



# Roads Australia Research Project 2025



*'The Road to Safety Starts Here'*

**ROADS AUSTRALIA 2025 FELLOWSHIP GROUP 8**

Tania Anglin | Rajit Patel | John Perrott | Monica Raju | Brad Sherlock

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# 1. Introduction

Road safety remains a critical priority in Western Australia (WA), particularly in temporary traffic environments such as roadwork and school zones. Speed is the leading contributor to fatalities and serious injuries on WA roads, with 1,787 people killed or seriously injured (KSI) in speed-related crashes between 2018 and 2023 (WA Road Safety Commission). In 2023 alone, 41% of fatalities occurred in 110 km/h zones, demonstrating the direct link between excessive speed and crash severity.

Temporary traffic environments present additional risk due to dynamic conditions, reduced lane widths, changing traffic layouts, and increased exposure to vulnerable road users. For example, on a major Perth road construction project between 2022 and 2024, there were 203 safety incidents involving members of the public within the site, despite reduced speed limits, resulting in approximately \$1.1 million in costs to repair temporary barriers and infrastructure (excluding vehicle damages).

This data highlights the limitations of current speed-focused interventions and the need for a holistic, integrated approach to road safety. Strengthening engineering controls, enforcement strategies, and targeted education in temporary zones is essential to meet both WA State road safety targets and national federal targets, which aim to reduce fatalities and serious injuries on Australian roads by at least 30% by 2030 (*National Road Safety Strategy 2021–2030*; *WA Road Safety Strategy 2020–2030*). Implementing Safe System interventions in temporary traffic environments directly supports these targets by addressing the factors that contribute most to KSI crashes.

## 1.1 Research Purpose and Scope

This research paper aims to explore innovative, integrated approaches to strengthen Safe System implementation on sites across WA's metropolitan and regional areas, with a focus on temporary traffic environments such as roadwork and school zones. These settings pose elevated risks due to dynamic conditions, frequent layout changes, and the presence of vulnerable road users. Addressing these challenges is critical to achieving *Vision Zero*, ensuring that no death or serious injury is considered acceptable on WA roads.

The research will examine how Safe System principles, Safe Roads & Roadsides, Safe Speeds, Safe People, Safe Vehicles, and Post-Crash Care, can be applied more effectively in temporary environments by exploring:

- Engineering measures that provide consistent physical protection and safer layouts.
- Speed management solutions that integrate technology, enforcement, and intelligent infrastructure to ensure compliance with credible limits.
- Behavioural and cultural change strategies to reduce distraction, improve compliance, and promote safer decision-making by drivers, parents, and workers.
- System integration to ensure enforcement, education, infrastructure, and emergency response are coordinated across metropolitan, regional, and remote worksites.

Within this framework, the research will explore the role of average speed cameras (ASCs) as one component of an integrated speed management approach. Feasibility considerations including deployment in variable environments, power supply, and operational requirements will be examined to ensure ASCs are a practical and scalable tool within Traffic Management Plans. The research will also investigate operational and legislative enablers needed to support Safe System implementation, including enforcement authority, site integration, and public communication. By situating ASCs within a comprehensive Safe System framework, the paper will identify how multiple interventions can combine to reduce risks, protect workers and children, and build public confidence in temporary traffic environments.

Ultimately, the research aims to provide evidence-based recommendations for the WA State Government and Local Councils to strengthen Safe System application in temporary environments. Expected outcomes include reduced fatalities and serious injuries, contributing directly to federal and state road safety targets, lower healthcare and emergency response costs, improved traffic efficiency and flow and increased public confidence in the safety of temporary traffic zones.

## 2. Background

### 2.1 Road safety challenges in temporary traffic environments

Temporary traffic environments such as roadwork zones and school zones present some of the highest-risk conditions on the road network. These environments demand constant attention, rapid adaptation by drivers, and expose vulnerable road users to greater danger. In line with the Safe System and Vision Zero philosophy, addressing these risks requires an integrated approach that recognises human fallibility and seeks to ensure that mistakes do not result in death or serious injury.

While Western Australia has embedded Safe System principles into the management of roadwork and school zones, significant challenges remain in achieving the Vision Zero goal that no death or serious injury is acceptable. The following identifies the current road safety challenges and gaps:

- **Safe Roads & Roadsides**

At roadworks, rapidly changing layouts and inconsistent signage create confusion for drivers. A 2020 Austroads review found that detours, partial lane closures, and inadequate separation between live traffic and workers often lead to near misses and crashes (*Austroads, 2020*). Roadworkers continue to face significant exposure to struck-by-vehicle incidents, a leading cause of workplace fatalities in the construction and roadwork sector (*Safe Work Australia, 2021*). Inconsistent infrastructure standards and limited physical protection for vulnerable road users and roadworkers has also been identified as a gap in the current system, leaving people exposed to serious harm.

In school zones, children's safety relies on well-designed infrastructure such as clearly marked crossings, safe pick-up/drop-off areas, and effective parking controls. Where flashing lights or school crossing supervisors are absent, compliance falls and pedestrian safety is reduced (*Queensland TMR, 2018*). Poor sightlines caused by parked vehicles further heighten risks for children (*Transport for NSW, 2017*).

- **Safe Speeds**

Speed management is critical in both roadwork and school zones. Austroads (2022) found widespread non-compliance with temporary speed limits at roadworks, particularly when workers were not visible, with many drivers perceiving restrictions as unnecessary. Excessive speeds in these settings significantly increase the severity of crashes and the likelihood of fatalities for exposed workers.

In school zones, despite extensive awareness campaigns, speeding remains common. Transport for NSW (2017) reported that many drivers exceed 40 km/h limits during active times due to distraction, confusion, or deliberate non-compliance. Even small increases in speed greatly reduce a child pedestrian's chance of survival in a crash (*NSW Centre for Road Safety, 2016*).

- **Safe People**

Human behaviour remains a critical factor across both settings. At roadworks, distraction, inattention, tailgating, and unsafe overtaking are frequent, while negative attitudes toward roadwork zones often lead drivers to treat restrictions as an inconvenience rather than a safety measure (*Woolley & Stokes, 2018*).

In school zones, children are among the most vulnerable road users due to their unpredictability and limited safety awareness. Risks are often compounded by adult behaviours — parents double-parking, making U-turns, or crossing roads outside supervised areas, which undermine safety measures (*Queensland TMR, 2018*). Driver distraction, such as mobile phone use, further elevates crash risk in these areas.

Addressing these challenges requires a coordinated, system-wide response that strengthens all elements of the Safe System rather than relying on isolated measures. This includes building more forgiving road environments, ensuring credible and enforceable speed limits, embedding behavioural change programs, and integrating enforcement, education, and technology consistently across WA. Only through this holistic approach can the state move closer to Vision Zero and ensure that temporary traffic environments no longer place workers and children at disproportionate risk.

## 2.2 Existing measures in WA

The WA Road Safety Commission has adopted the Safe System framework, consistent with international best practice and Vision Zero. This approach recognises that people make mistakes, but the transport system should be designed so that these mistakes do not result in death or serious injury. Managing risks in temporary traffic environments such as roadwork and school zones requires coordinated action across all Safe System elements: Safe Roads & Roadsides, Safe Speeds, Safe People, Safe Vehicles, and Post-Crash Care.

Western Australia has already implemented a broad suite of measures that reflect Safe System principles:

### Safe Roads & Roadsides

*Roadwork zones:* Main Roads WA requires Traffic Management Plans (TMPs) at all worksites, incorporating physical barriers, flexible delineators, variable message signs, and flashing beacons to improve visibility and separation between workers and traffic (*Main Roads WA Code of Practice, 2022*). TMPs are supported by guidance from the *Main Roads Police Enforcement at Roadworks Sites* publication, which provides practical strategies for integrating police enforcement within worksites to reduce risk.

*School zones:* Engineering measures such as time-based 40 km/h limits, raised pedestrian crossings, kerb extensions, and traffic islands have been implemented to slow traffic and improve safety for children (*WA Road Safety Commission, 2020*).

### Safe Speeds

*Roadwork zones:* Main Roads WA has facilitated enforcement through mobile and fixed speed cameras, combined with patrols from police and authorised officers. Automated signage alerts drivers to detected violations, reinforcing compliance with temporary speed limits (*WA Road Safety Commission, 2022*). These measures build directly on existing enforcement frameworks described in the *Police Enforcement at Roadworks Sites* publication, demonstrating WA's proactive approach to on-site speed management.

*School zones:* Fixed and mobile cameras, visible police presence, and targeted enforcement during peak school periods aim to ensure compliance with 40 km/h limits (*WA Road Safety Commission, 2020*).

### Safe People

*Roadwork zones:* Public awareness campaigns address speeding, distraction, and aggressive driving, while contractors and employers are provided with safety toolkits to reinforce safe behaviours for both workers and road users (*WA Road Safety Commission, 2021*).

*School zones:* Education initiatives target students, parents, and drivers, including "Walking School Bus" programs, supervised crossings, and campaigns addressing distraction and unsafe parking behaviours (*WA Road Safety Commission, 2020; Safe Active Streets WA, 2021*).

## 2.3 What Now?

This paper recognises the extensive body of research on road safety challenges in temporary traffic environments, including roadwork and school zones across Australia (*Austrroads, 2019; 2020; 2022; Safe Work Australia, 2021; Transport for NSW, 2017; WA Road Safety Commission, 2020, 2022; Woolley & Stokes, 2018; QLD TMR, 2018*). Building on these insights, the focus of this research is on strengthening Safe System implementation on-site to reduce the risk of fatalities and serious injuries. This includes examining how integrated interventions encompassing speed management, infrastructure design, education, and enforcement can work together to improve safety for both road users and roadworkers in temporary traffic environments.

Within this context, average speed cameras (ASCs) are considered as one tool within a broader, system-wide approach to credible speed management. The research also explores enhancements to public education to increase awareness and understanding of speed-related risks in temporary zones.

## 3. Research Methodology

The research methodology was designed to provide a comprehensive, evidence-based exploration of integrated solutions to improve the safety of road users and roadworkers in temporary traffic environments, addressing the key

gaps identified in Western Australia: inconsistent infrastructure, speed non-compliance, unsafe behaviours, and uneven system integration. By combining data analysis, literature review, stakeholder consultation, public engagement, feasibility assessment, and a practical demonstration, the methodology ensures recommendations are both practical and effective.

### **Problem Definition**

The research began with a detailed analysis of safety challenges in roadwork and school zones. Crash data, enforcement practices, and infrastructure constraints were examined to clearly define where risks exist and how current measures fall short. This step directly addresses the Safe System gaps in Safe Roads & Roadsides and Safe Speeds, ensuring the research targets the most critical areas for reducing fatalities and serious injuries.

### **Literature Review**

An extensive review of Australian and international research identified proven strategies for integrated speed management, education, and engineering in temporary zones, including the effectiveness of ASCs. This addresses the challenge of system-level knowledge gaps, providing evidence to inform practical, Safe System-aligned interventions.

### **Public Survey**

A survey of a broad cross section of road users was undertaken by the research group and used to examine driver behaviour, perceptions and attitudes toward speed compliance, enforcement and safety in roadwork and school zones. These insights directly inform strategies to mitigate unsafe behaviours and negative driver attitudes, addressing the Safe People gap.

### **Stakeholder Engagement**

Interviews with Main Roads WA, WA Police, Road Safety Commission, Traffic Management Association of Australia (TMAA), RAC, schools, contractors, and other stakeholders provided practical insights on operational, legislative, and cultural barriers. This approach ensures recommendations are realistic, supported by those responsible for implementation, and directly addresses the challenge of system integration across agencies and sites. The following questions guided stakeholders interviews. They supported exploration of average speed cameras, public education, stakeholder engagement, and implementation feasibility in temporary traffic environments.

- Which innovations are most effective in improving road user/worker safety in Australia and internationally?
- What are the best practices that can be adapted for implementation in Western Australia, particularly in temporary traffic environments?
- What is the impact of ASCs on driver behaviour and speed compliance in countries where ASCs are used? How can this translate to driver behaviour and speed limit compliance in temporary work zones?
- How do ASCs compare to other speed enforcement methods in terms of reducing accidents and fatalities in temporary work zones?
- How could the combination of improved education and use of ASCs enhance overall road safety in temporary work zones?
- What are the perceptions and attitudes of key stakeholders (e.g., government agencies, road safety organisations, road workers, and the public) towards the potential implementation of ASCs in temporary work zones?
- What are the potential barriers (e.g. technology, cost or legislation) to implementing ASCs in temporary work zones in Western Australia? What barriers have others experienced?
- How can these barriers be addressed to ensure successful implementation?
- What policy or legislative changes would be required to support the use of ASCs in temporary work zones in WA?
- What metrics and indicators should be used to monitor and evaluate the effectiveness of ASCs in temporary work zones?

### **Technical, Legislative, and Operational Feasibility Analysis**

The research assessed the practical requirements for deploying ASCs, including technology, logistics, power supply, and legal frameworks. By identifying and addressing barriers to implementation, this step mitigates risks that could limit enforcement effectiveness, tackling the Safe Speeds and Safe Roads gaps.

### **Average Speed Camera Demonstration**

The research team planned and implemented a two-week demonstration of the effectiveness of ASCs within a live highway roadworks zone, ordinarily subject to a 100 km/h speed limit, to assess whether the use of ASCs influenced driver behaviour. During the first week, cameras were deployed without accompanying signage. In the second week, signage was introduced to inform drivers of the cameras' operation. The trial was undertaken with the approval of Main Roads WA and the WA Road Safety Commission.

### **Development of a Trial-Ready Solution**

Building on research findings and stakeholder input, we developed a trial-ready proposal outlining how ASCs could be deployed in temporary environments. This included considerations for site selection, camera operation requirements, and integration with existing traffic management practices.

### **Public Education Strategy Exploration**

Recognising that enforcement alone is insufficient, the research explored targeted education campaigns to increase awareness of speed-related risks and reinforce compliance behaviours. This step addresses the Safe People gap by promoting safer decisions among drivers, parents, and workers.

### **Roadmap and Implementation Planning**

Finally, the methodology synthesised findings into a practical roadmap for Safe System implementation, including monitoring metrics, stakeholder collaboration, and continuous improvement processes. This provides a holistic approach to reducing risk across all Safe System pillars: Safe Roads & Roadsides, Safe Speeds, Safe People, Safe Vehicles, and Post-Crash Care, and moves WA closer to Vision Zero.

By combining evidence review, practical trials, stakeholder input, and education strategies, this methodology directly addresses the key gaps in temporary traffic environments: improving infrastructure design, strengthening speed enforcement, fostering safer driver behaviour, and integrating interventions across the system. The approach ensures recommendations are practical, sustainable, and capable of significantly reducing the risk of fatalities and serious injuries for roadworkers and vulnerable road users in WA.

## **4. Research findings**

### **4.1 Evidence of ASC's**

A comprehensive literature review was undertaken to understand the prevalence and effectiveness of ASCs in Australia and internationally with evidence consistently demonstrating that ASCs significantly improve road safety by reducing crashes, lowering speed variance, and promoting consistent driver compliance.

#### **4.1.1 Use of ASCs Internationally**

International studies highlight the effectiveness of ASCs on high-speed roads and in targeted zones.

Country	Key Research Findings
United Kingdom	<ul style="list-style-type: none"> <li>• ASCs on major highways have been associated with significant reductions in fatal and serious crashes, along with smoother traffic flow and improved compliance. Gains et al. (2005) and Pilkington &amp; Kinra (2005) found that ASCs on high-speed motorways were associated with <b>reductions of 40–50% in fatal and serious collisions</b>.</li> <li>• Demonstrated improved long-term compliance with speed limits, with the presence of ASCs having both a direct deterrent effect and a long-lasting normative influence on driving behaviour. UK studies also highlighted that ASCs are most effective when combined with signage, public education campaigns, and enforcement awareness. Informing drivers about the purpose of ASCs, the consequences of speeding, and safety benefits enhances compliance (RAC Foundation, 2016).</li> <li>• ASC's have been deployed in <b>motorway work zones</b> since the early 2000s, targeting high-traffic corridors undergoing maintenance or construction (Gains, Shrewsbury, &amp; Robertson, 2005; Highways England, 2010; Miller, 2009). Evaluations have reported <b>up to 60% reductions in serious crashes</b>, highlighting the ability of ASCs to sustain compliance and protect both drivers and workers.</li> <li>• In the United Kingdom, <b>cameras along school routes significantly reduced speeding and near-miss incidents</b> involving children (Department for Transport, 2010).</li> </ul>
Norway	<ul style="list-style-type: none"> <li>• ASC's <b>decreased personal injury crashes by 12–15% and serious/fatal crashes by 22%</b>, with the largest effects observed on rural high-speed roads (Christiansen &amp; Elvik, 2016; Elvik, 2010).</li> <li>• The largest effects were on rural high-speed roads: Sites with higher speed limits and less traffic enforcement experienced the greatest reductions, demonstrating the effectiveness of ASCs in environments where conventional enforcement is limited or drivers are more likely to exceed speed limits. Urban roads showed smaller reductions in crashes, likely because baseline speeds were lower and existing enforcement and traffic calming measures already contributed to compliance. (Christiansen &amp; Elvik, 2016; Elvik, 2010).</li> </ul>
Italy	<ul style="list-style-type: none"> <li>• Italy's "Tutor" system is a network of automatic average speed cameras installed along Italian highways. "Tutor" system <b>reduced fatal crashes by 27% and injury crashes by 19%</b>, with continuous enforcement lowering speed variance and further improving safety (Montella, Imbriani, &amp; Galante, 2015; Automobile Club d'Italia, 2017).</li> <li>• Speed variance among drivers declined significantly, indicating smoother traffic flow and reduced abrupt braking/acceleration.</li> <li>• Public awareness campaigns accompanying the Tutor system reinforced compliance, enhancing long-term safety benefits</li> </ul>
Netherlands	<ul style="list-style-type: none"> <li>• ASC's have been linked to <b>15–25% reductions in serious crashes</b>, particularly on high-speed motorways and expressways. Consistent speed monitoring reduced speed variance, contributing to smoother traffic flow and fewer rear-end collisions (Van der Horst et al., 2010).</li> <li>• <b>ASC's near schools</b> improved driver compliance and lowered speed variance, <b>creating safer crossing conditions for students</b> (SWOV Institute for Road Safety Research, 2015).</li> </ul>
Spain	<ul style="list-style-type: none"> <li>• Deployment of ASCs on major highways showed <b>reductions in fatal and serious crashes of 20–25%</b>. Speed compliance improved notably on stretches with long monitoring distances, and public awareness campaigns increased driver adherence (Vázquez, de Oña, &amp; Gutiérrez, 2011).</li> </ul>
Sweden	<ul style="list-style-type: none"> <li>• ASC systems contributed to a <b>15–20% decrease in fatal and serious injury crashes</b>, mainly on rural and high-speed roads. Average speed enforcement was particularly effective in reducing high-severity crashes, consistent with the "Vision Zero" approach emphasizing crash prevention (Tingvall &amp; Haworth, 1999).</li> <li>• Higher reductions on motorways than urban roads. Continuous monitoring over long distances discouraged intermittent speeding and improved overall compliance (Van der Horst et al., 2010).</li> </ul>

<b>Portugal</b>	<ul style="list-style-type: none"> <li>Implementation of ASCs achieved <b>20–25% reductions in serious crashes</b> on highways. Speed variance decreased, and ASC data were used to evaluate and target high-risk locations (<i>Van der Horst et al., 2010</i>).</li> </ul>
<b>Austria</b>	<ul style="list-style-type: none"> <li>Studies reported <b>15–30% reductions in serious crashes</b>, with stronger effects on rural and high-speed roads. Continuous monitoring contributed to sustained compliance and smoother traffic flow (<i>Van der Horst et al., 2010</i>).</li> </ul>
<b>Belgium</b>	<ul style="list-style-type: none"> <li><b>Fatal and serious crashes decreased by approximately 15–25%</b> following ASC deployment. Systems were particularly effective when combined with clear signage and public education campaigns (<i>Van der Horst et al., 2010</i>).</li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>Average speed cameras <b>reduced serious crashes by 15–20%</b>, with rural motorways seeing the highest benefit. Driver compliance improved significantly due to continuous enforcement, even in long stretches without direct police presence (<i>Van der Horst et al., 2010</i>).</li> </ul>
<b>South Africa</b>	<ul style="list-style-type: none"> <li>Targeted ASC deployment in high-risk corridors led to <b>15–25% reductions in serious crashes</b>. Enforcement in combination with public awareness campaigns improved driver behaviour and reduced speed variance (<i>Van der Horst et al., 2010</i>).</li> </ul>
<b>New Zealand</b>	<ul style="list-style-type: none"> <li>Average speed cameras contributed to a <b>15–25% decrease in serious crashes</b>, particularly on high-speed roads and rural highways. ASCs were effective at reducing both speed-related crashes and the variability of vehicle speeds (<i>Van der Horst et al., 2010</i>).</li> </ul>
<b>United Arab Emirates (UAE)</b>	<ul style="list-style-type: none"> <li><b>Serious crash reductions ranged from 15–30%</b>, with the largest effects on long, high-speed arterial roads. High visibility signage, combined with ASC enforcement, encouraged compliance and reduced excessive speeding (<i>Van der Horst et al., 2010</i>).</li> </ul>
<b>United States</b>	<ul style="list-style-type: none"> <li>Pilot programs in the United States have also shown promising outcomes, with <b>ASCs in construction zones reducing speeding violations and encouraging safer driving behaviour</b> over extended stretches (<i>Federal Highway Administration, 2015</i>). Sites equipped with ASCs recorded significant decreases in speeding violations, often ranging from 30–50% compared with baseline measurements</li> <li>Data from the pilots suggested a positive compliance spillover effect, with drivers maintaining compliant speeds on adjacent road segments even after passing through monitored zones. Effectiveness of ASCs was further supported by high-visibility signage and warnings, which increased driver awareness and adherence to temporary speed limits.</li> <li>In states such as Maryland and California <b>piloted point-to-point ASC enforcement in school zones</b>, demonstrating <b>reduced speeding</b> and <b>safer environments for children</b> walking or cycling to school (<i>Federal Highway Administration, 2015</i>).</li> </ul>
<b>Canada</b>	<ul style="list-style-type: none"> <li>ASC's are not widely used or legal for general use in Canada while some jurisdictions, such as Alberta and Ontario, have banned them on major highways to focus on school and construction zones. Use of automates speed cameras in school zones in the City of Guelph has resulted in an average speed reduction of 9 km/h as published by City of Guelph in September 2025.</li> </ul>

In Europe, countries such as the Netherlands, Austria, and Italy have implemented Average Speed Cameras (ASCs) in construction and work zones, with significant safety benefits (*European Road Safety Observatory, 2018; Ministero delle Infrastrutture e dei Trasporti, 2017*). These systems monitor average vehicle speeds over the entire worksite, reducing instances of intermittent speeding and lowering speed variance. Evaluations have shown that ASCs in these settings improve compliance with temporary speed limits and contribute to measurable reductions in crash risk. Additionally, continuous enforcement has enhanced the safety of worksite personnel by maintaining more predictable traffic flow and decreasing the likelihood of collisions within construction areas. The experience in these European countries demonstrates that ASCs are an effective tool for protecting both road users and workers in temporary traffic environments.

### 4.1.2 Use of ASCs in Australia

Research in Australia has demonstrated the effectiveness of ASCs across various jurisdictions:

Region	Key Research Findings
Western Australia	<ul style="list-style-type: none"> <li>• ASC's have been in operation on the Forrest Highway since September 2017.</li> <li>• Mobile safety camera trial was conducted in July 2022 by the WA Road Safety Commission at metropolitan, regional, and remote locations which included testing mobile ASCs, spot speed detection, mobile phone use and correct wear of seatbelts. Preliminary findings from the trial include (<i>WA Road Safety Commission. (2022). Mobile Safety Camera Trial Report. Perth: WA Road Safety Commission</i>): <ul style="list-style-type: none"> <li>○ Compliance improvement: Initial findings suggested improved adherence to speed limits in locations where ASCs were deployed, consistent with international evidence (UK, Norway, Italy).</li> <li>○ Feasibility: The trial demonstrated that mobile ASCs can be effectively deployed in both metropolitan and regional/remote areas, offering flexible enforcement options.</li> <li>○ Safety potential: While permanent data collection and crash analysis are pending, the trial indicated potential benefits for roadworker and road user safety by reducing speeding in temporary traffic environments.</li> </ul> </li> </ul>
New South Wales	<ul style="list-style-type: none"> <li>• ASC's are primarily used to monitor heavy vehicles on major freight corridors, including the Hume Highway and Pacific Motorway. Evaluations have demonstrated substantial safety benefits, with an <b>80% reduction in heavy vehicle fatalities</b> reported on monitored corridors (<i>Transport for NSW, 2015</i>). ASCs encourage consistent speed compliance over long stretches, reducing speed variance and the risk of severe crashes, while also promoting sustained behavioural change among drivers.</li> <li>• <b>Temporary deployments of ASCs in roadwork zones on high-speed routes</b>, such as the Hume Highway, have also been trialled. These trials showed improved compliance with reduced speed limits, helping to protect both roadworkers and other road users (<i>Transport for NSW &amp; Centre for Road Safety, 2015</i>). The presence of ASCs in these environments discourages drivers from intermittent speeding, a common issue in temporary traffic zones, and contributes to smoother and safer traffic flow.</li> <li>• New South Wales has deployed both <b>temporary and fixed ASCs during school arrival and departure</b> times, with evaluations showing <b>reductions in speeding of up to 30% in monitored zones</b> (<i>Transport for NSW, 2017</i>).</li> </ul>
South Australia	<ul style="list-style-type: none"> <li>• ASC's have been installed on major highways, including the Dukes Highway, to improve road safety for all users. Evaluations indicate substantial safety benefits, with a reported <b>52% reduction in fatal and serious injury crashes</b> following ASC implementation (<i>Government of South Australia, 2014</i>).</li> <li>• The deployment of ASCs has also resulted in <b>lower average vehicle speeds</b>, contributing to smoother traffic flow and a reduction in crash severity. By discouraging intermittent speeding—a common issue with fixed-point cameras—ASCs reinforce safer driving behaviour over extended distances, which is <b>particularly important on high-speed rural highways</b>.</li> </ul>
Victoria	<ul style="list-style-type: none"> <li>• ASC's are deployed on high-volume corridors to promote consistent compliance with speed limits. (<i>Delaney et al., 2015</i>).</li> <li>• Research by the Monash University Accident Research Centre (MUARC) found that ASCs are effective in maintaining driver behaviour over extended distances, reducing speed variance and the risk of crashes. By providing continuous monitoring, <b>ASCs discourage intermittent speeding</b>, which is common when drivers slow only near conventional cameras.</li> <li>• The Victorian experience <b>demonstrates the value of ASCs as a tool for improving road safety across high-traffic</b></li> </ul>
ACT	<ul style="list-style-type: none"> <li>• A single point-to-point ASC is in operation, managed by Access Canberra.</li> <li>• Although limited in number, this ASC has demonstrated the potential to improve compliance with speed limits and reduce speed variance along the monitored corridor.</li> </ul>
Queensland	<ul style="list-style-type: none"> <li>• ASCs are deployed on high-volume routes, including Brisbane motorways and the Bruce Highway (<i>Drive.com.au</i>).</li> </ul>

	<ul style="list-style-type: none"> <li>TMR have completed a trial in July 2025 which deployed <b>mobile spot speed cameras to temporary work sites</b>. These innovative cameras were mounted on rubber tracks and remotely controlled to enable ease of deployment on changing site environments. Initial results show a reduction in non-compliant speeds by up to <b>2% over the first month of installation and 3% over the first four months</b>.</li> <li>Queensland implemented ASC trials in <b>high-risk school zones</b>, which resulted in <b>improved compliance with speed limits during peak drop-off and pick-up periods</b> (<i>Queensland Government, 2019</i>).</li> </ul>
<b>Tasmania and Northern Territory</b>	<ul style="list-style-type: none"> <li>There are currently no ASCs in operation in Tasmania and Northern Territory.</li> </ul>

### 4.1.3 Limitations of ASCs

Research completed on ASC's for deployment in temporary speed zones has highlighted the below limitations:

- Suitability for long-term roadworks zones (minimum 6 months) only due to costs, approval timeframes and logistical considerations associated with deploying the cameras on a short term basis.
- Contractual arrangements with suppliers may affect deployment and workflow for approval. Recommended as part of implementation strategy that an approved list of vendors and technology be developed.
- Based on approved and available technology in each jurisdiction physical constraints such as space and terrain may be a limiting factor to implementing ASC's in temporary work zones.

## 4.2 Effectiveness of Road Safety Education Campaigns

Research shows that education campaigns can influence driver behaviour, increase awareness of hazards, and support compliance with speed limits, particularly when integrated with enforcement and engineering measures in a Safe System framework. However, education alone is generally less effective at sustaining long-term behaviour change compared with combined interventions that include enforcement and infrastructure improvements.

### Australian evidence:

In New South Wales, campaigns targeting work zone safety, distracted driving, and school zone compliance (e.g. *Transport for NSW public awareness initiatives*) have demonstrated short-term improvements in driver adherence to speed limits and safer behaviour around vulnerable road users (*Transport for NSW, 2017*).

Queensland's "School Zone Safety" and "Roadwork Safety" campaigns have been associated with increased driver awareness and improved compliance with temporary speed limits, particularly when combined with visible enforcement such as speed cameras or police patrols (*Queensland TMR, 2018; Queensland Government, 2019*).

Austrorads reviews (2019, 2020) highlight that campaigns work best when targeted, context-specific, and reinforced by complementary measures such as physical traffic calming, signage, and automated enforcement in temporary environments.

### International evidence:

In the United Kingdom, school zone campaigns combined with signage, speed feedback signs, and enforcement reduced speeding near schools by up to 30%, improving pedestrian safety (*Department for Transport, 2010*).

European studies in the Netherlands and Sweden show that campaigns integrated with engineering measures and enforcement (e.g., speed cameras, traffic calming) can reduce speeding and near-miss incidents in both school zones and work zones (*SWOV Institute for Road Safety Research, 2015; European Road Safety Observatory, 2018*).

In the United States, federal and state-level campaigns targeting construction zone safety, distracted driving, and school crossings have increased driver awareness, particularly when paired ASCs (also known as point-to-point cameras), high-visibility signage, and active enforcement, leading to measurable reductions in speed violations (*Federal Highway Administration, 2015*).

There are several well-documented examples in Australia and internationally where education campaigns have successfully reduced speeding in roadworks and school zones, particularly when combined with enforcement and infrastructure measures.

- Transport for NSW – Work Zone Safety Campaigns
  - Focus: Raising driver awareness of hazards in roadwork zones and encouraging compliance with temporary speed limits.
  - Methods: Multi-channel media campaigns including roadside signage, social media, radio, and public service announcements.
  - Outcome: Evaluations showed improved driver compliance with speed limits and safer passing behaviour near worksites, especially when reinforced by police presence and mobile cameras (*Transport for NSW, 2017*).
- Queensland “School Zone Safety” Campaign
  - Focus: Reducing speeding during school drop-off/pick-up periods and increasing awareness of children’s vulnerability.
  - Methods: Community engagement, posters, digital media, school newsletters, and on-site education sessions.
  - Outcome: Targeted schools saw up to a 30% reduction in speeding during active school hours when combined with enforcement and signage (*Queensland Government, 2019*).
- WA Road Safety Commission – Roadworks Awareness Campaigns
  - Focus: Driver awareness around temporary speed limits and hazards at roadwork sites.
  - Methods: Media releases, social media messaging, variable message signs at work zones, and toolkits for contractors to educate workers and road users.
  - Outcome: Contributed to improved adherence to temporary speed limits when paired with mobile speed enforcement trials (*WA Road Safety Commission, 2022*).
- UK “Think!” Roadworks and School Zone Campaigns
  - Focus: Encouraging safe driving near work zones and schools.
  - Methods: TV, radio, social media campaigns, high-visibility signage at work zones, and school-based programs.
  - Outcome: Reduced speeding in monitored areas; work zones saw fewer rear-end collisions, and school zones had measurable reductions in near-miss incidents (*Department for Transport, 2010; Highways England, 2010*).
- Netherlands SWOV School Zone Safety Initiatives
  - Focus: Encourage compliance with school zone speed limits and safe driver behaviour.
  - Methods: Community campaigns, driver feedback signs showing speed, school engagement programs.
  - Outcome: Improved compliance with speed limits, reduced speed variance near schools, and safer pedestrian conditions for students (*SWOV, 2015*).
- United States – Federal Highway Administration Work Zone Awareness Campaigns

- Focus: Reduce speeding and crashes in construction zones.
- Methods: “Work Zone Safety Week,” radio/TV ads, digital campaigns, combined with variable message signs and point-to-point average speed cameras.
- Outcome: Pilot sites reported 30–50% reductions in speeding violations and improved overall work zone safety (*Federal Highway Administration, 2015*).

Key lessons from these campaigns are that:

- Education is most effective when targeted, contextual, and combined with enforcement.
- High-visibility signage and media messaging reinforce behavioural change.
- Multi-channel approaches that engage drivers, communities, and local stakeholders achieve the greatest compliance.
- Education works best as part of a Safe System approach. It raises awareness but needs engineering and enforcement to sustain long-term safety outcomes.

Overall, the research indicates that education campaigns are a valuable component of road safety strategies in temporary traffic environments, but their greatest impact occurs when combined with engineering controls, enforcement technologies (like ASCs), and system-level integration. This aligns with Safe System and Vision Zero principles, emphasising that responsibility for safety is shared between road users and the broader road transport system.

### 4.3 Legislative Framework for Implementing and Enforcing Temporary Speed Zones in Western Australia

Legislation covering the implementation and enforcement of temporary speed zones in Western Australia is already in place and is governed by three key legislative components:

#### Enforcement

The *Road Traffic Act 1974* provides the authority for the use of speed and distance measuring equipment to enforce speed limits. This framework is further supported by the *Road Traffic (Administration) Act 2008 (WA)*, which establishes provisions for the use of “average speed detection systems” to complement enforcement under the principal Act.

#### Regulation

The *Road Traffic Code 2000* sets out the specific offences associated with exceeding posted speed limits, thereby defining the regulatory basis for prosecution of speeding offences.

#### Signage

The Commissioner of Main Roads WA delegates authority to the Manager of Traffic Management Services to approve regulatory speed limits. This delegation applies to both permanent speed zone changes and the implementation of temporary speed zones.

### 4.4 Summary

Research was undertaken on the use of ASC’s internationally and within Australia, with a focus on three key environments: permanent sites, work zones and school zones. The above information demonstrates that average speed cameras provide significant safety benefits, consistently reducing crashes, fatalities, and serious injuries, with typical reductions ranging from 15% to 50% depending on road type, traffic volume, and deployment strategy. They are most effective on high-speed, long, and rural corridors, where continuous enforcement reduces speed variance and promotes consistent driving behaviour. ASCs not only improve compliance near camera sites but also encourage smoother traffic flow and sustained adherence to speed limits over long distances.



Figure 1: TMR School Zone and Work Zone Pilot Cameras 2025

Globally, ASCs are widely deployed across Europe, the Middle East, South Africa, and Oceania through permanent, trial, and mobile systems, with strong evidence of effectiveness. In Australia, permanent ASCs operate in NSW, SA, VIC, QLD, and the ACT, while WA is trialling mobile cameras and TAS and NT have none.

Despite this strong evidence, there is limited research on the use of ASCs in temporary work zones, which are areas where a high proportion of incidents occur, highlighting a potential opportunity for targeted deployment. Overall, the international and Australian evidence supports expanding ASCs as a cost-effective measure to improve road safety, particularly on high-speed routes and in high-risk work zones.

The following key points were identified through this literature review:

- Presence of ASCs appears to have both a direct deterrent effect and a long-lasting normative influence on driving behaviour.
- Evidence strongly demonstrates that ASC's are highly effective at permanent sites, both in Australia and internationally. In Australia, ASC's have been successfully implemented at permanent sites, particularly within NSW and QLD.
- Evidence demonstrates that ASC's can be effective in roadwork zones, based on trials undertaken in NSW, QLD and the United States with evidence of long-term use in the UK.
- ASCs are an effective and versatile tool for enhancing safety in temporary traffic environments. Their ability to enforce speed limits over the entire worksite, rather than at a single point, addresses a key challenge in roadworks zones: protecting both workers and drivers while maintaining traffic flow.
- By enforcing speed limits across the entire worksite, ASCs reduce the common "slow down at the camera, speed up after" behaviour, encouraging consistent speed compliance and enhancing safety for both road users and workers (*Gains, Shrewsbury, & Robertson, 2005; Highways England, 2010*).
- Reducing speed variance not only lowers crash risk but also improves traffic flow and reduces rear-end collisions, which are common in temporary traffic environments.
- High-visibility signage and warnings further enhance compliance, while the continuous monitoring encourages drivers to maintain consistent speeds throughout the monitored stretch, creating longer-term behavioural change
- ASCs can be a highly effective tool in temporary traffic environments, providing continuous enforcement over extended stretches. Lessons from these initiatives are particularly relevant for Western Australia, where mobile ASCs in roadwork zones could improve speed compliance, reduce speed variance, and enhance safety for both road users and work crews, over an extensive road network
- ASC's are most effective on rural high speed roads

Though less common than on highways or in roadwork zones, Average Speed Cameras (ASCs) have been trialled in school zones to improve the safety of children.

- Research indicates that whilst ASC deployment in school zones is less widespread than on highways or in roadwork areas, the technology can effectively enhance compliance with speed limits, reduce speed variance, and significantly improve safety for child pedestrians.

These findings suggest that whilst ASC's have been widely investigated and implemented in Australia, further research and implementation of ASC's in work zones and school zones would be warranted to improve safety of road users. ASCs are most effective when combined with signage, public education campaigns, and enforcement awareness, and should be utilised as part of a holistic approach to improve road safety, in alignment with Safe System and Vision Zero principles.

## 5. Stakeholder engagement

Several stakeholders were interviewed to identify the level of support for use of ASC's in workzones and school zones and to gain a better understanding of the potential barriers to the implementation of ASCs in temporary traffic environments. To ensure representation across the broader roads and transport sector, stakeholders were selected from key groups including government, industry, advocacy, and community interests. Multiple organisations were approached within each group to capture a diverse range of views.

Stakeholder groups engaged include:

**Government & Agencies:** Main Roads WA Road Safety Policy Department, WA Police, WA Road Safety Commission, QLD TMR Engineering & Technology Department.

**Peak Bodies & Advocacy:** RAC WA, WA Traffic Management Association, ANZ Interjurisdictional Road Safety Camera Reference Group and worker representatives.

**Industry & Delivery Partners:** Major contractors, heavy vehicle drivers, traffic management companies, road safety auditors, and ASC technology providers.

**Community:** General Public, Schools, parents.

Across all stakeholder groups, there was strong overall support for initiatives aimed at improving driver awareness of the risks associated with temporary speed zones and for investigating the use of ASCs as a tool to enhance compliance and reduce incidents. Consistent themes emerged across government, industry, advocacy, and community stakeholders, including the need for improved public education explaining why reduced speed limits remain in place when workers or children are not visible, and for greater consistency in how temporary traffic management plans are implemented and communicated.

Stakeholders emphasised that enforcement and speed zone management must be supported by clear, visible signage and fair, transparent practices to build public trust and acceptance. Many also highlighted that education campaigns should prioritise positive, evidence-based messaging over punitive or fear-based approaches, supported by collaboration between government, industry, and advocacy bodies. Overall, feedback indicates that integrating ASCs with strong community education, consistent enforcement, and improved signage and planning will be critical to achieving sustained behaviour change and safer outcomes in both roadwork and school zones.

The following sections identify the key feedback points provided by each stakeholder group.

### 5.1 Government & Agencies

#### Main Roads WA Department for Road Safety Policy

- Supportive of effectiveness of ASCs in work zones, but both suggested we frame the research around implementing safer systems on site rather than proving ASCs are effective.
- Pointed to new WA guidelines *Police Enforcement at Roadwork Sites*
- Recommended looking at Compass IOT, which collects speed data from vehicles (from 2018 onwards).

#### WA Police - Road Policing Mobile Safety Camera Operations

- Deployment of Police Force at work zones is deemed high risk with site-by-site assessment required to ensure safe working area. Consultation with site team required to understand changing environment
- Use of trailer mounted cameras at work zones is constrained with access and egress requirements as well as height obstacles such as barriers and requirement for temporary signs to be audited to allow infringements
- Public perception of reduced speed in work zone's only being implemented for safety of road users is a challenge. Division would welcome education piece around changed road environment and road user safety
- Have seen significant push back from public groups such as Revenue Raiser Resistance at certain times which has resulted in unsafe sites due to stolen signs
- Currently assisting roll out of School Zone and Children crossing improvements program across WA where 40 km/hr speed limit will be enforced at all controlled crossings

For ASC deployment road must be surveyed to confirm *driven path* distances between camera locations

#### WA Road Safety Commission

- Road Safety Commission actively working on initiatives in both work zones and school zones, however they are quite different. The requirements and procedures of both are different.

- School zone average speed camera, looking to do something like TMR in the next 12 months. Currently being developed.
- Local government and schools have been funding\implementing trailer mounted speed advisory signs.
- With work zones, picking the right location key. Public perception that no\little roads works are occurring often results in higher speeds. Busy sites with constrained environment gains better buy-in from road users to adhere to posted speed limit.
- Regarding data handling, third parties are already processing and sending through. Data gets handled in three streams; Statistical (for various teams to use the data), Evidential (photographs etc. locked away in case an offence goes to court) and Infringement (data for back-end to process fines).
- Surveying of the 'driven path' needs to be undertaken.
- WA legislation is already set-up to handle variable speed zones within an enforcement area. Prepared under the Forrest Highway ASC zone implementation.
- Further areas to be looked at include the 40 kph past tow trucks and how better compliance can be achieved.
- Funding: Road Safety Council makes recommendations. Funding comes from the Road Trauma Trust Account (supported by revenue collected from road infringements), which also supports other programme like Audible Edge Lines.

### **TMR - Engineering and Technology**

- Pilot included deployment of fixed point speed cameras at school zones and at work zones over a two year period which was completed in July 2025
- School zone camera signs were developed in the form of repeater signs within the middle of a school zone and are combined with advance warning signage.
- Cameras were only operating during active school zone times.
- Education piece done through schools and local community through media platforms
- Initially noted 8-12 offences per hr which generally dropped to 1/2 per hour over pilot duration.
- Speed cameras for work zones were developed on track platforms with a blade on the front and solar panels. Track platforms can be operated by remote control and can be delivered to site via trailer and then positioned via remote control
- Positive feedback from public and road workers
- TMR developed roadworks signage requirements which were required to be installed prior to deployment of mobile speed camera
- Minimum of two weeks of traffic speed data needed at each site prior to enforcement and infringements being generated
- Mobile Track cameras were also used at Brimmer River Bridge where temporary speed restrictions were required

## **5.2 Peak Bodies and Advocacy**

### **ANZ Interjurisdictional Road Safety Camera Reference Group**

- Trial experience: Victoria has trialled single-point speed cameras in long-term roadwork zones but not ASCs due to cost and logistical constraints.
- Operational barriers: Effective ASC deployment requires safe, stable camera locations, integration into traffic management plans, and consideration of vibration, visibility, and minimum 2 km distance for accuracy.
- Cost structure: The financial model and supplier contracts (hourly vs fixed-term) significantly affect feasibility for short-term or mobile deployments.
- Public acceptance: Drivers are more supportive of cameras when workers are visibly on site and less so during inactive periods, highlighting a need for public education on ongoing work zone risks.
- Behavioural effectiveness: ASCs encourage consistent compliance across the entire zone, whereas single-point cameras only influence driver behaviour at fixed locations.
- Communication strategy: Informing drivers about camera presence can improve compliance, reinforcing that enforcement aims to reduce speeds, not raise revenue.

### **RAC (WA)**

- Strong support for ASCs: RAC endorses the use of enforcement cameras, particularly in roadwork and school zones, aligning with government and Austroads' recognition of these as high-risk areas.

- Visibility and fairness are essential: Cameras and signage should be highly visible, with early phases using warning letters to educate drivers before issuing fines.
- Data and monitoring gaps: Current crash reporting does not distinguish roadwork zones, and there is a need for accurate records of temporary speed limits to support enforcement and evaluation.
- Public education focus: Address community frustration about speed limits when no workers are visible through positive, explanatory messaging (e.g., “lower speeds save lives”) rather than shock tactics.
- Integrated approach required: Effective speed management relies on balanced enforcement, clear visual cues, and consistent signage to encourage compliance.
- Valuable partner for collaboration: RAC offers research expertise, credibility, and strong community reach, making it a key ally for implementing and communicating ASC initiatives.

#### **NTRO**

- Defining ASC applicability: The duration and length of temporary work zones are key factors influencing the feasibility and accuracy of ASCs; shorter works may limit their effectiveness.
- Evidence base and research integration: Prior and ongoing research by NTRO and NACOE should inform implementation, particularly studies on driver messaging at roadworks, mobile point-to-point enforcement, and ASC behavioural impacts.
- ASC effectiveness: ASCs deliver greater long-term compliance benefits than fixed or single-point cameras, which only create a short “halo” effect (typically 500m–1km).
- Community education focus: Successful implementation relies on public awareness and messaging, emphasising that cameras can be deployed “anywhere, anytime” to protect workers and the community, supported by relatable campaigns (e.g., “you wouldn’t endanger colleagues at work—don’t do it on the road”).
- Governance and enforcement clarity: Legislative and operational frameworks should define clear responsibility for ASC operation and enforcement—whether under Main Roads WA, WA Police, or contractors.
- Technical implementation considerations: Accurate speed measurement requires reliable vehicle-matching methods and, in some cases, intermediate radar verification for longer ASC segments; these details should be captured in the implementation plan.

#### **RTAA**

- High percentage of non-compliance in work zone signage
- Traffic management companies are taking initiative to develop and deploy technology which will improve the safety of their works such as “Smart Cones” which can alert workers when cars are approaching worksites above the signed speed limit

### **5.3 Industry and Delivery Partners**

#### **Traffic controllers from Altus/Kany Biddi**

- Widespread non-compliance and distraction: Drivers frequently fail to slow down in roadwork zones and often appear distracted, particularly by mobile phone use, even when using hands-free devices.
- High exposure to risk: All traffic controllers reported experiencing dangerous driving behaviours and near misses, with many feeling vulnerable due to inadequate traffic management layouts on high-volume roads.
- Strong support for enforcement: There was unanimous support for introducing ASCs in roadwork zones, with the belief that increased enforcement would reduce speeds and improve driver attentiveness.
- Preference for proactive communication: Controllers emphasised the need for advance warning signage to alert drivers that cameras are in operation, ensuring the focus remains on speed reduction rather than revenue.
- Need for stronger public education: Participants agreed that there is insufficient education explaining why speed reductions in roadwork zones are critical for worker and driver safety.

#### **Heavy Vehicle Drivers (Saxonbee/Barfields)**

- Difficult for trucks with heavy loads to slow down quickly. Advance warning signage would assist with reducing speeds in advance of roadwork zones.
- Drivers traveling long distances feel high levels of frustration with roadwork zones with reduced speed limits when they can’t visibly see any workers or works occurring.

- Drivers hauling oversized loads already often drive at lower speeds due to the weight of their loads. Due to the long distances taking a long time, drivers often suffer fatigue and additional delays such as roadwork zones cause time pressure and lead to increased fatigue.
- Poor signage causes frustration and it is sometimes unclear where roadwork zones start and end. In addition, on regional roads, drivers of cars often get frustrated and overtake trucks which is more dangerous than not adhering to the reduced speed limits.

## 5.4 Community

### Neerigen Brook Primary School Admin Staff

- All staff expressed strong support for school zones, reduced speed limits around schools and the presence of traffic wardens.
- There have been many instances of students displaying unpredictable behaviour around the road. Drivers don't realise that children don't always focus on their own safety and will be playing and not realise they are so close to the road when walking to and from school.
- Teachers have reported that speeding through school zones isn't the only problem – people do U-turns, double park, block the school driveway etc and often it is parents that undertake these unsafe moves.
- It was noted that parents also often don't model good and safe behaviour and will cross roads outside of the designated school pedestrian crossing area.
- All staff support visible enforcement in school zones.
- All staff agreed that permanent average speed cameras would improve compliance with the speed limit.
- All staff agreed that additional measures such as raised pavement and flashing signage would encourage drivers to stick to the speed limit.

### Darlington Primary School P&C

- All parents agreed 40 km/h speed limits in school zones are essential.
- All parents advised they regularly see drivers speeding through school zones but that it seems to mostly happen earlier in the morning when there aren't many students around the school.
- All parents advised they would support regular Police presence in the school zones and would support the use of average speed camera.
- Parents agreed that rather than just issuing fines, alternative enforcement could be used such as offenders having to attend an information/education session on why it is important to slow down in school zones.
- Some parents thought that school zones should be longer to include after school care times but acknowledged that this was probably an unreasonable expectation and would cause driver frustration.
- A small number of parents thought that more time should be invested in teaching children how to safely cross roads. The remainder of the parents thought it was more important that traffic wardens be provided at all schools to ensure children cross the road safely.



## 6. Survey

A public survey was conducted to examine community perspectives and experiences related to road safety in roadwork and school zones. The survey sought to capture insights on driver behaviours, compliance with speed limits, awareness of enforcement, and support for potential safety measures, particularly the use of ASCs. The target audience included drivers and road users with experience travelling through these temporary traffic environments.

The survey instrument included questions on personal driving habits, observations of other drivers, awareness of enforcement measures, and demographic information (age, gender, and driving experience). The intent was to collect input from a broad cross-section of the driving population, encompassing different demographic groups and varying levels of driving experience.

### 6.1 Survey Demographics

The survey achieved 365 responses from a broad cross-section of road users. Most respondents were between 31 and 60 years old. The majority (nearly 60%) reported over 20 years of driving experience, indicating a highly experienced sample of road users.

Key demographic characteristics of the respondents are as follows:

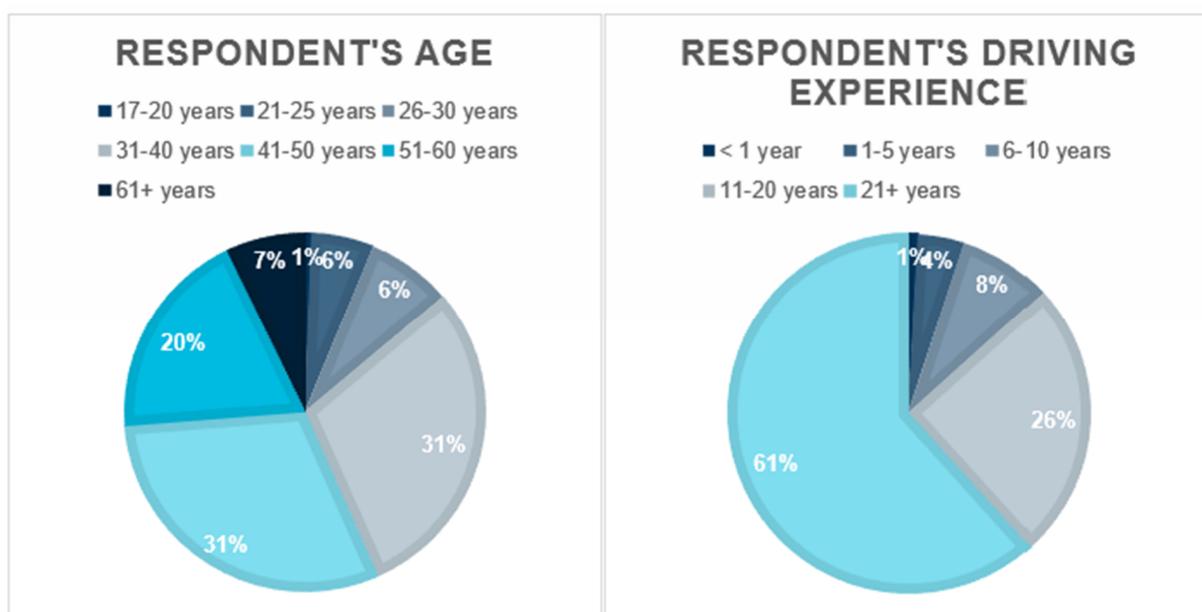


Figure 3: Survey Respondents

### 6.2 Key Findings and Insights

**Driver behaviour and compliance:** Younger and less experienced drivers (particularly those aged 17–25) and those with less than 10 years driving experience were less likely to report consistent compliance with speed limits in roadwork zones. In contrast, older and more experienced drivers, especially females aged 31–40 with 11–20 years of driving experience, reported higher levels of compliance ("most of the time" or "always").

**Crash and Near-Miss Experience:** 46% of respondents had personally experienced or witnessed a near-miss or crash in roadwork or school zones due to speeding.

**Self-Reported vs. Observed Compliance:** Self-reported compliance with speed limits was high, particularly in school zones. Approximately 96% of respondents indicated they 'always' or 'mostly' follow the speed limit in school zones, compared to 80% in roadwork zones. However, perceptions of other drivers' behaviour were less favourable. Only 31% believed other drivers follow the limit in roadwork zones, while 61% perceived compliance in

school zones. This gap between self and perceived compliance suggests social desirability bias and highlights that non-compliance is more noticeable in roadwork zones.

**Reasons for Speeding:** The most common reasons cited for exceeding speed limits were the absence of visible workers or children (68%), the perception that enforcement was unlikely (51%), time pressure or running late (44%), and distrust or disregard for temporary speed zones (43%). Other contributors included a lack of awareness of the limit and inadequate signage.

**Awareness of Enforcement:** Awareness of enforcement measures such as police patrols and speed cameras was high (74%). However, 62% of respondents stated they rarely or never see enforcement in roadwork and school zones. Only 53% felt that enforcement measures were 'somewhat' or 'very' effective, with many indicating limited visibility and inconsistent application. The most common reasons cited for enforcement ineffectiveness included perceptions that enforcement was unreasonable when no workers or children were present, lack of respect for enforcement, unclear speed limits, and a belief among drivers that they could drive safely at higher speeds.

**Support for Average Speed Cameras:** There was strong support for the use of ASCs in both roadwork and school zones. Approximately 79% of respondents agreed that ASCs would encourage compliance, and 75% supported their use to enhance safety. Most respondents (79%) indicated they would be more careful to maintain the limit if ASCs were introduced, suggesting a positive behavioural effect and strong public acceptability.

**Preferred Additional Measures:** Beyond enforcement, respondents identified several measures that would help improve compliance and safety. Top suggestions included road surface treatments such as rumble strips and textured pavements, presence of traffic controllers or school wardens, clearer signage and markings, and advance warning signs.

**Communication and education campaigns:** Approximately two-thirds of respondents (66%) believed targeted advertising campaigns focused on speeding in roadwork and school zones could help change driver behaviour. However, respondents stressed that communications alone are insufficient and should complement physical and enforcement-based measures.

Based on survey findings, the following actions are recommended to improve driver compliance and safety in roadwork and school zones:

**Increase Visible Enforcement:** Respondents indicated that low visibility of enforcement contributes to non-compliance. Over 60% reported rarely or never seeing enforcement in school and roadwork zones. Increased use of speed cameras and police patrols, along with clearly visible signage indicating active enforcement may enhance deterrence.

**Introduce Average Speed Cameras:** With approximately 79% of respondents believing ASCs would encourage compliance and 75% supporting their use, the introduction of ASCs in roadwork and school zones represents a strong, evidence-based opportunity to improve speed compliance.

**Enhance Signage and Road Markings:** Improved clarity and visibility of signage was frequently mentioned by respondents as necessary improvements. The use of advance warning signs, high visibility markings and well timed variable speed displays could help reduce driver confusion and reinforce compliance, particularly in changing roadwork environments.

**Implement Physical Safety Measures:** Physical cues were amongst the most supported interventions. Respondents highlighted road surface treatments such as rumble strips and textured pavement, and the presence of traffic controllers or wardens as effective methods to prompt speed reduction and maintain driver attention.

**Conduct Education and Awareness Campaigns:** Two thirds of respondents agreed that education and awareness campaigns could influence behaviour, provided they are meaningful and evidence-based. Targeted communication initiatives and education campaigns that focus on explaining why speed reductions matter, highlight the human impact of speeding, and promote fair and consistent enforcement could address misconceptions, increase awareness of temporary speed zones, and encourage positive behavioural change among drivers. Based on the feedback, messaging that connects compliance with protecting workers and children would likely resonate most strongly.

## 7. Trial: Demonstration of Impact of ASCs in Roadworks Zone

To demonstrate the potential impact of ASCs within roadwork zones, a two-week trial was undertaken on a major Western Australian project — the Tonkin Highway Extension and Thomas Road Upgrade (THETRU). The trial aimed to demonstrate how the use of ASCs could effectively increase compliance with speed limits in roadwork zones and demonstrate how the use of ASCs can effectively be used in roadwork zones on large-scale Main Roads WA projects where long-term speed restrictions are in place and conditions support consistent monitoring.

The THETRU is being delivered by the Tonkin Extension Alliance (TEA), a partnership between Georgiou Group, BMD, Civcon, GHD and BG&E together with Main Roads WA. The project includes a 14km extension of Tonkin Highway from Thomas Road to South Western Highway, providing a high standard north-south transport link to improve freight efficiency, safety, and connectivity across Perth's eastern corridor. The project was considered an ideal demonstration site to evaluate the effectiveness of ASCs in roadwork zones due to:

The project spans approximately 14kms, providing sufficient continuous road length for ASCs to measure average vehicle speeds between cameras. The Tonkin Extension offers a consistent, uninterrupted corridor ideal for speed monitoring. The works are long term duration and staged, meaning temporary traffic management and reduced speed limits will remain in place for extended periods.

Tonkin Highway is used by light and heavy vehicles and typifies large scale, high traffic volume roadwork zones found on key freight and commuter corridors across WA. The worksite has a high level of coordination, compliance and access control ensuring conditions are suitable for safe and reliable ASC installation.

### 7.1 Trial design and approach

A two-week trial to assess the use of ASCs in a roadwork environment was planned to evaluate their effectiveness in improving driver compliance and safety.

To ensure the validity and reliability of the findings, baseline data was required to accurately evaluate driver behaviour prior to the installation of the ASCs and before drivers were aware of their presence. This data would provide a reference point for measuring the impact of the cameras once they were introduced.

The trial was proposed for the Tonkin Highway work site where the posted speed limit had been temporarily reduced from 100km/h to 60km/h to accommodate ongoing construction activities. The intent was to install a discreet type of ASC that would remain inconspicuous to drivers throughout the two-week monitoring period. This approach aimed to capture authentic driver behaviour unaffected by visible enforcement cues.

The trial was structured in two stages:

**Pre-awareness data collection phase (baseline control phase)** – ASCs were deployed without signage or advance warning to establish baseline data on driver speeds and behaviours through the work zone. (No fines will be issued during this phase).

**Post-awareness data collection phase (intervention awareness phase)** – ASCs were deployed with signage and advance warning to measure the effect of awareness and visible enforcement on driver compliance. (No fines will be issued).

Implementation of the trial and approach required formal approval from key stakeholders, with requirements and conditions identified as part of the approval process (refer to Section 8: Proposed Implementation for further details). Approvals for the demonstration were granted by the following stakeholders:

- Tonkin Extension Alliance Director – Approved
- MRWA Project Director – Approved
- MRWA Road Safety Policy Manager – Approved
- Road Safety Commission – Approved on the 13/10/2025

Due to project reporting deadlines, time constraints, and the need to ensure suitable site conditions for the trial, it was not feasible to complete the study using ASCs within the timeframe required for this report. As an interim measure, a fixed-point camera was utilised to capture both pre-awareness (baseline) and post-awareness data at the same location.

The post-awareness data presented in this report represents only two of the seven days of the intended trial period. The full dataset will be analysed and reported following the submission of this report and incorporated into the final presentation.

### 7.1.1 Trial Location and Site Description

The selected location was Tonkin Highway, a major arterial route serving as the primary thoroughfare for residents within the Shire of Serpentine Jarrahdale. This location was deemed suitable due to its high traffic volumes and representative operating conditions for roadwork environments. More details can be provided upon request.

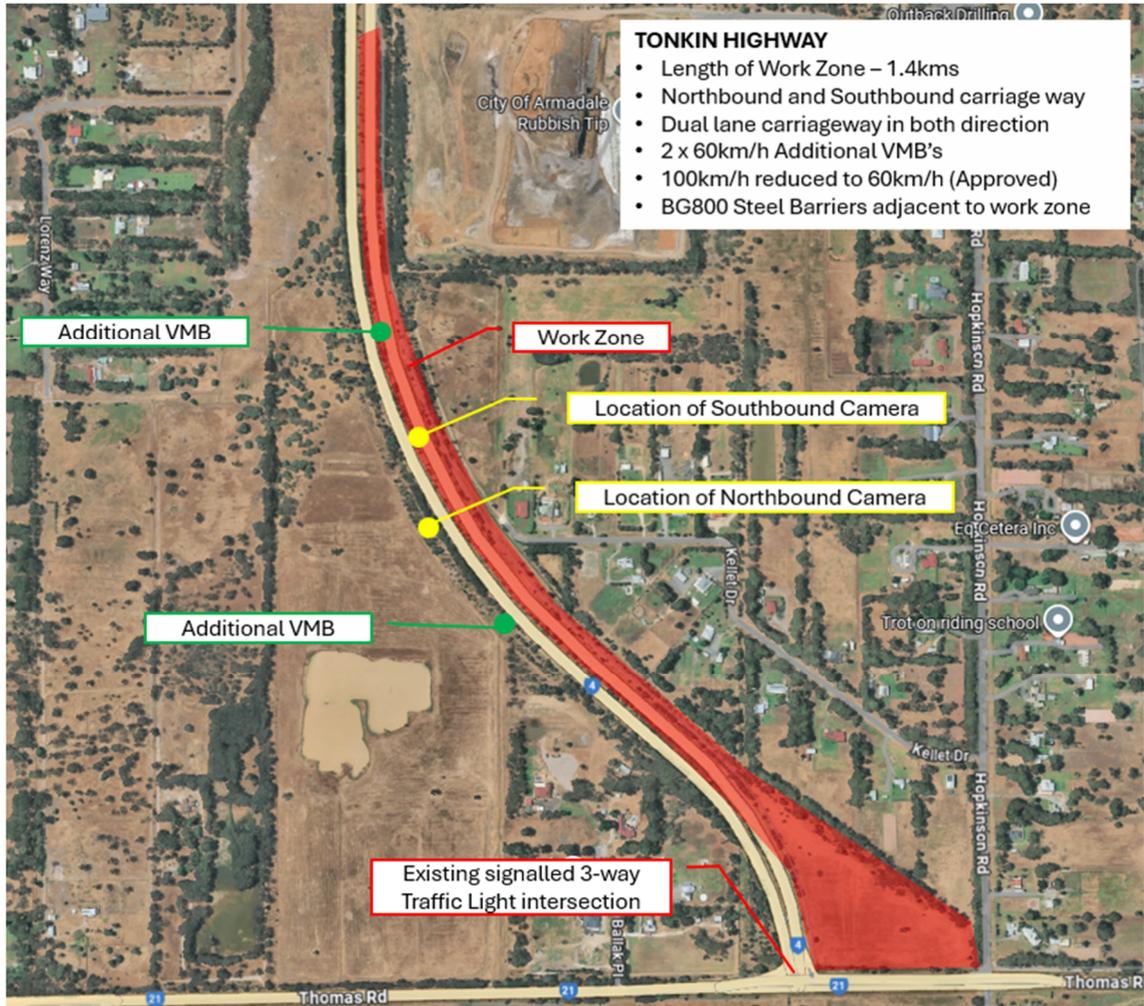


Figure 4,5,6 & 7 – Site Location for Trial, Work Zone location with VMB (Pre Awareness), Post Awareness Signs

## 7.1.2 Equipment used

As the ASCs could not be deployed within the required timeframe due to project reporting deadlines, time constraints, and unsuitable site conditions, a fixed-point camera was utilised instead to capture both pre-awareness and post-awareness data.

If future implementation proceeds, the proposal is to use the approved point-to-point cameras currently deployed across the Main Roads Western Australia (MRWA) network (see MRWA's approved Speed Camera list). Our research identifies several commercially available point-to-point systems that are suitable for this purpose, offering capabilities such as monitoring multiple speed zones, connecting routes, and providing coverage over large areas.

For the purposes of this trial, the following equipment and parameters were adopted:

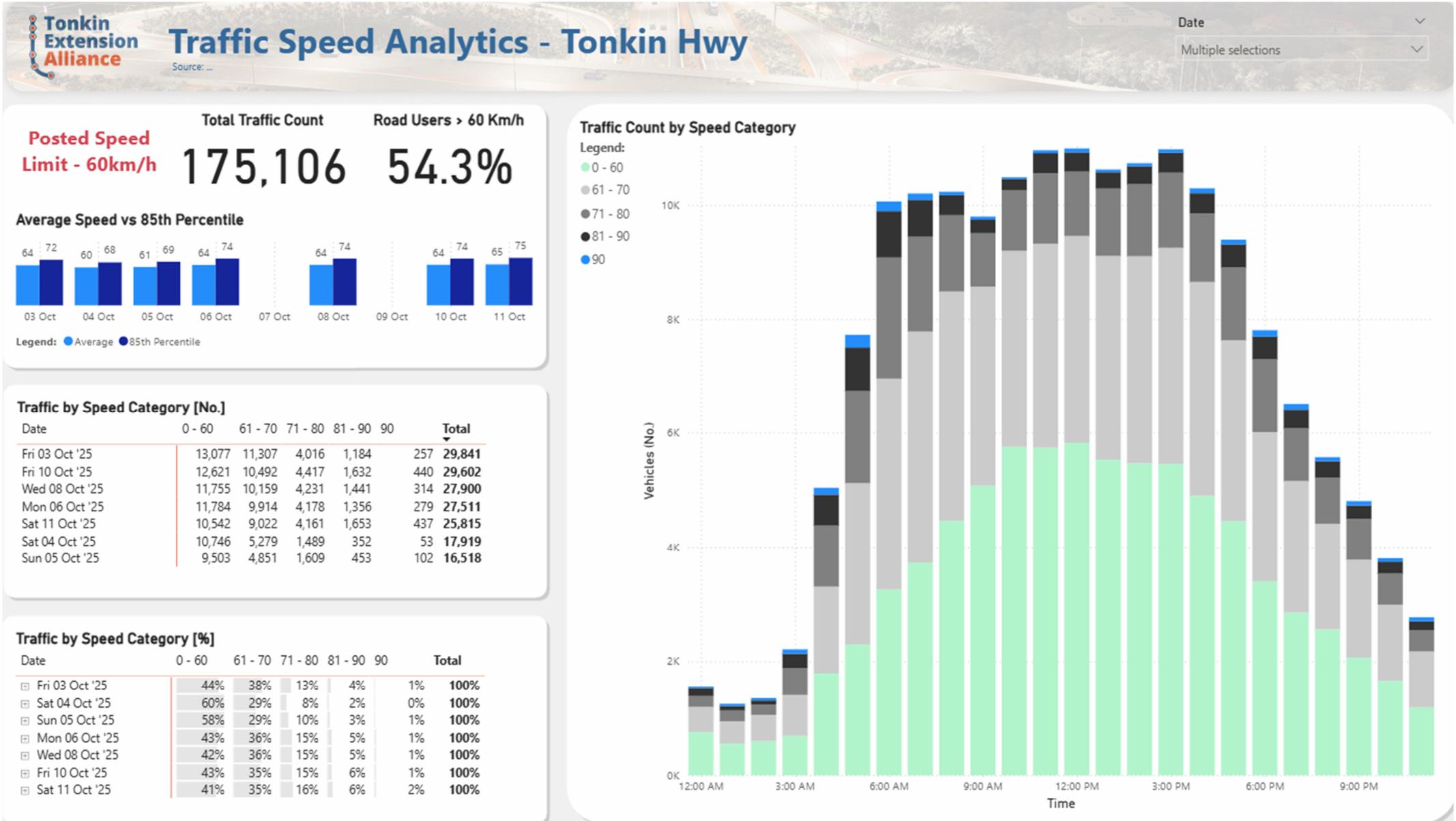
- Type and Specification of Camera Used
  - Datasign VMS-S5, including direct reply-to-VMS functionality for road user feedback.
- Camera Installation Points
  - Installed midway through the work zone, approximately 600–800 m from both the start and end points.
- Data Collected
  - Date and time (24/7)
  - Vehicle speeds (accuracy within <0.5km/h)
  - Direction of travel – Both directions, Northbound and Southbound
- Duration of Data Collection
  - Pre-awareness: 7 days (3 October – 11 October 2025)
    - Note: Data for 7 and 9 October was unreadable due to a power fault.
  - Post-awareness: 7 days (13 October – 21 October 2025)
    - Note: This report only includes data from 13–15 October 2025. Full results will be presented in November.
- Weather Conditions
  - Conditions between 3 and 15 October were fine with no rainfall recorded. Daily temperatures ranged from 9°C to 23°C, with full visibility throughout the period. It is unlikely weather conditions contributed to a change in driver behaviour during the trial period.

## 7.2 Results

### 7.2.1 Pre-Awareness Phase

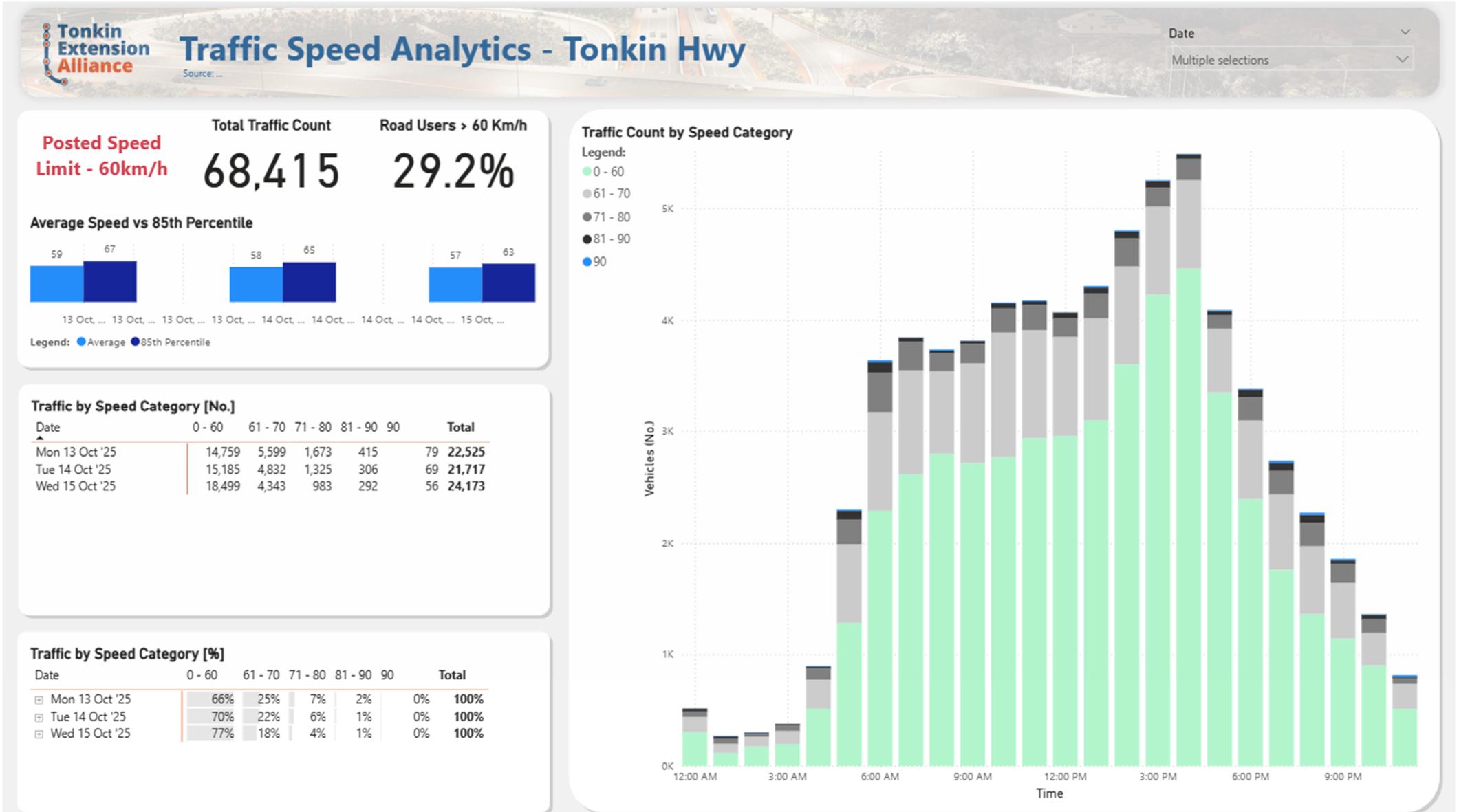
See the dashboard below for results from the pre-awareness phase. Additional data analytics can be provided upon request. Key observations are summarised as follows:

- Speed Limit Compliance:
  - Fewer than half of all vehicles remain within the 60 km/h limit.
  - Over 54% of drivers exceed the speed limit, indicating widespread non-compliance.
  - Over >32,000 vehicles were recorded travelling more than 10 km/h over the posted limit.
  - A concerning number of vehicles (>8,000) exceeded 20 km/h above the limit, substantially increasing the risk of collisions with other road users and on-site workforce.
- Temporal Pattern:
  - Elevated speeds are most common during early and mid-morning periods, suggesting drivers are commuting to work or rushing to reach destinations.
- Weekly Trend:
  - Higher average speeds are evident later in the week (Thursday to Saturday), potentially reflecting reduced congestion, less enforcement, or increased driver familiarity with site conditions.
- Weekend Pattern:
  - Although traffic volumes decrease, speed compliance remains poor, indicating habitual speeding behaviour rather than congestion-driven variation.



## 7.2.2 Post-Awareness Phase

See the dashboard below for results from the post-awareness phase. Additional data analytics can be provided upon request. Note: Data shown below is for a total of 3 days. Full 7-day results will be presented in November.



Key observations are summarised as follows:

- Speed Limit Compliance
  - 29% of road users exceeded the posted 60 km/h speed limit.
  - Only 4% of road users were travelling above 65 km/h, which is considered enforceable.
- Temporal Pattern
  - Higher speeds were most prevalent during early and mid-morning periods, indicating commuter traffic or drivers rushing to reach destinations.
- Weekly Trend
  - Average speeds decreased as the week progressed, suggesting increased awareness and compliance among frequent road users.

### 7.2.3 Comparison and Findings

- Speed Limit Compliance
  - 25.1% reduction was observed in road users exceeding the 60 km/h speed limit.
  - 30% increase was recorded in vehicles travelling below 60 km/h.
  - 60% decrease was observed in vehicles travelling between 70–80 km/h and those exceeding 90 km/h reducing the risk of an accident.
  - 85<sup>th</sup> percentile speeds reduced from 72km/h to 65km/h
- Temporal Pattern
  - Elevated speeds are primarily observed during early to mid-morning periods, indicating that drivers are likely commuting or trying to reach destinations quickly. This pattern is consistent across both pre- and post-awareness data. Focusing awareness efforts during the morning peak could help achieve further reductions in speeding.
- Weekly Trend
  - Average speeds have consistently decreased each day following the introduction of road user awareness measures. This indicates a positive behavioural shift, where drivers are progressively adjusting their driving habits in response to the awareness campaign.

## 7.3 Limitations of the Trial

It is acknowledged that the findings presented in this report do not represent the full two week trial period and that the data collected was using a fixed-point camera, rather than a full ASC system. Consequently, the data provides an indicative view of driver behaviour rather than a complete assessment of the effects of sustained enforcement or driver awareness across the work zone.

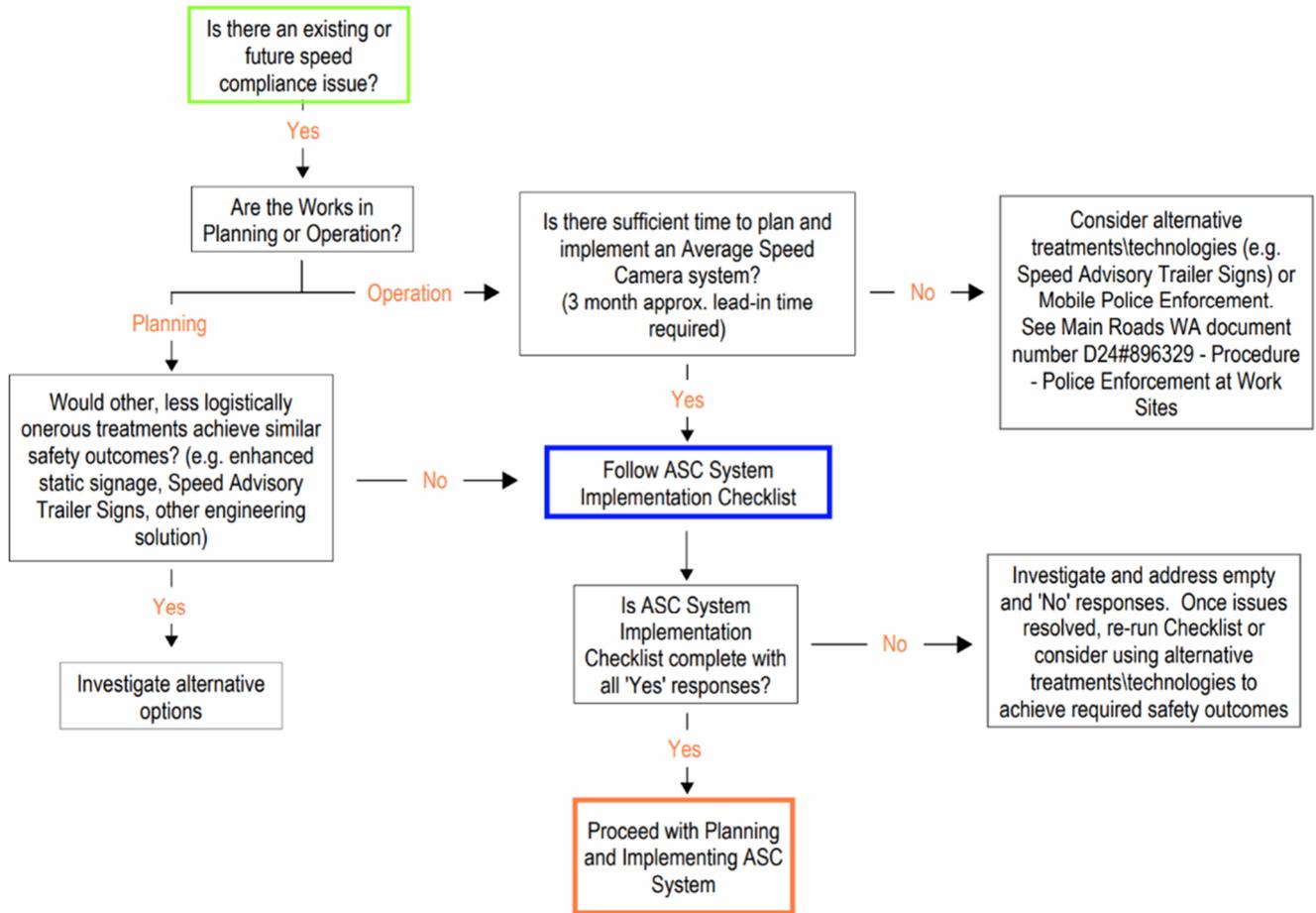
- Other key limitations of this trial are as follows:
  - The data does not distinguish between light and heavy vehicles, limiting analysis of behavioural differences between vehicle classes.
  - As number plates were not captured, the dataset cannot identify repeat offenders or track changes in individual driver behaviour.
  - Due to the project's reporting timeframes, the trial period was restricted to two weeks. A longer trial (ideally two months) would provide more robust insights into long-term behavioural trends.
  - Weather conditions were manually recorded; however, the influence of adverse weather on driver behaviour could not be quantified accurately.
  - If roadworks or an incident occurred within the trial zone, they may have altered traffic flow and driver speeds, potentially skewing the results and requiring exclusion of certain data points.
  - As the trial was non-enforceable, behavioural changes observed may differ once enforcement or an awareness campaign is introduced – likely resulting in improved compliance.

## 8. Proposed Implementation Plan

### 8.1 Roadmap

Following an extensive literature review, stakeholder consultation, public survey and on-ground trial, a roadmap was developed to capture the components of the research that would assist project owners in assessing the

viability of implementing an ASC system into a future roadworks zone. Once working through the roadmap an ASC system is deemed appropriate, more detailed Implementation Checklist has been developed to assist in the Planning and Design of the system, prior to *Going Live*:



## 8.2 Implementation Checklist

The following implementation checklist has been developed as an initial guideline for key items to be considered prior to implementing an ASC system.

ITEM	ACTIONED (Yes/No)
<b>PLANNING</b>	
<b>Appropriateness</b>	
Does implementation of an Average Speed Camera (ASC) system align with the safety objectives of the temporary Traffic Management Plan and Traffic Guidance Scheme to be implemented? Is use of the ASC system appropriate for the location, type of works and hazards that shall be present?	
Is implementation of the system appropriate for the traffic speeds and volumes recorded on the existing road \ expected on the road during operation of the system?	
Shall community and road user buy-in be achieved (in the majority), should the ASC system be implemented on this project?	
Have the Police and/or Local Government been consulted? Are they aware of any frequent speeding, crash or hooning related incidents?	
<b>Logistics</b>	

ITEM	ACTIONED (Yes/No)
Shall the ASC systems be in place for the start of the works or at a certain milestone\traffic management switch or trigger point? Has sufficient time been programmed for approvals, endorsements, procurement, system set-up and road safety audits?	
How long shall the system be implemented? What maintenance is required?	
<b>Communications</b>	
Given that ASC systems in roadwork zones is a new technology in Western Australia and community\road user familiarity with the system shall be low, has non-technical summary information been published in advance (and during) the system's implementation, to better inform the community and road users of the Temporary Traffic Management's road safety objectives? (consider publishing information on Main Roads WA and Road Safety Commission websites).	
Local communications plan to be distributed to local residents and business. For school zones communications to be distributed through school users	
<b>Administration</b>	
Does the Review and Enforcement Team have capacity to undertake back-end processing of imagery, evidence review and issuing of cautions\infringement notices.	
<b>DESIGN</b>	
<b>ASC System Selection</b>	
Is the device type approved and compliant with local applicable specifications?	
Are device specific considerations\limitations known and can be addressed?	
Do third-parties have robust quality management systems and required certifications to handle sensitive data appropriately? (e.g. ISO 9001 - Quality Management, ISO 27001 - Information Security Management and ISO 27701 - Privacy Information Management)	
<b>Location and Safety</b>	
Does the Risk Assessment give due consideration for the additional site based activities associated with installation, commissioning, and maintenance and de-commissioning of the ASC system?	
Have hazards to road users been identified, eliminated and/or otherwise adequately addressed? Is ASC system infrastructure located outside of clear zones, protected by safety barriers or utilises frangible posts?	
Can the ASC system be mounted to existing overhead structures to minimise additional hazards and costs? If not has an appropriate site location been identified which will not disrupt activities	
Has safe access been provided for regular inspection, cleaning and testing of equipment?	
Does the location of ASC system infrastructure adequately mitigate, or does the ASC system adequately account for, road users who may attempt to circumvent detection? e.g. road users who may drive in the emergency lane or 'tail-gate' to avoid detection.	
Have location specific considerations including variable speed limits, change of traffic conditions have been identified and addressed?	

ITEM	ACTIONED (Yes\No)
Has the driven path been surveyed for average speed calculations? Are multiple surveys required for each applicable traffic management switch?	
<b>Services\Connectivity</b>	
Has the power source has been identified? Can nearby power infrastructure support the ASC system? Have applications to the Power Authority have been submitted (if applicable).	
Has the communications source been established? Fibre optics, wireless or both?	
Does the ASC system require water for camera cleaning (maybe piped or tank refilled during maintenance interval)	
Has the method of activation been identified and necessary works planned for? e.g. laser or induction loops cut into the road surface?	
Additional signage (speed camera sign and speed limit repeater signs have been added to the Traffic Control Diagram(s)	
Is street lighting required or does it adversely affect the operational effectiveness of the ASC system? Are the advanced warning signs (of the presence of an ASC system) adequately illuminated or of sufficient retro-reflectivity?	
<b>Review</b>	
The layout of the ASC system has been reviewed in line with the safety objectives of the Temporary Traffic Management (i.e. the layout provides a safe work environment for road workers, contractors and the travelling public who pass through the site) and minimises opportunities for the ASC systems objectives to be misconstrued by the media or public (e.g. 'the speed camera at the bottom of a hill' or a revenue raising exercise)?	
<b>OPERATION AND MAINTENANCE</b>	
Is the site team across the requirements for maintaining operational performance of the system? i.e. preventing visual obstructions, maintaining induction loops (if applicable), who to liaise with regarding faults or issues?	
Performance monitoring e.g. is the system reducing vehicle speeds and having a positive safety impact?	
Are Lessons Learnt being captured for future deployments?	

### 8.3 Education and engagement

The outputs of the literature review, survey responses, trial results and stakeholder feedback demonstrates that education campaigns are most effective when integrated with enforcement and engineering measures and that sustained behaviour change will only occur when drivers clearly understand the purpose of the speed limits, perceive enforcement as being fair and consistent, and see tangible evidence of safety benefits. It will be important to:

- increase public understanding of why speed compliance matters,
- build support for ASCs as a fair and effective safety tool,
- address misconceptions that lower speed limits are unnecessary when workers or children are not visible, and
- Ensure all drivers understand that safety in roadwork and school zones is the responsibility of every driver.

RAC (WA) emphasised that messages should be clear, empathetic and evidence-based and not rely on the use of 'scare tactics'.

Consideration of people's preferred method of communication also needs to be considered. Education campaigns should use a multi-channel approach, combining television, radio, digital media, signage and face-to-face engagement.

- Younger drivers should be targeted through social media and peer-based messaging.
- Schools and other community and industry-based organisations can support localised outreach through newsletters, events and interactive educational materials.
- Older drivers would likely prefer radio and television or newspaper formats. Collaboration with organisations such as RAC (WA) who are considered credible messengers, could also be highly effective for this demographic.

Any education must be timed and integrated with any planned new enforcement activities. Communication would need to begin prior to the implementation of ASCs in roadwork and/or school zones to explain the purpose and benefits and intensify at commencement of their use inclusive of high visible signage and media coverage, and continue periodically to reinforce long-term compliance. Localisation featuring WA roadworkers, parents, and school communities could improve trust and reliability. For example, the use of real WA road maintenance and emergency service workers sharing personal stories about near misses and the dangers they face in Main Roads and Road Safety Commission's WA "Slow Down, Move Over" Campaign resulted in improved public empathy and awareness, leading to measurable improvements in driver behaviour near roadside works.

This approach aligns with best practice identified by Austroads (2019, 2020), Transport for NSW (2017), and the WA Road Safety Commission (2022), all of which highlight that the strongest behavioural change occurs when education, enforcement and infrastructure measures work together. It also reflects feedback from the survey, where two thirds of respondents supported targeted awareness campaigns and 79% indicated ASCs would encourage compliance.

This approach also aligns strongly with proven Australian and international campaigns that combine education, enforcement, and engineering.

In Australia, Transport for NSW's Works Zone Safety Campaign (2017) used multi-channel messaging and visible enforcement to improve driver compliance and awareness – a model reflected in this strategy's focus on fairness, empathy, and protection of workers. Similarly, Queensland's School Zone Safety Campaign (2019) combined community engagement, local school initiatives, and enforcement to achieve up to a 30% reduction in speeding during school hours, mirroring this approach's emphasis on local partnerships and protecting children. The WA Road Safety Commission's Roadworks Awareness Campaign (2022) also demonstrated improved compliance when education was reinforced by mobile speed cameras and clear on-site signage, a structure replicated here through integration with ASCs.

Internationally, the UK "Think!" Campaign and the US Federal Highway Administration's Work Zone Awareness Week both achieved measurable reductions in speeding through empathetic messaging, consistent enforcement, and community participation.

## 9. Conclusion and recommendations

This report confirms that road safety in Western Australia (WA) remains a key priority, especially in temporary traffic environments such as roadwork and school zones, which pose heightened risks due to dynamic conditions and the presence of vulnerable road users. Evidence from both Australia and overseas demonstrates that the best results are achieved through an integrated Safe System approach, combining safer road designs, clear and reliable signage, fair and consistent enforcement of speed limits, and strong public education that helps drivers understand why slowing down matters. Within this framework, Average Speed Cameras (ASCs) are a practical, scalable enforcement measure that encourage drivers to maintain safe speeds over longer distances, and help protect road workers, children and vulnerable road users. This is especially important on long, high speed roads and large scale construction sites with variable roadwork stages over prolonged durations. Stakeholder consultation, community survey results, and the preliminary trial demonstration data all point in the same direction.

Key recommendations for future implementation include:

## Key Recommendations for Future Implementation



a Establish a trial program of ASCs at long-term roadwork sites and selected school zones across WA



b Collaborate with Main Roads WA, WA Police, Road Safety Commission and other agencies to develop a policy and procedure framework for ASC use in temporary traffic environments



c Investigate improvements to signage and other physical treatments to reduce driver confusion in temporary traffic zones



d Engage with government, industry and advocacy bodies to develop and implement strong public educational campaigns



e Develop and apply an evaluation framework to track speeds, infringements, near-misses, crashes, and community sentiment

Implemented together, these recommendations support Vision Zero and State/National 2030 road safety targets, while improving traffic efficiency, reducing road trauma cost, and strengthening public confidence in the road network.

By combining well designed roadwork and school zones with fair and consistent ASC enforcement, supported by evidence-based education, meaningful reductions in fatalities and serious injuries can be achieved. This integrated approach will create safer conditions for all roadworkers, school children and all road users.

# Appendices

# Appendix A

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