, Council must rely heavily on non-infrastructure measures—such as safety cameras, driver feedback signs, and lane narrowing—to support compliance and mitigate speed-related crash risks. There will be heavier reliance on education, campaigns, and partnerships to influence driver behaviour and achieve compliance in the absence of widespread physical interventions. Expected DSI reduction: Low to Moderate (≈10–20%).

Table 1: Comparison of Scenarios

Aspects	**Scenario 1: Safe System End State**	**Scenario 2:** Staged Safe System Progression: **Land Transport Rule: Setting of Speed Limits 2022 + PN 2 (2024) RSP application**	**Scenario 3: Current** & future Delivery **– Land Transport Rule: Setting of Speed Limit 2024 + PN 2 (2024) RSP application**
Speed Management Approach	Set safe and appropriate speed limits consistent with the 2022 Speed Management Framework; can apply on arterial routes.	Set safe and appropriate speed limits consistent with the **previous** Land Transport Rule 2022 framework; can apply on arterial routes.	Speed limits managed under Land Transport Rule 2024; includes new processes for consultation, certification, and variable school zones.
Raised Safety Platforms (RSP)	Permitted at high-risk locations, including arterials, to achieve Safe System speeds.	Restricted by Practice Note 02 (2024) to low-volume roads without bus routes; limits application on key corridors and bus route	Restricted by Practice Note 02 (2024) to low-volume roads without bus routes; limits application on key corridors and bus route
Infrastructure Treatments	Roundabouts, RSP, median and side barriers, protected crossings delivered at scale to close Safe System gaps.	Standard treatments combined with speed management; limited RSP due to updated guidance.	Standard treatments only; constrained by regulatory and cost-benefit limitations.
Key Constraints	High cost and complexity; requires strong legislative and community support.	Practice Note 02 limits RSP; design complexity; increased reliance on non-infrastructure measures and speed enforcement	Low benefit-cost ratio for speed reductions hence unlikely to justify; administrative burden; uncertainty in speed

Aspects	**Scenario 1: Safe System End State**	**Scenario 2:** Staged Safe System Progression: **Land Transport Rule: Setting of Speed Limits 2022 + PN 2 (2024) RSP application**	**Scenario 3: Current** & future Delivery **– Land Transport Rule: Setting of Speed Limit 2024 + PN 2 (2024) RSP application**
		measures; RSP restrictions	limit changes. RSP restrictions
Reliance on Non-Infrastructure Measures	Low – focus on physical interventions to achieve Safe System outcomes. Low level of enforcement will be required.	Moderate – safety cameras and supporting measures needed where RSP cannot be installed.	High – safety cameras, driver feedback signs, lane narrowing and other measures critical to manage speed-related risks.
Expected DSI Reduction Impact	High– Greatest potential to achieve Safe System outcomes and meet 2030 targets.	Moderate– Can deliver meaningful reductions but limited by RSP constraints and reliance on enforcement.	Low to Moderate - Limited physical interventions; relies heavily on compliance measures, making reductions less certain.

9 Monitoring and Evaluation

Monitoring and evaluation are critical to understanding whether the Road Safety Infrastructure and Speed Management Programme is delivering the intended safety outcomes. Evaluation should test whether interventions are reducing deaths and serious injuries, lowering crash severity, improving operating speeds, addressing the targeted crash movements and supporting safer outcomes for the road users they are designed to protect.

A strong monitoring system also helps identify unintended or unwanted consequences, such as crash displacement, new conflict points, poor compliance, maintenance issues, accessibility impacts, adverse effects on vulnerable road users, or operational effects on public transport, freight and general traffic. Understanding these outcomes is essential so treatments can be adjusted, supported or redesigned where needed.

The results should inform future programme development, funding decisions, prioritisation, treatment selection and updates to Part B – Supporting Tools and Treatment Selection Guidance Compendium. This creates a continuous learning cycle where evidence from delivered projects strengthens future interventions.

Monitoring and evaluation also support transparent governance, local board reporting and public accountability by showing what has been delivered, what has changed on the network, what safety benefits are emerging, and where further action is required.

10 Future Pathway

This review identifies future pathways to strengthen Auckland's road safety system and support progress toward a Safe System future state. These initiatives focus on clearer governance, more systematic network risk identification, and better integration of infrastructure, speed management, enforcement, education and operations so future investment decisions are evidence-led, accountable and aligned with DSI reduction.

- Establish a Road Safety Management System to provide a clear, repeatable approach to safety governance, assurance and decision-making.
- Develop a Network Safety Programme to identify, prioritise and manage network-wide safety risk.
- Increase the use of predictive risk assessment and proactive investment planning to address emerging risks before serious harm occurs.
- Strengthen integration across infrastructure, speed management, enforcement, education and operational responses, using monitoring results and new evidence to update Part B – Supporting Tools and Treatment Selection Guidance Compendium over time.

11 References

Auckland Transport. (2020). *Vision Zero – So far 2020* [PDF]. https://at.govt.nz/media/1983262/vision-zero-so-far-2020.pdf

Auckland Transport. (n.d.). *Vision Zero for Tāmaki Makaurau – Road Safety Strategy* [PDF]. https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

Auckland Transport. (2025–2027). *Road Safety Action Plan* [Internal document: AT001145 – Road safety plan.pdf].

Auckland Transport. (2024). *Urban KiwiRAP 2024 – Network Risk Assessment* [Internal report].

Auckland Transport. (2024). *AT Practice Note 02: Raised Safety Platforms (RSP) Design Guidance*.

Auckland Transport. (n.d.). *Road Safety Programme Business Case (PBC)*.

Auckland Transport. (n.d.). *Road Safety Investment Refresh – Intersections (Workshop 2)* [PowerPoint].
SharePoint link: https://aucklandtransport-my.sharepoint.com/

Austroads. (2024). *Guide to Road Safety: Part 7 (AGRS07-24)*. https://austroads.gov.au/publications/road-safety/agrs07

Austroads. (2024). *APR74325: Charting a Pathway to Eliminating Road Death and Serious Injury*.

New Zealand Government. (2024). *Land Transport Rule: Setting of Speed Limits 2024*.

New Zealand Transport Agency (Waka Kotahi). (2022). *Speed Management Guide and 2022 Speed Rule*.

New Zealand Transport Agency (Waka Kotahi). (n.d.). *Crash Analysis System (CAS)* [Data system].

Auckland Transport. (n.d.). *Pedestrian Level of Service (ANOP) Guidance* [Internal technical guidance].

Austroads. (2009). *Guide to asset management: Part 5F – Skid resistance* (AGAM05F-09). Austroads Ltd.
https://austroads.gov.au/publications/asset-management/agam05f-09

Austroads. (2009). *Guide to the management of road surface skid resistance*. Austroads Ltd.

Austroads. (2016). *Safe System Assessment Framework* (AP-R509-16). Austroads Ltd. https://austroads.gov.au/publications/road-safety/ap-r509-16

Austroads. (2017). *Verification of Austroads road design criteria based on objective safety evidence* (AP-T230-17). Austroads Ltd. https://austroads.gov.au/publications/road-design/ap-t230-17

Austroads. (2021). *Guide to road design: Part 3 – Geometric design* (AGRD03). Austroads Ltd.

Corbett-Davies, J., Turner, S., Koorey, G., Tate, F., & Abley, S. (2025). *The safety risks of out-of-context curves: Three decades of rural curve research in New Zealand*. ViaStrada Ltd. https://viastrada.nz/sites/default/files/2026-01/The%20Safety%20Risks%20of%20Out-of-Context%20Curves_revised.pdf

International Road Assessment Programme. (n.d.). *iRAP road safety toolkit*. https://irap.org/

KiwiRAP. (n.d.). *Measures of road risk: Collective risk and personal risk*. New Zealand Automobile Association. https://www.kiwirap.org.nz/measures_risk.html

KiwiRAP. (2018). *Highway safety ratings: Tracking the safety performance of New Zealand's state highway network*.
https://www.kiwirap.org.nz/assets/pdf/KiwiRAP%202018%20compressed.pdf

Ministry of Transport. (2020). *Road to Zero: Aotearoa New Zealand road safety strategy 2020–2030*. New Zealand Government. https://www.transport.govt.nz/area-of-interest/road-safety/road-to-zero/

Safe Roads Alliance. (2020). *Delivering safer high-risk rural roads across New Zealand*. Beca Ltd. https://www.beca.com/what-we-do/projects/transport-and-infrastructure/safe-roads-alliance

VicRoads. (2018). *Technical note TN-110: Measuring and interpretation of skid resistance using a SCRIM machine*. Victorian Government.

Waka Kotahi NZ Transport Agency. (2011). *High-risk rural roads guide*. https://www.nzta.govt.nz/resources/high-risk-rural-roads-guide/

World Road Association (PIARC). (n.d.). Road safety manuals and countermeasure guidance. https://www.piarc.org/

(Part B)

Intervention Selection Tools and Treatment Guidance Compendium

Table of Contents

1. Introduction

1.1 What is Part B?

Part B is the technical companion to **Part A – Main Framework Document** of the Safety Infrastructure Framework. While Part A sets the strategic direction, governance context, Safe System philosophy and intervention selection principles, Part B provides the practical tools and treatment guidance needed to apply the framework in programme and project decisions.

It brings together the key technical material required to identify safety problems, assess network risk, compare treatment options, consider speed management, and apply the detailed treatment guidance included in the appendices.

Part B is intended as a working technical reference as part of the overall framework. It helps users explain where intervention is required, what response is most appropriate, how options should be assessed, and how step-towards treatments can be used where a full Safe System outcome is not immediately deliverable.

1.2 Why is Part B needed?

Part B is needed because programme teams require a consistent way to translate the framework in Part A into practical decisions. Auckland's road safety risks vary by road environment, user group, crash movement, speed, exposure, infrastructure condition and local context, so treatment selection must be guided by evidence rather than applied generically.

The compendium provides the practical layer for this work by linking risk assessment, safety planning, investment guidance, treatment suitability and intervention menus. This supports interventions that are targeted to the identified safety problem, proportionate to the level of risk, and expected to reduce the likelihood or severity of deaths and serious injuries.

It also supports decision-making where the preferred Safe System treatment is constrained by cost, space, statutory requirements, governance settings, community considerations, operational needs or timing. In these cases, Part B helps identify step-towards treatments that reduce risk now while maintaining a pathway to stronger long-term outcomes.

This improves the transparency and defensibility of programme decisions by giving Auckland Council, local boards, project teams and technical reviewers a common reference for how evidence, network risk, treatment effectiveness, value for money, deliverability and residual risk have been considered.

1.3 How to use Part B?

Use Part B after confirming the principles, governance context and intervention selection logic in Part A. It should then guide users through the relevant risk tools, safety problem definition, treatment family selection, deliverability and value-for-money considerations, and the documentation of residual risk or staged pathways toward the preferred Safe System outcome.

- Use Section 2 to understand the systems approach, Safety Management System and Network Safety Programme logic.
- Use Section 3 to apply risk assessment tools and identify where intervention is required.

- Use Section 4 to guide intervention investment, treatment selection and prioritisation.
- Use the appendices as treatment menus and screening guidance, not as automatic design standards.

2. The thinking: A systemic approach

Improving safety across Auckland's transport network requires an integrated and disciplined response, rather than isolated or reactive interventions. Safety issues are influenced by the road environment, operating speeds, user behaviour, enforcement, land use, operations and maintenance. Considering these factors together helps ensure interventions address the underlying safety problem and are supported by complementary actions where needed.

2.1 Safety Management System

The Safety Management System provides the organisational framework for managing road safety risk across Auckland Council's network responsibilities. It defines how risks are identified, assessed, governed, prioritised, monitored and reviewed, and provides the structure for applying the wider framework through governance, risk assessment, infrastructure safety management, project prioritisation, asset management, speed management, monitoring, training and continuous improvement.

The Safety Management System should be read alongside the future Network Safety Programme. The system explains how safety risk is managed, while the plan will identify where the key risks are and what programme responses are required. Together, they provide the management structure and evidence base for investment and delivery decisions.

Part A introduces the Safety Management System within the wider governance framework. This section shows how it works in practice, with the infographic and table below summarising how the system sets direction, identifies risk, selects interventions, monitors performance and supports continuous improvements.

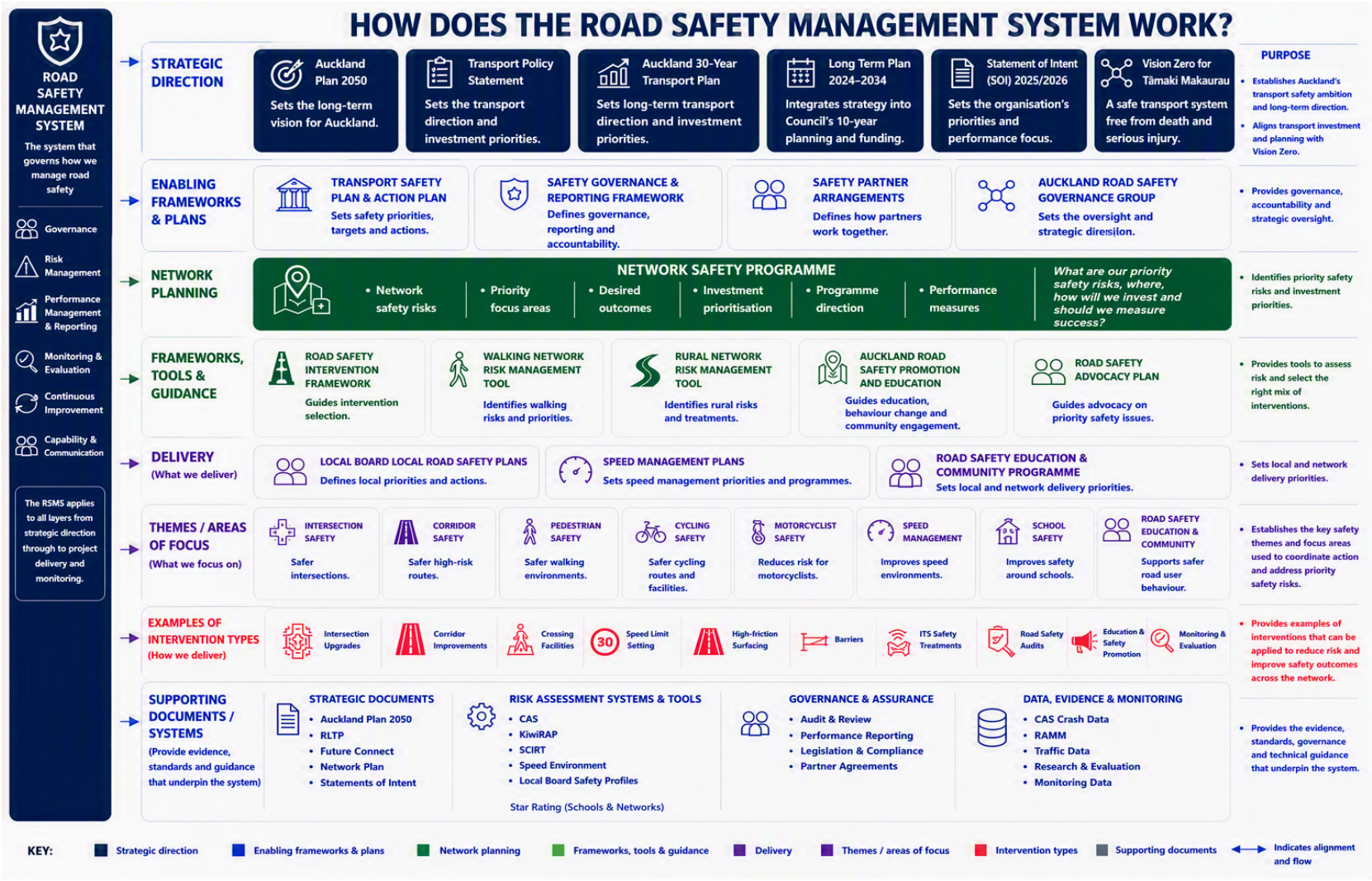


Figure 1: Road safety management system overview.

The following table summarises each component of the road safety management system and explains how it contributes to identifying, managing and reducing road safety risk.

Table 1: Core components of a road safety management system

Safety Management Area	Purpose	Tools / Processes Used	How This Helps Address Safety Issues
Safety Governance	Establish leadership, accountability and decision-making.	Governance framework, safety committees, reporting processes.	Ensures safety risks are identified, prioritised and managed consistently across the organisation.
Safety Policy and Objectives	Define safety vision and performance targets.	Strategic plans, safety policies, KPIs.	Provides clear direction and measurable outcomes for improving safety.
Network Risk Assessment	Identify and prioritise high-risk locations and routes.	Crash analysis, KiwiRAP, Road Assessment Programmes, risk maps.	Focuses resources on locations with the highest potential for preventing deaths and serious injuries.
Infrastructure Safety Management	Manage risks associated with road design and operation.	Road Safety Audits, Safe System Assessments, design reviews.	Identifies and mitigates infrastructure-related risks before crashes occur.
Serious Crash Review Process	Understand contributing factors to serious crashes.	Serious crash investigations, multidisciplinary reviews.	Helps identify systemic issues and informs future safety improvements.
Safety Project Prioritisation	Prioritise investment based on risk and benefit.	Business cases, prioritisation frameworks, benefit-cost assessments.	Directs funding towards interventions that deliver the greatest safety benefit.
Asset Management and Maintenance	Ensure infrastructure remains safe over time.	Inspections, defect management systems, maintenance programmes.	Addresses safety hazards such as poor road surfaces, signage, lighting and visibility issues.
Speed Management	Manage travel speeds to safer levels.	Speed management plans, speed reviews, speed limit changes.	Reduces crash severity and improves survivability in the event of a crash.
Vulnerable Road User Safety	Improve safety for pedestrians, cyclists and motorcyclists.	Safe System assessments, route reviews, user audits.	Addresses risks experienced by road users most vulnerable to serious injury.
Development and Change Management	Assess safety impacts of network changes and development.	Traffic impact assessments, safety reviews, design approvals.	Prevents new developments and projects from introducing additional safety risks.

Safety Management Area	Purpose	Tools / Processes Used	How This Helps Address Safety Issues
Monitoring and Performance Reporting	Track trends and evaluate outcomes.	Safety KPIs, crash monitoring, programme evaluation.	Supports continuous improvement and early identification of emerging risks.
Training and Competency	Ensure staff and decision-makers have appropriate safety capability.	Professional development, accreditation, technical guidance.	Improves consistency and quality of safety-related decisions.
Continuous Improvement and Assurance	Review effectiveness of safety systems and interventions.	Audits, peer reviews, lessons learned reviews.	Ensures the organisation continuously improves its safety management practices.

In summary, the Safety Management System turns Safe System principles into organisational practice. It connects leadership, policy, risk evidence, intervention selection, delivery, monitoring, capability and assurance so that road safety risks are managed through a transparent and evidence-led process rather than as isolated projects.

2.2 Systemic approach to addressing road safety issues

Building on Section 2.1, this section explains how the Safety Management System can be applied to common road safety issues through coordinated packages of interventions.

A systemic response recognises that deaths and serious injuries occur when people are exposed to crash forces beyond human tolerance. Infrastructure and speed management are central to reducing this risk, but stronger outcomes are often achieved when they are supported by enforcement, education, engagement, operations, maintenance, policy settings and partner-led actions.

Table 2 shows how different Safe System levers can contribute to selected road safety issues. The effectiveness rating is indicative only and should be tested against the local safety problem, road environment, exposure, treatment design, delivery scale, compliance, monitoring and residual risk.

Safety issue	Infrastructure changes	Speed management	Enforcement and compliance	Education, engagement and safety campaigns	Other system levers	Overall effectiveness
Urban local roads with high vulnerable road user exposure	Safer crossings, traffic calming, protected cycling facilities, intersection improvements, lighting and visibility upgrades.	Lower and more consistent speeds that reflect land use, activity levels and conflict-point risk.	Targeted speed and red-light compliance at high-risk locations.	Local board, school, town centre and community engagement to support safer behaviour and acceptance of changes.	Land-use planning, public transport access, maintenance and operational changes.	**Very effective** when delivered as an area or corridor package.
High-risk intersections and side-impact crashes	Roundabouts, protected turns, raised or slowed conflict points, signal phasing, visibility improvements and movement restrictions.	Lower approach and turning speeds, supported by self-explaining design.	Red-light, stop/give-way, turning and speed compliance.	Campaigns focused on safe turning, red-light running and intersection awareness.	Signal operation, network management, access control and monitoring of residual risk.	**Very effective** where conflict is removed, controlled or slowed to survivable speeds.
Pedestrian risk on arterials, centres, schools and public transport routes	Formal crossings, raised or protected facilities, shorter crossing distances, kerb build-outs, lighting, continuous footpaths and safer intersection geometry.	Lower speeds at crossings, centres and school environments.	Speed, red-light and turning compliance near key crossing points.	School travel, older pedestrian, community and centre-based safety programmes.	Pedestrian demand planning, accessibility improvements and public transport stop placement.	**Very effective** when crossing protection and survivable speeds are both addressed.
Cyclist risk on urban	Protected cycleways, safer	Safe-speed local streets,	Compliance with cycle lanes,	Driver awareness, safe	Network planning,	**Effective**, and **very effective**

Safety issue	Infrastructure changes	Speed management	Enforcement and compliance	Education, engagement and safety campaigns	Other system levers	Overall effectiveness
corridors and intersections	intersection design, protected approaches, conflict separation, driveway management and safer kerbside design.	neighbourhood greenways and lower-speed conflict points.	parking restrictions, passing rules and signal controls.	passing, door-zone awareness and route-specific campaigns.	maintenance, surfacing and construction traffic management.	where continuous protected networks are delivered.
Motorcyclist risk in urban intersections and high-risk corridors	Intersection conflict reduction, high-friction surfacing, hazard mitigation, safer barriers, improved visibility and surface maintenance.	Lower speeds at conflict points and on routes with loss-of-control or turning risk.	Speed, impairment, lane discipline and red-light compliance.	Rider skills, protective gear, conspicuity and targeted route-based safety campaigns.	ACC partnerships, maintenance prioritisation, route monitoring and motorcycle-friendly design review.	**Effective**; higher effectiveness where surface, speed and conflict risks are addressed together.
Rural run-off-road and loss-of-control crashes	Curve treatments, high-friction surfacing, shoulder improvements, barriers, clear zones, rumble strips, delineation and signage.	Safe and appropriate speeds aligned with geometry, roadside risk and curve consistency.	Targeted speed, impairment and high-risk behaviour enforcement.	Fatigue, impairment, motorcycle, holiday and rural-road campaigns.	Maintenance, asset condition management, weather response and route-based risk monitoring.	**Very effective** where roadside protection, surface condition and speed are managed as a corridor package.
Head-on crashes on undivided	Median barriers, wider centrelines, audio-tactile markings, shoulder	Lower speeds where separation is not feasible or where	Overtaking, speed, fatigue and impairment enforcement.	Campaigns on overtaking risk, fatigue,	Route classification, maintenance, resilience	**Very effective** where median separation is feasible;

Safety issue	Infrastructure changes	Speed management	Enforcement and compliance	Education, engagement and safety campaigns	Other system levers	Overall effectiveness
higher-speed roads	widening, curve treatments and separation where feasible.	alignment risk is high.		distraction and rural driving.	planning and heavy vehicle considerations.	**effective** where only supporting measures are deliverable.
Unsafe speed environments	Self-explaining road design, traffic calming, raised treatments, gateway treatments and lane narrowing where appropriate.	Safe and appropriate speed limits, variable speeds, school zones and targeted speed reviews.	Safety cameras, mobile enforcement and targeted compliance operations.	Campaigns explaining why speed matters and supporting community acceptance.	Policy settings, legal processes, technology, data monitoring and operational management.	**Very effective** when infrastructure, credible limits and enforcement are aligned; **not effective** if education is used alone.
Behaviour-led risks such as impairment, distraction, non-use of restraints and deliberate risk-taking	Forgiving roadsides, separation, simplified layouts and treatments that reduce consequences when mistakes occur.	Lower operating speeds can reduce crash severity but may not directly change risky behaviour.	Critical lever: alcohol/drug, distraction, restraint, speed and licence compliance.	Targeted behaviour-change campaigns and community programmes.	Police partnerships, vehicle safety, licensing, health, workplace and community interventions.	**Effective** as part of a system package; **not effective** if relying on infrastructure or education alone.
Micromobility and emerging transport modes	Safer shared path design, protected lanes, smoother surfaces, clearer markings,	Lower-speed environments where micromobility mixes	Targeted compliance where unsafe riding, parking or	User education, operator partnerships and	Data monitoring, operator controls, device standards and	**Effective** where exposure is growing; **not effective** if

Safety issue	Infrastructure changes	Speed management	Enforcement and compliance	Education, engagement and safety campaigns	Other system levers	Overall effectiveness
	intersection treatments and conflict management.	with traffic or pedestrians.	speed creates risk.	public awareness campaigns.	kerbside management.	treated only as a behaviour issue.

This table should be used to support early intervention thinking, not as a stand-alone decision tool. Effectiveness depends on whether the safety problem is clearly defined, the treatment package addresses the relevant crash forces and user exposure, and whether any remaining residual risk is understood and managed.

Residual risk is the safety risk that remains after an intervention package has been applied. It may result from site constraints, funding limits, network function, property access, traffic volumes, road user behaviour, governance settings or the inability to deliver a full Safe System treatment immediately.

Because not all safety risks can be fully eliminated, residual risk should be assessed in relation to the local context, road function, crash severity potential and the vulnerability of exposed road users. Locations with higher vulnerable road user exposure, school activity or higher-speed conflicts will generally require a lower tolerance for residual risk. Any residual risk should be documented and managed through complementary measures, monitoring, staged improvements or future escalation.

Coordinated packages are therefore preferred where they combine infrastructure and speed management with supporting levers that strengthen the overall Safe System response.

2.3 Developing a 10-year Network Safety Programme

The 10-year Network Safety Programme is a core planning output of the Safety Management System. It translates the direction in Part A into a long-term, evidence-led programme by identifying the most significant risks, the types of responses likely to be required, and how interventions should be prioritised and sequenced. The programme provides the network evidence base for governance, investment and programme decisions. It draws on crash history, network risk, infrastructure risk, operating speed, exposure, road function, vulnerable road user demand, asset condition and local context to identify priority corridors, intersections, areas and user groups. It also supports the systemic approach in Section 2.2 by identifying where different Safe System levers need to be combined. This allows responses to be packaged and staged while maintaining a clear pathway toward stronger Safe System outcomes.

Within the wider system, the Network Safety Programme links risk assessment, project prioritisation, speed management, infrastructure safety management, asset management, monitoring and continuous improvement. It defines the programme pipeline and uses monitoring to update priorities over time.

The indicative steps for developing a Network Safety Programme are outlined below.

2.3.1 How to develop a Network Safety Programme

A Safety Network Programme is a planned and prioritised package of interventions designed to reduce death and serious injury risk across corridors, areas and systemic risk locations, rather than relying on isolated site responses.

2.3.2 Define purpose, scope and constraints

The programme should clearly define its purpose, network scope and delivery constraints. This includes the safety outcomes being sought, the network or local board areas being considered, and the practical constraints that may affect delivery, including funding, timing, policy settings, statutory requirements and organisational transition.

2.3.3 Establish Safe System framing

The programme should be anchored in Safe System principles by focusing on deaths and serious injuries, managing kinetic energy, recognising human error and vulnerability, and selecting interventions that reduce both crash likelihood and crash severity. This ensures that programme decisions remain aligned with the desired future-state outcomes described through the back casting approach.

2.3.4 Identify network risk

Network risk should be identified using a combination of Urban Kiwi RAP, crash data, road function, speed environment, vulnerable road user exposure, land-use patterns, movement and place value, RAMM data, traffic volumes, operating conditions and road imagery. The objective at this stage is to identify risk patterns, priority corridors, priority intersections and area-based issues, rather than final design solutions.

2.3.5 Select intervention families

Rather than selecting individual treatments too early, the Network Safety Programme should identify intervention families matched to the risk types identified. These may include speed management, intersection conflict reduction, pedestrian and cyclist protection, run-off-road mitigation, motorcycle safety treatments, compliance support, education and behaviour-management initiatives.

2.3.6 Develop programme logic and sequencing

The programme should explain the risks being addressed, how the selected intervention families are expected to change system conditions, and how these changes will reduce deaths and serious injuries. Programme elements should then be prioritised and sequenced using severity-weighted risk, Safe System alignment, expected safety benefit, readiness, deliverability, equity, vulnerable road user considerations and value for money.

This process will inform local board road safety plans and speed management programmes by identifying the safety issues, road environments, user groups and community priorities within each area. Local plans should respond to local risks while remaining aligned with Auckland Council's network safety priorities.

Given funding and resource constraints, the Network Safety Programme will help identify an optimal programme by balancing local board priorities with network-wide risk, expected DSI reduction, deliverability, value for money and residual risk. It will also help ensure local programmes consider complementary measures where they strengthen the overall safety outcome.

2.3.7 Monitor, review and adapt

The programme should include clear performance measures, including outcome indicators, intermediate indicators and delivery indicators. Monitoring should test whether interventions are achieving the intended safety outcomes, support adaptive management, and allow

priorities to be recalibrated as new evidence, tools, funding settings and governance arrangements mature.

2.3.8 Programme prioritisation

As part of the reform of transport governance in Auckland in late 2026, local boards have greater input into local transport priorities and investment decisions. As these arrangements are implemented, road safety investment will increasingly need to align with local board priorities.

In response, the Road Safety Engineering Programme is developing Local Road Safety Improvement Plans for each local board area. These plans will identify potential investigation and improvement locations and provide a structured basis for discussions with local boards on safety issues, priorities, delivery timing and preferred intervention approaches. They will cover infrastructure safety improvements and speed management initiatives, including school safety improvements, variable school speed zones, speed limit corrections, crossing facilities and other locally prioritised treatments.

Council's role is to provide clear, evidence-based advice so local boards can make informed decisions about road safety projects. The Framework and this Compendium support that role by providing a consistent way to explain the safety problem, intervention options, expected benefits, trade-offs, delivery constraints and recommended priorities.

Post-reform, local board endorsement is a mandatory step for projects. Following endorsement, projects will enter a prioritisation process based on a weighted matrix that considers:

- The projected reduction in deaths and serious injuries, and
- The cost-effectiveness of these reductions, expressed as DSI equivalent (DSI_eq) saved per $100 million of expenditure. (DSI_eq is the expected number of deaths and serious injuries estimated based on injury crash history and crash severity factors).

3. Risk assessment tools

3.1 Urban KiwiRAP

The Urban KiwiRAP network risk assessment method helps understand the risks of death and serious injuries based on historical crash data from NZTA's Crash Analysis System, at a macro network level. It calculates the estimated DSI casualty equivalents, recognising that actual crash data alone is not a good indicator of underlying risk due to the randomness and scarcity of these events. This method systematically assesses risk and identifies safety shortcomings across the network, which can be addressed with practical road improvement measures.

In the Auckland context, the Urban KiwiRAP 2024 update identified 646 intersections in Auckland as high-risk, characterised by high or medium-high ***personal risk*** (measured by the risk of death or serious injuries per 100 million vehicle kilometres travelled) and high or medium-high ***collective risks*** (i.e. Crash density, measured by the risk of death or serious injuries).

In addition to the general network risk layers for all road users, Auckland Council also has two more focused risk mapping layers for vulnerable road users: one combining pedestrian and cyclist risk, and one focused on motorcyclist risk.

This analysis revealed that 1,302 km (16%) of the network has a collective risk value of 'High' or 'Medium-High', while 192 km (2.3%) of Auckland's transport network has a personal risk value of 'High'.

3.2 Pedestrian risk assessment

3.2.1 Walking Network Operating Plan and Pedestrian Auckland Network Operating Plan (ANOP)

Auckland Council is currently developing a dedicated Walking component for the Auckland Network Operating Plan (ANOP), to establish clear service expectations for pedestrian movement, access and safety. This will help the ANOP support better investment, operations and design decisions by identifying where walking should be prioritised and what level of service should be provided in different street contexts.

A key output of this work is expected to be a prioritised list of crossing and pedestrian improvement locations, including locations where crossing facilities are missing, poorly connected or not aligned with pedestrian desire lines. Prioritisation should consider safety and Safe System outcomes, universal access, network connectivity, equity, Crime Prevention Through Environmental Design objectives, proximity to key destinations and the role of walking in supporting public transport, schools, centres and local access.

Because comprehensive pedestrian volume data is not yet available across the full network, the assessment should use a combination of data sources and risk indicators to identify locations where pedestrian exposure to serious harm is likely to be high.

3.2.2 Pedestrian risk assessment principles

- Proxy measures should be used to identify systemic pedestrian risk and exposure, not to justify inaction where pedestrian counts are incomplete.

- Investment should prioritise locations where mistakes are likely to result in severe outcomes, regardless of whether detailed pedestrian counts or crash histories are available.
- Risk tools such as Urban KiwiRAP should be combined with land-use indicators, professional observation and local knowledge to identify where pedestrian exposure and crash severity risk are likely to be highest.
- A suite of pedestrian data proxies should be used, including automated counts, census travel data, public transport patronage, points of interest, land use and road environment characteristics.

3.2.3 Alignment with Future Connect

Future Connect is the long-term network plan for Auckland's transport system. It identifies the most important parts of the transport network and identifies the most critical issues and opportunities. This helps us make our 10-year investment programme, the Regional Land Transport Plan (RLTP).

Pedestrian risk assessment should align with Auckland's walking strategic network as set out in Future Connect, which recognises primary walking routes, centres, schools, public transport interchanges and key destinations as locations where walking demand and crossing need are likely to be high. These routes should provide safe, accessible and reliable pedestrian movement, including continuous footpaths, frequent safe crossing opportunities and speed environments that reduce the likelihood of serious harm.

3.2.4 Road and Street Framework context

The Road and Street Framework provides an important context layer for pedestrian risk assessment. It helps identify how streets function not only as movement corridors, but also as places where people walk, wait, cross, access properties, use public transport and interact with local destinations. The surrounding land use, place value and level of people activity should therefore influence how pedestrian risk is assessed and how crossing, speed and access treatments are prioritised.

3.2.5 Pedestrian level of service

Pedestrian level of service defines the quality of safety, accessibility, comfort and convenience that people can expect when walking. In a Safe System context, pedestrian level of service should include continuous and legible routes, appropriate crossing frequency, manageable delay, safe crossing distance, suitable lighting and environments that support people of all ages and abilities. These expectations should be used to identify where the network is not adequately serving pedestrians and where intervention is required.

3.2.6 Pedestrian risk assessment method

Many pedestrian crashes occur where safe and convenient crossing opportunities are limited, where traffic speeds are not aligned with pedestrian vulnerability, or where people need to cross busy urban arterial roads to reach schools, centres, public transport stops and local destinations. Pedestrian risk assessment should therefore combine crash history with proactive indicators of exposure and severity.

Urban KiwiRAP provides a useful proxy for pedestrian risk by combining road speed, traffic volume, road width and roadside demand to identify locations with elevated active road user risk. This should be supplemented with local land-use (existing and projected) and

movement indicators so that investment is not limited to locations where pedestrian crashes have already occurred as well as latent demand due to the change in land use.

Future pedestrian risk assessment should continue to develop toward a more predictive model that considers future land use and dwelling density, built environment, traffic speed, traffic volume, crossing distance, number of lanes, destination density, pedestrian desire lines and the needs of older people, children and people with disabilities. This will allow the programme to identify systemic pedestrian risk before severe crashes occur.

2.2.7 Pedestrian demand and exposure proxies

Where direct pedestrian counts are limited, practical demand and exposure proxies should be used to support prioritisation. These proxies help identify locations where pedestrian activity is likely, where crossing demand is expected, and where the road environment may create higher severity outcomes.

- **Automated pedestrian counters** at representative locations can be used to understand relative demand, trends and seasonal patterns.
- **Census journey-to-work data** can provide insight into baseline walking demand and socioeconomic context, while recognising that it does not capture all walking trips.
- **Public transport patronage** can be used as a proxy for walking to and from stops, stations and interchanges, particularly on arterial and centre-based networks.
- **Points of interest**, including schools, shops, health services, community facilities, parks and public transport nodes, can indicate likely pedestrian demand and crossing need.
- **Land-use and destination data** should be used to identify centres, schools, interchanges, high-density residential areas and other locations where pedestrian exposure is likely to be high.
- **Road environment characteristics**, including speed, traffic volume, number of lanes, crossing distance, visibility and intersection complexity, should be used to identify locations where pedestrian crash severity risk is likely to be high.

2.2 Rural network risk-based assessment

The Rural Network Risk-Based Assessment provides Auckland Council with a structured and repeatable method for identifying rural corridors, routes and discrete sites where safety investment is most likely to reduce deaths and serious injuries (DSI). While rural roads account for a smaller proportion of Auckland's total DSI than urban roads, crashes on these roads are often more severe due to higher operating speeds, unforgiving roadsides, challenging geometry, longer travel distances, and increased exposure to run-off-road, loss-of-control and head-on crashes.

The assessment combines both reactive and proactive evidence. Crash history helps identify locations where serious harm has already occurred, while infrastructure, speed, roadside and exposure indicators identify locations where severe outcomes are likely, even where fatal and serious crashes have not yet accumulated. This approach enables Auckland Council to identify both existing high-harm locations and parts of the network where the road environment is least forgiving of human error.

The assessment is intended as a screening and prioritisation tool to support programme-level investment decisions. It helps inform rural corridor programmes, curve treatment initiatives, roadside hazard mitigation, surface and skid-resistance improvements, speed

management reviews, and targeted local safety improvements. It does not replace detailed site investigations, engineering judgement or design assessments.

The assessment should integrate both crash-based and infrastructure-led indicators to provide a comprehensive understanding of risk.

Crash-based indicators may include:

- Deaths and serious injuries (DSI)
- Serious and minor injury crash history
- Crash movement type
- Collective risk
- Personal risk

Infrastructure-led indicators may include:

- Road geometry and curve context
- Operating speed and speed limit
- Lane and shoulder width
- Roadside hazards
- Surface condition and skid resistance
- Traffic volume
- Motorcycle exposure
- Consistency of the road environment

Together, these indicators help identify where the combination of speed, geometry, surface condition, roadside environment and exposure creates the greatest likelihood of severe outcomes.

The proposed rural risk prioritisation process should follow a staged approach:

1. Identify rural routes and corridors for assessment.
2. Compile relevant crash, exposure, geometry, speed, surface and roadside data.
3. Identify high-risk curves, corridors and intersections.
4. Assess risks against Safe System boundary conditions.
5. Group locations into treatment packages.
6. Prioritise investment based on expected safety benefits, feasibility, deliverability and value for money.
7. Monitor outcomes and use the results to refine future rural safety programmes.

This process provides Auckland Council with a consistent and evidence-based framework for identifying, prioritising and managing risk across the rural road network. It helps direct investment to locations where it can achieve the greatest reduction in deaths and serious injuries. The method should continue to be refined as additional risk mapping layers, including those described in Sections 3.4 and 3.5, are developed.

2.3 Out-of-context curve risk mapping

Out-of-context curve analysis is a key component of rural risk assessment. It identifies curves where the prevailing approach speed is materially higher than the speed needed to safely negotiate the curve. These locations create an expectancy mismatch for drivers and riders, increasing the likelihood of loss-of-control crashes, particularly where delineation, surface friction, shoulder width or roadside protection is limited. It is also important to recognise that some locations are particularly sensitive to changes in maintenance performance. At these locations, even a small reduction in the application of maintenance standards—such as delayed renewal of road markings, reduced skid resistance, poor

drainage, limited vegetation control, damaged signs or degraded delineation—could materially increase crash risk or severity. This is especially relevant on high-speed rural roads, curves, intersections, motorcycle routes and locations with limited recovery space, where road users have less margin for error. These locations should therefore be identified and managed with a stronger maintenance focus, as maintaining the existing asset condition may be a critical safety control in its own right.

The method should use high-resolution geometry data (including superelevation development) and operating-speed information to identify individual curves, estimate the expected curve negotiation speed and compare this with the approach speed environment. Curves with large or unexpected speed reductions should be flagged for further review, especially where they coincide with motorcycle activity, wet-road crash history, poor skid resistance, limited recovery area or unforgiving roadside hazards.

Curve-level results should then be aggregated into corridor-level risk profiles so that interventions can be planned as route packages rather than isolated spot treatments. This supports consistent delineation, warning, surfacing, shoulder, roadside and speed-management responses along priority rural corridors.

2.4 NZTA Mega Maps

MegaMaps - 2024 Edition is the NZTA's spatial mapping tool that provides the base information layers required for road controlling authorities under the Setting of Speed Limits Rule 2024, including historic crash data, collective and personal risk, Infrastructure Risk Rating (IRR), One Network Framework classifications, travel speed data, posted speed limits, and the locations of schools and marae.

NZTA MegaMaps is expected to provide a national mapping and data platform that can support strategic network risk understanding, speed management planning and infrastructure investment decisions. Within Part B, MegaMaps should be used as a complementary risk-assessment source alongside Urban KiwiRAP, crash data, speed environment analysis, road function, infrastructure risk and local knowledge.

The tool is expected to assist with identifying high-benefit safety opportunities by bringing together information such as speed limits, operating speeds, infrastructure risk, crash risk, traffic volumes, One Network Framework classifications, schools and other contextual network layers. This will help test whether proposed speed and infrastructure responses are aligned with known risk, road function and wider programme priorities.

Further detail will be added once NZTA confirms the relevant MegaMaps datasets, methodology and use cases for local road safety planning. In the interim, this section should be treated as a placeholder for integrating MegaMaps into future versions of the Risk Assessment Tools section.

2.5 NZTA proposed change approach — Backcasting

(Safe System future state investment logistic analysis)

Backcasting is a strategic planning approach that starts with the desired Safe System future state and works backwards to identify the changes required to achieve it. Unlike forecasting, which projects forward from current trends, backcasting first defines the safety outcome sought and then identifies the staged infrastructure, speed management, operational, enforcement and behaviour-change responses needed to move the current network toward that outcome.

For the Road Safety Infrastructure and Speed Management Programme, backcasting helps distinguish between the preferred future-state treatment and the practical step-towards treatments that can be delivered now.

Future-state treatments describe the Safe System end condition needed for a corridor, intersection, area or user group.

Step-towards treatments are interim or staged measures that reduce risk where the preferred treatment is constrained by cost, space, timing, statutory requirements, governance, delivery readiness or community considerations.

2.6.1 Backcasting process

Step	Purpose	Application to road safety
1. Define the desired future state	Set the Safe System outcome to be achieved.	Define the safe operating conditions required to prevent deaths and serious injuries, such as safe speeds, protected crossings, forgiving roadsides and controlled intersection movements.
2. Assess the current state	Understand current network risk and system gaps.	Use crash data, Urban KiwiRAP, audits, speed environment reviews, network risk tools and local knowledge to identify where current conditions fall short.
3. Identify the gap	Compare the current network with the desired Safe System condition.	Identify where speeds are too high, infrastructure is unforgiving, vulnerable users are exposed, or high-energy conflicts remain uncontrolled.
4. Map backwards from the future	Identify the changes needed to close the gap.	Determine the infrastructure, speed management, enforcement, education and operational changes needed to move from current conditions to the future-state outcome.
5. Develop a staged intervention pathway	Sequence short-, medium- and long-term actions.	Identify what can be delivered immediately, what requires further planning or funding, and what longer-term transformation may be needed.
6. Monitor and adjust	Check whether the programme is moving toward the desired outcome.	Track DSI trends, operating speeds, compliance, risk indicators, delivery progress and community feedback, then adjust the programme as evidence improves.

2.6.2 Applying back casting to programme development

Applied to road safety, back casting keeps programme development anchored to the outcome being sought, rather than only to what is immediately deliverable. For example, the preferred future-state outcome at a high-risk intersection may be a layout that removes or controls high-energy side-impact conflicts and provides safe crossing opportunities. If that outcome cannot be delivered in the short term, the programme can still identify step-towards measures such as speed management, phasing changes, visibility improvements, enforcement support or interim physical treatments that reduce risk while preserving the pathway to the end state.

This approach supports the development of a 10-year Network Safety Programme by linking immediate investment decisions to longer-term network outcomes. It provides a defensible

basis for sequencing packages of work, explaining interim decisions, and demonstrating how current investment contributes to progressively safer network conditions.

Backcasting should also reflect NZTA's intervention investment logic. This means starting with the desired Safe System outcome, then working backwards to identify the interventions, investment pathway and delivery stages needed to move the network toward that outcome. The approach should consider whether the proposed intervention is proportionate to the level of risk, whether it targets the crash types and road users most likely to result in deaths and serious injuries, and whether it represents an effective use of available funding.

In practice, this requires distinguishing between the preferred long-term Safe System response and lower-cost or staged treatments that can reduce risk in the short to medium term. Where the full intervention is not immediately deliverable, the investment logic should clearly explain how interim treatments contribute to DSI reduction, what residual risk remains, and how future investment could progressively move the site, corridor or programme area toward the preferred end state.

This aligns the backcasting process with programme prioritisation by ensuring investment decisions are not based only on current constraints or individual project readiness. Instead, they are linked to a long-term safety outcome, expected DSI reduction, value for money, deliverability and the ability to preserve a pathway toward stronger Safe System performance.

3. Intervention and Investment Guidance

3.1 Intervention investment philosophy

The intervention investment philosophy is to direct available funding to the locations and treatment packages that are expected to deliver the greatest reduction in deaths and serious injuries. It supports proportionate investment by matching the scale of intervention to the level of risk, the likely safety benefit, treatment effectiveness, deliverability, cost and residual risk.

The selection process should begin with the preferred Safe System outcome. Primary Safe System treatments are generally preferred because they are more effective at preventing fatal and serious injuries. However, they are not always immediately feasible because of road classification, traffic volumes, speed environment, intersection form, space constraints, delivery timing, statutory requirements, governance settings or funding limitations. In these situations, supporting or interim treatments may be used to reduce risk while preserving a pathway toward the stronger long-term outcome.

The Safe System Treatment Philosophy Matrix supports value-for-money decision-making by signalling the level of investment likely to be appropriate for different combinations of collective and personal risk. High-volume roads may have higher collective risk because more injury crashes occur along them, while lower-volume roads may have higher personal risk once exposure is considered. Both perspectives are needed to avoid over-investment in lower-risk locations and under-investment where the risk to individual users is high.

The matrix groups locations into four investment categories. Each category is associated with a different level of potential intervention, ranging from maintenance or low-cost safety improvements through to transformational treatments. This helps ensure that investment is targeted to the safety problem and that treatment packages are proportionate to the expected safety benefit.

High-risk locations should be further categorised using crash severity, crash type and road user risk to determine the most appropriate level of safety management and intervention:

i. Locations with the highest risks and high DSI numbers (approximately a quarter of the high-risk locations identified) are likely to benefit from transformational interventions, which can achieve significant crash reduction potential and are economically viable with high benefit/cost returns. (top right quadrant of figure 2 below)

ii. Locations with lower DSI numbers may not justify transformational interventions but may still benefit from medium- to high-cost treatments, such as movement restrictions or intersection narrowing, where these treatments address the relevant crash types and risk profile.

For locations with no DSI, a staged/incremental approach with road-safety performance monitoring is recommended to determine if further interventions are required. These locations can be further categorised into two groups:

iii. Locations with no DSI but have more than three minor injury crashes would be unlikely to benefit economically from high-cost treatments. The most appropriate interventions will involve medium to low-cost measures (e.g. lighting upgrades, driver feedback signs, electronic intelligent solutions with limited civil work). (top left quadrant)

iv. Locations with no DSI but with three or fewer minor injury crashes will be programmed for maintenance safety improvements (e.g. road marking, visibility improvements with no civil work). (bottom left quadrant)

Intervention Selection Tools and Treatment Guidance Compendium

Where Urban KiwiRAP or other risk tools identify high pedestrian, cyclist or motorcyclist risk, the treatment category may be escalated by one level. This recognises that vulnerable road users are more exposed to serious injury and that treatments designed to create safer conditions for them will often also improve safety for drivers and passengers.

While individual safety benefits for each individual treated locations may be smaller, the cumulative safety benefits can be significantly greater through provision of multiple low-cost treatments at the same time, as more locations are addressed.

The investment approach also strengthens prioritisation. After high-risk roads and intersections are identified, future-state and interim treatment packages should be selected, expected DSI reductions estimated using appropriate crash reduction factors, high-level costs prepared, and safety benefits compared against investment requirements. This makes it clearer which treatment packages provide the strongest safety return for the available funding.

In terms of prioritisation, the approach favours implementing more of the low to medium-cost treatments at a greater number of high-risk locations, rather than focusing exclusively on expensive, complex projects. While individual benefits may be smaller, the cumulative safety gains across the network are expected to be significant. After the investigatory phase at high-risk locations, interventions are prioritised for delivery based on the number of DSI saved and overall cost-effectiveness, to maximise safety returns.

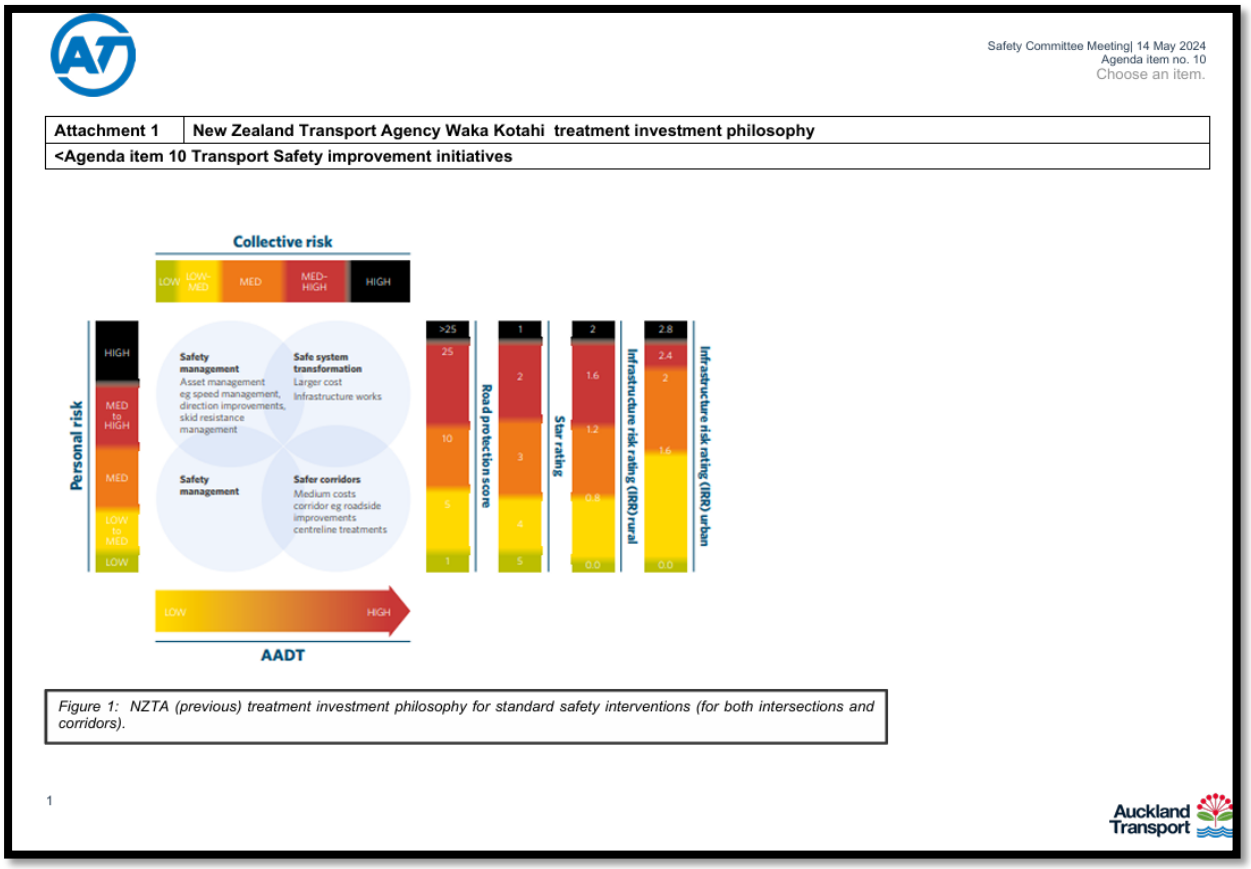


Figure 2: NZTA previous treatment investment philosophy for standard safety interventions for intersections and corridors

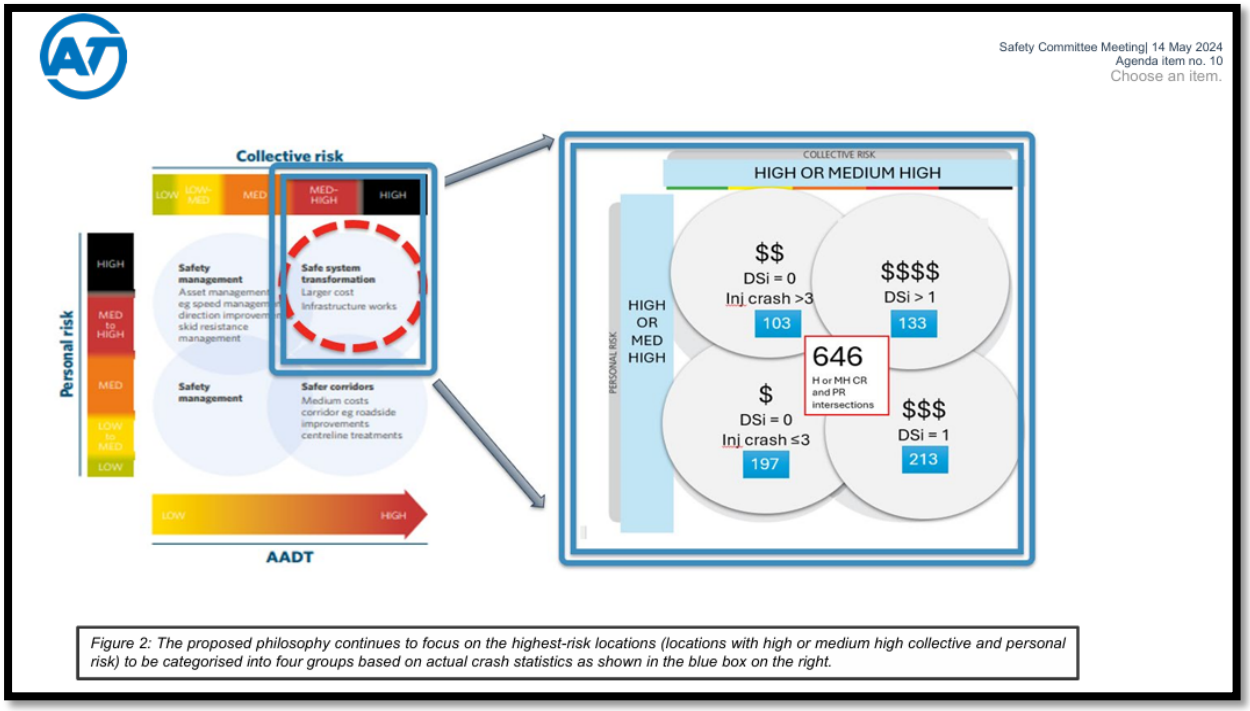


Figure 2: The proposed philosophy continues to focus on the highest-risk locations (locations with high or medium high collective and personal risk) to be categorised into four groups based on actual crash statistics as shown in the blue box on the right.

Figure 3: Proposed investment philosophy for categorising high-risk locations by crash severity and treatment response

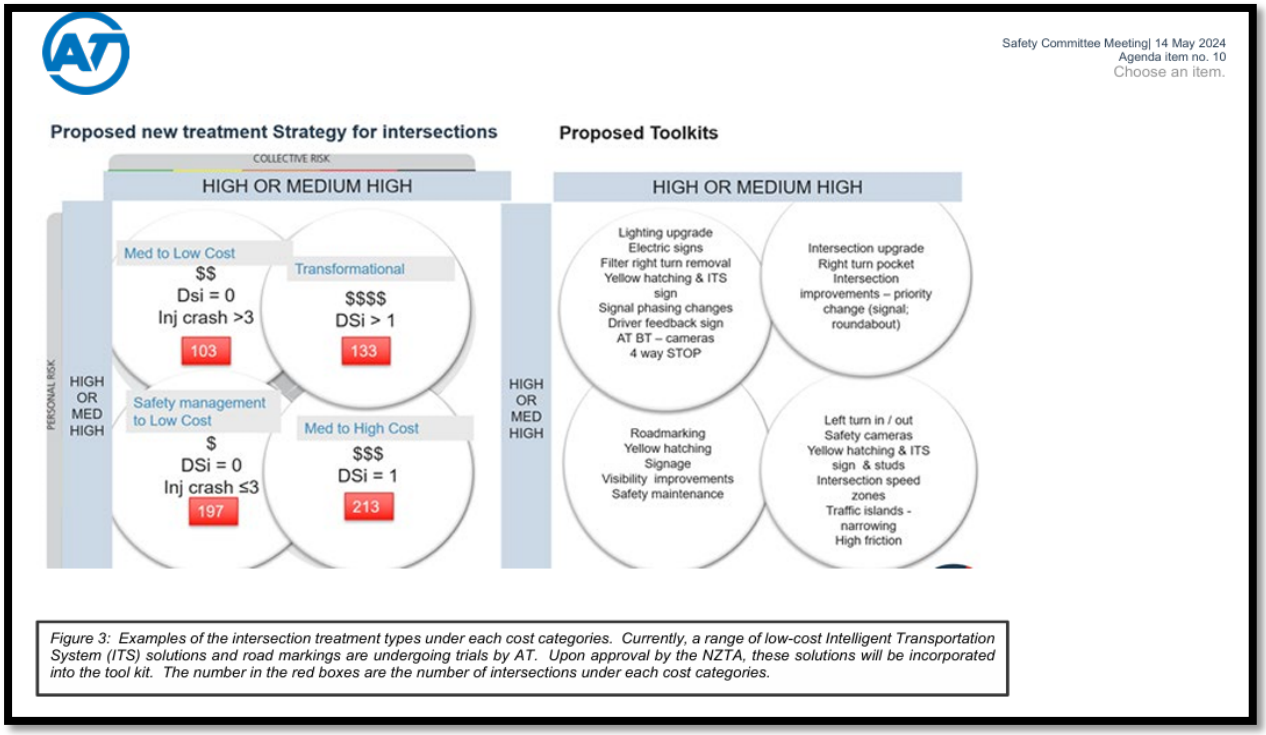


Figure 3: Examples of the intersection treatment types under each cost categories. Currently, a range of low-cost Intelligent Transportation System (ITS) solutions and road markings are undergoing trials by AT. Upon approval by the NZTA, these solutions will be incorporated into the tool kit. The number in the red boxes are the number of intersections under each cost categories.

Appendices

Appendix A: Interventions applications and effectiveness

A1. Infrastructure hierarchy for Intersection

The tables in this appendix should be read as practical treatment guidance to support, not replace, the decision-making philosophy set out in Part A. Readers should first refer to Part A to understand the Safe System principles, intervention selection logic, investment philosophy and future-state/step-towards approach that sit behind these treatment options. The tables then help apply that philosophy by summarising possible interventions, the safety issues they address, suitable road hierarchy contexts, indicative effectiveness, indicative cost and key application notes. They should be used as an initial screening and comparison tool, with final decisions confirmed through site-specific assessment, professional judgement, value-for-money testing, deliverability review and residual-risk consideration.

Tier 1 — Preferred Safe System Interventions (Intersection Only)

Treatment/ intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Roundabout	Side-impact, right-turn, crossing and high-severity intersection crashes	All	High	Medium–High	Preferred where geometry, approach speed control, property access and heavy vehicle movements can be managed. Most effective when designed to reduce entry and circulating speeds.
Raised safety platform at intersection	High-speed side-impact, turning and pedestrian/cyclist conflicts	C, L Can be used for arterial subject to DfS approval	High	Medium - High	Suitable where vertical deflection is appropriate and consistent with current design guidance. Most effective where speed reduction at the conflict point is required.
Protected signal phasing	Right-turn, pedestrian, cyclist and conflicting movement crashes at signalised intersections	A, C	High – for specific RT crashes	Low–Medium	Includes fully controlled right turns, protected pedestrian phases, leading pedestrian intervals or separated movement phases. Useful where conflict

Treatment/ intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
					removal is needed but full geometric change is constrained.
Intersection layout simplification	Complex turning, crossing and decision-making conflicts or protected RT movement	All	Medium-High	Medium-High	Includes reducing lanes, tightening geometry, removing slip lanes, narrowing entries and simplifying priority. Helps reduce task complexity and conflict exposure.
Movement restriction / turn control	High-risk right-turn, crossing or access-related crashes	All	Medium–High	Low–Medium	Includes banning or controlling high-risk turns, median closures and access rationalisation. Should be supported by network assessment to avoid transferring risk.
Raised pedestrian or cyclist crossing at intersection	Pedestrian and cyclist injury risk at intersection crossings	C, L	High	Medium	Most suitable where vulnerable road user exposure is high and lower vehicle speeds are required at the crossing point.
Protected intersection treatment for cyclists	Cyclist turning, crossing and side-swipe conflicts	A, C	Medium - High	Medium–High	Suitable on urban corridors with high cycling exposure or planned cycling routes. Requires sufficient space and careful integration with signal phasing and pedestrian movements.
Compact or channelised	High approach speeds, wide turning paths and	All	Medium–High	Medium	Can include kerb build-outs, splitter islands, tighter corner radii and reduced crossing distances. Useful where full reconstruction

Treatment/ intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
intersection redesign	uncontrolled conflict areas				is not required but physical speed and path control is needed.
Grade separation or major intersection reconstruction	Severe conflict exposure at very high-risk locations	A	High	High	Reserved for locations where at-grade treatments cannot adequately manage fatal and serious injury risk and where strategic network function justifies major investment.
Full Safe System intersection package	Multiple severe crash types involving vehicles, pedestrians, cyclists or motorcyclists	All	High	Medium–High	Combines geometry change, speed control, protected movements, crossing upgrades, access management, lighting and compliance support. Preferred where a single treatment will not sufficiently address the risk.

Tier 2 — Supporting Interventions (Intersection Only)

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Intersection Speed Zones / Rural Intersection Active Warning Signs / Urban ISZ	High approach speeds and high-risk intersection conflicts	A, C	Low - Moderate	Low	Dynamically lowers legal speeds during high-risk periods or when side-road activity is detected. Most applicable to rural priority intersections and emerging urban ISZ contexts.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Safety cameras for red-light and speed compliance	Red-light running, speeding and unsafe approach speeds at intersections	A, C	Moderate	Medium	Best suited to high-risk signalised intersections and priority approaches or movements. Particularly important where enforcement support is needed while infrastructure changes are constrained.
Operational signal phasing and timing changes	Late entries, red-light running, pedestrian conflict and insufficient clearance time	A, C	Low - Moderate	Low	Includes extended all-red time, red clearance, leading pedestrian protection and detection loops. Useful where operational changes can reduce conflict exposure without major civil works.
Advance warning for signals	Late braking, poor signal conspicuity and high-speed approaches	A, C	Low–Moderate	Low	Includes flashing “Signals Ahead” or similar warning signs on high-speed rural or peri-urban approaches. Works best as part of a broader approach-speed management package.
High-friction surfacing / skid-resistance upgrades on approaches	Skidding, braking, turning and loss-of-control crashes near stop lines	All	Low - Moderate	Low	Suitable for downhill, curved or heavy-braking approaches, especially where wet-road crash patterns or poor skid resistance are present.
Audio-tactile markings / transverse	Driver inattention, late braking and poor speed awareness on approaches	A, C	Low–Moderate	Low	Most useful on rural or peri-urban approaches. Should be paired with speed management, warning signs or other conspicuity improvements.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
rumble strips before stop lines					
Enhanced intersection lighting	Night-time crashes, poor visibility and low conspicuity of users or controls	All	Moderate	Low	Suitable for rural and urban intersections with night-time crash patterns, pedestrian activity or poor visibility. Requires maintenance to remain effective.
Active STOP/GIVE WAY beacons	Poor conspicuity of priority control and failure to detect intersections	C, L	Low–Moderate	Low	Best suited to high-risk rural priority intersections or locations with poor control visibility. Supports, but does not replace, stronger speed or layout treatments where risk is high.
Driver feedback signs on approach legs	Elevated operating speeds and poor speed compliance approaching intersections	All	Low–Moderate	Low	Provides real-time feedback to drivers. Useful as an interim measure before Tier 1 works or where speed compliance is a known issue.
Marking and conspicuity upgrades	Poor visual guidance, unclear positioning and low visibility of conflict areas	All	Low–Moderate	Low	Includes signal backplates, larger lenses, high-visibility lanterns, stop-line relocation, high-contrast crossings and coloured cycle conflict surfacing.
Activated advance warning signs for	Poor advance detection of intersection form or	A, C	Moderate	Low	Supports earlier deceleration and improved driver expectancy on approaches to roundabouts and signalised intersections.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
roundabouts and signals	required speed change				Most useful where approach speeds are high or visibility is constrained.
Sight-distance improvements at intersections	Poor detection of controls, crossings, opposing traffic or vulnerable users	All	Low–Moderate	Low	Includes trimming vegetation, relocating street furniture and removing screening hazards. Should be maintained over time and combined with stronger measures where residual risk remains high.

A2 Infrastructure hierarchy for Corridor

Tier 1 — Primary / Safe System Aligned, High Impact Treatments (preferred) - Rural Corridors (≥80 km/h)

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Safe and appropriate speed limit changes at route level	High-speed rural corridors and severe crash outcomes	A, C	High	Medium	Sets speeds to more survivable levels and reduces both crash severity and likelihood. Most suitable for rural corridors where existing speeds are not aligned with risk, road function or roadside environment.
Rural Intersection Speed Zones	High-speed rural intersection conflicts where side-road traffic is present	A, C	Moderate	Low	Dynamically lowers mainline speeds when side-road activity is detected. Useful where the main risk is high approach speed and crossing or turning conflict at priority intersections.
Median barriers	Head-on and cross-centreline crashes on high-risk rural corridors	A, C	High	Medium - high	Includes flexible, steel or concrete barriers deployed continuously or on priority high-risk sections. Most effective where head-on crash risk is high and space is available.
Continuous three-barrier corridor treatment	Head-on, run-off-road and roadside hazard crashes	A, C	High	High	Combines median and roadside barriers to manage both opposing-traffic and roadside hazards. Suitable for corridors with severe risk on both sides of the road and in the median.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Narrow median with flexible barrier / 2+1 layout	Head-on crashes and unsafe overtaking on rural corridors	A, C	High	Medium – high	Provides separated overtaking opportunities and reduces head-on crash risk. Best suited where overtaking demand is high and corridor geometry allows staged separation.
Roadside safety barriers	Run-off-road crashes involving fixed roadside hazards	All	High	Low–Medium	Provides systematic protection along high-risk rural lengths with unforgiving roadsides. Should be prioritised where hazards are close to the carriageway or recovery space is limited.
Rural roundabouts at priority intersections	High-severity crossing, turning and side-impact rural intersection crashes	A, C	High	Medium–High	Reduces approach speeds and crash severity at rural priority intersections. Most suitable where geometry, heavy vehicle movements and land constraints can be managed.
Median treatments and turn controls	Uncontrolled crossing, right-turn and access-related conflicts on rural arterials	A, C	Moderate–High	Low–Medium	Includes turn restrictions, median treatments and access control. Should be supported by corridor-level assessment to avoid transferring risk to nearby locations.
Separated shared paths, side paths or widened shoulders	Vulnerable road user exposure to high-speed traffic	All	High	Low–Medium	Physically separates pedestrians, cyclists or other vulnerable users from high-speed traffic. Most relevant on rural corridors with existing or expected active mode demand.

Tier 1 — Primary / Safe System Aligned, High Impact Treatments (preferred) - Urban Corridors (≤70 km/h)

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Speed limit changes to context-appropriate survivable speeds	Unsafe or non-survivable speeds in town centres, mixed-use corridors and urban areas with high vulnerable road user exposure	All	High	Low–Medium	Applies where operating speeds need to be reduced to better match land use, activity level and Safe System boundary conditions. Examples include 30–40 km/h environments in town centres and mixed-use corridors.
Raised medians / median barriers on higher-speed urban arterials	Head-on, right-turn and uncontrolled crossing conflicts on higher-speed urban arterials	A, C	High	Medium -	Helps separate opposing traffic flows and manage turning movements. Most suitable where space is available and access impacts can be managed.
Road diets with protected cycle lanes	Excessive operating speeds, cyclist exposure and side-swipe or turning conflicts on mixed-use arterials	A, C	Moderate	Low	Reallocates road space to reduce operating speeds, simplify the corridor and provide protected cycling facilities. Best suited to corridors where movement and place outcomes support reallocation.
Driveway consolidation, turn	Frequent access-related conflicts, risky turning	A, C	Moderate	Low–Medium	Should be applied consistently at corridor level to avoid shifting risk to nearby accesses or intersections.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
bans and median U-turn schemes	movements and side-impact crashes along corridors				Requires access, network and property impact assessment.
Protected bicycle lanes / separated paths with raised crossings and protected pedestrian phasing	Vulnerable road user exposure along corridors and at intersections	All	Moderate- High – for cyclists	Medium - High	Provides physical separation and safer crossing or turning conditions for pedestrians and cyclists. Most effective where applied as a coordinated corridor package.
Suitable pedestrian crossing facilities aligned with pedestrian level of service	Pedestrian crossing risk, severance, poor access to destinations and unsafe crossing conditions	All	Moderate	Low	Includes signalised crossings, pedestrian refuges, zebra crossings or other crossing types selected according to demand, road context and ANOP level-of-service expectations. Should be as close as practicable to Safe System conditions.
Roundabouts or signal upgrades with raised safety platforms where roundabouts are not feasible	High-severity intersection crashes along arterial corridors, including side-impact and turning conflicts – speed limit on the approaches of the intersections will need to be reduced to 60 km/h or lower.	A, C	High	Low–Medium	Roundabouts are preferred where feasible because they reduce conflict speed and severity. Where not feasible, signal upgrades with speed control and protected movements may provide a staged Safe System response.

Tier 2 — Supporting / Step Towards Safe System - Rural Corridors

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Wide centrelines with audio-tactile line marking	Head-on and lane-departure crashes on rural corridors	A, C	Moderate	Low–Medium	Increases separation between opposing traffic and alerts drivers when they depart their lane. Suitable where there is sufficient carriageway width.
Audio-tactile pavement markings as mass-action treatment	Run-off-road, head-on and fatigue or inattention-related crashes	All	Moderate	Low–Medium	Includes edge-line and centreline rumble strips. Best suited to rural corridors and high-risk sections where lane departure is a key risk.
Shoulder widening / seal widening	Run-off-road crashes and limited recovery space, particularly at curves	All	Moderate	Medium-High	Provides additional recovery space and can reduce run-off-road crash severity. Most useful at high-risk curves, narrow shoulders and constrained rural sections.
Passing lanes / additional lanes	Risky overtaking and head-on crash risk on rural corridors	A, C	Low - Moderate	High	Provides safer overtaking opportunities where overtaking demand is high. Should be planned as part of a corridor programme to avoid creating new conflict points.
Signage and road marking upgrades	Poor driver expectancy, curve awareness and route guidance	All	Low–Moderate	Low	Includes systematic curve warning, delineation and road marking packages. Useful as part of wider corridor risk

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
					treatment, especially at curves and intersections.
Speed-activated / vehicle-activated warning signs	Excessive approach speeds at high-risk rural locations	All	Low–Moderate	Low	Provides targeted speed or hazard warnings to drivers. Most effective where used with other speed management or delineation measures.
Skid-resistance improvements	Loss-of-control crashes on slippery or low-friction surfaces	All	Moderate	Low	Should be targeted to high-risk lengths using SCRIM or other surface-risk data, particularly curves, braking areas and wet-road crash locations.
Lighting at selected rural conflict points or sections	Night-time crashes and poor visibility where vulnerable users or conflict risk is present	All	Low–Moderate	Low	Most suitable at rural intersections, crossings, settlements or conflict points with night-time crash patterns or vulnerable road user exposure.
Average speed or static speed cameras	Speed-related crashes and poor compliance on rural corridors	A, C	Moderate (Average speed) – Low (static)	Low–Medium	Should be used as part of a multi-measure corridor plan to support speed compliance. Most effective where aligned with speed management, infrastructure and enforcement strategy.

Tier 2 — Supporting / Step Towards Safe System Urban Corridors

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Traffic calming package along a route	Excessive operating speeds and vulnerable road user risk on urban corridors	C, L	High	Low	Includes platforms, cushions, lane narrowings and chicanes applied in series. Most suitable where lower speeds are needed across a corridor or local area.
Lane narrowing, space allocation and self-explaining road design	Excessive speeds, wide lanes and unclear driver cues	All	Moderate - high	Low	Encourages lower operating speeds and safer driver behaviour. Most suitable where traffic volumes, turning activity and road function allow reallocation or narrowing.
Signage and road marking refresh / upgrade	Poor visual guidance, unclear lane assignment and low crossing conspicuity	All	Low – Medium	Low	Includes wayfinding, lane assignment, high-visibility crossings and general marking upgrades. Most effective when supporting physical or operational changes.
Skid-resistance improvements and corridor lighting / delineation upgrades	Loss-of-control, braking and night-time crashes on urban corridors	All	Moderate	Low	Applies to approaches, curves and conflict points with poor surface condition, wet-road crash patterns or poor visibility.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Parking management, clearways and kerbside parking	Side friction, parking-related conflicts and vulnerable road user exposure	A, C	Low and can be negative if not well managed with a clearways / SVL	Low	Can support protected cycling, bus priority, visibility and reduced conflict. Requires assessment of access, loading, parking demand and corridor function.
Signal timing and phasing improvements	Turning, pedestrian, cyclist and signal-related conflicts along urban corridors	A, C	Low	Low	Includes protected turn phases, pedestrian priority, adjusted clearance times and consistent signal operation across a corridor.
Automated enforcement as part of a corridor package	Speeding, red-light running and poor compliance with traffic controls	A, C	Moderate	Low - moderate	Includes safety cameras, red-light cameras and static speed cameras. Should support, not replace, infrastructure and speed management measures.
Traffic calming through small rural communities	High speeds and pedestrian or local access risk where rural corridors pass through settlements	A, C	Moderate - High	Medium – high	Includes gateways, platforms, narrowing and other speed-management treatments to reinforce lower-speed environments through small communities.
Lighting, visibility and environmental control	Poor visibility at crossings, conflict points and pedestrian activity areas	All	Low–Moderate	Low	Includes pedestrian-scale lighting, enhanced lighting at crossings and visibility improvements at conflict

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
					zones. Most effective where night-time or conspicuity risk is present.

A3 Speed Management for intersection and corridor

Tier 1 — Primary Safe System Interventions - Regulatory & Network-Level Speed Tools

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Posted speed limit reduction	Speeds that exceed safe and appropriate levels	All	High	Low	Reduces crash severity and supports survivable operating speeds where existing limits are not aligned with road function, users or risk.
Variable / time-of-day speed limits	Time-specific risk, including school, commuter and vulnerable road user activity	All	Low - Moderate during operating hours.	Low	Matches speed limits to periods of higher risk, such as school start/end times, peak pedestrian or cyclist activity, or commuter periods.
Area-wide speed limit treatment	Neighbourhood or settlement-wide speed risk	C, L	High	Medium	Supports consistent lower speeds across residential, suburban, town centre or rural settlement areas.
Safe Speed Zones	High vulnerable road user exposure in schools, centres and suburban areas	C, L	Moderate	Low	Protects people walking, cycling and accessing local destinations by creating a lower-speed environment.
Corridor-based speed limit changes with	Speed-related risk along rural or urban corridors	A, C	High	Low–Medium	Most effective when paired with infrastructure, enforcement, gateway

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
supporting interventions					treatments or other self-explaining design measures.
Speed limit transitions at urban / rural thresholds	Poor speed transition and driver expectancy at changing road environments	A, C	Moderate–High	Low	Helps reinforce the change from high-speed rural environments to lower-speed urban, town centre or settlement contexts.
Permanent low-speed limits	Severe vulnerable road user exposure and high place activity	C, L	High	Low	Suitable for 10–30 km/h environments such as shared spaces, residential streets, town centres and pedestrian-priority areas.
Raised platforms, tables, humps and cushions	Excessive speeds at conflict points	C, L	High	Low	Physically manages vehicle speeds at intersections, crossings and mid-block locations. Application may be constrained on bus routes, arterials or emergency response routes.
Raised pedestrian crossings	Pedestrian crossing risk and excessive vehicle speeds	C, L	High	Low	Improves pedestrian priority and reduces vehicle speeds at high-demand crossing locations.
Raised intersections	High conflict speeds and severe intersection crash risk	C, L	High	Medium	Creates lower-speed intersections and supports safer crossing and turning movements.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Raised safety zones	High activity areas requiring low-speed environments	C, L	High	Low – medium	Suitable for school zones, shopping areas, health precincts and other locations with high vulnerable user exposure.
Continuous raised corridors / plateaus	Sustained speed management across high-activity corridors	C, L	High	Medium – High	Maintains lower speeds across town centres, main streets, shared spaces or other place-based corridors.
Entry ramp treatments into low-speed areas	High entry speeds into lower-speed environments	All	Moderate–High	Low	Reinforces the transition into safe-speed areas through physical or visual threshold treatment.
Chicanes	Excessive vehicle speeds on residential and collector roads	C, L	Moderate–High	Low	Uses horizontal deflection to reduce speed and increase driver attention.
Lane shifts / lateral deflection	Excessive speeds and long, straight driving paths	C, L	Moderate–High	Low	Encourages lower speeds by changing the vehicle path along urban or suburban streets.
Kerb build-outs forming deflection	Wide carriageways, long crossings and high turning speeds	All	Moderate–High	Low	Narrows the roadway, improves visibility and reduces pedestrian crossing distance.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Alternating parking bays	Excessive speeds on streets with on-street parking	C, L	Low- Moderate	Low	Creates horizontal deflection and narrows the effective carriageway where parking demand and layout support this approach.
Curved alignments replacing straight corridors	High speeds encouraged by long straight corridors	All	High	Medium	Most relevant to new or reconstructed corridors where alignment can be designed to self-enforce lower speeds.
Lane narrowing	Excessive speeds and wide lane environments	All	Low - Moderate	Low	Reduces operating speeds and increases driver attention where road function and vehicle mix allow.
Removal of auxiliary lanes	Excessive speeds, complex layouts and intersection conflicts	A, C	Low - Moderate	Low	Simplifies intersections or corridors and may reduce conflict points where spare capacity exists.
Reduction in effective carriageway width	Excessive operating speeds on urban and suburban roads	All	Low - Moderate	Low	Uses narrowing, markings, medians, kerbside changes or other measures to reduce the perceived or usable road width.
Road diets	Excessive speeds, multi-lane crossing risk and poor space allocation	A, C	Moderate–High	Low	Removes or reallocates lanes to support lower speeds, safer crossings, cycling, bus priority or place outcomes.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Conversion from four-lane undivided to two-lane formats	Head-on, turning, lane-change and pedestrian crossing risk	A, C	High	Low	Reduces conflict complexity and provides opportunities for medians, cycle facilities or safer crossings.
Shared spaces	High pedestrian activity and low-speed place environments	L	High	Low	Prioritises vulnerable road users and supports very low vehicle speeds in town centres or mixed-use streets.
Shared zones	Mixed user environments requiring low speeds	L	High	Low	Suitable for residential, commercial and school environments where drivers, pedestrians and cyclists share space.
Pedestrian-priority streets	Pedestrian exposure and high place activity	L	High	Low	Reduces vehicle dominance and supports safer movement in shopping streets, centres and activity areas.
Pedestrian malls	Vehicle conflict in high pedestrian-demand areas	L	High	Low	Removes vehicle access to maximise pedestrian safety in city centres, retail precincts or high-place-value areas.
Slow streets	Local street speeding and low active mode comfort	L	Moderate–High	Low	Supports lower speeds and safer active mode movement on residential and local streets.
Home zones / woonerfs	Residential street safety and vulnerable road user priority	L	High	Low	Gives priority to residents and vulnerable users through very low-speed street design.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Vehicle-restricted corridors	Vehicle conflict where walking, cycling or school activity is prioritised	L	High	Low	Can be time-based or permanent, and is suitable for town centres, school streets and event zones.
Central medians	Opposing-flow conflict, turning risk and wide carriageway speeds	A, C	Moderate–High	Low	Separates opposing flows, manages turning movements and can narrow the perceived carriageway.
Pedestrian refuge islands	Pedestrian crossing risk and wide-road exposure	All	Low (if on multilane road) - Moderate	Low	Provides staged crossing opportunities and narrows travel lanes. Most suitable where full crossing priority is not warranted or feasible.
Narrow medians	Excessive speeds and wide carriageway environments	All	Moderate	Low	Narrows travel lanes and can support improved pedestrian refuge or turn management.
Reduced vehicle access frequency	Frequent turning and driveway-related conflicts	A, C	Moderate–High	Low	Reduces conflict points along urban and suburban corridors. Best applied as part of corridor access management.
Driveway consolidation	Access-related conflicts and turning movements	A, C	Moderate	Low	Improves safety by reducing the number of access points and simplifying movements.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Left-in / left-out access control	Right-turn and crossing conflicts at accesses	A, C	Moderate-High	Low	Reduces high-risk turning movements and can improve safety and flow on busier corridors.
Removal of turning movements	High-risk turning or crossing conflicts	A, C	Moderate–High	Low	Includes turn bans, median closures and movement restrictions. Should be supported by network assessment to manage displacement effects.
Raised side-road entries reinforcing priority	High entry speeds and unclear priority at side roads	C, L	Moderate–High	Low – medium	Slows vehicles entering or leaving side roads and reinforces pedestrian or mainline priority.
Rural-to-urban thresholds	Speed transition risk entering settlements or lower-speed areas	A, C	Moderate	Low – medium	Signals a change in environment and encourages speed reduction at town entrances or rural/urban boundaries.
Urban centre gateways	Poor recognition of lower-speed town centre or main street environments	A, C, L	Moderate	Low	Visually marks entry to a lower-speed, higher-place-value area.
School zone gateways	Driver awareness and speed management near schools	All	Low – moderate	Low	Supports recognition of school environments and reinforces safe-speed expectations.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Surface texture change at zone entry	Poor speed awareness at gateways or thresholds	All	Low – moderate	Low	Alerts drivers to a change in speed environment and supports other gateway treatments.
Vertical deflection at gateway	High entry speeds into low-speed areas	C, L	Moderate–High	Low	Physically reinforces speed reduction at gateways or transition points.
Planting or architectural framing at entry	Poor driver expectancy and weak visual transition	All	Low – Moderate	Low	Visually narrows the road and signals a change in road environment or place context.

Tier 2 — Supporting/Interim Interventions - Regulatory & Network-Level Speed Tools

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Kerb extensions, side islands and chicanes	Excessive speeds, wide carriageways, poor sight lines and vulnerable road user exposure	All	Low - - Moderate	Low	Narrows the road, alters vehicle paths and improves visibility, particularly at crossings, intersections and traffic-calmed areas.
Removal of centre lines	Higher operating speeds on low-volume roads	L	Unknown	Low	Encourages lower speeds by reducing lane certainty. Most suitable for low-

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
					volume local or rural roads where the environment supports shared caution.
Edge-line narrowing	Excessive speeds caused by wide perceived lane width	All	Low -moderate Low	Low	Narrows the perceived lane width and can support lower operating speeds on urban, suburban and rural roads.
Pavement art or placemaking visual cues	Weak visual cues in low-speed or high-place environments	L	Low	Low	Visually signals a lower-speed environment. Most suitable for town centres, shared spaces, school streets and local streets with a strong place function.
Visual narrowing using pavement markings	Excessive speeds linked to wide carriageway appearance	All	Low - Moderate	Low	Uses markings to narrow the perceived road width and encourage lower speeds. Works best where supported by other speed management or gateway treatments.
Gateway treatments	Poor recognition of entry into a lower-speed or higher-activity area	All	Low - Moderate	Low	Visually signals a change in road environment, such as entry into a town centre, main street, school zone or settlement.
Road surface colour or texture change	Poor driver awareness of speed change, crossing	All	Low Moderate	Low	Alerts drivers to a change in context at gateways, crossings, shared spaces or priority areas.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
	point or special area within 30 km/h areaa				
Street trees / vertical enclosure	Wide, open road environments that encourage higher speeds	All	Low - Moderate	Low	Creates visual narrowing and enclosure to support lower speeds. Requires consideration of sight lines, maintenance and roadside safety.
Threshold markings	Poor transition into low-speed areas	All	Low – Moderate	Low	Reinforces a change in speed environment at gateways, thresholds, school zones, centres or local streets.
Perceptual speed reduction markings	Excessive speeds where visual cues do not encourage slowing	All	Low - Moderate	Low	Alters driver perception to encourage speed reduction. Most effective where used with supporting road layout or gateway measures.
Edge protection barriers close to traffic lanes	Roadside hazard exposure and wide perceived road space	All	Moderate	Low	Protects users from hazards and can visually narrow the road. Placement must consider clear zones, deflection space and road user safety.
Parking removal near crossings	Poor visibility and pedestrian crossing risk	All	Low - Moderate	Low	Improves sight lines between pedestrians and drivers. Best applied near crossings, intersections, schools and high pedestrian activity areas.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Street furniture close to kerb line	Wide perceived road space and lack of low-speed visual cues	L	Low - Moderate	Low	Can visually narrow the street and reinforce a lower-speed environment. Must maintain pedestrian accessibility, visibility and clear path requirements.
Guardrails, context specific	Run-off-road risk and exposure to roadside hazards	All	Moderate - High	Low	Protects users from roadside hazards where appropriate. Should be used based on risk, deflection requirements, roadside context and vulnerable user exposure.
Removal of visual clutter that hides pedestrians	Poor visibility of pedestrians and crossing activity	All	Moderate	Low	Improves sight lines and reduces hidden pedestrian risk, particularly near crossings, schools, centres and intersections.
Improved delineation of road edges	Poor driver guidance, edge tracking and road environment legibility	All	Moderate	Low	Improves awareness of road alignment and edge position. Useful on urban and rural roads, especially where visibility or edge definition is poor.

A4. Pedestrians

Tier 1 — Primary Safe System Interventions - Pedestrian Crossing Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Mid-block pedestrian signals	Pedestrian crossing risk on busy corridors and high-demand desire lines	A, C	Moderate - High	Low	Suitable near schools, shops, public transport stops and other activity areas where pedestrians need a controlled crossing away from intersections.
Signalised pedestrian crossings	Pedestrian crossing risk on arterials and busy intersection approaches	A, C	High	Low	Provides controlled crossing opportunities where traffic volumes, speeds or pedestrian demand make uncontrolled crossings unsuitable.
Zebra crossings where operating speed is within Safe System boundary	Pedestrian crossing risk on lower-speed urban, suburban and local roads	C, L	Medium – high	Low	Only suitable where operating speeds are already low enough, or can be managed, to align with Safe System conditions.
Raised platform crossings / raised zebra crossings	Pedestrian crossing risk and excessive vehicle speeds at crossing points	C, L	High	Low	Provides pedestrian priority while physically reducing vehicle speeds. Most suitable near schools, centres and local streets with high pedestrian demand.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Pedestrian refuge islands	Wide-road crossing exposure and staged pedestrian crossing need	All	Low (on multilane) - Medium	Low	Provides a staged crossing opportunity and can narrow the carriageway. Best used where full signalised or priority crossing treatment is not required or feasible.
Non-priority / assisted crossings	Pedestrian crossing need in low-speed, low-volume environments	L	Low	Low	Includes staged crossings, kerb extensions without formal markings and other assisted treatments. Should be limited to locations where traffic speed and volume support safe informal crossing behaviour.

Tier 1 - Pedestrian Crossing Treatments - Intersection-Specific Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Pedestrian phases at intersections, including Barnes Dance	Pedestrian conflict with turning or through traffic at signalised intersections	A, C	Moderate	Low	Suitable for town centres, high pedestrian-demand areas and complex signalised intersections. Barnes Dance treatments are most useful where high pedestrian volumes justify full pedestrian separation.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Pedestrian-only signal phases	Pedestrian exposure during conflicting vehicle movements at signalised intersections	A, C	Moderate - High	Low	Provides a dedicated crossing phase for pedestrians. Best suited to signalised intersections with high pedestrian demand or recurring pedestrian conflict risk.
Raised priority pedestrian crossings at intersections	Pedestrian crossing risk and excessive turning or approach speeds	C, L	High	Low	Gives pedestrians priority while physically lowering vehicle speeds. Application may be constrained on arterials, bus routes or corridors with high traffic volumes.
Slip-lane crossings, marked or raised	Pedestrian conflict with turning vehicles at slip lanes, intersections and roundabouts	All	Marked – if speed within safe system speed – Medium Raised – High	Low	Raised slip-lane crossings are preferred where speed reduction is required. Marked-only treatments should only be used where speeds and visibility are appropriate.
Corner kerb build-outs	Long crossing distances, poor visibility and high turning speeds	All	Low - Medium	Low	Shortens pedestrian crossing distance, improves sight lines and helps slow turning vehicles at intersections.
Shortened crossing distances	Pedestrian exposure across wide roads and intersections	All	Low - Medium	Low	Can be achieved through kerb build-outs, medians, refuges or lane narrowing. Best used where pedestrian exposure time needs to be reduced.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Refuge islands within intersections	Pedestrian exposure on wide intersections or multi-lane roads	All	Medium	Low	Provides staged crossing opportunities where a full signalised or raised priority crossing is not feasible.
Pedestrian bypasses around roundabouts	Pedestrian exposure and route legibility around roundabout locations	All	Medium	Low	Helps guide pedestrians away from high-conflict areas and provides safer crossing points on roundabout approaches.
Pedestrian priority crossings on side roads	Pedestrian conflict at side-road entries and exits	C, L	Medium	Low	Reinforces pedestrian priority and supports lower turning speeds. Most suitable in urban streets, centres and local access environments.

Tier 1 — Primary Safe System Interventions - Pedestrian Crossing ./ Traffic-Calming Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Raised pedestrian crossing platforms, speed humps and speed cushions	Pedestrian crossing risk and excessive vehicle speeds near conflict points	C, L	High	Low - medium	Physically reduces vehicle speeds near schools, crossings and urban or suburban streets. Application may be constrained on arterials, bus routes and emergency response routes.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Raised intersections	High conflict speeds and severe crash risk at intersections	C, L	High	Medium	Creates a lower-speed intersection environment and reduces crash severity for pedestrians, cyclists and turning vehicles.
Raised safety zones	High vulnerable road user exposure in schools, shopping centres and activity areas	C, L	High	Low	Supports a consistent low-speed environment across areas with high pedestrian activity or community access needs.
Horizontal traffic calming measures	Excessive speeds, wide carriageways and poor speed compliance near crossings	All	Medium – High	Low	Includes road narrowing, lane narrowing, chicanes, kerb blisters and build-outs. Most effective when applied as part of a route or area-based package.
Vertical deflection devices near crossings	Excessive approach speeds at pedestrian crossing points	C, L	Unknown	Low	Helps reduce vehicle speeds before crossing points. Should be designed to suit traffic volumes, route function and accessibility requirements.
Surface texture and visual narrowing	Poor speed awareness and weak visual cues on approaches to crossings	All	Low–Medium	Low	Encourages drivers to slow through visual or surface cues. Best used as a supporting measure rather than a stand-alone treatment.

Tier 1 — Primary Safe System Interventions - Pedestrian Crossing / Footpath & Route Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Footpath / sidewalk	Pedestrian exposure where no safe walking facility is provided	All	Moderate - High	Low – moderate	Provides basic pedestrian separation from traffic. Should be provided on urban and suburban streets where pedestrian movement is expected.
Separated pedestrian path	Pedestrian exposure along busy roads and corridors	A, C	Moderate - High	Low – moderate	Provides physical separation from traffic on higher-volume or higher-speed corridors. Useful where footpaths need greater separation from vehicle movement.
Shared path for pedestrians and cyclists	Pedestrian and cyclist exposure along busy roads and corridors	All	Medium – for cyclist if well designed with good visibility; but LOS for pedestrians and safety - LOW	Low – moderate	Provides an off-road facility for pedestrians and cyclists. Suitability depends on path width, user volumes, speed differences, conflict management and crossing treatment.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Boardwalks and pedestrian bridges	Severance, unsafe crossings and pedestrian exposure near rivers, highways or rail corridors	All	High	Medium – high	Provides grade-separated or off-road pedestrian connectivity where at-grade routes are unsafe, unavailable or constrained.
Pedestrian tunnels / underpasses	Severance and unsafe crossing of roads or rail corridors	A, C	High – but with Crime Prevention Through Environmental design & universal design etc	High	Suitable where feasible, legible, accessible and safe for users. Requires careful consideration of personal security, lighting, drainage, maintenance and universal access.

Tier 1 — Primary Safe System Interventions - Pedestrian Crossing ./ Shared-Space & Low-Speed Environment Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Shared spaces	Vehicle conflict and vulnerable road user exposure in high-place environments	L	High	Low	Prioritises pedestrians and other vulnerable users in town centres and mixed-use streets. Most suitable where very low operating speeds and high pedestrian activity are intended.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Pedestrian-priority streets	Pedestrian exposure and vehicle dominance in shopping or entertainment areas	L	High	Low	Gives pedestrians priority and supports lower vehicle speeds in high-activity streets. May require access, loading and servicing arrangements to be managed.
Low-speed zones, including 10–30 km/h environments	High vulnerable road user exposure in residential, commercial and school areas	C, L	High	Low	Creates survivable speed environments where people walking, cycling and accessing local destinations are common. Works best when supported by self-explaining street design.
Vehicle-restricted streets	Vehicle conflict in town centres, school streets and high pedestrian-demand areas	L	High	Low	Can be permanent or time-based. Suitable where reducing or removing vehicle access provides a clear safety and place benefit.
Pedestrian priority tables in shared spaces or low-speed zones	Pedestrian crossing risk and vehicle speed at priority points	L	High	Low	Reinforces pedestrian priority and supports low operating speeds within shared spaces, centres and other low-speed environments.

Tier 2 — Supporting Safe System Interventions - Pedestrian Safety & Visibility Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Pedestrian lighting	Poor visibility and night-time pedestrian risk at crossings, footpaths and walking routes	All	Medium	Low – medium	Can be crossing-specific or route-based. Most useful where night-time activity, poor lighting or pedestrian visibility issues are present.
Improved sight lines / parking removal	Poor visibility between pedestrians and drivers at crossings and intersections	All	Medium	Low	Improves intervisibility and reduces hidden pedestrian risk. Best applied near crossings, intersections, schools and high-demand pedestrian areas.
Guardrails, selective use	Pedestrian exposure to hazards or uncontrolled access near busy roads	All	Medium	Low – medium	Should be used selectively where it guides pedestrians away from unsafe areas or protects from hazards. Must avoid creating accessibility or entrapment issues.
Fencing to guide pedestrian desire lines	Unsafe pedestrian crossing behaviour near busy roads or formal crossings	All	Low–Medium	Low - medium	Helps guide pedestrians to safer crossing points. Should be used carefully so it does not create excessive detours or severance.
Contrast surfacing	Low conspicuity at crossings and intersections	All	Low	Low	Improves visual recognition of crossing or conflict areas. Best used with other crossing, speed or visibility treatments.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Anti-skid crossing surfaces	Slippery surfaces and braking risk at crossings or intersections	All	Low–Medium	Low – medium	Improves skid resistance for vehicles approaching pedestrian conflict areas. Most useful where wet-road or braking-related risk is present.
Pedestrian advance warning signs and markings	Poor advance awareness of pedestrian crossings or high pedestrian activity	All	Low–Medium	Low	Provides early warning to drivers approaching crossings, schools or pedestrian activity areas. Works best as a supporting measure.
High-visibility crossings	Pedestrian crossing conspicuity near schools and busy roads	All	Medium	Low	Improves visibility and awareness of crossing locations. Should be supported by appropriate speed environment and sight-line controls.

Tier 2 — Supporting Safe System Interventions - Pedestrian Safety / School & Vulnerable-User-Specific Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
School patrol crossings, including school zebra crossings, signalised crossings and kea crossings	School-related pedestrian crossing risk and child vulnerability near schools	C, L	High – during the school hours	Low	Suitable where school pedestrian demand is high. Kea crossings should only be used on low-volume, low-speed roads where supervision and operating conditions support safe use.
School crossing points	Pedestrian exposure and unsafe crossing movements near schools	All	High – during school hours	Low - medium	Provides defined crossing opportunities on routes to school. Treatment type should reflect traffic volume, speed, pedestrian demand and Safe System boundary conditions.
Threshold treatments near schools	Poor driver awareness and high approach speeds entering school environments	All	Low - Medium	Low	Reinforces the transition into a school environment through signs, markings, gateway treatments, surface changes or other visual cues.
Reduced speed environments near schools	High pedestrian exposure and non-survivable speeds around schools	All	High – moderate	Low	Supports survivable speeds on approaches to schools and within school zones. Most effective when supported by self-explaining design, gateway treatments and compliance measures.

A5. Motorcyclist and cyclist safety

A5.1` Urban cyclists and motorcyclists — intersection-focused Safe System interventions

Tier 1 — Safe System Design and Operational Change (Preferred) - Intersection Speed Management & Layout Treatments

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Intersection speed management	High approach speeds and severe conflict speeds at intersections	All	High together with reduced exposure	Low	Supports Safe System outcomes by reducing vehicle speeds at conflict points. Most effective when combined with layout, phasing or crossing improvements.
Variable speed limits at and on approaches to intersections	Time-based or risk-based speed exposure at intersections	A, C	Low – moderate (high short term)	Low	Useful where risk varies by time of day, traffic conditions, side-road activity, school activity or vulnerable road user exposure.
Management of operating speeds to Safe System thresholds	Non-survivable impact speeds at intersection conflict points	All	High	Low	Focuses on achieving operating speeds that align with Safe System boundary conditions for the relevant crash type and road users.
Intersection Speed Zones / dynamic speed management	High-speed intersection approaches and priority-controlled conflicts	A, C	Moderate	Low	Dynamically manages speeds where permanent speed reduction or full infrastructure change is constrained. Particularly useful at high-risk rural or peri-urban intersections.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Intersection layout and operational changes to reduce conflict points	Multiple or complex turning, crossing and through-movement conflicts	All	Moderate - High	Low	Includes layout simplification, lane changes, access control and operational changes that reduce the number or severity of conflicts.
Restriction or removal of high-risk turning movements	Right-turn, crossing and access-related intersection crashes	A, C	High	Low	Includes turn bans, median closures and movement restrictions. Should be supported by network assessment to manage displacement effects.
Protected signal phasing or dedicated cycle phases	Turning conflicts involving vehicles, pedestrians and cyclists	A, C	Moderate - High	Low	Separates conflicting movements in time. Suitable where signalised intersections have high pedestrian, cyclist or turning-movement risk.
Intersection layouts that reduce vehicle turning speeds and clarify priority	High turning speeds, unclear priority and complex decision-making	All	High	Low	Includes tighter kerb radii, splitter islands, raised entries, compact layouts and priority clarification.
Enhanced visibility and conspicuity by design	Poor detection of controls, users, crossings or conflict areas	All	Low - Medium	Low	Uses design measures to make intersections, users and conflict points more visible and legible. Best used with speed or conflict-reduction measures.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Lane and stop-line positioning for improved visibility	Poor intervisibility, blocked sight lines and late detection at intersections	All	Low	Low	Adjusts lane alignment, stop-line location or approach positioning to improve visibility between drivers, pedestrians, cyclists and opposing traffic.

Tier 2 — ITS, Supporting Infrastructure, and Reinforcement Measures

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Intersection-based ITS warning signs	Poor driver awareness of intersection risk, side-road activity or changing conditions	A, C	Low - Medium	Low	Provides advance warning of intersection activity or hazards. Most useful on higher-speed approaches, rural/peri-urban intersections or locations with limited visibility.
Driver feedback signs / vehicle-activated signs / speed advisory signs	Elevated approach speeds and poor speed compliance near intersections	All	Low	Low	Provides real-time speed feedback or advisory messages. Best used as a supporting measure alongside speed management, layout changes or enforcement.
High-quality skid-resistant surfacing at stopping areas and conflict zones	Skidding, braking and loss-of-control risk at intersection approaches and conflict points	All	Low - Medium	Low - medium	Most useful where wet-road crashes, heavy braking demand, downhill approaches or poor surface friction are present.
Targeted urban safety campaigns addressing turning conflicts	Unsafe turning behaviour and poor awareness of vulnerable road users at intersections	All	Low–Medium	Low	Can support physical, operational or enforcement measures, but should not be relied on as a stand-alone treatment for high-risk intersections.
Rider-focused education on intersection	Motorcyclist and cyclist exposure to turning, crossing and visibility-	All	Low–Medium	Low	Supports rider awareness and positioning, particularly at complex urban intersections. Most effective when

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
positioning and hazard anticipation	related intersection conflicts				combined with infrastructure, visibility and speed-management measures.

A2 Rural motorcyclists — corridor focused Safe System interventions

Loss of Control and Run-off Road Risk (Primary Focus)

Tier 1 — Rural motorcyclists — corridor focused Safe System interventions **-**Safe System Design and Physical Infrastructure (Preferred)

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Speed and alignment consistency	Loss-of-control and run-off-road risk on rural corridors	A, C	Low - High	Low	Supports consistent operating speeds and reduces surprise for drivers and riders, particularly where road alignment changes suddenly.
Variable speed limits at high-risk locations	Elevated risk during wet weather, peak periods or other changing conditions	A, C	Moderate–High – during operating hours	Low	Temporarily lowers operating speeds where risk conditions vary by time, weather, traffic or road environment.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Safe and appropriate operating speeds aligned with curve geometry, sight distance and stopping distance	Loss-of-control risk and non-survivable speeds on rural curves	A, C	Low – moderate low	Low	Aligns operating speed with the physical road environment and Safe System boundary conditions.
ITS curve warning systems	Curve-related speed risk and rider or driver expectancy mismatch	A, C	Low -	Low	Activated by speed, weather or rider presence to warn users of curve risk and encourage speed reduction.
Curve consistency treatments	Sudden speed change, driver surprise and loss-of-control risk	A, C	Moderate–High	Low	Improves consistency along rural corridors so drivers and riders are not unexpectedly required to slow sharply.
Surface quality and friction improvements	Loss-of-control risk linked to poor surface condition or low friction	All	High	Low - medium	Supports safer braking and vehicle control, particularly on curves, approaches and high-risk rural lengths.
High-friction surfacing on high-risk curves and curve sequences	Braking and loss-of-control risk on rural curves	All	High	Low - medium	Most effective where crash history, geometry or surface condition indicates high loss-of-control risk.

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
High-friction surfacing on braking zones before tight bends and downhill sections	Skidding and braking-related loss-of-control crashes	All	Low – moderate	Low - medium	Improves braking and control where drivers or riders need to reduce speed before tight bends or downhill sections.
High-friction surfacing at wet-weather or motorcycle crash locations	Wet-road and motorcycle loss-of-control crashes	All	High – moderate	Low – medium	Best targeted to sites with wet-road crashes, motorcycle-only crashes or known skid-resistance issues.
Motorcycle-friendly roadside barriers	Motorcyclist injury severity in run-off-road crashes	A, C	Low Moderate - Low	Low – medium	Includes lower rails or underrun protection where motorcyclists may strike roadside barriers.
Removal or shielding of hazardous roadside objects	Severe injury risk from run-off-road impacts with fixed hazards	All	High	Low – high	Reduces crash severity by removing, relocating or shielding unforgiving roadside hazards.
Sealed and widened shoulders	Edge drop-off, limited recovery space and run-off-road risk	All	Moderate–High	Low	Provides recovery space and supports safer travel through high-risk rural sections and curves.

Tier 2 -Supporting design - Rural motorcyclists Safe System interventions - Rural Intersections (Secondary Risk)

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Intersection layout simplification and speed reduction	High approach speeds and crash risk at rural intersections	A, C	Moderate–High	Low	Simplifies priority, improves driver expectancy and reduces approach speeds at rural intersections. Most effective where layout changes are supported by clear speed management and visibility improvements.
Roundabout conversion (preferred signle lane)	High-energy crossing, turning and side-impact crashes at rural intersections	A, C	High	Low	Removes or reduces high-energy angle crashes by lowering approach speeds and changing conflict angles. Suitable where geometry, land, heavy vehicles and route function can be managed.
Improved sight distance and advance warning	Poor approach visibility, late detection and braking risk at rural intersections	A, C	Low – Moderate (MGSD min)& ASD, CSD	Low	Includes visibility improvements, advance warning signs and approach treatments. Most useful where crash history or site review shows poor sight distance or late driver recognition.
Skid-resistant surfacing on approaches and stop lines	Braking, skidding and loss-of-control risk at rural intersection approaches	A, C	Low – moderate Low	Low	Supports safer braking and vehicle control, particularly for riders and drivers on wet, downhill, curved or high-speed approaches.

Tier 2 — Rural motorcyclists — ITS, Speed Management, and Reinforcement Measures

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Rider awareness programme	Rider anticipation, hazard recognition and decision-making on rural roads	All	Low – Medium low	Low	Supports riders to recognise rural corridor and intersection risks, including curves, surface changes, roadside hazards and speed-related risk. Best used alongside physical and speed-management treatments.
Speed advisory signs on curves and downhill approaches	Excessive approach speeds and loss-of-control risk on curves or downhill sections	A, C	Low Medium	Low	Reinforces appropriate speeds and can include motorcycle-specific warnings where rider risk is elevated. Most useful on high-risk curves, downhill approaches and routes with motorcycle activity.
Driver feedback signs / vehicle-activated signs on long rural straights leading into curves	High approach speeds before curves and poor speed adaptation	A, C	Medium	Low	Provides real-time feedback to encourage drivers and riders to slow before higher-risk curve environments. Best used as part of a corridor speed-management package.
Gateway and threshold treatments	Poor recognition of transition into higher-risk curve or rural settlement environments	A, C	Medium	Low	Signals a change in road environment and supports earlier speed reduction. Useful where drivers or riders move from open-road conditions into more constrained or higher-risk sections.

Tier 2 — Rural motorcyclists — ITS, Speed Management, and Reinforcement Measures - Enforcement Support

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Static or average speed safety cameras on rural corridors	Persistent high-speed riding and speed-related motorcycle crashes on rural corridors	A, C	Low - Moderate	Low	Most suitable on rural corridors and popular riding routes where speed compliance is a known issue. Should support a wider package of speed management, road design and rider safety measures.
Enforcement locations supporting credible speed environments	Speed non-compliance where the road environment and posted speed need stronger reinforcement	A, C	Low - Moderate	Low	Helps reinforce safe and appropriate speeds and complements design measures. Most effective where enforcement locations are aligned with credible speed limits, high-risk routes and known crash patterns.

Tier 2 — Rural motorcyclists Education and Safety Promotion (Supporting Role)

Treatment / intervention	Safety issue addressed	Road hierarchy suitability	Effectiveness	Indicative cost	Notes
Education and promotion programmes for rural motorcyclists	Rural motorcycle risk related to speed choice, hazard awareness and rider decision-making	A, C	Low–Moderate	Low	Supports Safe System infrastructure and speed-management measures but should not be used as a substitute for physical risk reduction.

Targeted rural motorcycle safety campaigns	Loss-of-control, curve approach speed, braking, lane positioning, surface awareness, seasonal risk and fatigue	A, C	Low–Moderate	Low	Most useful on rural corridors and intersections with known motorcycle activity or crash risk. Should be aligned with route-based infrastructure and speed treatments.
Route-based rider communications	Rider awareness on known recreational riding corridors	A, C	Low–Moderate	Low	Provides targeted information about high-risk routes, curves, surface conditions, seasonal hazards and safety improvements. Best used before, during and after corridor upgrades.
Pre- and post-implementation communications	Understanding and acceptance of infrastructure or speed-management changes	A, C	Low–Moderate	Low	Helps explain why changes are being made, what safety issue is being addressed and how users should respond. Supports compliance and community acceptance.

Appendix B – What is a bigger problem??? Intersection risks vs Corridor risks

Analysis of network crash patterns indicates that both intersections and corridors present material but different safety risks, requiring complementary intervention approaches.

Intersections present a high crash-risk environment, despite comprising a small proportion of the road network. Around 34% of all reported crashes occur at intersections, indicating a disproportionately high crash rate per metre of road. This elevated risk is driven by the complexity of movements occurring in a confined space, including turning vehicles, pedestrian and cyclist crossings, lane changes, queuing and stopping. Risk is greatest at multi-lane and complex urban intersections, particularly where permissive right-turn phasing creates overlapping and competing priorities. While speeds are generally lower, decision complexity, visibility constraints and multiple conflict points increase the likelihood of crashes.

Corridor (mid-block) locations account for the most severe outcomes. Approximately 66% of deaths and serious injuries occur between intersections, primarily due to higher operating speeds, run-off-road and loss-of-control crashes, and limited opportunities for error recovery. Although crashes are less frequent on corridors, when they occur, they are more likely to result in serious harm.

Risk is highly concentrated and unevenly distributed across the network. Intersections exhibit a much higher crash density than corridors, making them priority locations for safety investment. Because crashes are spatially concentrated and conflict points are fixed, targeted intersection treatments can deliver high safety returns per dollar, reducing both conflict frequency and crash occurrence more efficiently than broad corridor treatments.

Vulnerable road users face heightened exposure at intersections. Pedestrians, cyclists, micromobility users and motorcyclists are especially at risk due to turning conflicts and side-impact crashes, which are strongly influenced by intersection layout and signal phasing. Conspicuity issues, gap-acceptance errors and interactions with turning vehicles are dominant contributors to serious injuries for these groups. Depending on how you retrieve the CAS data: 53% of the intersection crashes involved VRU vs 40% of the VRU crashes were at intersections. It is still a big problem!!

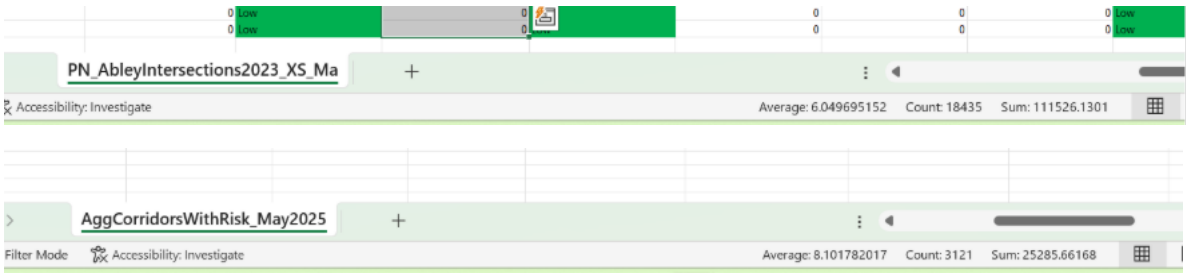
Intersection risk is more controllable than mid-block risk. Safety outcomes can be more directly influenced through signal phasing changes, separation or removal of conflicting movements, and geometric design modifications such as lane allocation, approach alignment and corner radii. In contrast, addressing mid-block risks linked to speed and loss of control typically requires longer, corridor-wide treatments to achieve comparable reductions in harm.

So, Intersection vs. midblock: 34% of crashes occur at intersections, 66% at midblocks. Which is riskier?

Comparing the Personal Risk Value (DSi casualty equivalents per 100 million VKT – 2023 urban Kiwirap update) for:

- All intersection = 111,526, vs
- All corridor = 25,286,

confirming intersections are way riskier than corridors. These are the snapshot from the Urban KiwiRap calculations updated in May 2025 (2020 – 2024 data)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Appendix C: Selection of crossing facilities

Selection process for crossing facilities

The selection of crossing facilities should follow a combined **reactive and proactive assessment process** so that investment is directed to locations with the greatest safety risk, user demand and network need. The process should not rely on crash history alone, as some locations may have high pedestrian, cyclist, motorcyclist or micromobility exposure but limited recorded DSI history.

The first step is to identify crossing deficiencies through **safety-led evidence**. This includes reviewing DSI and injury crash data, with particular attention to crashes involving pedestrians, cyclists, motorcyclists and other vulnerable road users. Community, customer and Local Board requests should also be considered, as these can identify perceived safety issues, severance and locations where people may avoid crossing because the existing environment feels unsafe or inconvenient.

The second step is to apply a **proactive risk-based assessment**. This should use DSI-equivalent risk measures, Urban KiwiRAP vulnerable road user collective risk, motorcycle collective risk and other network risk indicators to identify high-risk corridors and intersections, including locations where crash numbers are low but the risk environment is poor. Area-wide analysis should also be used to identify wards, corridors and centres with higher concentrations of vulnerable road user risk.

The third step is to assess **demand, land use and desire lines**. Crossing need should be tested against land use generators such as schools, bus stops, town centres, public transport interchanges, community facilities and other high-demand destinations. Gap-analysis tools can help identify locations where pedestrian demand is likely to be high but no formal crossing is available within an appropriate walking distance.

The fourth step is to check **strategic alignment and programme opportunities**. Candidate locations should be considered alongside walking and cycling strategies, Future Connect, motorcycle priority routes, speed management planning, public transport projects, TERP, maintenance renewals and other capital works. This helps ensure crossing investment supports wider network outcomes and can be delivered efficiently where it aligns with planned works.

The fifth step is to select the most appropriate crossing type based on **road context and Safe System conditions**. Factors should include road hierarchy, traffic volume, operating speed, pedestrian and cyclist demand, crash risk, visibility, accessibility, surrounding land use, public transport access and network function. In lower-speed, lower-volume contexts, non-priority or assisted crossings such as kerb build-outs, refuges or staged crossings may be suitable. In higher-demand or higher-risk environments, priority or controlled crossings such as raised zebra crossings, signalised mid-block crossings or signalised intersections are likely to be required.

The sixth is to prioritise and develop the programme. Locations should be ranked using a consistent value-for-money lens, including DSI saved per $100 million invested, predictive DSI-equivalent risk, deliverability, cost, alignment with other programmes and the ability to address residual risk. This ensures that crossing improvements are selected and sequenced as part of a transparent, evidence-led programme rather than as isolated responses.

The final step is to monitor and evaluate the programme to confirm whether the measures are effective and whether the expected level of service and safety outcomes have been achieved.

Where similar safety issues are identified for **e-scooters, cyclists and motorcyclists**, the same planning logic should be applied. This may not require a separate plan for each mode, but the crossing and corridor assessment should explicitly consider their exposure, desire lines, operating environment and crash risk so that vulnerable road user needs are addressed as part of an integrated Safe System assessment.

Current methodology to Identify Network Deficiencies for Crossing Facilities

A combined **reactive and proactive** approach is used to identify gaps and deficiencies in crossing provision across the network, ensuring investment is targeted to locations of highest risk and demand.

Reactive Identification (Safety-led)

Deficiencies are first identified through analysis of **actual safety outcomes**, including:

- **Death and Serious Injury (DSI) crash analysis**, with a focus on pedestrian, cyclist and motorcyclist crashes and known blackspots.
- **Community, Local Board and customer requests**, which provide insight into perceived safety issues and barriers to safe crossing. These sources help highlight locations where the existing network is demonstrably failing to provide safe crossing opportunities.

Proactive Risk-Based Assessment

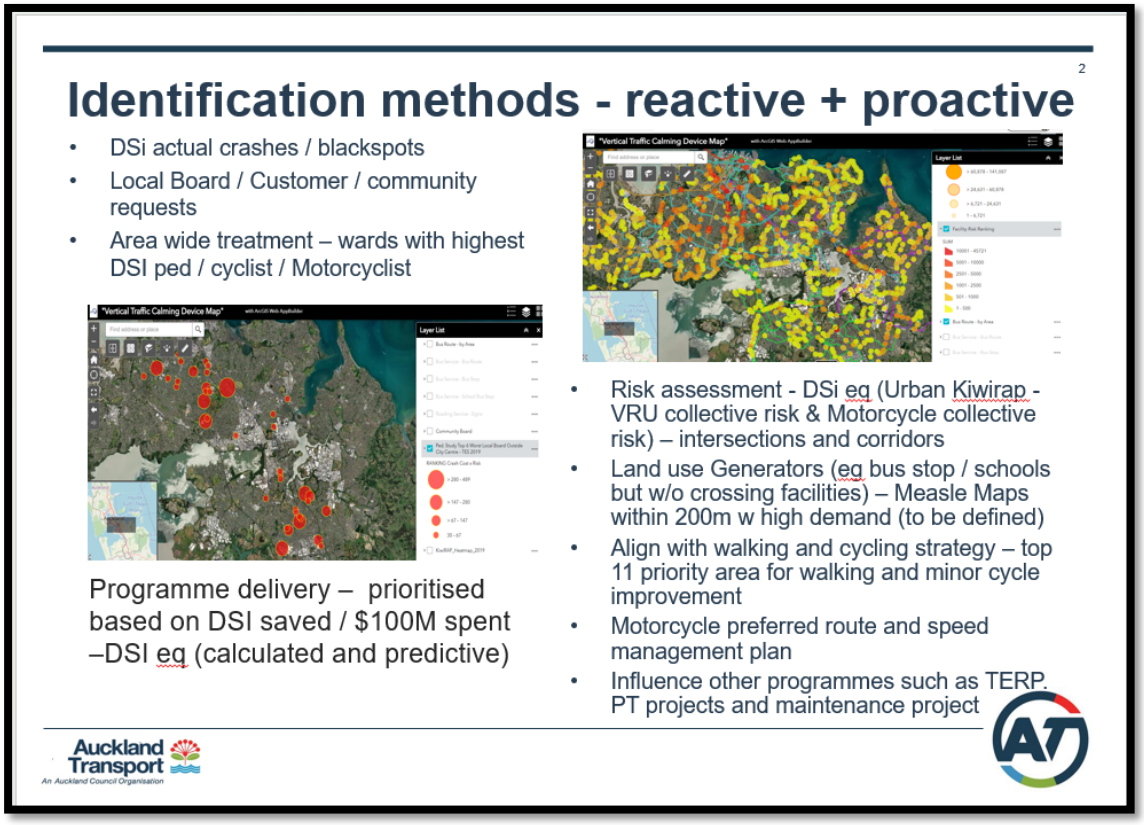
To address the limitations of relying on crash history alone, a proactive risk-based approach is applied:

- **Risk assessment using DSI-equivalent measures**, including Urban KiwiRAP VRU collective risk and motorcycle collective risk, to identify high-risk intersections and corridors even where crash numbers are low.
- **Area-wide analysis**, prioritising wards and corridors with the highest concentrations of pedestrian, cyclist and motorcyclist DSI risk.

Demand and Land-Use Analysis

Crossing deficiencies are also identified by assessing whether crossing provision aligns with where people need to cross:

- **Land-use generators** such as bus stops, schools and other high-demand destinations are mapped.
- **Measle maps** are used to identify locations with high pedestrian demand but **no crossing facilities within 200 metres** (high-demand threshold to be defined). This highlights gaps where crossing facilities are missing or poorly spaced relative to desire lines.



Strategic Alignment

Identified deficiencies are filtered and prioritised to ensure alignment with wider network strategies:

- Alignment with **walking and cycling plans**, focusing on top-priority areas for mode shift and safety improvement.
- Consideration of **motorcycle preferred routes** and links to speed management planning.
- Integration with other programmes such as **public transport projects, and maintenance works**, to maximise efficiency and impact.

Prioritisation and Programme Development

All identified locations are prioritised using a consistent value-for-money lens:

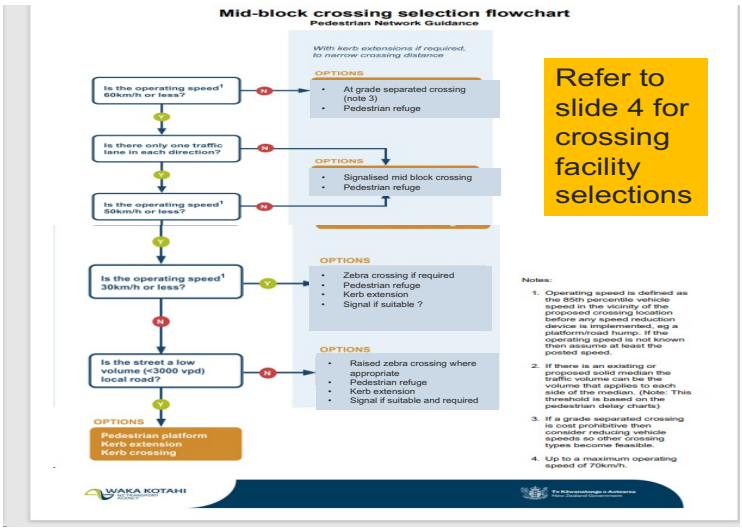
- Schemes are ranked based on **DSI saved per $100M spent**, using both calculated and predictive DSI-equivalent measures.
- This ensures investment is directed to locations where crossing improvements deliver the greatest safety benefit across the network.

Selection of crossing facilities

Selecting the most appropriate crossing facilities involves a context-sensitive approach that considers factors such as traffic volume, speed, and the needs of pedestrians and other road users. For low-traffic areas, non-priority crossings like kerb extensions or pedestrian refuges may suffice, while high-traffic zones often require priority crossings such as raised zebra crossings or signalised midblock crossings or signalised intersections. Below is the modified crossing facility selection process based on the NZTA's method:

5

Crossing selection process | Waka Kotahi NZ Transport Agency (nzta.govt.nz)



Refer to slide 4 for crossing facility selections

Pedestrian Network Guidance - Mid-block crossing selection flowchart (October 2022) (nzta.govt.nz)

High level principles for arterials with mid to high pedestrian demands:

- For single used arterial - a formal controlled crossing such as signalised or zebra Xing every 400 m – including crosswalks as signalised intersections. (LoS D in ANOP– as minimum);
- For mix used arterial with high pedestrian volume – 200 m and 100 m in town centres.
- Refer to slide 4 for facility type selections.
- Refer to RSP principles and prioritisation update March 24 TO BE CONFIRMED.pptx for RSP assessment criteria – only for zebra or signalized crossings.
- Refer to the mapping tool on slide 6 to complete the corridor assessment – taking consideration on the locations of all existing crossing facilities and RSP locations, landuse, bus stop locations, patronage numbers, ~~and~~ functions and urban kiwirap [illegible]

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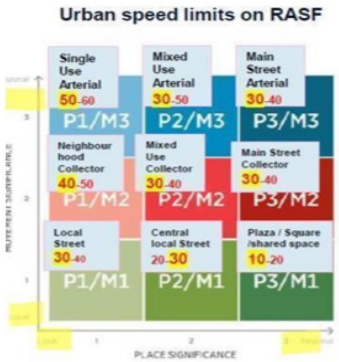
Use your engineering judgement!!

In areas with significant pedestrian activity, raised platforms crossings can enhance safety. The selection process should also account for the surrounding environment, ensuring visibility, accessibility, and minimal disruption to traffic flow. Below are the selection criteria for crossing facilities for the road safety engineering programme:

4

Recommended (Minimum) pedestrian LOS - LOS in ANOP (last slide) defines the distance between crossing facilities and the acceptable level of Xing delays . Use land use to help define priority for peds. i.e. Raised zebra crossings have the best level of services in terms of highest safety protection and best connectivity, followed by signal. Pedestrian refuge offered the least. Universal and inclusive design principles must be applied at all times.



LOS D – signal (0utside school, high risk, high demand) - otherwise ped refuge	LOS C / D– can be both raised zebra if appropriate or otherwise signal	LOS B / C – due to high place value – prefer raised Xing, before consider signal.
LOS D – raised crossing / signal (0utside school, high risk, high demand) - otherwise ped refuge	LOS C / D – raised crossing / signal (outside school, high risk, high demand) - otherwise ped refuge	LOS B / C – prefer to be raised zebra to give ped priority – if not appropriate, consider signal.
(outside school, high risk, high demand), if required. Otherwise ped refuge, kerb built out	(outside school, high risk, high demand), if required – otherwise ped refuge – kerb built out will be suffice	LOS A – shared space (no need to have zebra xing or other xing facilities

Refer to AT's practice note for RSP principles. Speed management devices are required to ensure the operating speed at the zebra crossing is still in the order of the survival speed for pedestrians and cyclists of 30 km/h.

Auckland Transport
An Auckland Council Organisation

Appendix D: Relevant Auckland Council Strategic Transport Framework Documents[1]

Document	Organisation	Year established	How transport safety is explicitly called out
Auckland Plan 2050	Auckland Council	2018	Sets a vision of *"a safe transport network, free from death and serious injury"* under the Transport and Access outcome; safety is treated as a foundational wellbeing and liveability requirement for Auckland. [aucklandco…il.govt.nz]
Auckland Plan 2050 – Direction 1: Maximise safety, environmental protection and emissions reduction	Auckland Council	2018	Explicitly identifies *transport safety* as a core challenge; notes rising deaths and serious injuries and references adoption of Vision Zero for Tāmaki Makaurau as the response. [aucklandco…il.govt.nz]
Vision Zero for Tāmaki Makaurau – Transport Safety Strategy & Action Plan to 2030	Auckland Council (& partners)	2019	Establishes Vision Zero with the principle that *no death or serious injury is acceptable*; sets interim and long-term targets (250 DSI by 2030; zero by 2050) and commits to a Safe System approach. [at.govt.nz]
Vision Zero "for the greater good" programme overview	Auckland Council	2019	Describes Vision Zero as Council's overarching transport safety framework and explicitly states that people should not be killed or seriously injured when using the transport system. [at.govt.nz]
Regional Land Transport Plan (RLTP)	Auckland Transport / Auckland Council	2024 (refreshed every 3 years)	Embeds transport safety as a statutory outcome, aligning investment to reduce deaths and serious injuries and to deliver Vision Zero priorities. [at.govt.nz]
Regional Public Transport Plan (RPTP) 2023–2031	Auckland Council	2023 (refreshed every 3 years)	Sets *"Safe and accessible transport for everyone"* as one of five core public transport goals, explicitly

[1] 2026 Review

Document	Organisation	Year established	How transport safety is explicitly called out
			including personal safety and injury prevention. [oag.parliament.nz]
Future Connect – Auckland's Transport Network Plan	Auckland Council	2026 (refreshed every 3 years)	Frames safety as a fundamental network requirement; future network design explicitly supports reduction of deaths and serious injuries through Safe System principles. [at.govt.nz]
Road Safety Business Improvement Review (BIR)	Auckland Council	2017	Formally identifies a road safety crisis in Auckland and recommends adoption of Vision Zero and accelerated safety investment. [at.govt.nz]
Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan	Auckland Council	2020	Links transport safety with health and emissions reduction; recognises co-benefits of safe speeds, mode shift and safer streets. [aucklandco…il.govt.nz]
Transport Emissions Reduction Pathway (TERP)	Auckland Council	2022	Identifies safe walking, cycling and public transport as necessary enablers of mode shift, explicitly noting safety as a prerequisite for behaviour change. [aucklandco…il.govt.nz]

Appendix E: Reference

Auckland Transport. (2020). *Vision Zero – So far 2020* [PDF]. https://at.govt.nz/media/1983262/vision-zero-so-far-2020.pdf

Auckland Transport. (n.d.). *Vision Zero for Tāmaki Makaurau – Road Safety Strategy* [PDF]. https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

Auckland Transport. (2025–2027). *Road Safety Action Plan* [Internal document: AT001145 – Road safety plan.pdf].

Auckland Transport. (2024). *Urban KiwiRAP 2024 – Network Risk Assessment* [Internal report].

Auckland Transport. (2024). *AT Practice Note 02: Raised Safety Platforms (RSP) Design Guidance*.

Auckland Transport. (n.d.). *Road Safety Programme Business Case (PBC)*.

Auckland Transport. (n.d.). *Road Safety Investment Refresh – Intersections (Workshop 2)* [PowerPoint].
SharePoint link: https://aucklandtransport-my.sharepoint.com/

Austroads. (2024). *Guide to Road Safety: Part 7 (AGRS07-24)*. https://austroads.gov.au/publications/road-safety/agrs07

Austroads. (2024). *APR74325: Charting a Pathway to Eliminating Road Death and Serious Injury*.

New Zealand Government. (2024). *Land Transport Rule: Setting of Speed Limits 2024*.

New Zealand Transport Agency (Waka Kotahi). (2022). *Speed Management Guide and 2022 Speed Rule*.

New Zealand Transport Agency (Waka Kotahi). (n.d.). *Crash Analysis System (CAS)* [Data system].

Auckland Transport. (n.d.). *Pedestrian Level of Service (ANOP) Guidance* [Internal technical guidance].

Austroads. (2009). *Guide to asset management: Part 5F – Skid resistance* (AGAM05F-09). Austroads Ltd.
https://austroads.gov.au/publications/asset-management/agam05f-09

Austroads. (2009). Guide to the management of road surface skid resistance. Austroads Ltd.

Austroads. (2016). *Safe System assessment framework* (AP-R509-16). Austroads Ltd.
https://austroads.gov.au/publications/road-safety/ap-r509-16

Austroads. (2017). *Verification of Austroads road design criteria based on objective safety evidence* (AP-T230-17). Austroads Ltd.
https://austroads.gov.au/publications/road-design/ap-t230-17

Austroads. (2021). Guide to road design: Part 3 – Geometric design (AGRD03). Austroads Ltd.

Corbett-Davies, J., Turner, S., Koorey, G., Tate, F., & Abley, S. (2025). *The safety risks of out-of-context curves: Three decades of rural curve research in New Zealand*. ViaStrada Ltd.

https://viastrada.nz/sites/default/files/2026-01/The%20Safety%20Risks%20of%20Out-of-Context%20Curves_revised.pdf

International Road Assessment Programme. (n.d.). *iRAP road safety toolkit*. https://irap.org/

KiwiRAP. (n.d.). *Measures of road risk: Collective risk and personal risk*. New Zealand Automobile Association.
https://www.kiwirap.org.nz/measures_risk.html

KiwiRAP. (2018). Highway safety ratings: Tracking the safety performance of New Zealand's state highway network.
https://www.kiwirap.org.nz/assets/pdf/KiwiRAP%202018%20compressed.pdf

Ministry of Transport. (2020). *Road to Zero: Aotearoa New Zealand road safety strategy 2020–2030*. New Zealand Government.
https://www.transport.govt.nz/area-of-interest/road-safety/road-to-zero/

Safe Roads Alliance. (2020). *Delivering safer high-risk rural roads across New Zealand*. Beca Ltd.
https://www.beca.com/what-we-do/projects/transport-and-infrastructure/safe-roads-alliance

VicRoads. (2018). Technical note TN-110: Measuring and interpretation of skid resistance using a SCRIM machine. Victorian Government.

Waka Kotahi NZ Transport Agency. (2011). *High-risk rural roads guide*.
https://www.nzta.govt.nz/resources/high-risk-rural-roads-guide/

World Road Association (PIARC). (n.d.). *Road safety manuals and countermeasure guidance*. https://www.piarc.org/