Tempe

Safety Action Plan

October | 2026

Contents

Introduction 4

Why Do We Need This Plan? 5

A Commitment to Vision Zero 5

Building On Existing Plans 6

Safety as a Community Priority 7

Safe System Approach 9

Components of the Safety Action Plan 11

General Safety Summary 12

Crash Patterns Summary 13

Detailed Crash Patterns 14

Location of Safety Needs 21

Overview and Purpose 22

Segment High Injury Network 22

Intersection High Injury Network 22

High Injury Network Summary Statistics 24

Safety Strategies 26

Achieving Safer Streets 27

Location-Based and Systemic Strategies for Roadway Design 27

Safety Actions 44

Prioritizing Safety Strategies 52

Measuring Progress 52

Appendix:

Multimodal Safety Countermeasures Toolkit 55



Acknowledgements

1. INTRODUCTION

Introduction

WHY DO WE NEED THIS PLAN?

From July 1, 2020 through June 30, 2024, there were **75 fatal crashes and 317 serious injury crashes** on Tempe streets. Each of these fatal and serious injury crashes has a lasting impact on individuals, families, and the broader community. They result in loss of life and life-changing injuries, but they are preventable. The severity of these crashes reflect systemic conditions in how streets are designed and operated, how users interact with the system, how vehicles are designed and manufactured, and other factors.

The City of Tempe recognizes that no loss of life is acceptable and has made important investments in recent years in transportation safety. The Safety Action Plan, developed alongside the Tempe Transportation Plan, provides a comprehensive approach to further address safety for all roadway users and create conditions that promote a high quality of life.

A COMMITMENT TO VISION ZERO

Vision Zero is an approach to transportation safety that acknowledges that traffic deaths and severe injuries are preventable and sets the goal of eliminating both in a set time frame with clear, measurable strategies. Tempe's **Vision Zero Action Plan** (2019) establishes an explicit commitment to eliminate traffic fatalities and serious injuries and outlines a multidisciplinary approach and strategies to address transportation safety from a range of perspectives.

The Safety Action Plan builds upon the Vision Zero Action Plan by reaffirming the City's commitment to eliminating traffic fatalities and serious injuries, updating the City's priorities based on more recent analysis, and developing tools and strategies to create safer streets for all roadway users.

"Vision Zero is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all."

- Vision Zero Network

SEVERE CRASH REDUCTION GOAL: THE CITY OF TEMPE WILL WORK TOWARD THE GOAL OF ELIMINATING FATAL AND SERIOUS INJURY CRASHES BY 2050.

The Safety Action Plan reinforces a commitment initially made in the Vision Zero Action Plan to eliminate all fatal and serious injury crashes and establishes a framework for action through policy changes, coordinated strategies, and systemic changes to the design and operation of streets.

EXISTING COMMITMENTS AND POLICY:

» Resolution No. R2018.13, adopted by the Mayor and City Council on Februrary 8, 2018, formally commits the City of Tempe to Vision Zero.

» City Council Priority #1 is *to ensure a safe and secure community through a commitment to public safety and justice*. Element 1.08 High Severity Traffic Crashes specifically targets the reduction of fatal and serious injury crashes.

BUILDING ON EXISTING PLANS

The Safety Action Plan builds upon a strong foundation of City policy commitments, long-range planning efforts, and ongoing community engagement that all support the need to reduce fatal and serious injury crashes and create a transportation system that is safe and accessible for everyone. The table below summarizes existing plans and policies and the ways in which the Safety Action Plan builds on those previous efforts.

Plan / Policy Summary	Connection to Safety Action Plan
Vision Zero Action Plan (2019)	
The Vision Zero Action plan formally established Tempe's commitment to eliminating traffic fatalities and serious injuries through a goal of zero fatal and serious injury crashes across the city. The plan outlines a multidisciplinary set of strategies across engineering, education, enforcement, and emergency response.	The Safety Action Plan expands upon the Vision Zero Action Plan by reestablishing the goal of eliminating fatal and serious injury crashes, quantifying the locations with the highest rates of recurring crashes, and establishing strategies designed to sustain progress over time.
Tempe Climate Action Plan (2022)	
The Climate Action Plan outlines the City's strategy to build climate resilience, reduce greenhouse gas emissions, and make progress towards its carbon neutrality goals. The plan highlights the transportation sector as a key contributor to carbon emissions and advances policies and investments that support mode shift, electrification, and sustainable land use.	The Safety Action Plan supports the reduction of greenhouse gas emissions by encouraging people to walk, bike, or take transit through safer and more comfortable streets.
Tempe Tomorrow General Plan (2023)	
The General Plan establishes the City's long-term vision for growth, land use, and mobility, and outlines how transportation investments support compact, mixed-use development and connected, multimodal networks. Areas of emphasis include integrating land use and transportation to reduce reliance on single-occupancy vehicles, improving accessibility, and supporting sustainable, livable communities.	Along with the Tempe Transportation Plan, the Safety Action Plan defines specific strategies and action items to create a safe, multimodal transportation system.
City Council Strategic Priorities and Performance Measures (2025)	
This framework establishes measurable outcomes for a series of priority policy areas and reinforces the City's commitment to eliminating fatal and serious injury through data-driven performance tracking and accountability. Other priorities include commitments to carbon neutrality by 2050 and support for a 20-minute city concept would enable residents to meet daily needs within a short walk, bike ride, or transit trip.	The Safety Action Plan provides a baseline for measuring safety outcomes across Tempe over time. Key plan products such as the High Injury Network (HIN) can be integrated into various forms of performance tracking (e.g., reduction in fatal and serious injuries on the HIN and/or roadway projects with safety elements completed along the HIN).
Tempe Transportation Plan (2026)	
The Tempe Transportation Plan provides the City's long-range, multimodal vision for mobility, integrating safety, access, and land use. The plan prioritizes a transportation system that supports all users, including people walking, biking, rolling, taking transit, and driving. Equity is a central component of the plan through the identification of disparities in access and safety and prioritizing investments in underserved communities.	This Safety Action Plan, developed concurrently to the Tempe Transportation Plan, establishes priority locations for safety improvements, documents crash patterns, and identifies appropriate countermeasures to address common safety challenges.

SAFETY AS A COMMUNITY PRIORITY

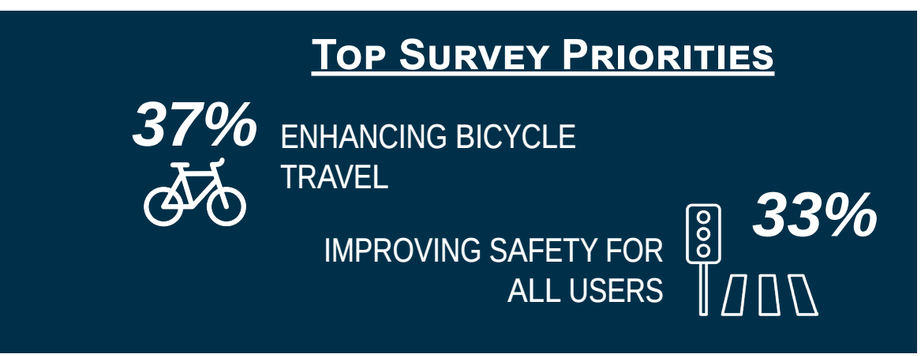
Tempe Transportation Plan Survey

The first phase of public input for the Tempe Transportation Plan featured a general transportation needs survey with multiple questions directly and indirectly related to safety concerns. Select highlights from the survey are presented below. See the Tempe Transportation Plan for a detailed summary of public input received during the plan development process.

General Transportation Needs: When asked to prioritize transportation needs, the top responses were "enhancing bicycle travel" (37 percent of respondents) and "improving safety for all users" (33 percent). Safety is also implied by responses related to comfort and infrastructure quality; other common answers included "create new off-street paths" (19 percent) and "improving sidewalk conditions and comfort" (17 percent), which involve the development of higher comfort facilities and opportunities for people to walk and bike. For this question, participants were able to select more than one response.

Safety Improvements: When asked to select which improvements would have the greatest impact on transportation safety across Tempe, the top responses were all related to intersection operations (participants were able to select more than one response):

- Signalized intersections for active transportation crossings: 42 percent
- Signal timing: 40 percent
- Green arrow left turns: 28 percent



Open Ended Comments: Between public meetings, interactive map input, and advocacy group input, the City of Tempe received more than 250 public comments related to general transportation concerns. Safety was a dominant theme among the public comments, including issues related to crossing conditions and the quality of infrastructure people walking and biking.

- Crossing conditions: Respondents described crossing major roadways as uncomfortable due to long distances between crossings, wide roadway cross sections, and the absence of pedestrian signals or traffic lights. Comments identified median islands, midblock crossings, and more crossings near bus stops, commercial destinations, and ASU as desired improvements. Several comments described narrow sidewalks and sidewalks located close to high-speed traffic as conditions that made participants feel unsafe or uncomfortable. Comments also referred to railroad crossings as uncomfortable for drivers, bicyclists, and pedestrians alike. Several comments suggested grade-separated crossings as a desired improvement.
- Bicycle and pedestrian infrastructure: Public comments consistently emphasized the need for a safer multimodal transportation options through better connected and more comfortable bicycle and pedestrian networks. Comments frequently referenced gaps in bicycle, pedestrian, and transit infrastructure, as well as abrupt endings to bicycle infrastructure before intersections or bicycle facilities that leave riders within shared travel lanes unexpectedly. Many comments requested bicycle infrastructure with higher degrees of separation, particularly along higher-volume corridors and major bicycle routes.
- Other safety concerns: Additional concerns included speeding vehicles near schools and throughout the city, drivers failing to yield to pedestrians, red-light running, inadequate signage visibility, and landscaping that blocks signs.



Safety needs were a focus area during public meetings and the community survey for the Tempe Transportation Plan. Outcomes from those outreach efforts are incorporated in the Safety Action Plan.

Bikeway System Priorities

The Tempe Bicycle Action Group, an advocacy organization, has also voiced safety-related priorities for bikeways in Tempe. Key safety priorities among bicycle advocates include protecting users at conflict points and maintaining existing facilities to ensure they remain safe and comfortable.

Public comments reveal a desire for high-quality and well-connected bikeway. Separated bike lanes, such as those along Smith Rd, have been shown to improve safety outcomes for all roadway users, not just bicyclists.[1]

Tempe Transportation Plan Outreach Events

Date	Event/Activity	Purpose/Outcomes
August 13, 2025	Virtual + in-person community meeting	Provided project overview, shared existing conditions analysis, and generated input on community survey
February 25, 2026	Virtual public meeting + community open house	Shared needs assessment and provided general project updates
August 12, 2026	Virtual public meeting + community open house	Shared draft plan recommendations
Various	Pop-up events (≈35)	Shared general project information, answer questions and encouraged participation in outreach activities (e.g., plan survey)



Separated bike lanes along Smith Rd.

[1] Wesley E. Marshall, Nicholas N. Ferenchak, "Why cities with high bicycling rates are safer for all road users," *Journal of Transport & Health,* Volume 13, 2019

SAFE SYSTEM APPROACH

Definition

The Safety Action Plan continues the movement toward Vision Zero by applying the Safe System Approach, a framework that prioritizes preventing fatal and serious injury crashes and emphasizes a broader system of policies, design decisions, and operations rather than just individual behavior. The Safe System Approach is based on the understanding that deaths and serious injuries are preventable and that responsibility for safety is shared across street designers, vehicle designers, emergency respondents, decision-makers, and people using the streets. The approach emphasizes proactive action and layered strategies to reduce and ultimately eliminate fatalities and serious injuries.

Key elements of the Safe System Approach, as depicted in **Figure 1** include:

» **Safer Roads**. Design and operate streets to reduce crash risk and severity, with a focus on high-risk locations and all users.

» **Safer Speeds**. Manage driver speeds through design, policy, and enforcement to reduce the likelihood and risk of severe crashes.

» **Safer People**. Support safe decision-making by street users through policies, design, education, outreach, and enforcement when necessary that prioritize safety.

» **Safer Vehicles**. Support the adoption of safer vehicle design and technologies that help prevent crashes and reduce injury severity.

» **Post-Crash Care**. Enhance emergency response and coordination to improve outcomes after a crash.

Together, these elements work as overlapping layers of protection so that if one part of the system fails, others are in place to reduce the severity of outcomes.

Vision Zero is Tempe's goal.

Safe System Approach is how Tempe will achieve that goal.

Figure 1: Safe System Approach



Source: U.S. DOT, FHWA

CORE PRINCIPLES

Tempe's approach to safety is also guided by core principles of the Safe System Approach. These principles shape how strategies are developed and implemented throughout this plan, and provide a consistent framework for aligning policies, projects, and programs with Tempe's broader goals for safety, sustainability, and access.

Death and Serious Injury is Unacceptable.
Tempe will first focus on the elimination of crashes that result in death and serious injuries.

Responsibility is Shared.
All stakeholders – including government at all levels, industry, non-profit/advocacy, researchers, and the general public – are vital to preventing fatalities and serious injuries on our roadways.

Humans Make Mistakes.
Tempe understands that people will inevitably make mistakes or decisions that can lead to crashes, but its transportation system can be designed and operated to accommodate certain human mistakes and avoid death and serious injuries when a crash occurs.

Safety is Proactive.
Proactive tools should be used to identify and address safety issues in the transportation system, rather than waiting for crashes to occur and reacting afterwards.

Humans Are Vulnerable.
Our bodies can only tolerate a certain level of crash forces before death or serious injury occurs; therefore, Tempe will design and operate a transportation system that is human-centric and accommodates physical human vulnerabilities.

Redundancy is Crucial.
Reducing risks requires that all parts of the transportation system be strengthened, so that if one part fails, the other parts still protect people.

CONSISTENCY WITH FEDERAL SAFE STREETS FOR ALL PROGRAM

This Safety Action Plan follows the guidance and best practices outlined in the U.S. Department of Transportation's Safe Streets and Roads for All (SS4A) grant program. SS4A was established through the Bipartisan Infrastructure Law to support local communities' efforts to reduce street fatalities and serious injuries. The program provides funding for communities to develop and implement comprehensive safety action plans grounded in the Safe System Approach. These plans are required to include a data-driven safety analysis, meaningful community and stakeholder engagement, identification of high-risk locations, and a prioritized set of strategies and projects.

This plan meets SS4A requirements by:

- Using crash data and analysis to identify safety risks
- Incorporating community and stakeholder input conducted through the Tempe Transportation Plan to inform priorities and solutions
- Establishing a framework for implementation, inter- and intra-governmental cooperation and collaboration, performance tracking, and ongoing evaluation

By meeting these requirements, Tempe is positioned to pursue future safety implementation funding to advance projects that reduce fatal and serious injury crashes.

COMPONENTS OF THE SAFETY ACTION PLAN

The Safety Action Plan is organized into three primary sections that establish a framework for understanding general safety issues, locations with the greatest safety needs, and safety strategies to address locations and systemic safety challenges. Together, these sections support a proactive, data-driven approach to improving safety for all roadway users.

The first section, **General Safety Summary**, documents citywide crash patterns and safety trends. This section includes analyses of crashes by severity, mode, crash type, contributing factors, time of day, and other characteristics associated with fatal and serious injury crashes.

The second section, **Location of Safety Needs**, introduces Tempe's High Injury Network (HIN), including both the Segment HIN and Intersection HIN. These networks identify corridors and intersections with recurring fatal and serious injury crashes and help prioritize locations for future safety investments and improvements.

The third section, **Safety Strategies**, includes **location-based and systemic strategies** for the City to address the design and operation of streets by identifying common roadway characteristics and safety challenges observed along the HIN and across the broader transportation network. This section includes preliminary analyses of select Segment HIN corridors, systemic safety considerations for typical arterial roadways, and a pedestrian crossing spacing analysis that identifies opportunities for additional crossings and safer multimodal access. This section also includes **Safety Actions** comprised of policies, programs, and practices that support Tempe's safety goals. The Safety Actions section includes both ongoing practices and new actions intended to strengthen planning, design, operations, education, enforcement, emergency response, and long-term coordination across City departments.

The Safety Action Plan includes a **Multimodal Safety Countermeasures Toolkit** as an appendix to provide a menu of context-sensitive countermeasures and design strategies that address roadway safety in Tempe. The toolkit is intended to support future project development, corridor studies, and implementation of safety improvements along the City's transportation network.

2. GENERAL SAFETY SUMMARY

General Safety Summary

CRASH PATTERNS SUMMARY

PURPOSE OF ANALYSIS

This section summarizes overall crash data patterns across the City of Tempe over the five-year study period from July 1, 2019 through June 30, 2024 (referred to in the Safety Action Plan as FY 2020 to FY 2024), with a particular emphasis on crashes that resulted in fatality and/or serious injuries, commonly referred to as FSI crashes. The analysis considers FSI crashes along all streets within the City's limits other than access-controlled freeways, which are operated and maintained by Arizona DOT, and allows for a data-driven understanding of the types of safety challenges that are contributing to fatal and serious crashes on city streets.[2] Considerations include crashes by mode, severity, and top contributing factors.

General and Location-Specific Crash Analysis

In addition to this general review of crash types, the Safety Action Plan contains **Segment and Intersection High Injury Networks** that identify the locations with recurring FSI crashes. See the Location of Safety Needs section for additional information.

[2] ***Note on crash types:*** *Crashes are classified in police reports according to the KABCO system, a standard law-enforcement-based injury classification system. In addition to fatal (K) and serious injury (A) crashes, other crash severity types include non-incapacitating/minor injury (B), possible injury (C), and no injury/property damage only (O). Serious injuries are defined as non-fatal injuries that prevent a person from walking, driving, or participating in activities they were capable of prior to the crash.*

KEY TAKEAWAYS FROM CRASH DATA ANALYSIS

The crash data analysis reveals the following key takeaways. The following section discusses the findings in greater detail.



» Crashes involving **bicyclists, pedestrians,** and **motorcyclists** (also referred to as vulnerable road users) make up small shares of total crashes, but crashes involving vulnerable road users are disproportionately likely to result in fatalities or serious injuries.



» **Motorcyclists** are involved in as many FSI crashes as other drivers, despite being a substantially smaller share of roadway users.



» A high share of total, motorcycle, and pedestrian crashes occur in the **evening**, indicating a need for greater **illumination** in key locations.



» **Drugs and alcohol** are involved in more than a quarter of FSI crashes, highlighting the need for enforcement programs related to impaired driving.



» Crashes along Tempe streets are most frequently the result of **turning movements** (including crashes recorded as angle and left turn crashes) **and rear end collisions**.

Table 1: Total Crashes and Severity by Mode, FY2020 – FY2024

	Motor Vehicle Only	Motorcycle	Bicycle	Pedestrian	Total
Fatal (K)	24	24	8	23	75
Serious Injury (A)	134	88	36	65	317
Minor Injury (B)	2,106	226	314	227	2,866
Possible Injury (C)	2,628	65	180	150	3,021
No Injury (O)	11,145	74	0	0	11,218
Unknown (U)	234	4	0	0	238
Total	16,271	481	538	465	17,735

Notes: The Total column contains the absolute number of crashes by classification. Some crashes involved multiple non-motor vehicle modes (i.e., motorcycles and bicyclists or pedestrians), meaning the sum of crashes by mode slightly exceeds the total number of crashes.

DETAILED CRASH PATTERNS

CRASHES BY SEVERITY AND MODE

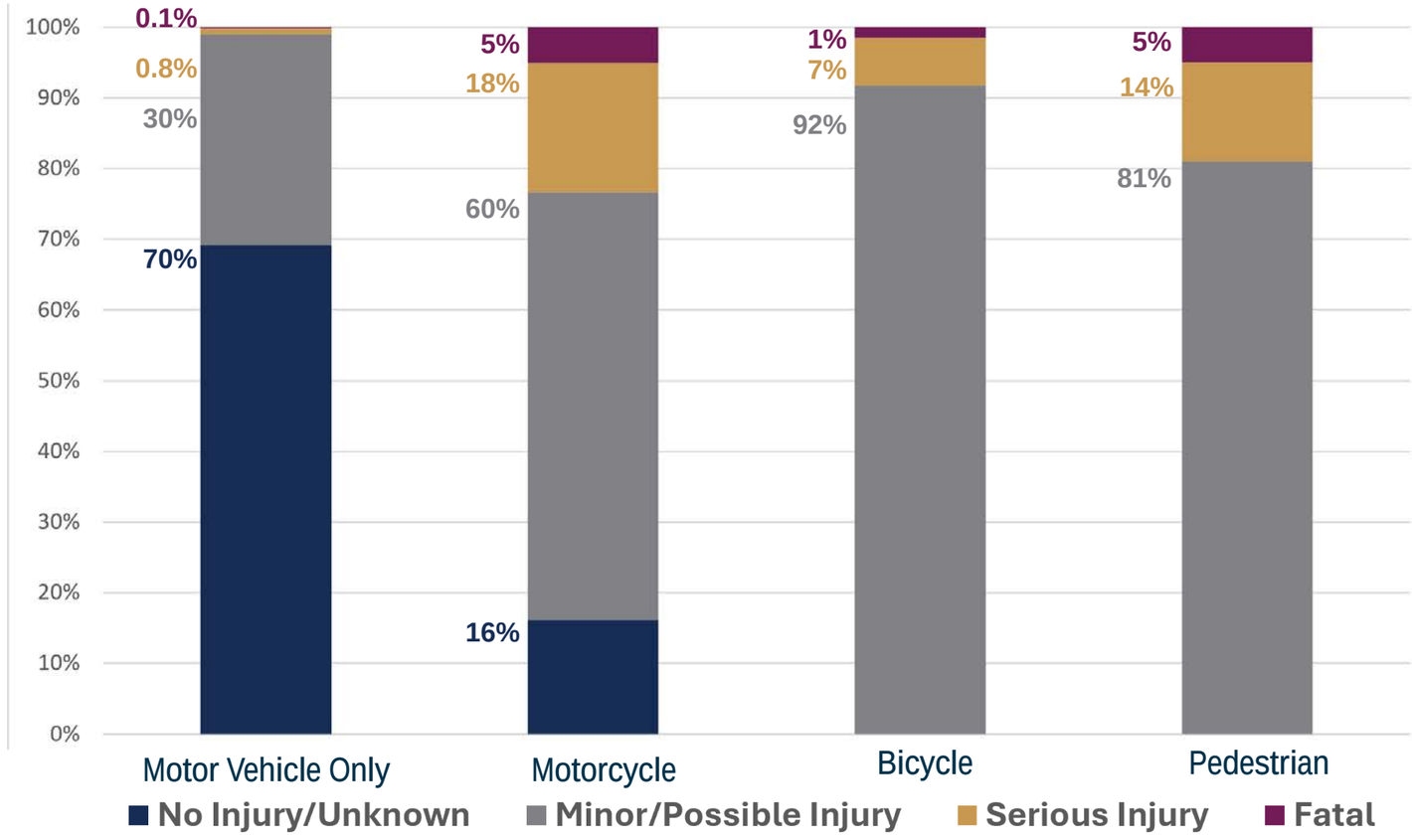
As shown in **Table 1**, there were a total of 17,735 crashes of all severity levels in the City of Tempe from FY 2020 to FY 2024, including 392 FSI crashes (2.2 percent of all crashes). Of the FSI crashes, there were 75 involving traffic fatalities and 317 involving serious injuries. About one-third of all crashes (33.2 percent or 5,887 total crashes) resulted in minor or possible injuries, while 63.3 percent (11,218) of all crashes resulted in property damage only (i.e., no injuries). The remaining crashes resulted in unknown severity levels.

The vast majority of crashes involved motor vehicles only (91.6 percent); however, motor vehicle-only crashes comprised a much smaller share of FSI crashes (39.3 percent). By contrast, crashes involving vulnerable road users (i.e., motorcyclists, bicyclists, and pedestrians) were disproportionately likely to result in fatalities or serious injuries; combined, vulnerable road users comprised less than one out ten total crashes (8.4 percent) but nearly one-third (32.8 percent) of FSI crashes. These trends are shown in **Table 2** and **Figure 2**.

Table 2: Share of Total and Serious Injury Crashes by Mode

	Total Crashes	Share of All Crashes by Mode	FSI Crashes	Share of FSI Crashes by Mode
Motor Vehicles Only	16,271	91.6%	158	39.3%
Motorcycle-involved	481	2.7%	112	27.9%
Bicyclist-involved	538	3.0%	44	10.9%
Pedestrian-involved	465	2.6%	88	21.9%

Figure 2: Severity of Crashes by Mode



CRASHES BY YEAR

Total crashes fell at the beginning of the pandemic and returned to pre-pandemic levels by FY 2023 (**Figure 3**). FSI crashes increased by from FY 2021 to FY 2023, then decreased slightly in FY 24. From FY 2022 through FY 2024, there were an average of 17.7 fatal crashes and 71.3 serious injury crashes per year. FY 2023 was the individual year with the highest number of total crashes and FSI crashes during the study period.

FSI CRASHES BY MODE OVER TIME

Motor vehicle-only FSI crashes increased from FY 21 to FY 2023, then decreased slightly in FY 2024 (see **Figure 4**). Additional analysis over time will be needed to determine if FY 2023 was an anomaly or if the decline in FSI crashes observed over the final 12 months of the study period reflects an emerging trend.

Motorcycle FSI crashes increased sharply following the pandemic and remained steady in 2022, 2023, and 2024. Notably, the number of motorcycle FSI crashes equaled motor vehicle only FSI crashes in FY 2024.

Pedestrian-involved FSI crashes fluctuated following the pandemic, with a decrease from FY 2022 to FY 2023, followed by an increase from FY 2023 to FY 2024.

The numbers of **bicyclist-involved** FSI crashes were consistent across the study period, ranging from 8 to 10 crashes per year.

Figure 3: Total and FSI Crashes by Year

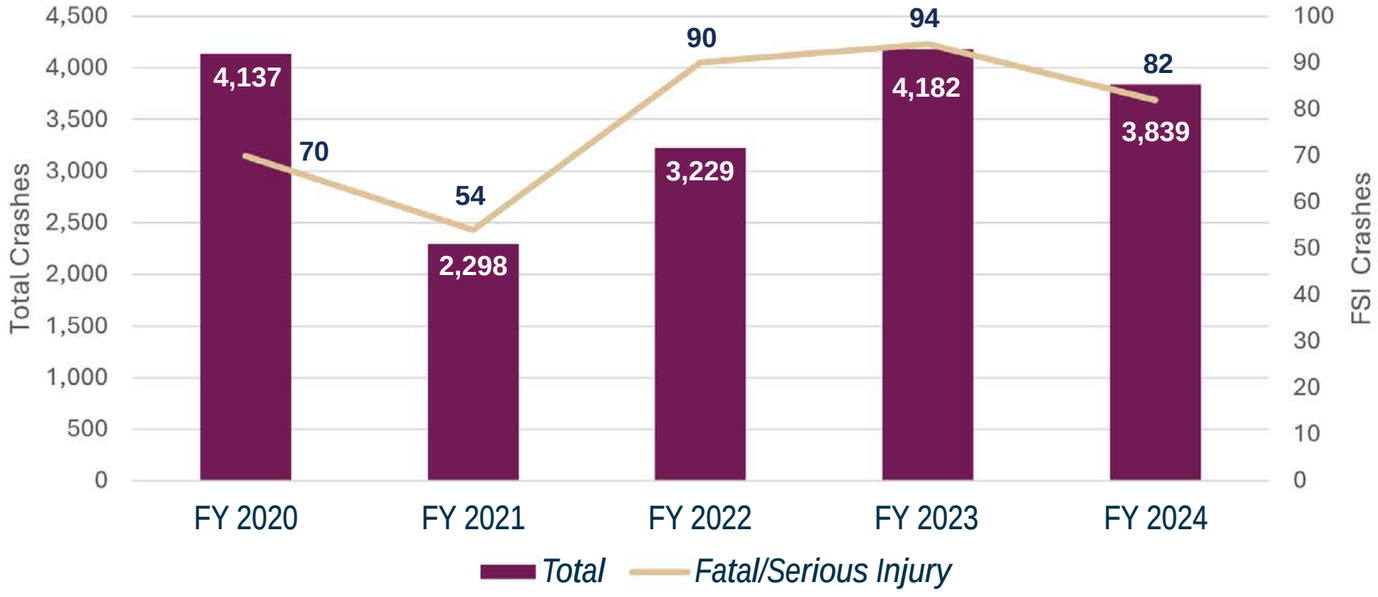
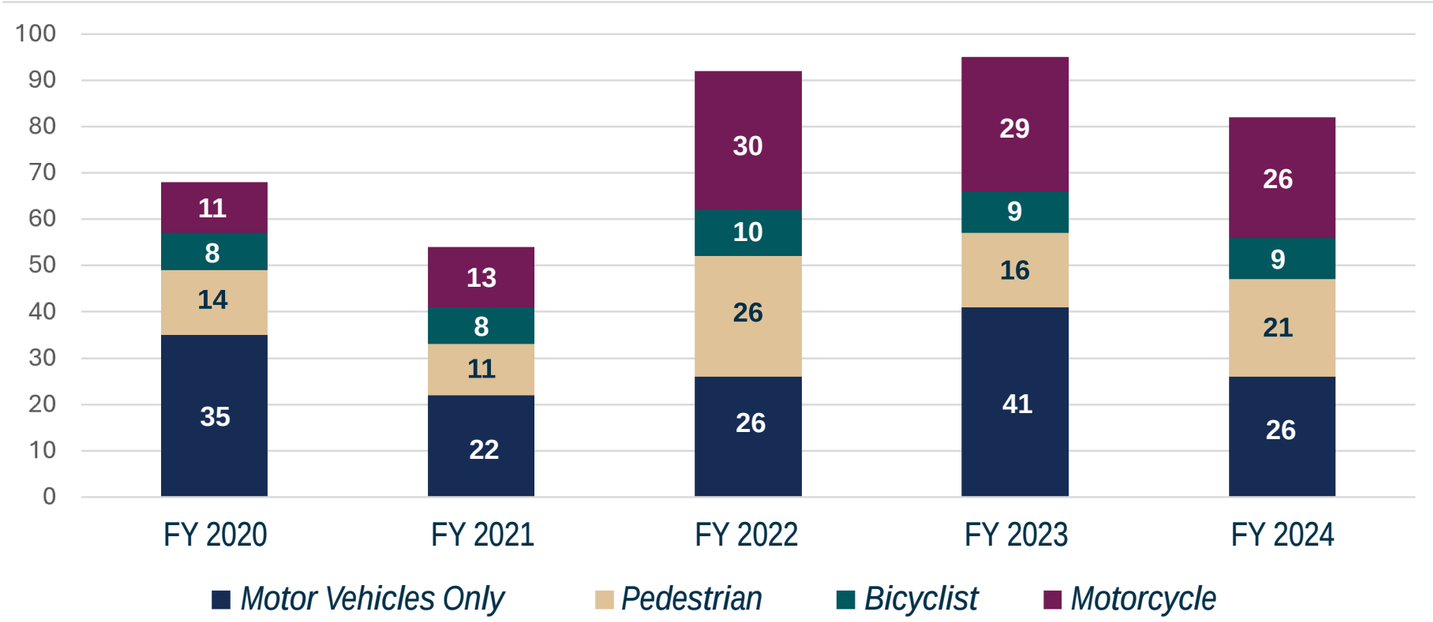


Figure 4: FSI Crashes by Mode by Year, 2020-2024



Note: The sum of FSI crashes by mode exceeds the overall total of FSI crashes shown in Table 1 due to crashes that resulted in fatalities or serious injuries involving multiple modes of travel.

SHARE OF CRASHES INVOLVING DRUGS OR ALCOHOL

About 20.4 percent of FSI crashes during the study period involved alcohol, versus 6.0 percent of all crashes, meaning that crashes involving alcohol are *more than three times* as likely to result in a fatality or serious injury (see **Figure 5**). About 4.9 percent of FSI crashes during the study period involved drugs, versus 1.1 percent of all crashes, meaning that crashes involving drugs are *more than four times* more likely to result in a fatality or serious injury.

Combined, about one quarter (25.3 percent) of FSI crashes across the study period involved alcohol or drugs, compared to 7.1 percent of all crashes.

CRASHES BY TIME OF DAY

The highest share of total crashes took place during the peak driving period (3 to 6 PM); however, the highest share of FSI crashes took place from 6 to 9 PM. Compared to total crashes, there was also a disproportionate share of FSI crashes during the hours of 9 PM to 3 AM (**Figure 6**). The time of the week with the most FSI crashes was Saturday evening.

Pedestrians and bicyclists are particularly vulnerable in the evening and late at night; more than half of pedestrian crashes and two out of five bicycle-involved crashes took place from 6 PM to midnight. A disproportionate share of motorcycle crashes also occurred in the evening and at night, with about two out of five motorcycle FSI crashes taking place from 6 PM to midnight. FSI trends by mode and time of day are shown in **Figure 7**.

In addition to lighting, alcohol played a significant role in crashes by time of day. More than half of FSI crashes involving alcohol occurred from 9 PM to 3 AM.

Figure 6: Total and FSI Crashes by Time of Day

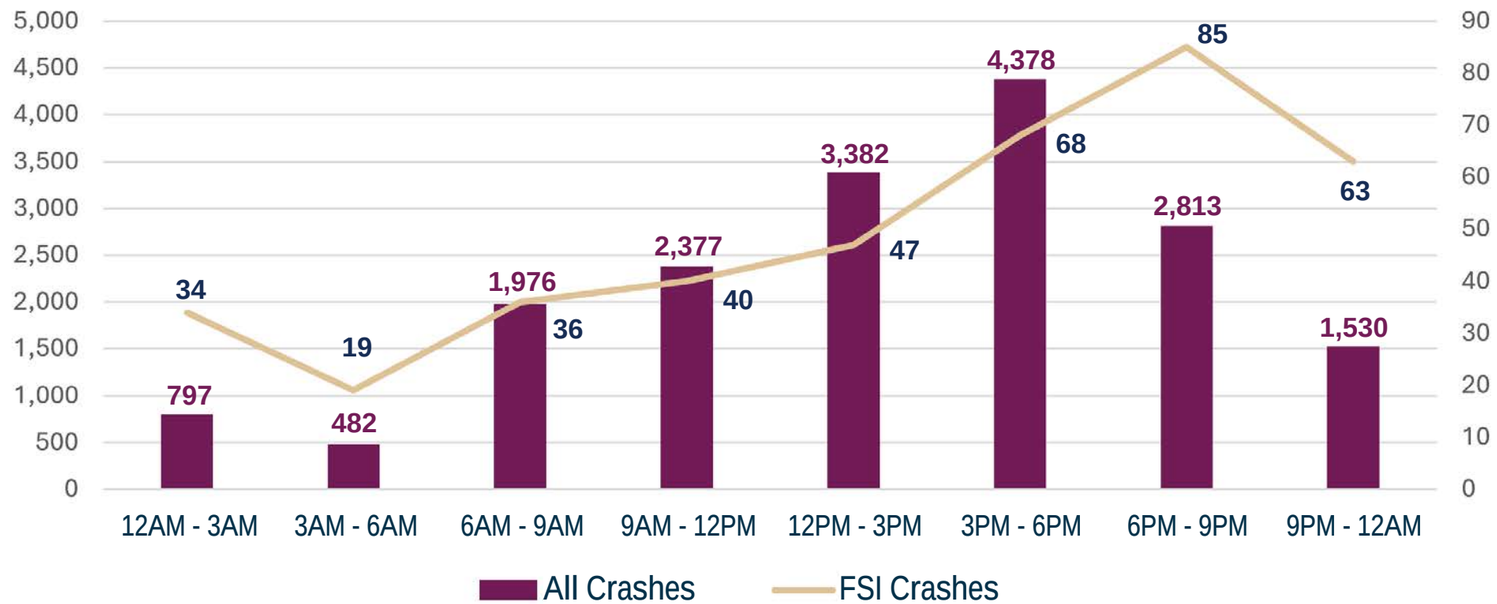
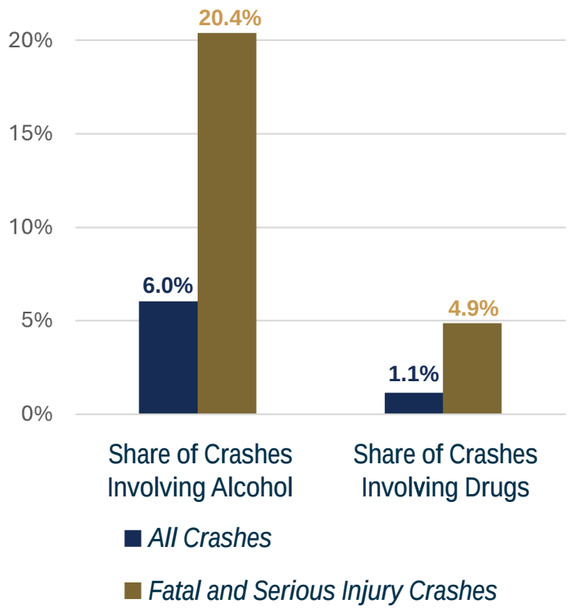


Figure 5: Share of All and FSI Crashes Involving Drugs or Alcohol



POSTED SPEEDS AND CRASH SEVERITY

Combined, 68.4 percent of total crashes and 70.4 percent of FSI crashes took place on streets with speed limits of 40 MPH or higher, reflecting the fact that traffic volumes are typically higher and crashes occur more frequently on streets with higher posted speeds.

As shown in **Figure 8**, crashes were less likely to result in fatal and serious injuries on roadways with posted speed limits less than 35 mph. Combined, 13.1 percent of total crashes and 10.5 percent of FSI crashes took place on streets with speed limits of 25 MPH or less.

CRASHES BY TYPE

All crashes: The most common crash types are associated with turning movements and intersection conflicts, including rear end collisions, angle crashes, and left turns (**Figure 9**). Angle, left-turn, and rear-end crashes are often associated with turning conflicts, speed differences between turning and through vehicles, and frequent access points like driveways and minor streets. These conditions may be more pronounced on high speed, multilane roadways with large intersections.[3]

FSI crashes: The most commonly cited crash types in police reports for FSI crashes are "unknown" or "other" (**Figure 10**). These crashes are often pedestrian and bicycle-involved crashes; coded as "unknown" or "other" as these crash types typically do not fit into the crash types developed for motor vehicle-only crashes. In review of the data, 74 percent of pedestrian-involved crashes and 67 percent of bicyclist-involved crashes were attributed to "other" or "unknown" crash types. Other FSI crash types include left-turn, angle, and single vehicle crashes where motorists run off the road and collide with an object.

[3] Chandler, B. E., et al. *Signalized Intersections: Informational Guide, Second Edition*. FHWA-SA-13-027. Federal Highway Administration, 2013.; Neuman, T. R., et al. *NCHRP Report 500, Volume 5: A Guide for Addressing Unsignalized Intersection Collisions*. Transportation Research Board, 2003.; Federal Highway Administration. *Corridor Access Management*. FHWA-SA-21-040, 2021.

Figure 7: FSI Crashes by Mode and Time of Day

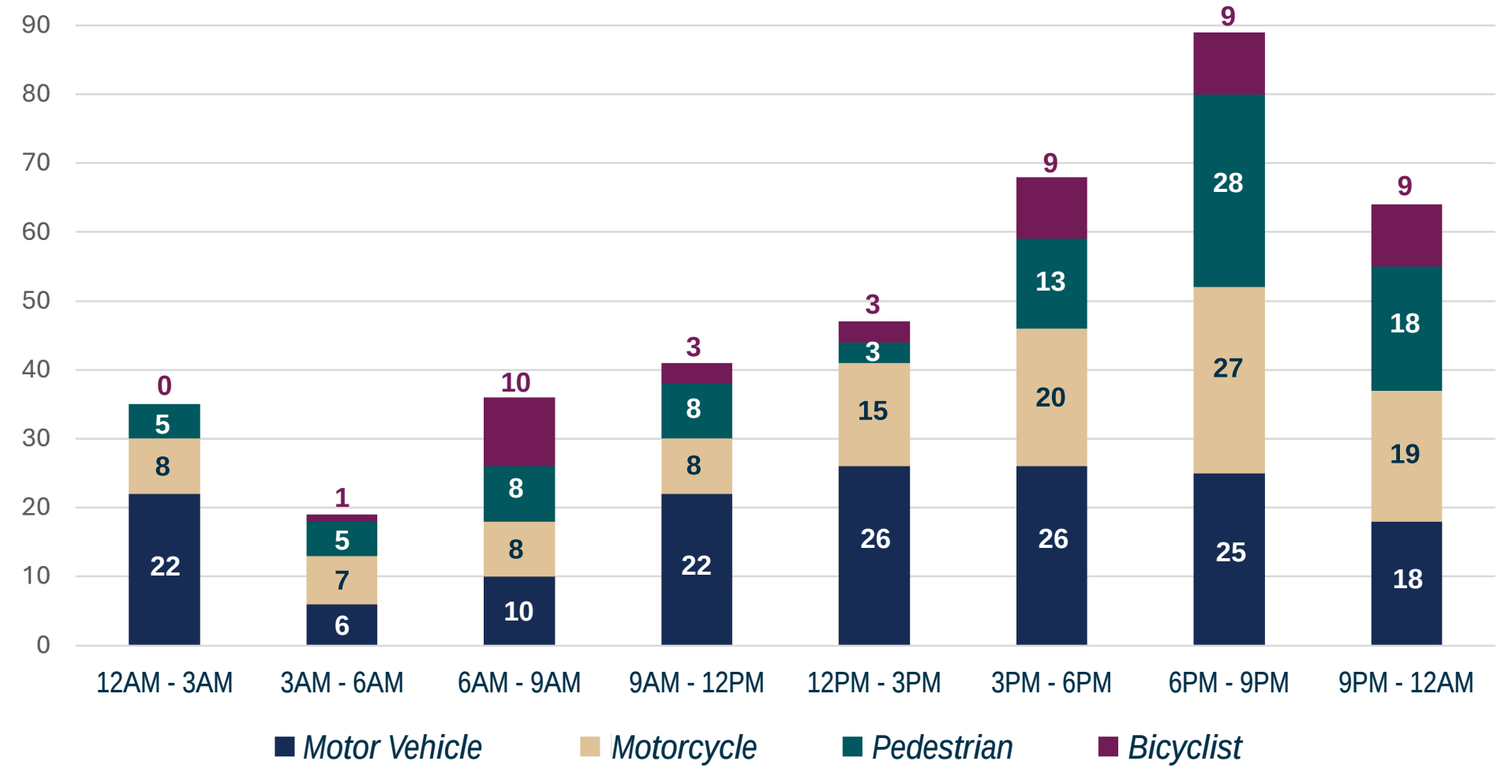
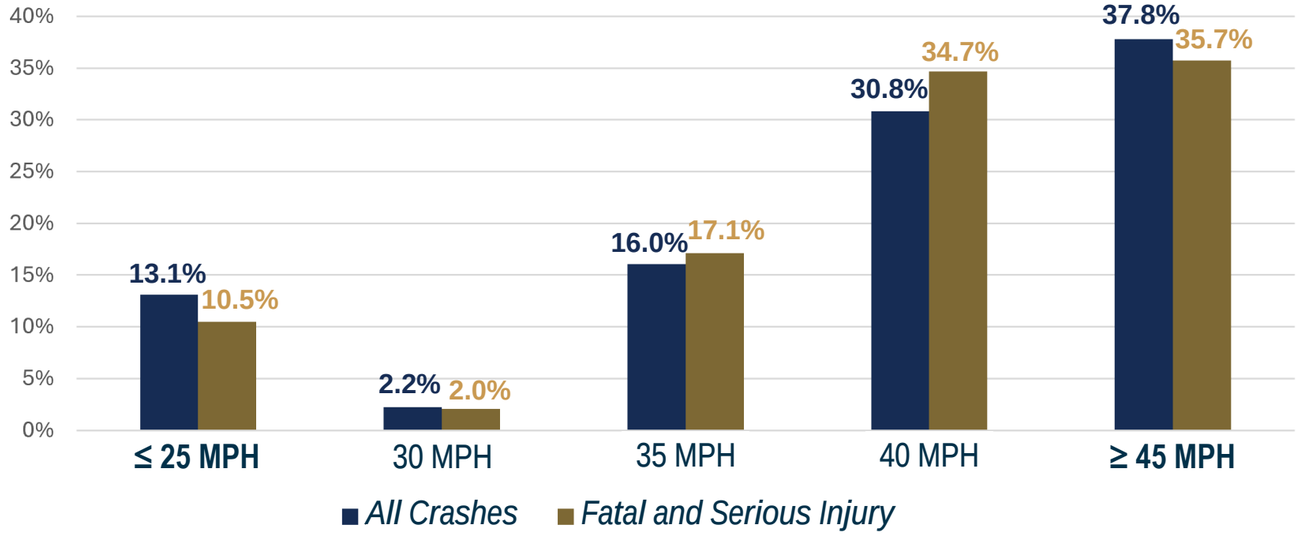


Figure 8: Share of Total and FSI Crashes by Posted Speed Limit



CONTRIBUTING FACTORS

Contributing factors of crashes in this analysis are derived from the violation code reported by law enforcement in police crash reports. This code is reported for each person involved in the crash and represents any cited traffic violation. It is important to note that the violation code reflects enforcement actions rather than direct measures of crash causation. As a result, large shares of violations are coded as "No Violation" or "Left Blank." Similarly, a high proportion of "No Improper Action" is indicated because these violation codes are assigned to all involved persons, including those not perceived to be at fault. Despite these limitations, the violation code is the closest available indicator of a crash's contributing factors.

The Safety Action Plan applies contributing factor **categories** to aggregate related violation codes into behavioral themes.

Categories containing multiple violation codes are as follows:

- **Failure to yield right of way**: Violations include failure to yield to pedestrians, general failure to yield right of way, and failure to yield while turning left.
- **Traffic control violation**: Violations include running a stop sign and disregarding a traffic signal.
- **Speed-related factors**: Violations include exceeding the lawful speed and driving too fast for the roadway conditions.
- **Lane discipline**: Violations related to improper lane use or lateral movement while vehicles are traveling in the same direction, such as drifting from the travel lane, passing in a no-passing zone, making an unsafe lane change, or failing to remain in the proper lane.
- **Following/path error**: Violations where a person's travel path created a direct conflict with another road user, such as following too closely or driving or riding in the opposing traffic lane.

Figure 9: Percentage of Crashes by Type – All Crashes

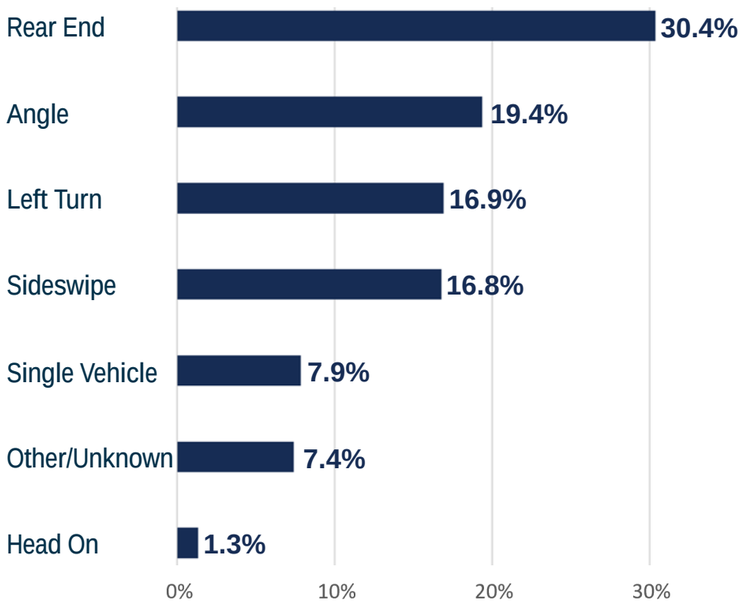
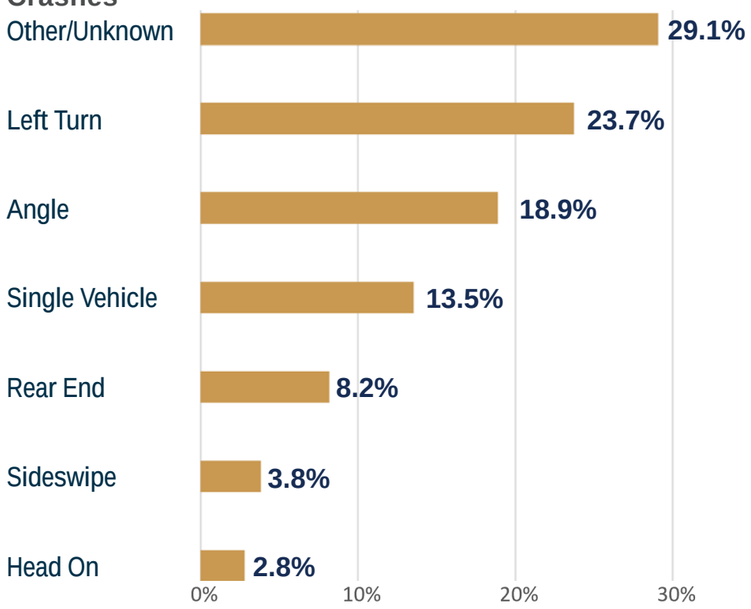


Figure 10: Percentage of Crashes by Type – FSI Crashes

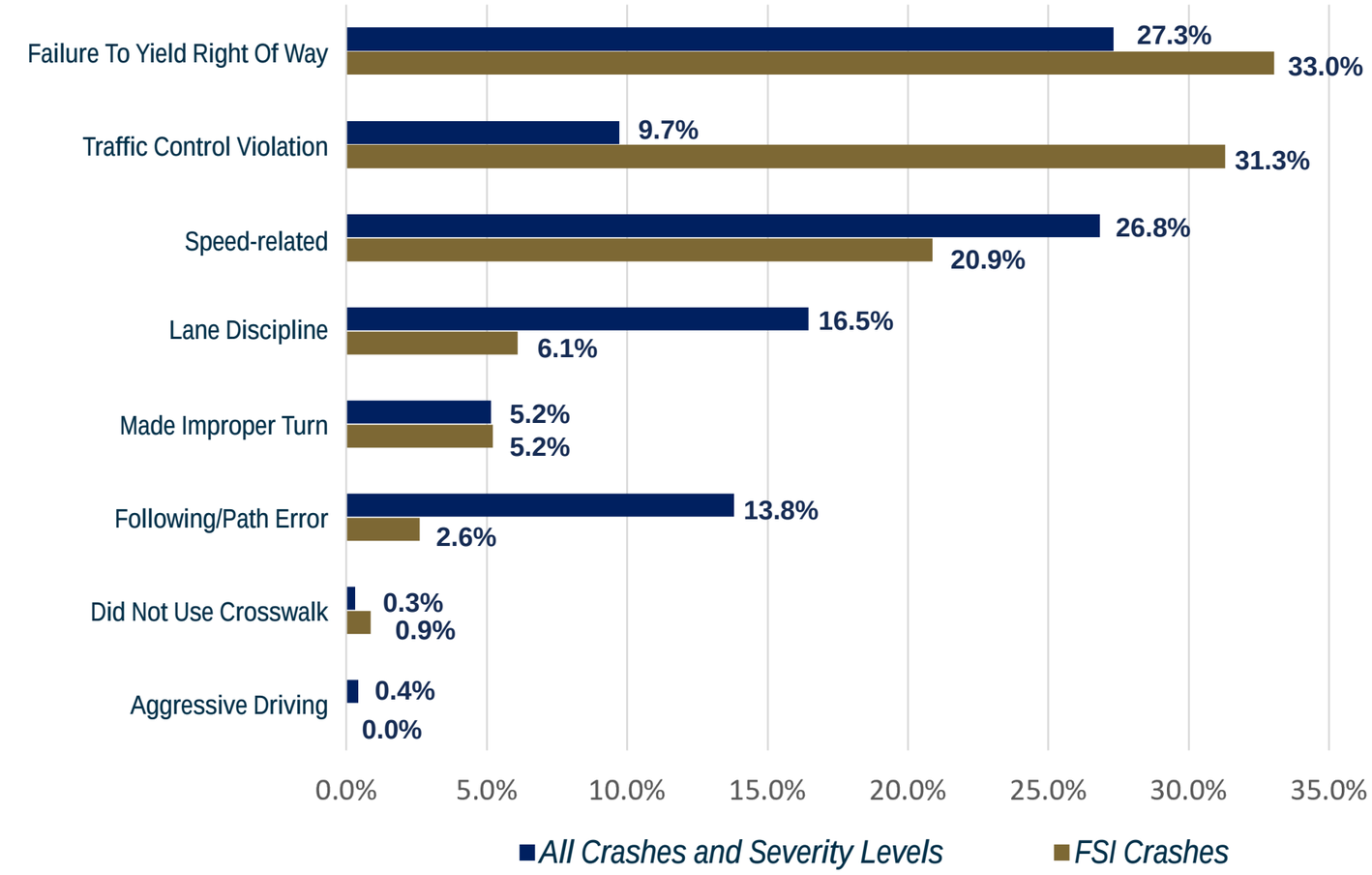


Key findings from the review of contributing factors:

- Top contributing factors for **all crashes** were drivers failing to yield right of way and speed-related.
- **Mid-block crashes** were disproportionately likely to be the result of drivers failing to yield and pedestrians not using crosswalks.
- **Intersection crashes** were disproportionately likely to be the result of drivers failing to yield and traffic control violations, such as running a stop sign or disregarding a traffic signal.

Figure 11 through **Figure 13** summarize contributing factors for all crashes and for FSI crashes based on whether the crashes were identified in police reports as having taken place at an intersection or mid-block location.

Figure 11: Top Contributing Factors – All Crash Severity Levels and FSI Only Crashes



Note: Crash reports included 16,261 total identified contributing factors; contributing factors were identified in a total of 15,016 crashes.

Figure 12: Top Contributing Factors – Mid-block FSI Crashes Only

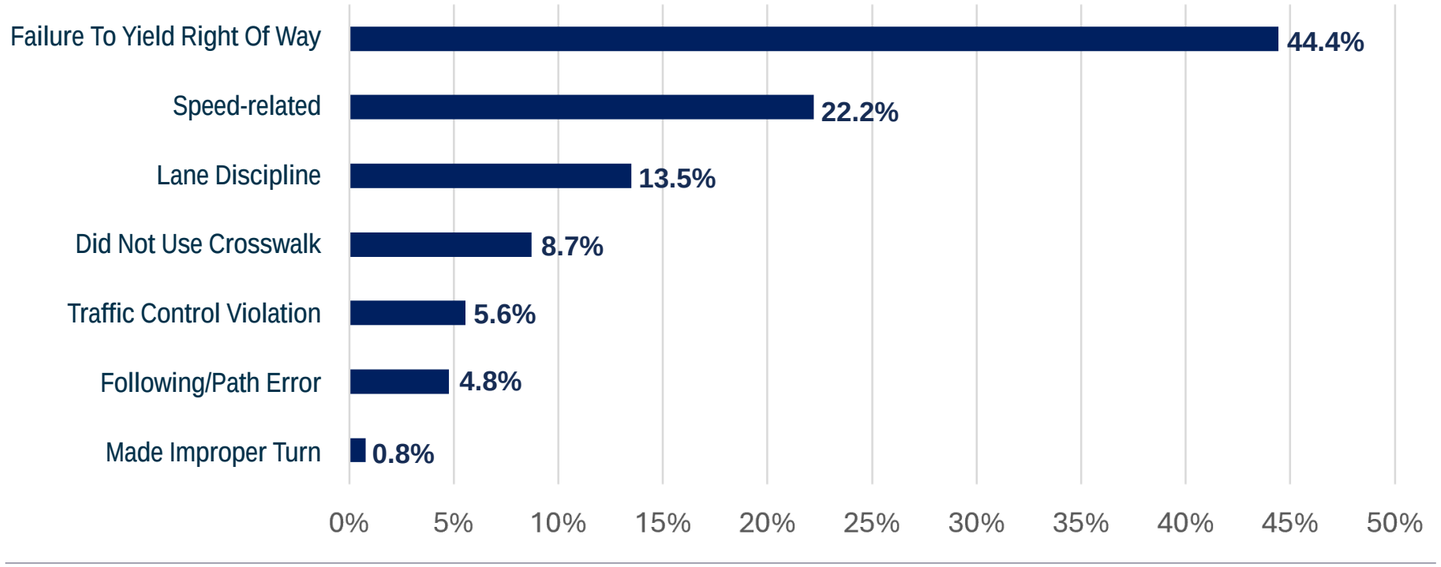
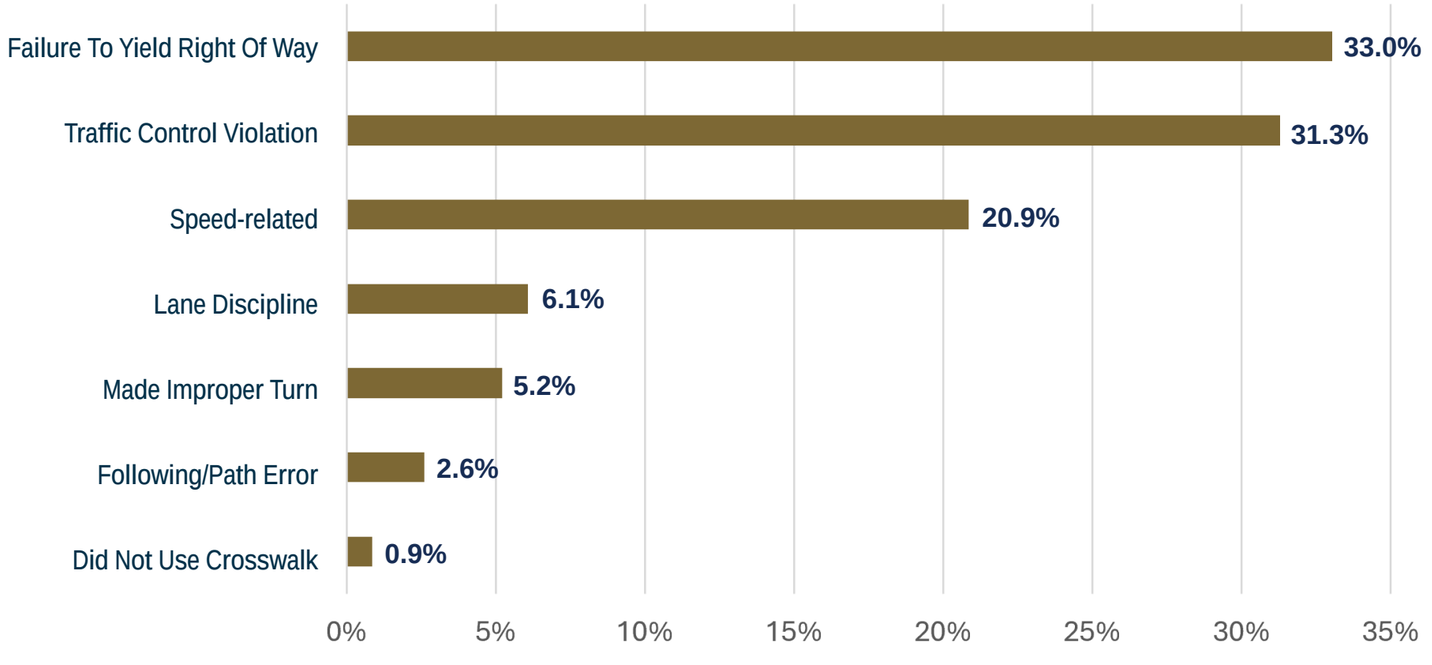


Figure 13: Top Contributing Factors – Intersection FSI Crashes Only



3. LOCATION OF SAFETY NEEDS

Location of Safety Needs

OVERVIEW AND PURPOSE

A high injury network (HIN) is a tool for understanding where fatal and serious injury crashes have occurred at the greatest density over a period of time and where safety countermeasures and design interventions should be prioritized. The Safety Action Plan identifies two distinct high injury networks to support different kinds of safety treatments and interventions: **Segment HIN** and **Intersection HIN**. Inputs to these networks are based on the designations in police crash reports, which include a field labeled "intersection crashes." All crashes not designated as an "intersection crash" are considered to occur at mid-block locations and are considered as part of the Segment HIN.

Key opportunities and benefits from developing a High Injury Network include:

» Targeting traffic enforcement activities

» Prioritizing public infrastructure improvements

» Tracking progress over time in reducing fatal and serious injury crashes

SEGMENT HIGH INJURY NETWORK

The Segment HIN, as shown in **Figure 14**, is based on crashes identified in police reports as occurring at mid-block locations. The resulting network helps identify corridors that may benefit from additional safety review and countermeasures, including speed enforcement and infrastructure investments to improve roadway safety.

The Segment HIN identifies street segments as priority locations based on the number of FSI crashes, as determined through a sliding window analysis with ½-mile segment lengths. Segments with three or more total FSI crashes over the five-year study period are included in the Segment HIN.

INTERSECTION HIGH INJURY NETWORK

The Intersection HIN, as shown in **Figure 15**, is based on FSI crashes that were identified in police reports as "intersection crashes." All intersections with two or more "intersection crashes" within 100 feet of the intersection center point over the five-year study period are included in the Intersection HIN.

Segment HIN Methodology

Sliding Window Analysis

The first step in the Segment HIN development process involved a sliding window analysis – a tool for processing crashes throughout a transportation network to identify segments with the highest crash density. For Tempe, the analysis focused on the number of mid-block FSI crashes in a **1/2-mile window** on a roadway. Crash density can be assessed by shifting a virtual "window" along the roadway **1/10 of a mile** at a time and counting the number of FSI crashes that occurred within each successive 1/2-mile segment.

Smoothing Process

Once the initial HIN was developed, segments were revised to remove any discrete segments that are less than 0.5 miles in length and to combine HIN segments with small gaps that feature common roadway design characteristics.

Figure 14: Segment HIN

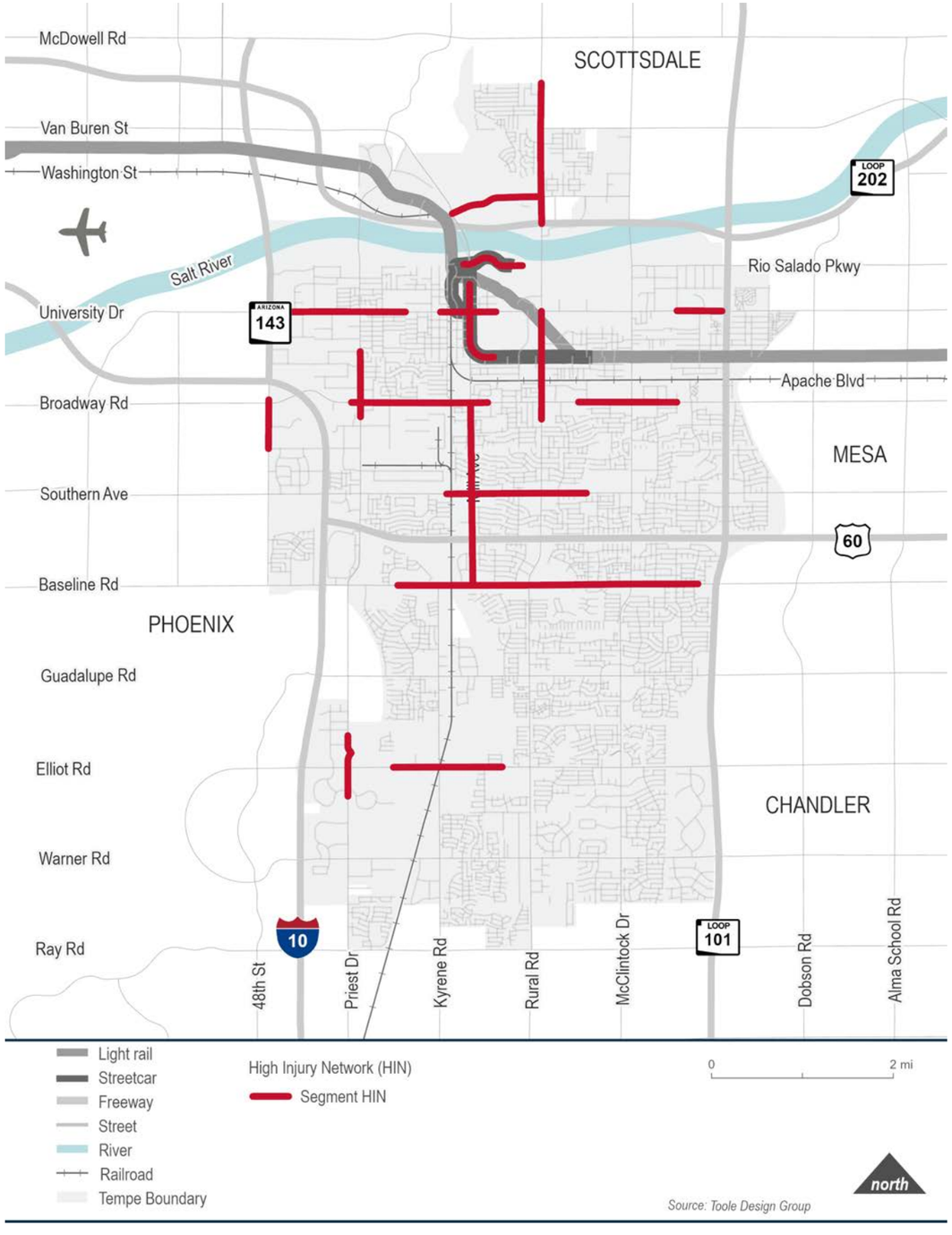


Figure 15: Intersection HIN

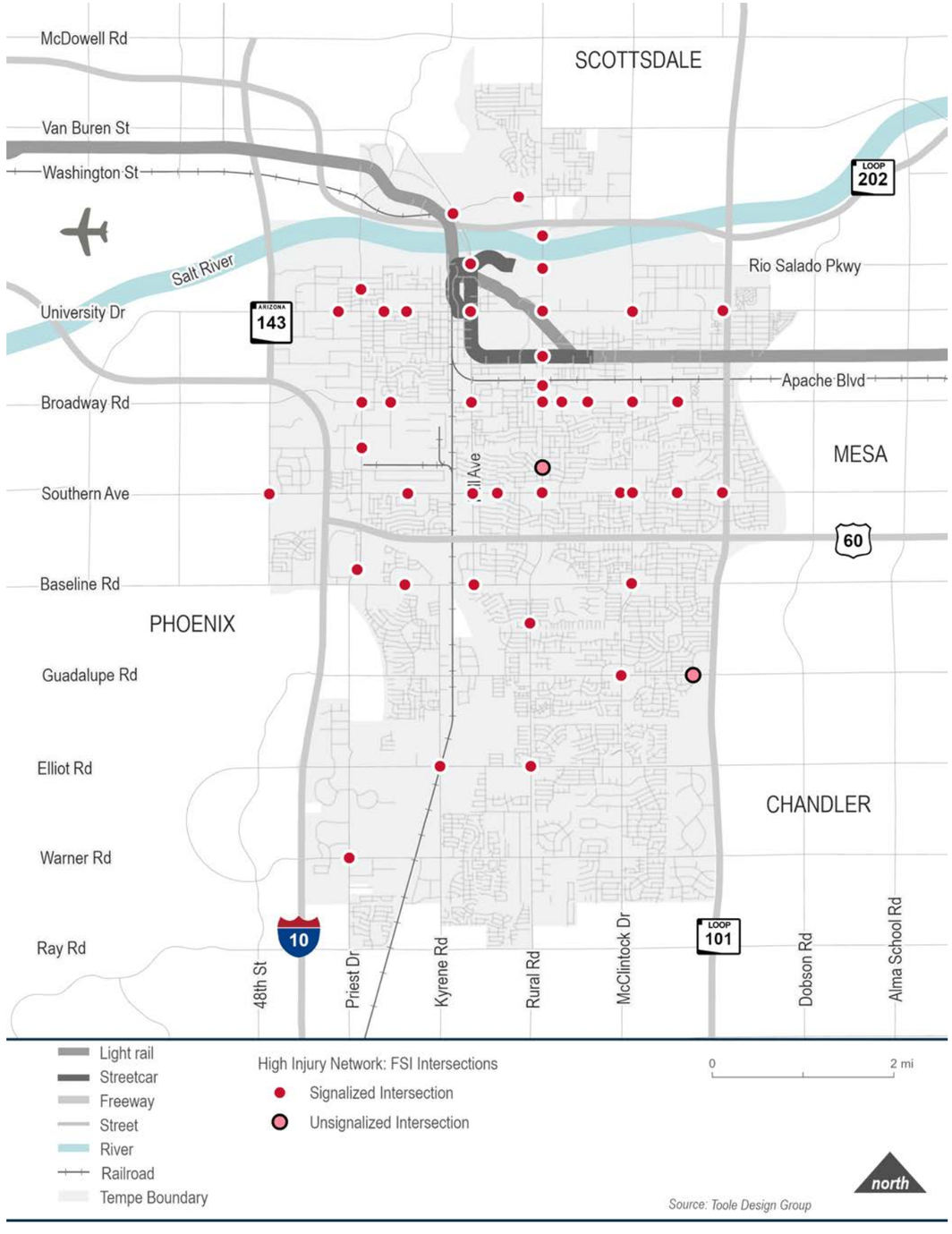
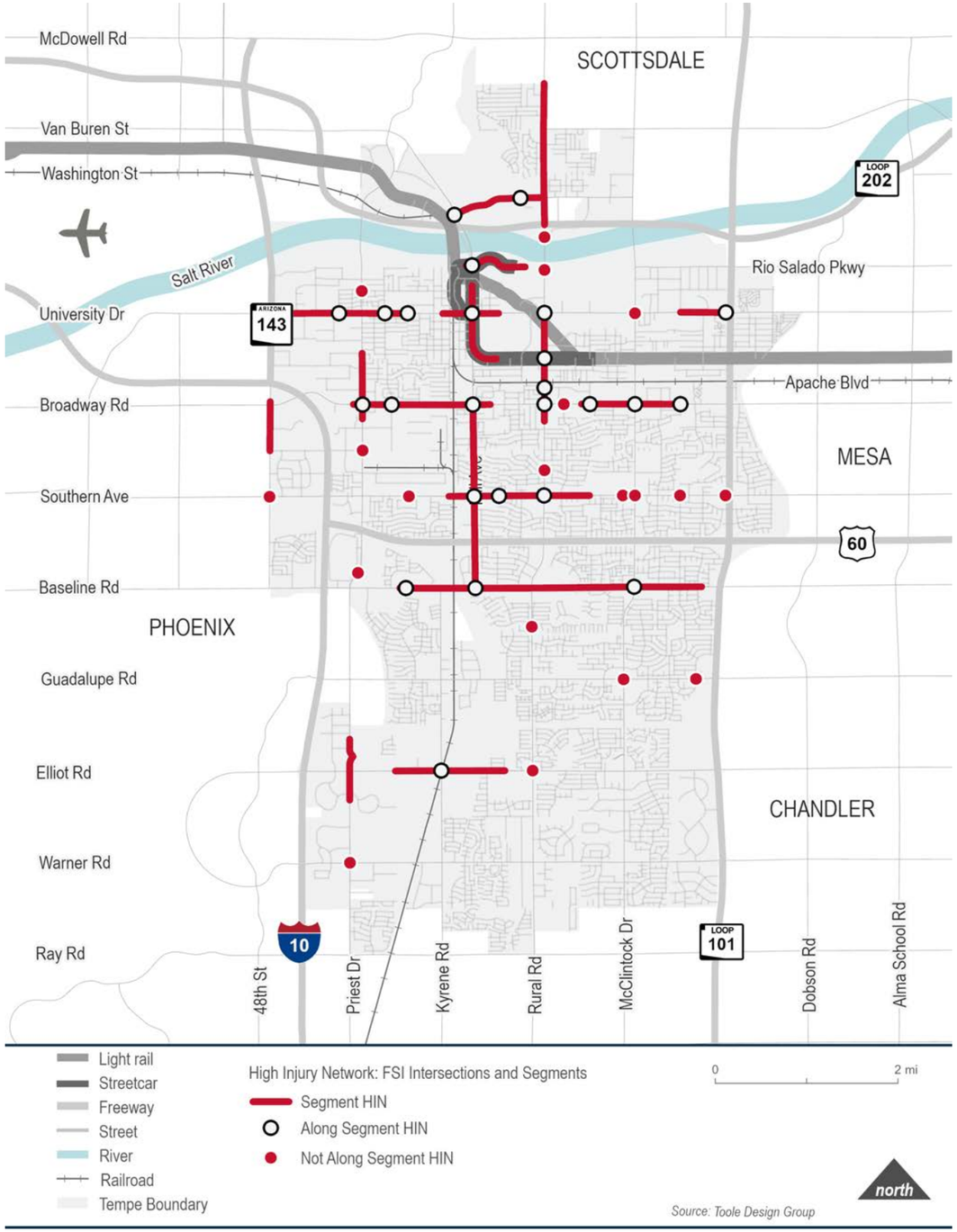


Figure 16: Combined Map of Segment and Intersection High Injury Networks



HIGH INJURY NETWORK SUMMARY STATISTICS

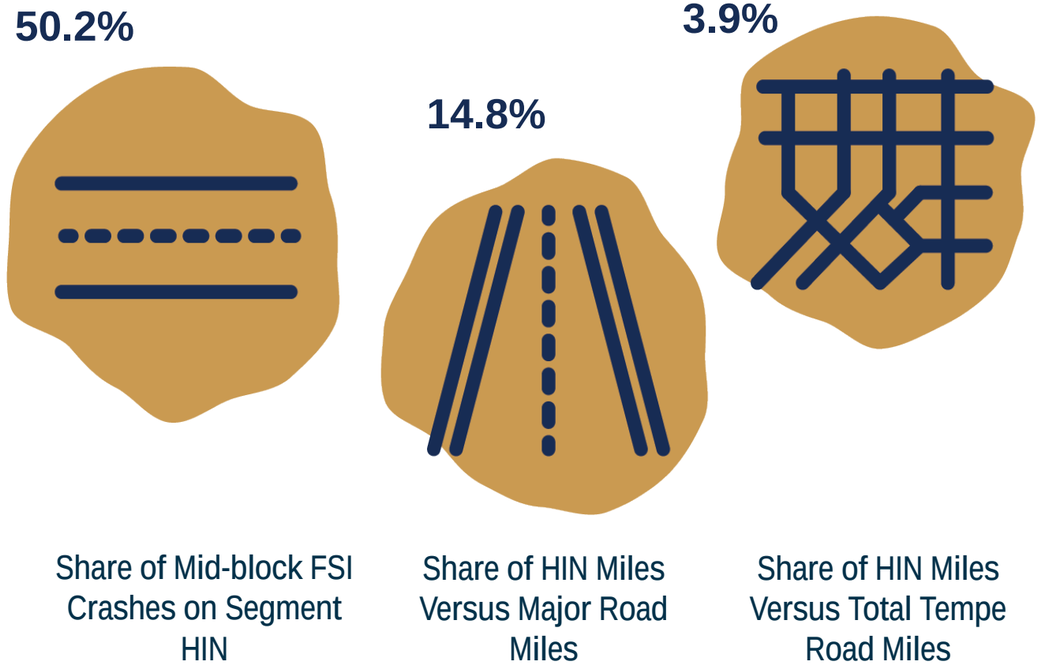
SEGMENT HIN

Of the **209 total FSI crashes on segments** across the study period, **105, or about 50.2 percent**, took place along the 20.7 miles that comprise the Segment HIN. All locations along the Segment HIN are major roads (i.e., roads classified as collectors or arterials); the Segment HIN comprises 14.8 percent of the major roads network and 3.9 percent of the total road miles in Tempe.

INTERSECTION HIN

The **183 intersection-related FSI crashes** took place at a total of 123 intersections, with 44 intersections experiencing multiple FSI crashes over the five-year study period (intersections with two or more crashes within the study period are identified as HIN intersections.) A total of **104 FSI crashes, or 56.8 percent**, took place along the Intersection HIN.

Figure 17: Segment HIN as Share of Tempe Road Network



Note: Total centerline mileage of major roads (collectors and arterials) = 139.25; Total centerline miles of all roads = 535.45

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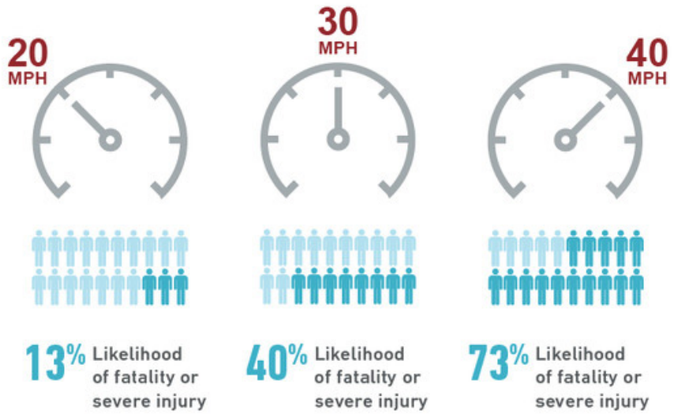
4. SAFETY STRATEGIES

Safety Strategies

ACHIEVING SAFER STREETS

Achieving safer streets in Tempe will require more than a single project, policy, or action. The Safe System Approach recognizes that safety is created through proactive measures and the application of multiple layers of protection working together. By layering different safety strategies, Tempe can reduce the likelihood that a single failure results in a fatality or serious injury.

The Safety Action Plan applies a series of corridor-level analyses as well as case studies of representative locations to demonstrate the ways in which the City of Tempe can apply location-specific countermeasures and proactive systemwide approaches to roadway design. These street design countermeasures are complemented by a series of policy and programmatic strategies that will enable the City to apply a comprehensive approach to transportation safety.



Managing speeds is critical for pedestrian safety.

Research has found that the odds of a pedestrian surviving a crash decrease dramatically as vehicle speeds increase.

Source: Tefft, B.C. (2011). Impact Speed and a Pedestrian's Risk of Severe Injury or Death (Technical Report). Washington DC: AAA Foundation for Traffic Safety

LOCATION-BASED AND SYSTEMIC STRATEGIES FOR ROADWAY DESIGN

This section includes analyses of select corridors along the Segment HIN as well as a review of potential safety improvements at illustrative intersections and corridors that are representative of locations across the Tempe transportation network. These general recommendations are intended to inform future project development with potential treatment ideas that address common crash types and safety concerns observed across the City of Tempe. Additional information about the potential safety countermeasures highlighted in this section can be found in the ***Multimodal Safety Countermeasures Toolkit*** (Appendix A).

GENERAL HIN CHARACTERISTICS AND SAFETY CHALLENGES

HIN Attributes

The Tempe Segment HIN consists primarily of arterial corridors that support multiple modes of transportation, but generally have auto-oriented characteristics that include:

- Wide cross-sections with 4–6 lanes plus a two-way left turn lane (TWLTL) or raised medians
- Moderate to high traffic volumes (12,000–37,000 vehicles per average day)
- Posted speeds of 35 to 45 mph

Other challenges arise from the high density of driveways and site access points, which create conflicts when vehicles slow to turn and access destinations while through traffic maintains higher speeds, contributing to speed variability and elevated risk of rear end crashes. In addition, the straight alignment of the roadways and distance between signalized intersections (usually ¼ or ½-mile) encourage higher speeds, which increase the severity of crashes, when they do occur.

Segment HIN corridors generally serve a mix of land uses and provide access to commercial, multi-family residential, and institutional land uses that generate frequent site access demands. Most Segment HIN corridors feature fixed route transit service.

Intersection HIN locations are predominantly comprised of four-legs involving arterial roadways, most of which are signalized and carry high traffic volumes. These intersections typically operate at speeds ranging from 35 to 45 mph and exhibit wide approaches with multiple through lanes and dedicated left and right-turn lanes.

Multimodal Considerations

Arterial roadways and intersections, including those on the Segment HIN, can present challenges for people walking, biking, rolling, and using transit due to their emphasis on vehicular throughput.

Pedestrian Needs: Limited crossing opportunities, long block lengths, and wide roadway widths increase pedestrian exposure and create barriers for crossing the street or accessing transit. Along many arterial roadways, sidewalks are also directly adjacent to the roadway without landscaping or buffered separation, which can reduce

pedestrian comfort while walking along higher speed roadways.

Bicyclist Needs: Some facilities are narrow or incomplete, including at intersections where turn lanes expand the roadway's footprint and require bicyclists to navigate high-speed traffic. This combination of limited separation from motor vehicles and a reliance on major roads for long-distance connections means that existing bikeways are only likely to appeal to the most confident bicyclists.

General strategies to address safety for vulnerable road users include:

» More frequent crossing opportunities

» Enhanced intersection design

» Signal operations techniques that increase pedestrian and bicyclist visibility and reduce speeds of turning vehicles

Strategies for Motorcyclists

Similar to pedestrians and bicyclists, motorcyclists are particularly vulnerable to severe outcomes when crashes occur. Many of the strategies for improving general roadway safety would also address the needs of motorcyclists, including high levels of illumination, access management, intersection geometry improvements, and speed management strategies. Other common measures include education and awareness campaigns. Research also highlights the benefits of maintaining pavement in good condition for reducing the frequency of motorcycle-involved crashes.[4]

Observed Crash Patterns

Segment HIN

Crashes on Segment HIN corridors are largely driven by conflicts related to turning movements and site access, reflected by angle and left-turn crashes, as well as single-vehicle and rear-end crashes, which reflect the risks associated with variable speeds. Contributing factors, especially failure to yield and speed-related behaviors, further demonstrate these patterns.

Intersection HIN

Wide intersections create complex, higher-conflict environments for all road users, while long crossing distances increase pedestrian exposure. Crashes on the Intersection HIN reflect these conditions as the most common crash types are left-turn, angle, and rear-end crashes. Contributing factors reflect intersection related challenges, with the highest proportions of crashes attributed to speed, failure to yield right of way, and disregarding traffic signals.

[4] Federal Highway Administration, *Addressing the Motorcyclist - Advisory Council Recommendations: Synthesis on Roadway Geometry, Pavement Design, and Pavement Construction*, FHWA-SA-21-090, November 2021

CASE STUDIES OF SELECT SEGMENT HIN CORRIDORS

PURPOSE

This section outlines potential next steps for addressing safety by demonstrating safety strategies on a selection of corridors along the Tempe Segment HIN as case studies (see **Figure 18**). These case studies highlight how recurring crash patterns and general safety concerns along arterial roadways across the city can be addressed through context-sensitive safety strategies. The analysis contained here is intended to inform future study and project development.

For each of the four case study locations, the analysis considers:

» **Corridor characteristics**, including street design elements, traffic volume, posted speed, transit service, and conditions for bicyclists and pedestrians.

» **Observed crash patterns**, based on incidents from July 2020 through June 2024, with an emphasis on FSI crashes.

» Potential safety enhancements at **key intersections**, including Intersection HIN locations.

» **Potential countermeasures and areas of further analysis**, including safety issues and street design elements that could be considered and explored further as part of a corridor study and/or more specific design recommendations. Proposed strategies are intended to improve safety for all users by both addressing observed crash patterns and proactively creating more multimodal street designs, in accordance with the Safe System Approach.

Figure 18: Case Study Locations of Select Segment HIN Corridors



Broadway Road
RURAL ROAD TO COUNTRY CLUB WAY

Corridor Characteristics

This corridor is a 1.5-mile, multi-lane arterial carrying approximately 30,000 vehicles per day. As of late 2025, the corridor had posted speeds of 40 mph west of Dorsey Lane and 45 mph east of Dorsey Lane and a six-lane cross section with 11-foot-wide travel lanes. Opposing travel directions are generally separated by raised medians. The corridor features regular fixed-route transit service with frequent stops. Sidewalks are continuous on both sides and are immediately adjacent to the outside lane of motor vehicle traffic.

The surrounding land uses include a mix of commercial, residential, and educational uses, with frequent driveways and minor street connections. Marked crossings are spaced roughly ½-mile apart, with no midblock crossings, contributing to limited, controlled crossing opportunities.



Daily Traffic Volume	30,000
Posted Speed	40-45 mph
Travel Lanes	3 WB and 3 EB
Median Type	Raised
Bikeways	None
Transit Service	Route 45: Service every 12-30 minutes



Broadway Road: Facing east of McClintock Dr

Broadway Road
RURAL ROAD TO COUNTRY CLUB WAY

Observed Crash Patterns

Crash patterns suggest safety challenges related to frequent access points, turning activity, and speed variability. This segment of Broadway Road experienced 198 total crashes over the five-year study period, including one fatal and four serious injuries. The most severe crashes are associated with turning and crossing conflicts. The most frequent crash types include:

- Angle crashes (64 total)
  - 1 fatal
  - 2 serious injuries (1 pedestrian-involved and 1 bicyclist-involved)
- Rear-end (41)
  - Left turn (34 total); 1 serious injury
- Sideswipe (31)

Note: The other serious injury crash type is documented as "other" and involved a pedestrian

Key Intersections

The following signalized intersections along the Broadway Road segment are identified as part of Tempe's Intersection HIN, reflecting locations where intersection-related crash patterns and corridor conditions may overlap. These intersections generally feature wide approaches, long crossing distances across major roadways such as Broadway Road, Rural Road, and McClintock Drive and nearby transit activity. Crashes at these intersections are generally documented as left turn and angle crashes. Each intersection features one or more FSI crashes.

- Rural Road
- Terrace Road
- Dorsey Lane
- McClintock Drive
- Country Club Way

Potential Countermeasures and Areas of Further Analysis

Based on observed crashes and the risks associated with existing roadway design characteristics, safety countermeasures focus on reducing conflict points, managing speed, and improving multimodal safety. The multi-lane configuration, raised median openings, and frequent driveways create potential conflicts associated with turning movements, while long block lengths and limited crossings create barriers for walking, biking, rolling, and accessing transit.

- **Access management**
  - Evaluate locations to implement restricted conflict intersections to reduce crossing and left-turn conflicts.
  - Implement right-in/right-out treatments.
  - Evaluate opportunities to consolidate driveways.
- **Intersection and crossings**
  - Evaluate turning movement volumes and dedicated turn lane needs.
  - Consider retroreflective signal head treatments to improve signal visibility.
- **Roadway reconfiguration**
  - Consider roadway reconfiguration and allocate space for buffers, bikeways, or Business Access and Transit (BAT) lanes.
  - Consider opportunities to narrow existing travel lanes.
  - Consider opportunities to shorten crossing distances, if turn-lanes can be removed.
- **Bicycle facilities**
  - Evaluate opportunities to create space for continuous bicycle facilities.
- **Operation strategies**
  - Review signal clearance intervals and left-turn phasing to ensure sufficient time is provided to support operations.
  - Consider opportunities to implement Leading Pedestrian Intervals.
  - Assess opportunities to minimize speed variability, including signal coordination, signal progression at the target speed or slightly below, shorter cycle lengths, etc.
  - Consider signal upgrades to support signal timing strategies, such as dilemma zone protection, that account for driver error and support safer decision-making when the signal changes.
- **Pedestrian crossing enhancements**
  - Based on the results of warrant analyses, consider new midblock crossings near pedestrian generators, including higher volume transit stops.
  - Identify locations where long distances between existing crossings may be a barrier for pedestrians and incorporate mid-block crossings to improve connectivity.
  - Continue to install ADA improvements, including accessible pedestrian signals and directional curb ramps and audible, vibro-tactile pedestrian signal push buttons.

Curry Road
MILL AVENUE TO SCOTTSDALE ROAD

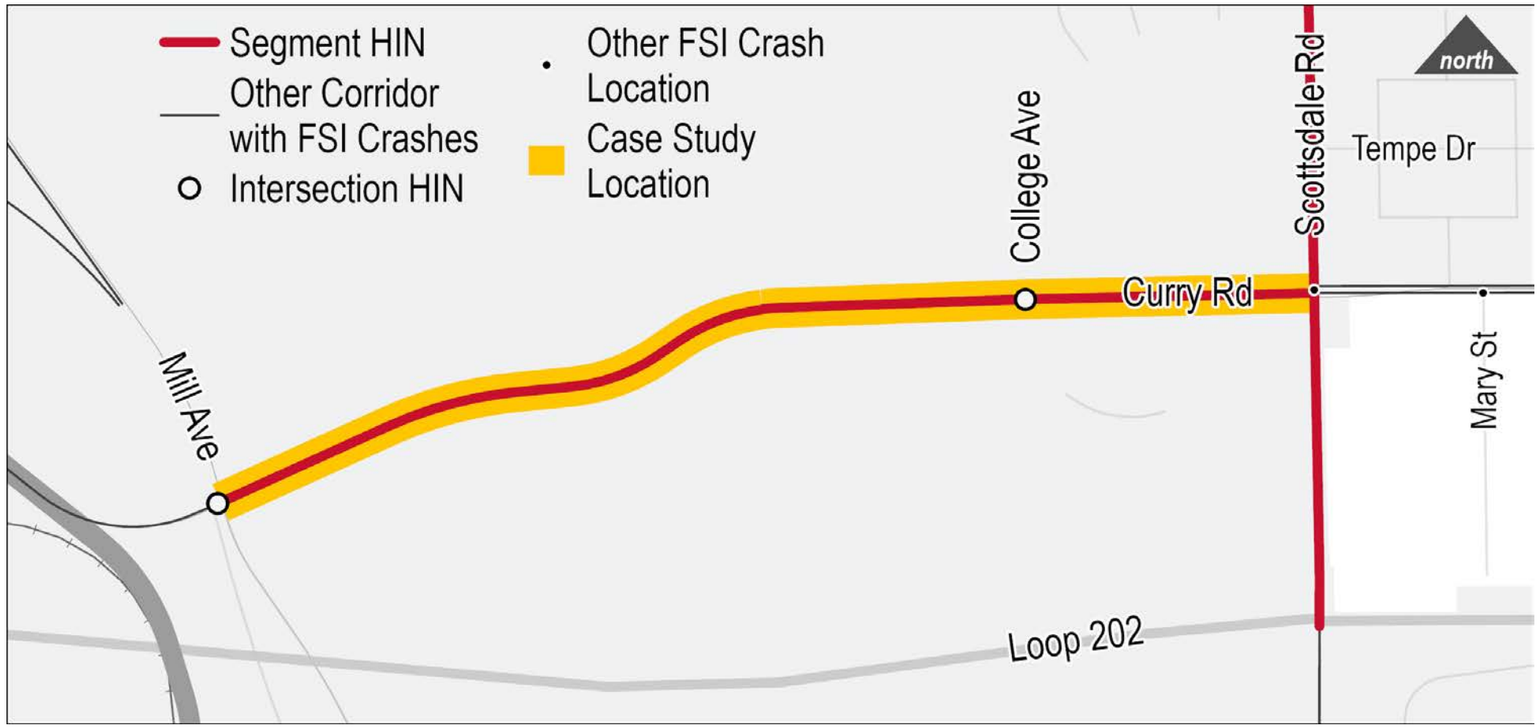
Corridor Characteristics

This segment of Curry Road is a minor arterial that spans one mile and carries 12,000 vehicles per day with a posted speed limit of 40 mph. The road has a four-lane cross section with two travel lanes in each direction varying in width between 11 and 15 feet plus a raised median or TWLTL.

Opposing travel directions are generally separated by raised landscaped medians west of College Avenue and a TWLTL east of College Avenue. The roadway supports transit service east of College Avenue. Sidewalks are continuous on both sides of the street, and the extent of the segment features buffered bike lanes.

Most of the adjacent land along the corridor is open space for recreational use. Land uses around Mill Avenue and Scottsdale Road are a mix of commercial, multi-family residential, and industrial. There are no on-street, accessible crossings between Mill Avenue and College Avenue, other than vehicle access at Lake View Drive, as there are currently no other destinations to access. The development of a new destination near Mill Avenue is slated to include a signalized crossing within the next five years.

Daily Traffic Volume	12,000
Posted Speed	40 mph
Travel Lanes	2 WB and 2 EB
Median Type	Raised
Bikeways	Buffered bike lanes
Transit Service	East of College Avenue: Orbit EARTH route: Service every 15 to 30 minutes





Westbound Curry Road: West of College Avenue

Curry Road
MILL AVENUE TO SCOTTSDALE ROAD

Observed Crash Patterns
Crash patterns suggest speed-related challenges, with fewer crashes related to turning and access-related conflicts than other corridors on the Segment HIN.

Overall, this segment of Curry Road experienced 21 crashes over the five-year study period, including three fatal crashes, all involving motorcyclists. No serious injury crashes were reported. The most frequent crash types include:

- Rear-end (6)
- Single vehicle (6 total); 3 fatal (all motorcyclist-involved)
- Angle (3)
- Left turn (3)

Key Intersections
Mill Avenue and College Avenue are signalized intersections along this segment of Curry Road that are identified as part of Tempe's Intersection HIN. In addition to multiple serious injury crashes, each intersection experienced at least one pedestrian-involved crash. The Scottsdale Road intersection also experienced an FSI crash during the study period and should be evaluated further as part of any future corridor study.

Potential Countermeasures and Areas of Further Analysis
Given the land use along the corridor, 40-mph posted speed limit, and lack of congestion, countermeasure opportunities focus on speed management and safety strategies that discourage roadway departure, such as enhanced delineation for horizontal curves, wide edge lines, and longitudinal rumble strips.

Proactive safety improvement opportunities include improving visibility, enhancements to existing pedestrian crossings, and physical separation between vehicular travel lanes and buffered bike lanes.

- **Intersection and crossings**
  - Review turning movement volumes at major intersections to identify opportunities where dual left-turn or dedicated right-turn lanes may be removed.
  - Consider retroreflective signal head treatments to improve signal visibility.
- **Operations strategies**
  - Review signal clearance intervals and left-turn phasing.
  - Consider implementing leading pedestrian intervals at all approaches or directional pairings at Mill Road and Scottsdale Road intersections.
  - Consider implementing dilemma zone protection, pending equipment upgrades.
- **Roadway departure**
  - Consider application of wide edge lines and edge line rumble strips.
  - Review for suitability of chevron signs around curves to increase motorist awareness.
- **Roadway reconfiguration**
  - Consider opportunities to narrow existing travel lanes to manage speeds.
  - Consider opportunities to shorten crossing distances at key intersections if turn lanes can be removed.
- **Pedestrian crossing enhancements**
  - Continue to install ADA improvements, including accessible pedestrian signals and directional curb ramps and audible, vibro-tactile pedestrian signal push buttons.
- **Bicycle facilities**
  - Evaluate opportunities to implement vertical features to increase separation between modes.

Mill Avenue
UNIVERSITY DRIVE TO COLLEGE AVENUE

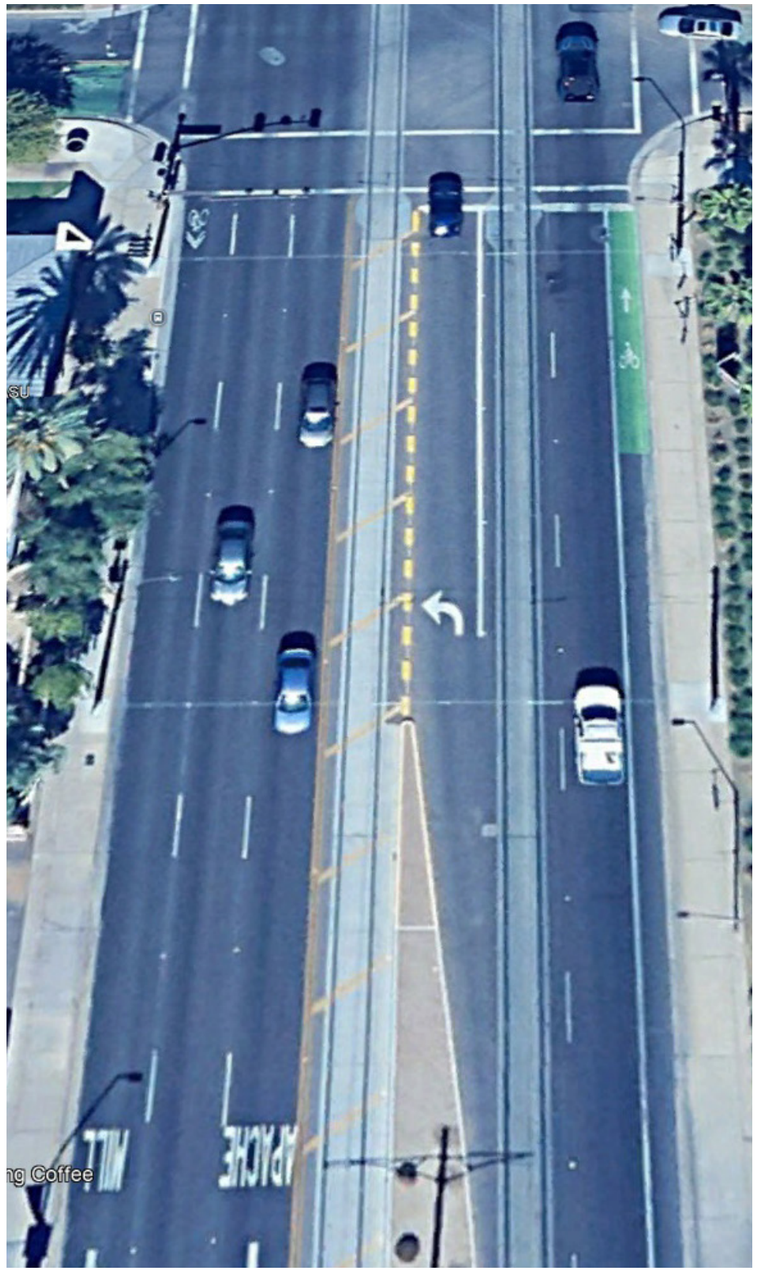
Corridor Characteristics

Mill Avenue/Apache Boulevard between University Drive and College Avenue is a 0.7-mile multi-lane arterial with a 35 mph posted speed limit and about 20,000 vehicles per day through the Gammage curve. Between College Avenue and 11th Street, Mill Avenue/Apache Boulevard is comprised of two travel lanes in either direction. North of 11th Street, the southbound direction features three travel lanes while northbound has two travel lanes, including one that is shared with the streetcar. Travel lanes are generally 10 feet wide.

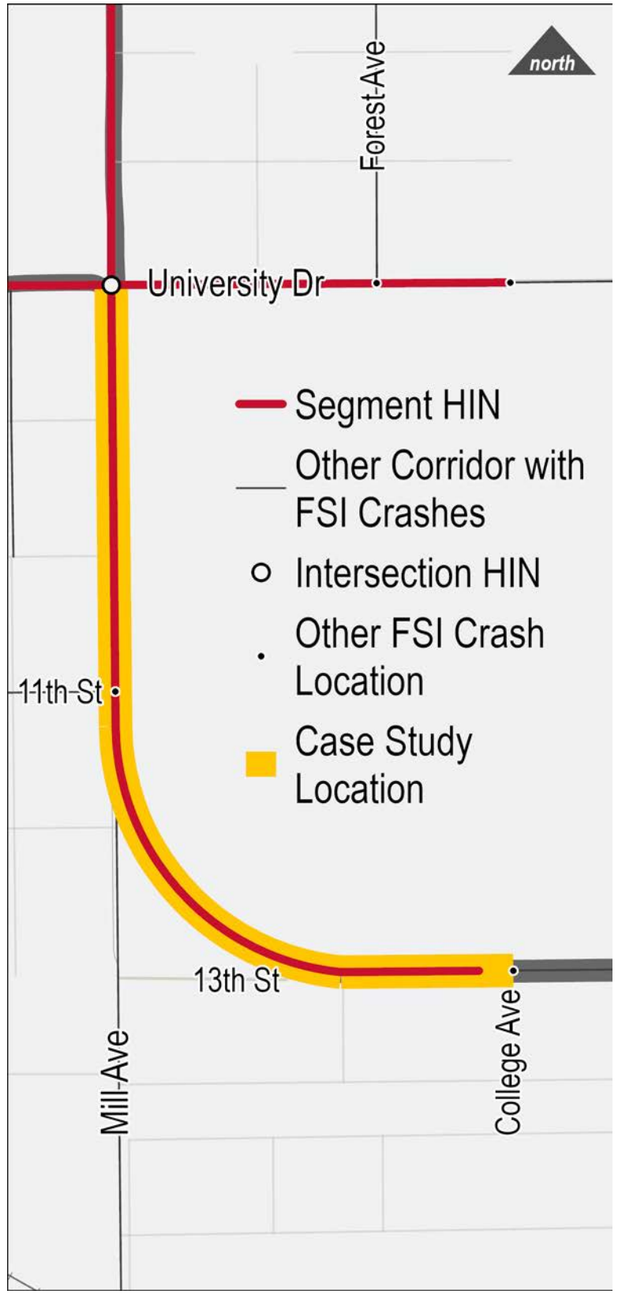
Mill Avenue is a major transit corridor that supports both streetcar service and fixed route bus transit. Opposing travel directions are separated by a raised median that accommodates streetcar stations.

A standard bike lane is present in the northbound direction along the corridor; however, there are no formal bikeways in the southbound direction from University Drive through the curve until the intersection with 13th Street. Sidewalks are generally continuous on both sides; however, no sidewalk is present along the southbound side through the curve section.

Daily Traffic Volume	20,000
Posted Speed	35 mph
Travel Lanes	North of curve: 3 SB / 2 NB Through curve: 2 SB / 2 NB
Median Type	Raised w/ transit platforms
Bikeways	NB: Bike Lane SB: Sharrow
Transit Service	Light Rail; Route 66; Orbit Venus and Jupiter routes



Mill Avenue: South of 10th Street



Mill Avenue
UNIVERSITY DRIVE TO COLLEGE AVENUE

The adjacent land uses include a mix of commercial, multi-family residential, industrial, recreational, and institutional uses. Marked crossings are approximately 450 to 1,000 feet apart with crossing opportunities concentrated near transit stops.

Observed Crash Patterns

Crash patterns indicate challenges related to constrained geometry and multimodal activity; however, there were relatively few severe crashes or access-related conflicts during the study period. Crash type patterns vary by direction of travel: rear-end crashes were more common among northbound motorists, while sideswipe crashes were most common for southbound motorists. Overall, this segment of Mill Avenue/Apache Boulevard experienced 37 crashes over the five-year study period, including two crashes resulting in serious injuries and no fatal crashes. The most frequent crash types include:

- Single-vehicle crashes (11 total); 1 serious injury crash
- Sideswipe crashes (10)
- Rear-end crashes (10)

Note: The other serious injury crash type is documented as "other" and involved a pedestrian.

Key Intersections

The signalized intersections listed below along this Mill Avenue/Apache Boulevard segment may warrant additional analysis. These intersections generally feature multimodal facilities such as bikeways, transit stops, and streetcar accommodations. Each of these locations experienced one or more serious injury crashes; one pedestrian-involved crash took place at the intersections with University Drive and 11th Street and one bicycle-involved crash took place at the intersection of College Avenue. Considerations include long crossing distances, the need for increased crosswalk and pedestrian visibility, and high levels of transit activity.

- University Drive*
- 11th Street
- College Avenue

** Intersection is identified in Tempe's Intersection HIN*

Potential Countermeasures and Areas of Further Analysis

Based on the documented crash trends, countermeasure opportunities focus on improving multimodal operations, enhancing bikeway continuity, and reinforcing speed management. Streetcar operations and related pedestrian activity highlight the benefits of enhanced crossings and improved visibility, in accordance with the Safe System Approach.

- **Access management**
  - Evaluate opportunities to consolidate driveways, including near intersections.
- **Intersection and crossings**
  - Evaluate turning movement volumes and need for multiple dedicated turn lanes at University Drive.
  - Consider retroreflective signal head treatments to improve signal visibility.
- **Operations strategies**
  - Review signal clearance intervals and left-turn phasing at Forest Ave.
  - Consider implementing leading pedestrian intervals.
  - Assess opportunities to manage speeds and minimize speed variability among motorists through signal coordination, consistent signal progression at the target speed or slightly below, shorter cycle lengths, etc.
  - Consider implementing dilemma zone protection, pending equipment upgrades.
- **Roadway reconfiguration**
  - Consider opportunities to shorten crossing distances if turn-lanes can be removed.
- **Pedestrian crossing enhancements**
  - Continue to install ADA improvements, including accessible pedestrian signals and directioncurb ramps and audible, vibro-tactile pedestrian signal push buttons.
- **Bicycle facilities**
  - Consider roadway widening or reallocating roadway space in southbound direction to ensure dedicated bikeways in both directions.
  - Ensure bikeways meet desired widths that support a high level of comfort.

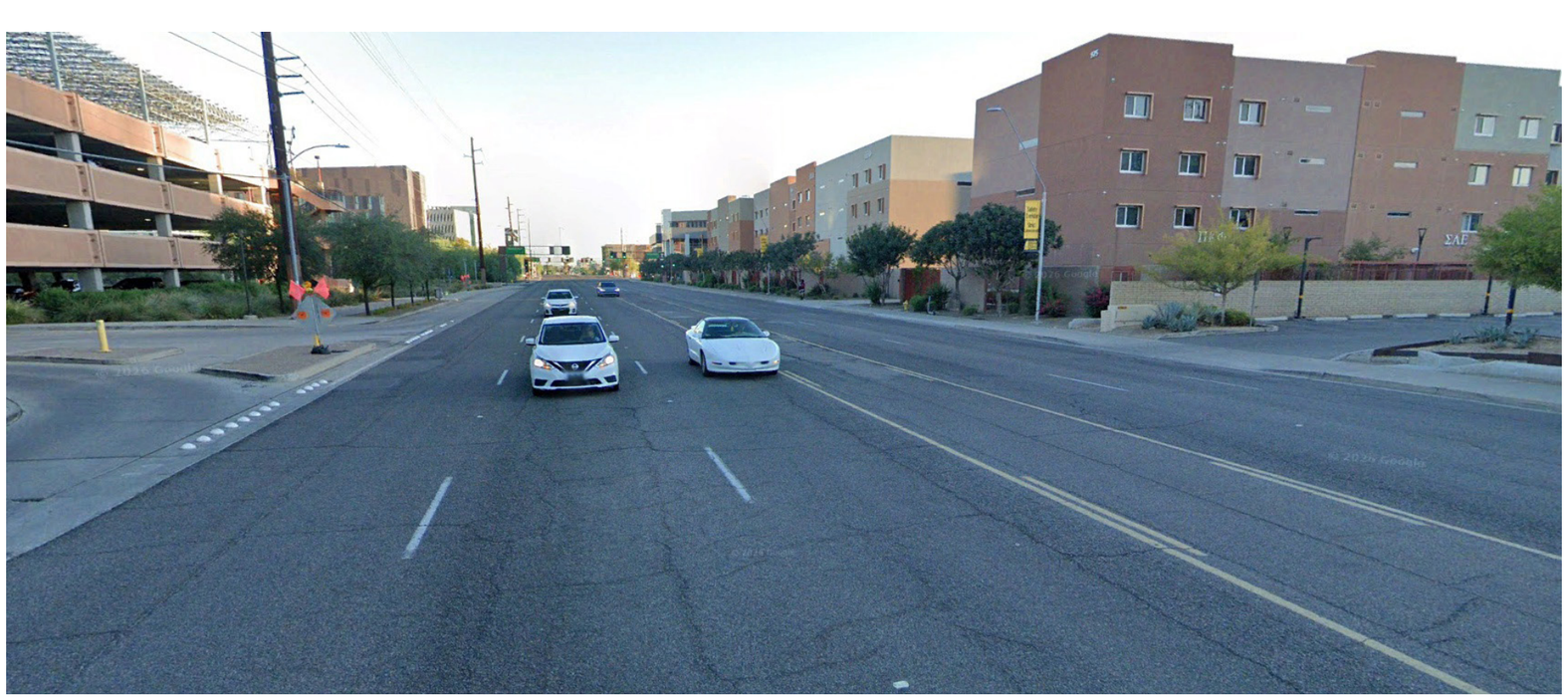
Rural Road
UNIVERSITY DRIVE TO ALAMEDA DRIVE

Corridor Characteristics

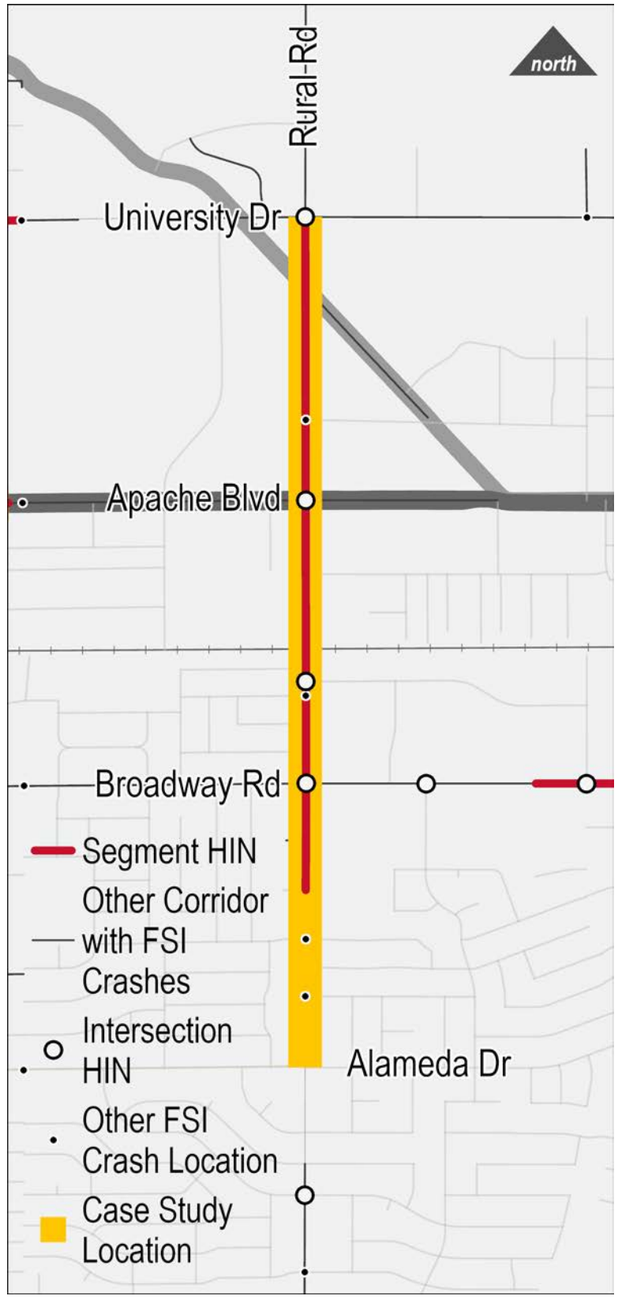
This 1.5-mile arterial road segment carries approximately 33,000 vehicles per day. The posted speed limit is 35 mph and the segment has a six-lane cross-section with three 11-foot-wide travel lanes in each direction. Opposing travel directions are separated by a continuous TWLTL.

Rural Road features fixed route transit service and continuous sidewalks on both sides of the street; however, there are minimal buffers from motor vehicle traffic. Marked crossings are spaced between ⅛-mile and ¼-mile apart, and there are several at-grade rail crossings in this corridor. There are no bicycle facilities along this section of Rural Road.

Daily Traffic Volume	33,000
Posted Speed	35 mph
Travel Lanes	3 SB and 3 NB
Median Type	TWLTL
Bikeways	None
Transit Service	Route 72: Service every 15 to 30 minutes



Northbound Rural Road: North of Lemon Street



Rural Road
UNIVERSITY DRIVE TO ALAMEDA DRIVE

The surrounding land uses include commercial, single-family residential, and the university campus. These land uses generate frequent turning activity through the corridor.

Observed Crash Patterns

Crash data suggest challenges stemming from speed variability and conflicts associated with turning movements and site access points. Overall, this segment of Rural Road experienced 230 crashes over the five-year study period, with one crash leading to one fatality (as a result of a single vehicle crash with a fixed object involving impairment) and four crashes resulting in serious injuries. The most frequent crash types include:

- Rear-end (78); 1 serious injury
- Angle (49)
- Sideswipe (33); 1 serious injury
- Left-turn crashes (31)

Note: Two serious injury crash types are documented as "other" and involved pedestrians.

Key Intersections

The following signalized intersections along this segment of Rural Road are identified as part of Tempe's Intersection HIN. These intersections generally feature wide approaches, long pedestrian crossing distances, and transit activity. Each intersection featured multiple serious injury crashes and at least one pedestrian-involved crash.

- University Drive
- Apache Boulevard
- Vista del Cerro Drive
- Broadway Road

Potential Countermeasures and Areas of Further Analysis

The crash trends along this segment of Rural Road suggest countermeasure opportunities that focus on improving multimodal safety, managing vehicle speeds, and reducing conflicts among roadway users. Potential strategies emphasize safer crossings, roadway visibility, access management, and context-sensitive street design to better support people walking, biking, rolling, taking transit, and driving.

Additional opportunities exist to provide continuous bikeways, reduce crossing distances, and create safer conditions at key activity centers.

- **Access management**
  - Convert TWLTL to raised medians.
  - Evaluate locations to implement restricted conflict intersections to reduce crossing and left-turn conflicts.
  - Implement right-in/right-out treatments.
  - Evaluate opportunities to consolidate driveways, including near intersections.
- **Intersection and crossings**
  - Evaluate turning movement volumes and dedicated turn lane needs.
  - Consider retroreflective signal head treatments to improve signal visibility.
- **Roadway reconfiguration**
  - Evaluate operational feasibility of roadway reconfiguration to allocate space for buffers, bikeways, or Business Access and Transit (BAT) lanes.
  - Review transit stop locations; consider relocation of near side stops to the far side of the intersection.
  - Consider opportunities to narrow existing travel lanes.
- **Operation strategies**
  - Review signal clearance intervals and left-turn phasing .
  - Consider opportunities to implement leading pedestrian intervals.
  - Consider implementing dilemma zone protection, pending equipment upgrades.
- **Pedestrian crossing enhancements**
  - Consider new crossings near transit stops and other pedestrian generators.
  - Incorporate mid-block crossings to shorten distance between crossing opportunities.
  - Continue to implement ADA-accommodations such as Accessible Pedestrian Signals (APS) and directional curb ramps.
- **Bicycle facilities**
  - Evaluate opportunities to create space for continuous bicycle facilities

SYSTEMIC STRATEGIES BASED ON REPRESENTATIVE LOCATIONS

Purpose/Overview

As a complement to the High Injury Network, which identify locations with recurring incidences of serious and fatal crashes, the representative locations analysis considers common street design conditions and the types of proven safety countermeasures that best address known safety challenges across the City of Tempe.

Rather than location-specific investments, this section uses visualizations to demonstrate potential applications to corridors and intersections with design characteristics and street elements typical of locations across Tempe. This analysis is intended as a reference for the identification and development of targeted, data-driven safety enhancements across Tempe that address potential conflicts and create a more multimodal transportation system. The potential countermeasures presented here are primarily comprised of strategies that complement City standards (e.g., ADA compliant sidewalks, pedestrian push buttons, etc.) and can be implemented without moving curblines or major changes to the geometry of the roadway. The following visualizations are intended to be used alongside the Multimodal Safety Countermeasures Toolkit, located in the Appendix. The Toolkit provides further information on each treatment.

Specifically, the figures on the following pages demonstrate how safety countermeasures can be applied in typical locations across Tempe, including both HIN locations and in other parts of Tempe that may not have experienced serious crashes recently but share similar risk factors. This type of proactive analysis is an integral part of the Safe System Approach and is critical as many corridors and intersections across Tempe feature characteristics associated with high rates of crashes, even if FSI crashes were not observed during the five-year study period.

Types of Locations Selected for Analysis

The representative locations analysis presents two intersections and two corridor segments with design characteristics that are typical of conditions across the City's roadway network. The graphics in **Figure 19** through **Figure 22** depict roadway designs inspired by existing roadways and land use patterns observed across the City of Tempe, but do not represent specific corridors or intersections. It is important to note that the application of all countermeasures depicted in the examples may not be necessary, applicable, or feasible in every situation.

Segments: Examples include a multi-lane arterial with two-way left turn lane and a multi-lane arterial with raised median. Safety priorities and potential countermeasures for typical corridors in Tempe include access management, opportunities to narrow travel lanes to manage speeds, reconfigure lane widths and allocate space for other users, and potential crossing opportunities in coordination with warrant analysis, particularly along corridors with regular transit service.

Intersections: Examples include an intersection of two arterial roads and an intersection of an arterial road with a lower functional class roadway. Safety priorities and potential countermeasures include crosswalk visibility enhancements, signal phasing strategies to manage conflicts, and design techniques that slow vehicles making turns and promote safe access to transit.

Figure 19: Intersection of Two Arterial Roads

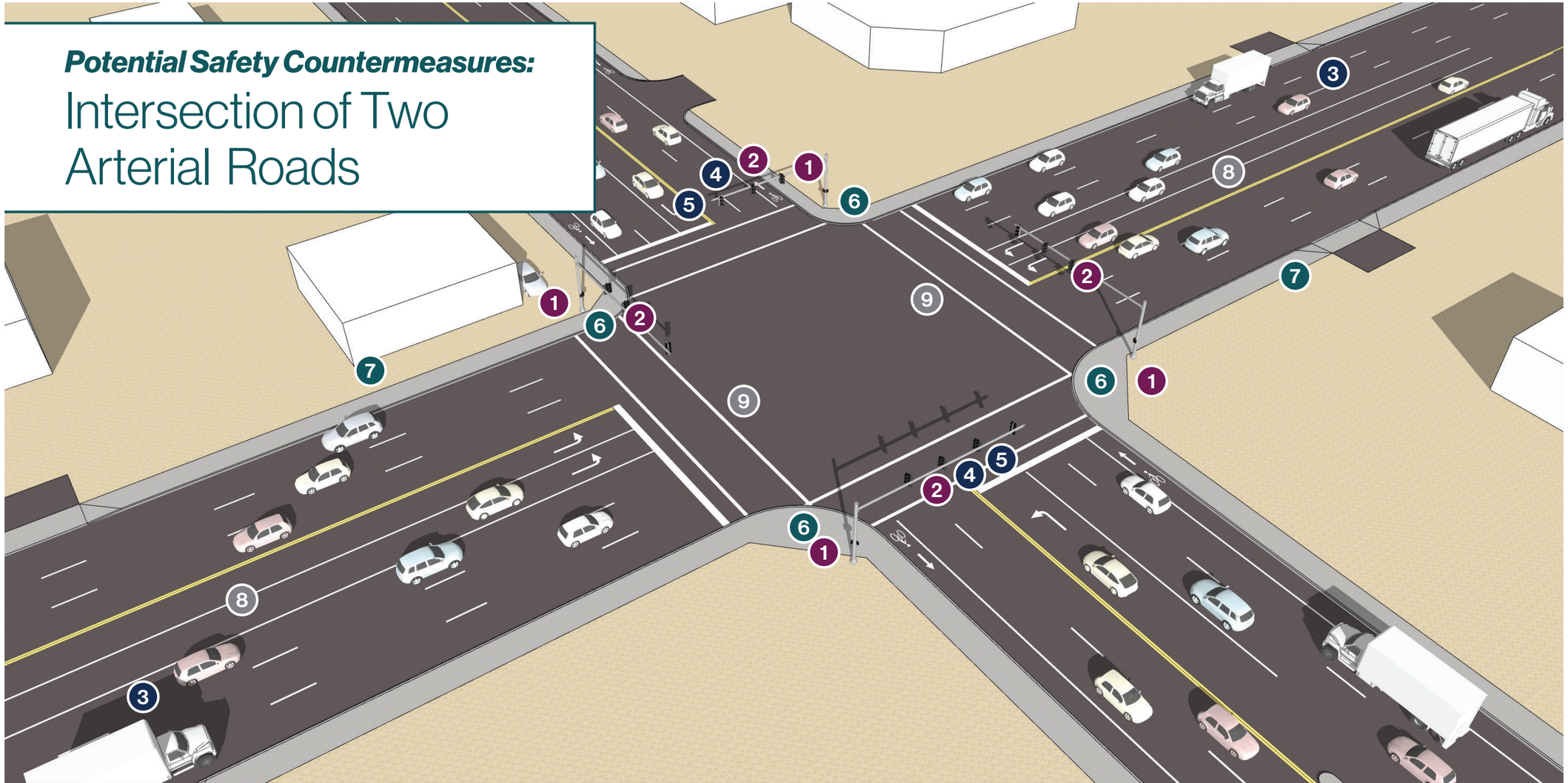


Figure 20: Intersection of Arterial and Collector Road

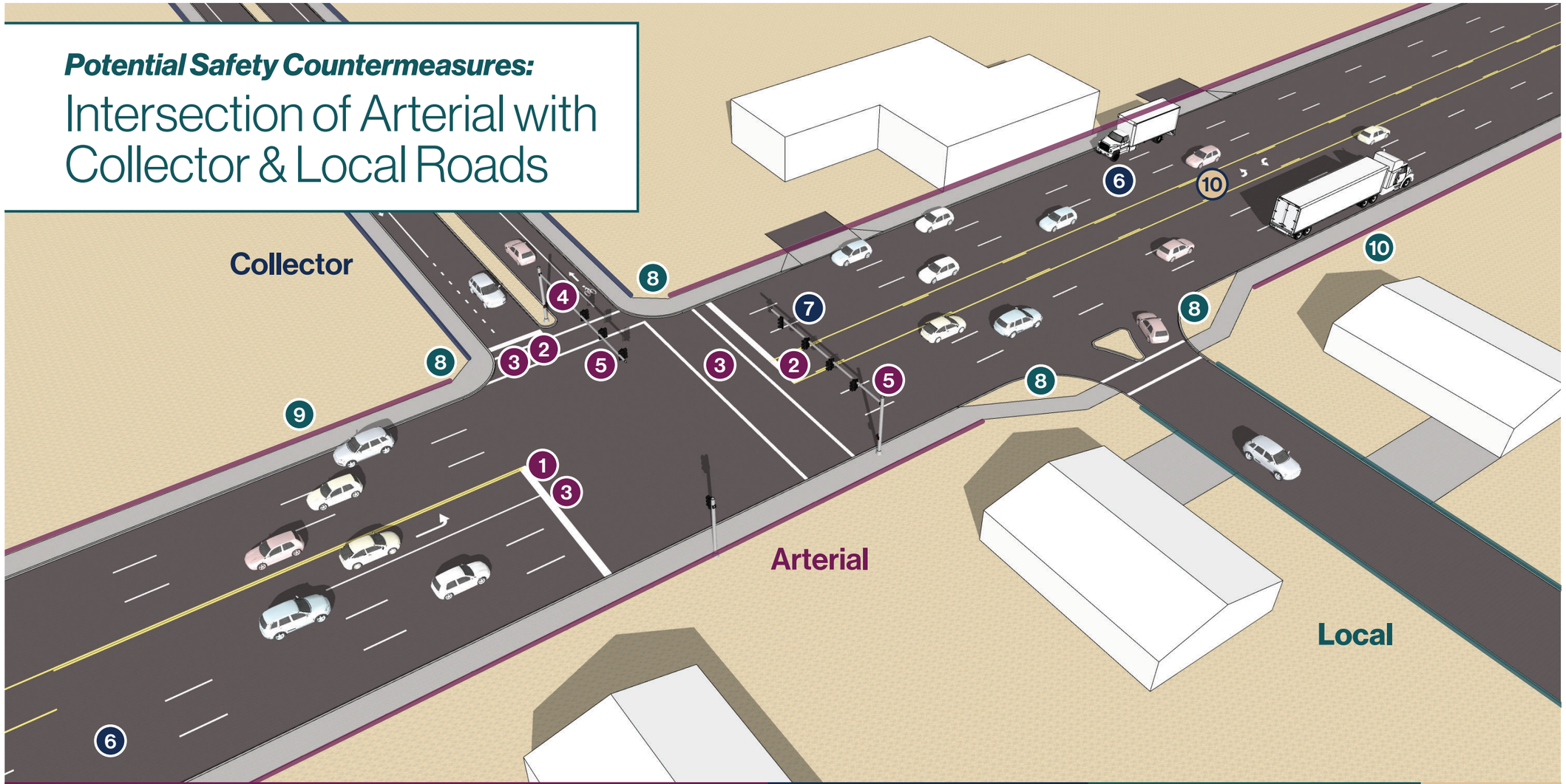
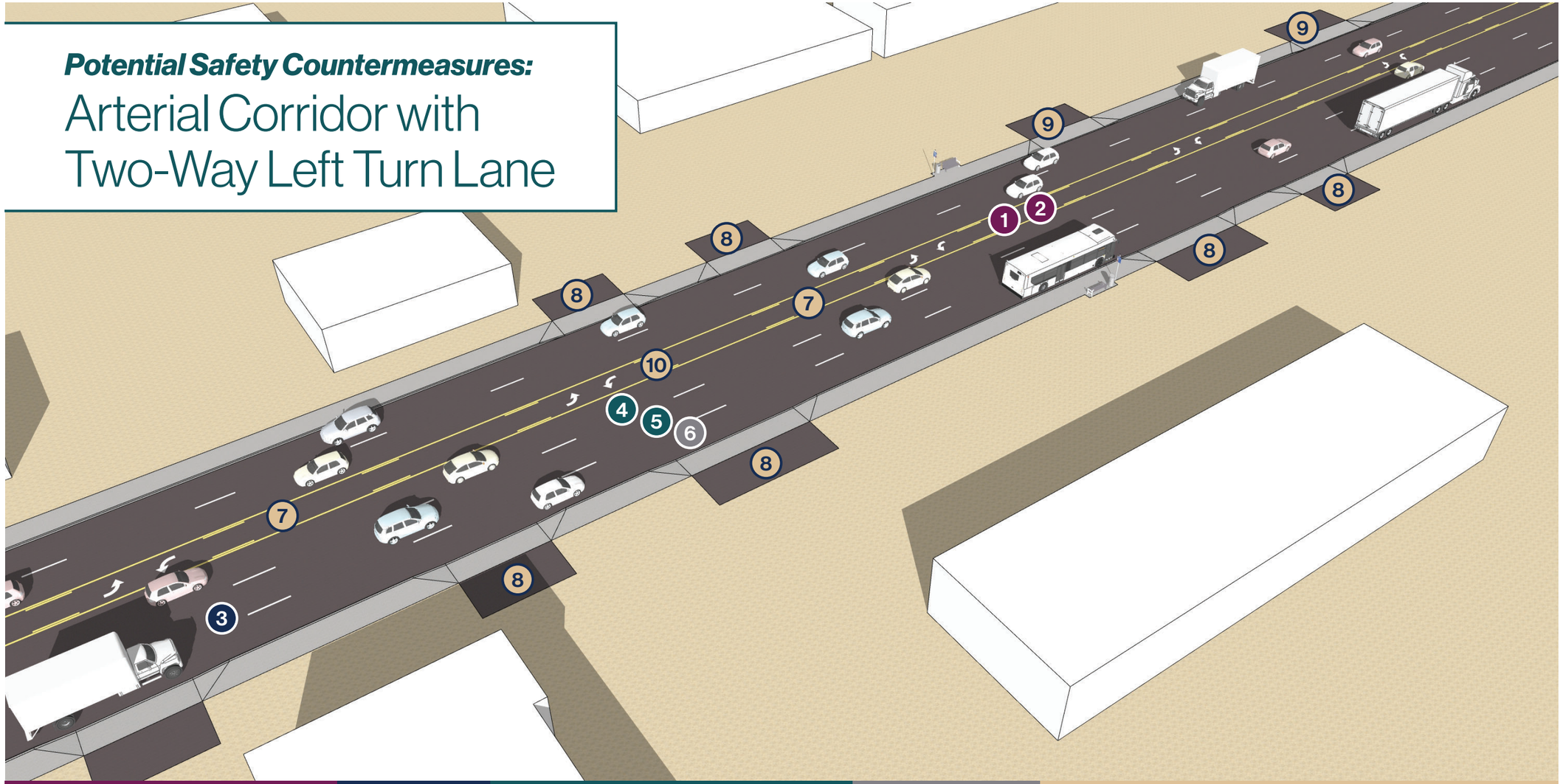


Figure 21: Arterial Corridor with 5 Lanes and Two-Way Left Turn Lane



Intersections & Crossings

1. **New crosswalk** Install high-visibility crosswalk with PHB & advance warning signs/markings
2. **Crossing enhancements** Install median refuge island

Operations Strategies

3. **Posted speeds** Align speed limit with updated street design & operating speeds

Roadway Reconfiguration

4. **Lane reconfiguration** Evaluate capacity needs & consider reallocating space to other street users
5. **Narrow travel lanes** Review lane widths & narrow as appropriate to manage speeds

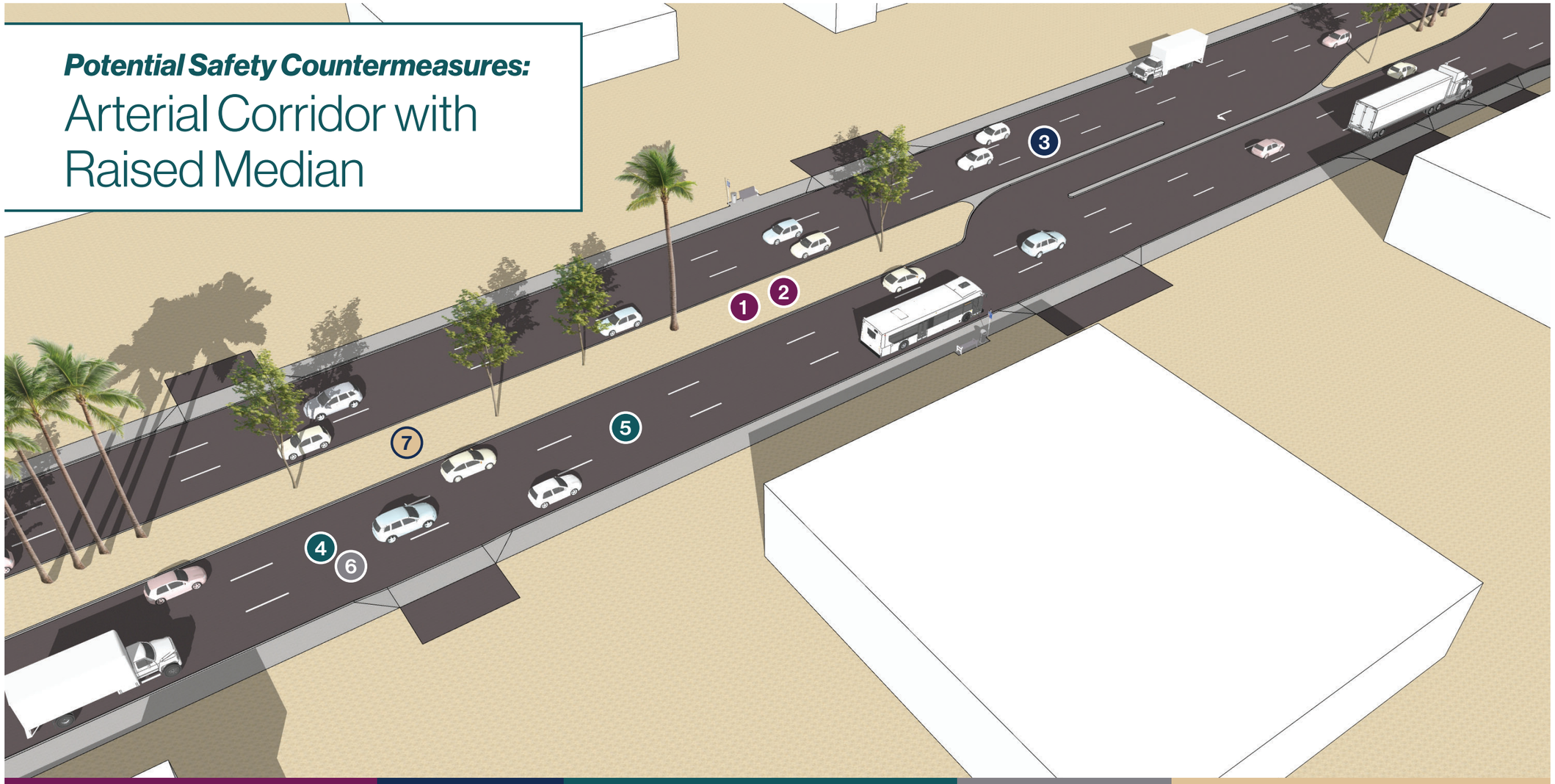
Infrastructure for Alternative Modes

6. **Bikeway** Consider suitability of corridor or parallel street for bikeways

Access Management

7. **Raised median** Convert two-way left turn lane to raised median
8. **Reduced driveway density** Consolidate access points
9. **Right-in, right-out** Convert to RIRO access only
10. **Reduced conflict intersection** Construct RCUT to manage turning conflicts

Figure 22: Arterial Corridor with 6 Lanes and Raised Median



SYSTEMIC STRATEGIES FOR PEDESTRIAN CROSSINGS

Overview

Frequent pedestrian crossings are critical for providing access to transit and key destinations and supporting walking and biking as viable modes of transportation. Long distances (e.g., ¼-mile or greater) between crossings are common across Tempe and are a particularly significant issue along Segment HIN corridors, which often feature wide streets, higher frequency transit service, and a mix of land uses. This combination of conditions creates barriers to walking, biking, and rolling and can lead to pedestrians attempting to cross in unsafe locations as people are unlikely to walk out of direction to access a destination on the opposite side of a street.

The Safety Action Plan contains an analysis of the spacing between designated pedestrian crossings along major streets across the City of Tempe. This analysis provides insights into the potential need for additional crossings; the identification of exact locations for crossings requires further analysis and studies such as signal warrant analyses. Crossings should generally be considered near sites and destinations that generate high levels of pedestrian activity, including higher ridership transit stops.

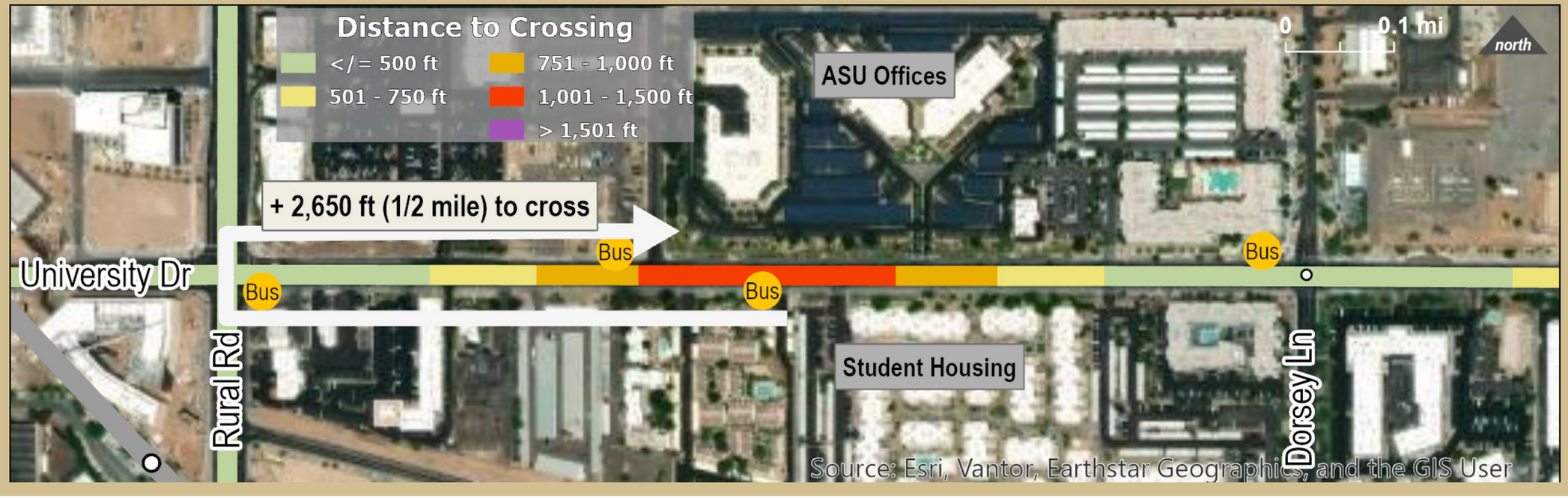
Methodology and Findings

Figure 23 depicts the distance to the nearest crossing for different points along the street. The analysis area is comprised of arterial roadway segments within a ½-mile of an FSI crash that took place over the study period; similar analysis is recommended for other corridors on a case-by-case basis. The colors represent how far an individual would have to walk to reach the nearest crossing location. Segments in orange and red indicate arterial roadways with longer distances between signalized pedestrian crossings.

The analysis finds that many arterial corridors feature ½-mile stretches between crossing locations, and many of these corridors feature higher frequency bus service (i.e., buses every 30 minutes or less), including Baseline Road, Southern Avenue, University Drive, Rural Road, and McClintock Drive.

BENEFITS OF ADDITIONAL CROSSINGS

If the distance to the nearest crossing were ¼-mile, then crossing to the opposite side of the street could require a ½-mile walk in total, or about 10 minutes, plus the time required to cross the street. The figure below depicts the spacing of crossings along University Drive to the east of Rural Road and the distance an individual would need to walk from the student housing on the south side of the street to the ASU facilities on the north side of the street. The lack of a location to quickly and efficiently cross a street can encourage people to make unsafe crossing movements, especially when there is an additional time penalty (for example, a user arriving at a bus stop late or during hot times of the year when waiting outside can be uncomfortable and dangerous to one's health). A Safe System Approach recognizes that people walking may choose a more direct crossing location when designated crossings are inconvenient.



Safety Benefits of More Frequent Crossings

Enhanced crossings, including pedestrian hybrid beacons (PHBs), rectangular rapid flashing beacons (RRFBs), and high visibility crosswalks – are proven safety countermeasures that help pedestrians safely cross higher-speed roadways at midblock crossings and uncontrolled intersections. Depending on the type, enhanced crossings can reduce pedestrian crashes by 47-55 percent. Research cited by FHWA also finds a 29 percent reduction in total crashes associated with the installation of PHBs. See the ***Multimodal Safety Countermeasures Toolkit*** in the Appendix for additional information on the appropriate crossing treatment by location and context.

Enhanced crossings are particularly important where there are a mix of land uses, destinations that generate pedestrian activity, and/or higher frequency transit service. These crossings should be paired with median refuge islands, advanced signage, advanced pedestrian technology treatments such as detection and lighting, and pavement markings to further increase motorist awareness of the potential for people to be crossing the street and to achieve greater safety benefits.

Recommendations

» Develop a policy around appropriate crossing spacing based on land use context and transit service frequency.

» Conduct a proactive analysis of potential crossing locations along the Segment HIN and higher frequency transit corridors.

POLICY SUPPORT FOR ENHANCED AND MORE FREQUENT PEDESTRIAN CROSSINGS

Existing City, regional, and state plans and policies support improving pedestrian crossing opportunities, particularly near transit stops, activity centers, schools, and along major arterial corridors.

» Tempe's goal of creating a **20-minute city** implies a need for more frequent pedestrian crossings to improve access to transit and key destinations.

» Next steps from the **Vision Zero Action Plan** include guidance around high visibility crosswalks and potential locations for grade separated pedestrian crossings.

» The **Maricopa Association of Governments' (MAG) Active Transportation Plan** states crossings should provide direct access across arterials and should serve major activity centers and transit stops.

» The **ADOT Pedestrian Safety Action Plan** (2017) highlights the need for crossing enhancements so that people can cross major streets safely, including near transit stops.

Figure 23: Pedestrian Crossing Analysis Along Arterials with FSI Crashes



Notes: This analysis is based on designated crossing locations as of January 2026. The analysis is intended to highlight areas with greater distances between pedestrian crossings. Designated crossings may include signalized intersections with crosswalks, roundabouts, and enhanced crossings at mid-block locations.

SAFETY ACTIONS

Safety actions are the policies, programs, projects, and operational practices the City of Tempe can implement to reduce fatal and serious injury crashes. The safety actions identified in this plan translate Tempe's safety goals and the Safe System Approach into specific implementation steps. These actions build upon existing efforts and address gaps identified through data analysis and stakeholder input. The actions include both ongoing practices the City will continue, and new actions intended to strengthen policies, programs, street design, education, enforcement, and emergency response efforts over time.

SUCCESSES TO DATE

Since adopting the 2019 Vision Zero Action Plan, Tempe has made significant progress toward advancing safer streets through policy changes, programs, and infrastructure improvements. The Safety Action Plan updates the status of the original Vision Zero strategies to better understand where progress has been made, where gaps remain, and how future actions can better align with the Safe System Approach.

The Vision Zero Action Plan identified 57 strategies across eight focus areas. As part of this Safety Action Plan update, the City evaluated those strategies against best practices and the five elements of the Safe System Approach. This review found that over half of the original Vision Zero strategies are completed or are currently underway. Existing efforts strongly support Safe System Approach elements such as safer roads, safer speeds, and safer people through roadway design improvements, education, enforcement, and multimodal safety programs.

Despite this progress, there are still opportunities to address systemic safety challenges and further reduce fatal and serious injury crashes. These findings helped shape the actions and priorities described in this section of the plan.

Current Tempe Practices and the Safe System Approach

The table below evaluates existing and completed Vision Zero strategies through the lens of the Safe System Approach to better understand where progress has been made and where opportunities remain. This assessment highlights Tempe's current strengths across the five Safe System elements and identifies areas where future actions can further strengthen safety outcomes.

Safe System Element	What Tempe Is Already Doing	Opportunities to Strengthen
Safe Roads	» Separating users in time » Separating users in space » Improving visibility through roadway design	» Expand systemic street design improvements » Improve access management and enhance midblock crossings » Continue building low-stress bikeway facilities
Safe Speeds	» Education and enforcement efforts focused on driver speeding » Updating speed limits to reflect context-based speed setting practices	» Expand speed management through street design
Safe Users	» Education for all users » Targeted enforcement strategies	» Expand a culture of safety and shared responsibility » Increase internal safety awareness and responsibility across City departments
Safe Vehicles	» Supporting vehicle safety technologies » Encouraging mode shift to decrease vehicle exposure	» Increase focus on vehicle size and compatibility for City vehicle fleet » Expand City fleet safety management practices
Post-Crash Care	» Post-crash review processes » Crash data collection and reporting » Rapid emergency response	» Strengthen post-crash coordination and partnerships » Expand crash response analysis and reporting

Actions Completed From the 2019 Vision Zero Action Plan

Since adopting the 2019 Vision Zero Action Plan, Tempe has implemented a wide range of actions to improve safety across the transportation system. This list highlights completed actions from the Vision Zero Action Plan and additional actions completed since 2019.

10
Action Plan items completed

8
Additional safety actions since 2018

General

Obtained and deployed mobile VMS boards to educate drivers and support Police Department efforts.

Improved data sharing between the Transportation Division and Police Department and migrated to electronic crash reporting software (example: TRACS).

Distraction

Advocated for the Arizona State Legislature to adopt legislation that bans texting while driving and is enforceable as a primary offense.

Modified city code to ban the use of electronic devices while driving, requiring drivers to use “hands free” electronic devices.

Inexperienced & Very Experienced Road Users

Improved driver compliance by converting “24 hour” 35 MPH high school zones to time-of-day operation with flashing warning lights.

Intersections

Conducted regular red light enforcement and education campaigns.

Nighttime

Developed implementation plan to convert all city street lighting to LED (4,000K for all collectors and arterials).

Provided free bicycle lights, reflectors, reflective backpack clips and other safety giveaways to improve visibility through community outreach events.

Pedestrians

Developed guidelines for installation of high visibility crosswalks, including shared use path crossings and school areas.

Educated pedestrians that they can be the victims of distraction and provided smart behaviors to adopt (including signage about crossing safety tips on Tempe buses).

Additional Safety Actions Since 2019

- ✓ Installed retroreflective tape around signal head borders to improve visibility on singular silver poles and arms.
- ✓ Conducted a near-miss analysis at five signalized intersections along Baseline Road to identify safety treatments for a Safe Streets and Roads for All grant application awarded in 2024.
- ✓ Developed an inventory of sidewalks throughout the city to identify sidewalk gaps and needs.
- ✓ Increased the size of speed limit signs to meet current standards, ensure consistent placement, and replace missing signs.
- ✓ Installed speed feedback signs at select locations to display driver speeds and “Slow Down” messaging as needed.
- ✓ Identified unsignalized intersection with high instance of serious injury and fatal crashes, and construction median barriers reduce conflict points.
- ✓ Constructed four new signalized pedestrian crossing locations (as of summer 2026)
- ✓ Worked with engineering team to review and identify opportunities for bike lane enhancements and lane width modifications along corridors undergoing pavement reconstruction.

NEXT STEPS

Achieving Tempe's safety goal will require both continuing successful afety practices already underway and implementing new actions that address remaining gaps in the City safety actions. The following sections identify ongoing actions the City will continue and new actions that will help strengthen Tempe's approach for safer streets.

The safety actions are organized into six categories. These categories help organize actions by implementation focus.

- Collaboration actions focus on improving coordination, communication, and accountability across City departments and partner agencies involved in transportation safety. These actions support regular collaboration between Transportation, Police, Fire Medical Rescue, Communications, and other departments to review crashes, coordinate implementation, share data, and monitor progress toward safety goals.
- Plans and Programs focus on integrating safety into City policies, long-range planning efforts, capital investment decisions, and ongoing transportation programs. These actions help ensure safety is consistently prioritized in project development, funding decisions, and future updates to City plans and programs.
- Engineering actions focus on creating safer streets through infrastructure improvements, operational changes, and context-sensitive roadway design. These actions include improvements for people walking, biking, rolling, taking transit, and driving, with an emphasis on reducing crash risk and severity on the High Injury Network.
- Education and Outreach actions focus on increasing public awareness, encouraging safer travel behaviors, and building a culture of shared responsibility for safety. These actions include community campaigns, partnerships with schools and businesses, public information efforts, and programs targeted toward specific road user groups.
- Enforcement actions focus on reducing dangerous driving behaviors that contribute to fatal and serious injury crashes, such as speeding, impairment, distraction, and red-light running. These actions combine targeted enforcement efforts with education and equitable practices to improve safety outcomes.
- **Emergency Response** actions focus on improving post-crash care, emergency response, and coordination between transportation and emergency response teams. These actions help reduce response times, improve incident management, and support faster and more effective response after a crash occurs.

Actions to Continue

Many of the actions that the City currently practices, as well as strategies identified in the 2019 Vision Zero Action Plan, remain important in helping Tempe achieve its safety goal. Existing actions take place across multiple City departments, and long-term programs, policies, and operational practices require continued coordination, funding, and implementation. Many of these actions support multiple Safe System Approach elements simultaneously, reinforcing the importance of layered and coordinated safety strategies. See **Table 3** for a comprehensive list of safety actions recommended for continuation.

Action IDs.

Action items are assigned an ID number organized by status and the department that will lead the implementation of the specific action.

Actions to continue are two digit numbers beginning with 01.

New actions are three digit numbers beginning with 101.

This system is intended to help departments track what actions they are responsible for implementing and tracking.

Action item abbreviations correspond to the following departments:

CD	Community Development
CM	City Manager's Office
CO	Communication and Marketing
PD	Police
PW	Public Works
TD	Transportation Division
TE	Traffic Engineering
TF	Tempe Fire Medical Rescue
TM	Transportation Maintenance
TP	Transportation Planning
TR	Transit

Table 3: List of Safety Actions to Continue

ID	Description	Lead Agency or Department	Supporting Agencies (if applicable)
Interagency Collaboration			
CM-01	Convene a Safety Taskforce with champions from each lead agency that meets quarterly or annually to review progress of all active strategies, discuss barriers to implementation, and define next steps.	City Manager's Office	Transportation Division
Engineering			
TE-01	Pursue a corridor-by-corridor approach to reevaluating speed limits and adjust posted speeds based on street context. Seek opportunities to pair adjusted speed limits with speed management treatments. Complete approximately three to five evaluations annually.	Traffic Engineering	
TE-02	Consider roundabouts as an alternative when intersection improvements are being designed, and convert as conditions permit and opportunities arise.	Traffic Engineering	
TE-03	Proactively identify locations where improperly maintained trees and landscaping are blocking signs or street lighting.	Traffic Engineering	Transportation Maintenance; Sustainability
TE-04	Identify opportunities to repair and close sidewalks gaps, including installation of sidewalks on both sides of streets.	Traffic Engineering	Transportation Planning
TE-05	Conduct engineering studies to identify locations to install signalized crossings every 1/4 to 1/2-mile across arterials.	Traffic Engineering	Transportation Planning
TE-06	Monitor high-volume intersections in real time during weekday AM and PM peak hours and large events to change intersection timing when a safety or congestion issue arises.	Traffic Engineering	
TE-07	Hold a bi-weekly multi-department Vision Zero meeting, in which fatal or serious injury crashes are reviewed among the Transportation Division, Police Department, and Public Information. Identify safety needs specific to the location, respond to needs as opportunity permits, and track systemic safety needs as applicable.	Traffic Engineering	Police; Public Information
TE-08	Consider low-cost pedestrian and bicyclist safety countermeasures (e.g., pavement markings, signal timing, signs) when reviewing intersections for safety improvements.	Traffic Engineering	
TE-09	Evaluate intersections that would benefit from left-turn phase change and seek opportunities to fund and implement conversions. Prioritize locations on the HIN.	Traffic Engineering	
TE-10	Establish criteria and standards for implementing leading pedestrian intervals (LPIs) or leading bicycle intervals (LBIs).	Traffic Engineering	
TE-11	Identify non-signalized marked crosswalks that could benefit from additional lighting.	Traffic Engineering	

ID	Description	Lead Agency or Department	Supporting Agencies (if applicable)
TE-12	Coordinate traffic engineering review during project design to evaluate potential multimodal safety and operational improvements.	Traffic Engineering	Transportation Planning
TE-13	Collaborate with Tempe K-12 schools to support safe access to and from school areas.	Traffic Engineering	Transportation Planning
TM-01	Analyze lighting conditions along the Segment and Intersection HIN and other high-crash locations and improve deficiencies.	Transportation Maintenance	
TP-01	Implement positive guidance to bicyclists and drivers with treatments such as bike lanes, pavement markings, and signs. Use appropriate levels of separation between bicyclists and drivers based on street context. Prioritize locations on the HIN and other arterials.	Traffic Engineering	Transportation Planning
Education and Outreach			
CO-01	Promote safe mobility options, including transit, ride hailing (e.g., Uber/Lyft) and taxis to people attending major events/establishments where alcohol is served.	Communication and Marketing	
CO-02	Work with partners to develop and provide training (online and/or in person) on transportation safety that targets all road users and all ages, such as motorcyclists training courses and bike safety events.	Communication and Marketing	Police
CO-03	Distribute street safety education materials to on- and off-campus ASU residences.	Communication and Marketing	
CO-04	Provide outreach support for events like Bike to Work Day (April) that promote non-motorized transportation.	Communication and Marketing	
CO-05	Foster partnerships with public information officers, Traffic Engineering, and the Police Department to coordinate a calendar of outreach efforts using social media, Tempe today, and other media outreach options.	Communication and Marketing	Police; Traffic Engineering
CO-06	Participate in World Day of Remembrance, a global event to remember the people who have been killed and seriously injured on streets and raise awareness of the need for safe streets.	Communication and Marketing	
PD-01	Provide Bike/Pedestrian/Scooter Diversion classes.	Police	
TE-14	Publish crash stats and trends via online dashboard and reports. Include information on crashes involving drivers and bicyclists or pedestrians.	Traffic Engineering	
Enforcement			
CO-07	Promote the City's Report Every Dangerous Driver Immediately (REDDI) program to inform community how to report drivers via 911.	Communication and Marketing	Police

ID	Description	Lead Agency or Department	Supporting Agencies (if applicable)
PD-02	Use safety cameras and mobile units to capture speed on green and red-light running violations.	Police	Traffic Engineering
PD-03	Train police officers to identify and remove impaired drivers from the roadway.	Police	
TE-15	Administer the Safety Corridor Program to increase enforcement in high severity crash corridors and educate road users about these corridors.	Traffic Engineering	Communications and Marketing; Police
Emergency Response			
TE-16	Invest in infrastructure maintenance to ensure efficient emergency response (e.g., Pavement Quality Index - PQI).	Traffic Engineering	Transportation Maintenance; Tempe Fire Medical Rescue; Police
TE-17	Identify opportunities to further improve emergency pre-emption at intersections.	Traffic Engineering	Transportation Maintenance

New Actions

In addition to continuing existing safety actions, the Safety Action Plan identifies new actions needed to strengthen systemic safety practices, improve coordination across departments, and advance proactive safety strategies that reduce the risk and severity of crashes. These actions are based on staff input, review of current practices, and Safe System Approach best practices and are organized by category. Each action identifies a lead agency, supporting partners where applicable, and a recommended implementation timeframe. See Table 4 for a comprehensive list of safety-related actions that the City of Tempe may pursue in the near future.

Implementation Timeframe

Each new action identified in this plan includes a recommended implementation timeframe to help guide coordination, prioritization, and resource allocation. The timeframes reflect when actions should begin or be substantially advanced following adoption of the Safety Action Plan.

- **Now**: Actions anticipated to begin or be completed within **1 to 3 years** of plan adoption.
- **Next**: Actions anticipated to begin or be completed within **3 to 5 years** of plan adoption.

Table 4: List of Safety Actions to Start

ID	Description	Lead Agency or Department	Supporting Agencies (if applicable)	Timeline
Interagency Collaboration				
TE-101	Identify a champion from the Vision Zero team for strategies in the “Now: 1-2 years” time frame. Develop performance measures and target dates for each strategy.	Traffic Engineering	Police; Communications	Now: 1-2 years
TR-101	Partner with the Human Services Office to address the transportation needs of older residents identified in the Age Friendly Tempe Report. Improve access to mobility programs (such as reduced fare passes).	Transit	Communications and Marketing; Human Services	Next: 3-5 years
Plans and Programs				
PW-101	Transition City fleet and require City contractor fleets to utilize low-mass and safety-enhanced vehicles.	Public Works		Next: 3-5 years
TD-101	Create criteria for prioritizing street safety improvements for inclusion in the City’s Capital Improvement Program.	Transportation Division	City Manager's Office	Now: 1-2 years
TE-102	Update the Safety Action Plan after 5 years; include a review of street safety projects and progress related to programmatic strategies.	Transportation Planning	Traffic Engineering	Next: 3-5 years
TE-103	Identify and evaluate high priority intersections for safety improvements based on the HIN.	Traffic Engineering	Transportation Planning	Now: 1-2 years
TP-101	Analyze crash data every 3 years to update the High Injury Network (HIN).	Transportation Planning	Traffic Engineering	Next: 3-5 years
Engineering				
TE-104	Proactively identify locations where sight visibility is obstructed and improve visibility.	Transportation Maintenance	Traffic Engineering	Now: 1-2 years
TE-105	Evaluate opportunities for raised median to provide access control. Prioritizing arterials with five or more lanes, and those on the HIN. Identify locations that could also benefit from the installation of pedestrian refuge islands as part of median improvements.	Traffic Engineering		Now: 1-2 years

ID	Description	Lead Agency or Department	Supporting Agencies (if applicable)	Timeline
TE-106	Update Tempe design and standards for developments to limit driveways to one per parcel, or one per 1/8th mile for larger parcels, in order promote access control, especially along arterials. Encourage shared access agreements for adjoining parcels where possible.	Community Development (Planning), Engineering	Transportation Planning	Now: 1-2 years
TE-107	Develop criteria for installing/upgrading new bicycle detection technology at signalized intersections. Identify priority intersections for improvements.	Traffic Engineering		Next: 3-5 years
TE-108	Provide visible pick-up/drop-off zones and enhance the convenience of rideshare and taxis in the downtown area and during special events.	Transportation Planning	Traffic Engineering	Next: 3-5 years
TE-109	Install ADA compliant ramps at every intersection as standalone projects or in tandem with other projects as retrofits.	Traffic Engineering		Next: 3-5 years
TE-110	Develop a Safety Countermeasures Toolkit that guides the application of context-sensitive treatments. Prioritize locations on HIN and implement as standalone projects or in tandem with other improvements.	Traffic Engineering		Next: 3-5 years
TP-102	Identify locations that could benefit from grade separated pedestrian crossings and conduct feasibility studies.	Transportation Planning		Next: 3-5 years
Education and Outreach				
CO-101	Continue and expand engagement with businesses and establishments that serve alcohol and drugs (pharmacies, medical marijuana dispensaries) to decrease driving under the influence.	Communication and Marketing	Police	Now: 1-2 years
CO-102	Engage School Resource Officers (SROs) at high schools in street safety education campaigns by building a partnership with Tempe Union High School District, and private/ charter high schools.	Communication and Marketing	Police; Traffic Engineering; Tempe Union High School District	Next: 3-5 years
Enforcement				
PD-101	Implement targeted nighttime enforcement to dissuade midblock pedestrian crossings and speeding in high crash areas.	Police		Now: 1-2 years
Emergency Response				
TF-101	Review and revise Fire and EMS call response procedures to: 1) ensure appropriate response vehicle per call type; 2) enhance computer aided dispatch (CAD) interconnections to support 911 dispatch; and 3) incorporate Next Generation 911-compliant telecommunicators with exact incident locations.	Tempe Fire Medical Rescue	Police	Next: 3-5 years

PRIORITIZING SAFETY STRATEGIES

Reducing fatal and serious injury crashes requires the City to focus limited resources where they can have the greatest impact. While safety remains a citywide priority, there are two primary considerations for prioritizing future safety investments and actions:

» Locations on the HIN

» Areas with greater equity needs

Location-based and systemic projects and general safety policies and programs should reflect these priorities.

The **Segment and Intersection HINs** identify corridors and intersections where fatal and serious injury crashes have occurred more frequently than other locations over the five-year study period. Infrastructure projects, operational improvements, and safety studies should prioritize HIN locations to address the roadway characteristics and crash patterns most closely associated with fatal and serious injury crashes.

The City should also prioritize investments in areas with **greater equity needs**, as defined in the Tempe Transportation Plan and/or subsequent planning efforts. These areas may include concentrations of lower-income households, older adults, people with disabilities, transit-dependent populations, and communities that have historically experienced barriers to transportation access. Many of these residents rely more heavily on walking, biking, rolling, and transit, making safe and comfortable transportation facilities especially important.

See the Tempe Transportation Plan for priority projects and additional information on project selection.

MEASURING PROGRESS

This Safety Action Plan focuses on strategies the City can take within the next five years. The City will track implementation progress, monitor safety outcomes, and periodically revisit and update this list of strategies and policies to reflect completed work, emerging safety needs, evolving best practices, and changes in crash trends. Measuring progress is an important part of implementing the Safe System Approach. This includes evaluating progress toward completing identified actions, monitoring changes along the HIN, and identifying opportunities to adjust strategies over time.

The City already maintains several ongoing safety monitoring practices that support implementation of the Safety Action Plan, including crash data reporting, interdepartmental crash review meetings, and corridor-level safety evaluations. These existing practices provide a foundation for expanding performance tracking and implementation monitoring over time.

DASHBOARDS

The City maintains a public-facing Vision Zero Dashboard that supports ongoing safety monitoring and transparency. This dashboard contains regularly updated crash data, including information on fatal and serious injury crashes, crash locations, travel modes involved, and crash severity. The dashboards help residents, staff, planners, and decision-makers better understand where crashes are occurring and support data-driven safety improvements across Tempe. The dashboard can support implementation of this Safety Action Plan by helping track safety trends over time, identify emerging issues, and inform future updates to the HIN and safety priorities. Tempe's Vision Zero Dashboard is available online at: **https://visionzero.tempe.gov/**

METRICS

The City can use a combination of output-based and outcome-based performance measures to monitor progress. Output measures help monitor whether projects, programs, and policy actions are being advanced as intended. Outcome measures help track long-term safety trends and changes in crashes.

Potential **output measures** may include:

» Number of projects implemented with safety improvements annually

» Number of intersections or corridors evaluated for safety improvements

» Completion of "Now" and "Next" safety actions

» Miles of bikeways, sidewalks, or other multimodal safety improvements installed

» Number of LPIs, medians, lighting improvements, or speed management treatments implemented

» Public engagement and educational activities completed annually

Potential **outcome measures** may include:

» Fatal and serious injury crashes citywide and on the HIN

» Fatal and serious injury crashes tabulated by mode of transport

» Changes in crash patterns and severity trends over time

» Near-miss analysis at select locations where immediate outcomes are deemed appropriate and cost effective

COORDINATION

The Plan establishes coordination and accountability actions that help integrate safety across the City's operations. These actions collectively ensure safety remains a long-term City priority through ongoing collaboration, implementation tracking, and progress monitoring.

Safety Taskforce Coordination (CM-01)

The Safety Taskforce establishes a formal structure for ongoing coordination between City departments most involved in implementing safety actions. The taskforce could include representatives from departments such as Transportation, Police, Fire Medical Rescue, Communications, and other implementation partners who meet regularly to review active actions, discuss barriers to implementation, and identify next steps.

This action helps institutionalize the Safe System Approach across City operations by creating a consistent process for collaboration, accountability, and decision-making. The taskforce also supports proactive safety management by coordinating efforts across disciplines and ensuring safety remains a continuous Citywide priority rather than a one-time planning effort.

Department Champions and Performance Tracking (CM-101)

This action establishes departmental champions responsible for advancing priority safety actions identified in this Plan, particularly those within the "Now" implementation timeframe. These champions will help coordinate implementation within their departments, track progress, develop performance measures, and support communication between agencies.

Each action identifies the lead agency or department responsible for implementation, along with supporting agencies where applicable. Department champions can help ensure accountability by monitoring implementation status, identifying resource needs, coordinating across departments, and supporting regular progress reporting. Over time, this structure will help Tempe evaluate which strategies are most effective, identify remaining safety gaps, and support future updates to the Safety Action Plan.

Concluding Thoughts

Tempe's Safety Action Plan establishes a clear path forward to reducing fatal and serious injury crashes and creating a safer transportation system for everyone. Building on the City's Vision Zero commitment, this Plan applies the Safe System Approach to guide how streets are planned, designed, operated, maintained, and used. The actions identified in this Plan recognize that achieving safer streets requires coordination across City departments, ongoing investment, proactive safety management, and shared responsibility.

This Plan also reflects Tempe's broader goals for sustainability, accessibility, equity, and community wellbeing. Many of the strategies identified in this Plan support multiple City priorities by improving access to daily destinations, creating safer conditions for people walking, biking, rolling, and taking transit, and supporting a more connected and resilient transportation system.

Implementation of this Plan will occur over time through continued coordination, monitoring, and collaboration with community members, partner agencies, and City departments. Some actions focus on continuing successful practices that are already underway, while others introduce new approaches that strengthen Tempe's ability to proactively identify and address safety risks before severe crashes occur.

The City will continue tracking progress through ongoing crash analysis, performance monitoring, and updates to the HIN and safety strategies. As conditions change and new opportunities emerge, Tempe anticipates revisiting and updating this Safety Action Plan to reflect progress, evolving best practices, and community needs.



APPENDIX:
MULTIMODAL SAFETY COUNTERMEASURES TOOLKIT

Multimodal Safety Countermeasures Toolkit

INTRODUCTION

Tempe's approach to improving street safety aligns with the broader vision and goals outlined in Transportation Plan 2050 and is grounded in the Safe System Approach, which emphasizes roadway designs that anticipate human error and reduce crash severity. This Speed Management and Safety Toolkit is a resource for the implementation of safety strategies to help enhance road safety in Tempe. The toolkit comprises a set of context-sensitive treatments that aim to manage speed, address common crash patterns, and improve safety, comfort, and connectivity along Tempe's arterial corridors.

A major focus of this toolkit is the city's arterial street network. Arterial streets carry high traffic volumes over longer distances and connect destinations across the transportation network. Arterials in Tempe typically feature wide cross-sections, high vehicle speeds, and frequent access points, resulting in complex operations and elevated safety risks for all road users.

The countermeasures in this toolkit are particularly appropriate for Tempe roadway and land use contexts. These treatments may be implemented in response to observed crash patterns or proactively along corridors with street designs associated with elevated crash risk. In accordance with Safe System principles, countermeasures may be applied in combination to reduce the likelihood and severity of crashes.

TOOLKIT ORGANIZATION

Countermeasure Categories

The countermeasures are organized into five categories, though countermeasures may correspond to or provide benefits across more than one category:

1. **Access Management**: *Managing driveways and turning movements*

   Treatments that reduce conflict points along a street by improving how and where drivers make turns to enter and exit site driveways and local streets. These treatments can improve traffic flow and reduce crash frequency by limiting unprotected left turns.

2. **Intersections and Crossings**: *Reducing crash risk and potential severity where conflicts may occur*

   Treatments that reduce potential for conflicts at intersections and crossings, where severe crashes have occurred or may occur. Countermeasures include design and signal improvements that enhance visibility and separate drivers and people walking or biking in time and space.

3. **Operations Strategies**: *Adjusting signals and traffic flow*

   Tools that optimize how traffic moves through a corridor, such as signal timing, phasing, coordination, and speed management measures. These strategies target severe crash types like left-turn, angle, and failure to yield crashes.

4. **Roadway Reconfiguration**: *Changing lane configurations and street design elements*

   Design changes that reallocate or reshape space within the roadway to better manage speeds and improve safety for all users.

5. **Infrastructure for Alternative Modes**: *Creating safe places for people to walk, bike, and roll*

   A range of countermeasures, design strategies, and enhancements that improve safety and comfort for people walking, biking, and using micromobility devices.

TOOLKIT CONTENT

Each countermeasure profile contains the following content:

- **Description**: Briefly defines the countermeasure.
- **Safety Benefits**: Identifies the potential safety benefits associated with implementing the countermeasure.
- **Target Crash Types**: Identifies the crash types targeted by each countermeasure.
- **Crash Reduction Factor and Crash Modification Factor ID**: References Federal Highway Adminstration (FHWA) Crash Modification Factors (CMF) quantitatively estimate the expected safety improvement associated with implementing a countermeasure. The Crash Reduction Factor (CRF) is the estimated percentage reduction in crashes that may result from countermeasure implementation, while the **Crash Modification Factor ID (CMF ID) identifies the entry in the FHWA CMF Clearinghouse**. Not all countermeasures have been researched, analyzed, and assigned a CMF.
- **Considerations and Applicability**: Describes the roadway, operational, and contextual factors that should be considered when determining the appropriateness of a countermeasure for a specific location. This section provides common applications, implementation considerations, potential tradeoffs, and conditions that may impact a treatment's effectiveness.

» **Feasibility**: Describes the perceived complexity of implementing a countermeasure based on cost, contruction effort, right-of-way needs, operational impacts, coordination, and timeframe. Countermeasure feasibility is categorized as Low, Medium, or High.

» **Multimodal Impacts and Benefits**: Describes how a given countermeasure may influence the safety, comfort, accessibility, and operations of non-motorized road users (i.e., pedestrians, bicyclists, transit riders, micromobility users, and individuals using mobility-assisted devices). Low, Medium, or High indicate the perceived likelihood of benefits and unintended tradeoffs a countermeasure may impart to these users.

» **Safe System Goals**: Indicates which Safe System principles each countermeasure supports.

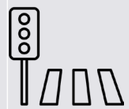
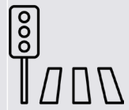
» **Resources**: Includes federal manuals, design guidelines, and research documents where designers and toolkit users may find additional informaiton on the benefits and appropriate application of each countermeasure.

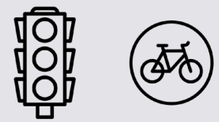
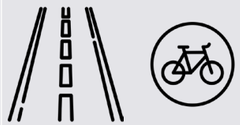
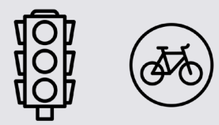
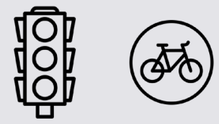
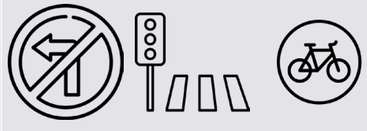
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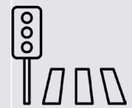
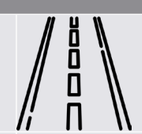
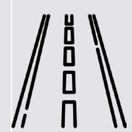
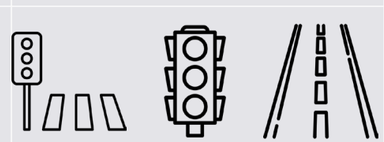
Effective speed management combines roadway design, operations, education, and enforcement strategies to create a safer and more predictable operating environment. Roadway design establishes the desired travel speed, while enforcement can reinforce the desired outcomes and support safer driver behavior, especially when changes are made along specific corridors.

Currently, Tempe uses a range of enforcement strategies, including the Safety Corridor Program, mobile speed feedback signs, and automated enforcement for red-light running and speeding. The existing automated enforcement programs include fixed and mobile cameras. Since these enforcement programs are actively implemented across the City of Tempe, they are not included in the Speed Management Toolkit. However, additional opportunities exist to expand speed management and enforcement efforts through a combination of automated and targeted officer enforcement, especially following countermeasure implementation. These strategies may help ensure consistent travel speeds and reduce speed variability, which can play a significant role in reducing severe crashes. Focused enforcement following countermeasure implementation may also help to reinforce new traffic conditions and encourage desired driver behavior changes.

SUMMARY TABLE

Countermeasure (pg #)	Definition & Crash Types Addressed	Secondary Category	Safer Speeds	Safer Roads	Safer People
Access Management					
Raised Medians (61)	A physical barrier that separates opposing traffic and restricts or directs turning movements at designated locations. Target crash types: Angle, fixed-object, head-on, rear-end, sideswipe, and single-vehicle crashes.				
Reduced Conflict Intersections (62)	Geometric design that redirects side-street left-turn and crossing movements to downstream U-turn locations to reduce conflict points. Target crash types: Angle and left-turn crashes at unsignalized intersections.				
Reduced Driveway Density (63)	Consolidation or reduction of driveways along a corridor to reduce vehicle access points and related conflicts. Target crash types: Angle, left-turn, rear-end, and sideswipe crashes.				
Right-In/Right-Out (RIRO) Only Site Access (64)	A restriction of driveway access to right-turn entry and exit, eliminating left-turn and crossing movements. Target crash types: All crash types.				
Intersections and Crossings					
Advanced Signs and Pavement Markings (65)	Signs and pavement markings that increase driver awareness, crossing visibility, and driver yielding compliance. Target crash types: Pedestrian-involved and angle crashes.				
Clear Intersection Sight Distance Triangles (66)	The removal of visibility obstructions at intersections and driveways so roadway users can see one another. Target crash types: All crash types.				
Marked Conflict Areas (67)	Pavement markings that highlight locations where bicyclists and drivers may cross paths. Target crash types: Bicycle-involved, turning, and angle crashes.				

Countermeasure (pg #)	Definition & Crash Types Addressed	Secondary Category	Safer Speeds	Safer Roads	Safer People
Retroreflective Signal Head Treatments (68)	Reflective treatments added to traffic signal heads to improve signal visibility and driver awareness. Target crash types: Rear-end and angle crashes at signalized intersections.				
Active Pedestrian Crossing Treatments (69)	Pedestrian-activated beacons or signals that improve crossing visibility and require drivers to yield or stop. Target crash types: Pedestrian-involved crashes.				
High-Visibility Crosswalk Markings (70)	Enhanced pavement markings to increase the visibility and recognition of pedestrian crossing locations. Target crash types: Pedestrian-involved crashes.				
Median Refuge Islands (71)	A separated area in the center of the roadway that allows pedestrians to pause and cross in two stages. Target crash types: Pedestrian-involved crashes at unsignalized locations.				
Right Turn on Red Restrictions (72)	Prohibition of right turns during the red signal phase to reduce conflicts with crossing pedestrians and bicyclists. Target crash types: Pedestrian- and bicycle-involved, right-turn, and angle crashes.				
Leading Pedestrian Intervals (LPIs) (73)	A pedestrian signal phase that gives pedestrians a few second head start before parallel vehicle movements receive a green signal. Target crash types: Pedestrian-involved left-turn and angle crashes.				
Operations Strategies					
Dilemma Zone Protection (74)	Signal timing strategy that uses advance detection to extend green or all-red time and reduce abrupt stopping and red-light running. Target crash types: Rear-end and angle crashes.				
Protected Only Left-Turn Signal Phasing (75)	Signal phasing that provides a dedicated phase separating left-turn traffic from opposing through movements. Target crash types: Bicycle-involved and angle crashes.				

Countermeasure (pg #)	Definition & Crash Types Addressed	Secondary Category	Safer Speeds	Safer Roads	Safer People
Signal Clearance Interval (Yellow + All-Red) (76)	Yellow and all-red signal timing that provides sufficient time for drivers to stop or clear the intersection. Target crash types: Rear-end crashes.				
Roadway Reconfiguration					
Lane Reconfiguration (77)	Reallocation of roadway space that changes the number or arrangement of travel and turn lanes. Target crash types: All crash types.				
Narrow Travel Lanes (78)	A reduction in travel-lane width to manage speeds and allow roadway space to be reassigned to other uses. Target crash types: All crash types.				
Corner Redesign (79)	Modifications to intersection geometry that reduce curb radii or add curb extensions to slow turning vehicles, shorten crossings, and improve visibility. Target crash types: Intersection-related pedestrian-involved crashes.				
Infrastructure for Alternative Modes					
Separated Bike Lanes and Shared Use Paths (80)	Dedicated space for bicyclists that is physically separated from motor vehicle traffic. Target crash types: Bicycle-involved, sideswipe, and angle crashes.				
Bicycle Network Gap Completion (81)	The completion of missing bicycle facility segments to create a continuous and predictable network. Target crash types: Bicycle-involved, sideswipe, and angle crashes.				
Protected Intersections (82)	Intersection design that continues a separated bikeway through the intersection and separates bicyclists and drivers in time and space. Target crash types: Pedestrian- and bicycle-involved, angle, and left-turn crashes.				

Icons via Freepik, Karyative, xnimrodx, and Good Ware

Raised Medians
ACCESS MANAGEMENT

Description:

A physical barrier that divides the roadway, typically curb-height or higher, that separates opposing traffic and may be used to restrict turns or direct drivers to turn at specific location.



Feasibility: Medium

Requires the presence of TWLTLs or a reconfiguration of roadway space. May require community engagement where there are changes in access to private properties and/or driveways.

Safety Benefits: Separates opposing traffic, calms speeds, and enhances turning movement predictability.

Targets: Angle, fixed object, head on, rear-end, sideswipe, single vehicle crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** Safer People Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

FHWA Corridor Access Management

Considerations and Applicability:

- » Confirm road is wide enough to accommodate a median and meet travel lane width regulations.
- » Manage access by strategically aligning median gaps with intersections, driveways, turning lanes and desired U-turn locations.
- » Coordinate with the Fire Department and School Districts to maintain access for emergency vehicles, school buses, and public transit.
- » Implement refuge islands at mid-block crossings.
- » Incorporate landscaping to act as a traffic-calming feature by increasing visual friction.

Location Type: Mid-Block

Multimodal Impacts and Benefits: Medium

Can support safe crossing opportunities when paired with refuge islands; without safe crossings, may limit pedestrian access.

CRF: 19-47%

CMF ID: 2514, 2515, 2516, 2517, 2518

Reduced Conflict Intersections

ACCESS MANAGEMENT

Description: A geometric design that redirects side-street left-turn and crossing movements to downstream U-turn locations to reduce intersection conflicts.



Feasibility: Medium

Requires the presence of TWLTLs or raised medians. May require community engagement where there are changes in access to private properties and/or driveways.

Safety Benefits: Reduces the number and complexity of conflict points, lowering the potential for severe crashes.

Targets: Angle, Left-turn crashes at unsignalized and minor street stop-controlled intersections

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** Safer People Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

FHWA Alternative Intersections/Interchanges

FHWA RCUT Informational Guide

Considerations and Applicability:

- Consider opportunities on high-speed multilane roads with regular access points.
- Confirm sufficient median width and downstream intersections that allow U-turn movements.
- Coordinate with the Fire Department and School Districts to maintain access for emergency vehicles, school buses, and public transit.
- Incorporate pedestrian and bicycle crossings.
- Consider corridor access spacing and signal coordination.
- May require additional signing, wayfinding, and guidance.

Location Type: Intersection

Multimodal Impacts and Benefits: Low

May create indirect crossings and affect bicycle routing.

CRF: 54-63%

CMF ID: 4884, 5556

Reduced Driveway Density

ACCESS MANAGEMENT

Description: Consolidation or reduction of driveways along a corridor to reduce conflict points between drivers and people walking, biking, and rolling.

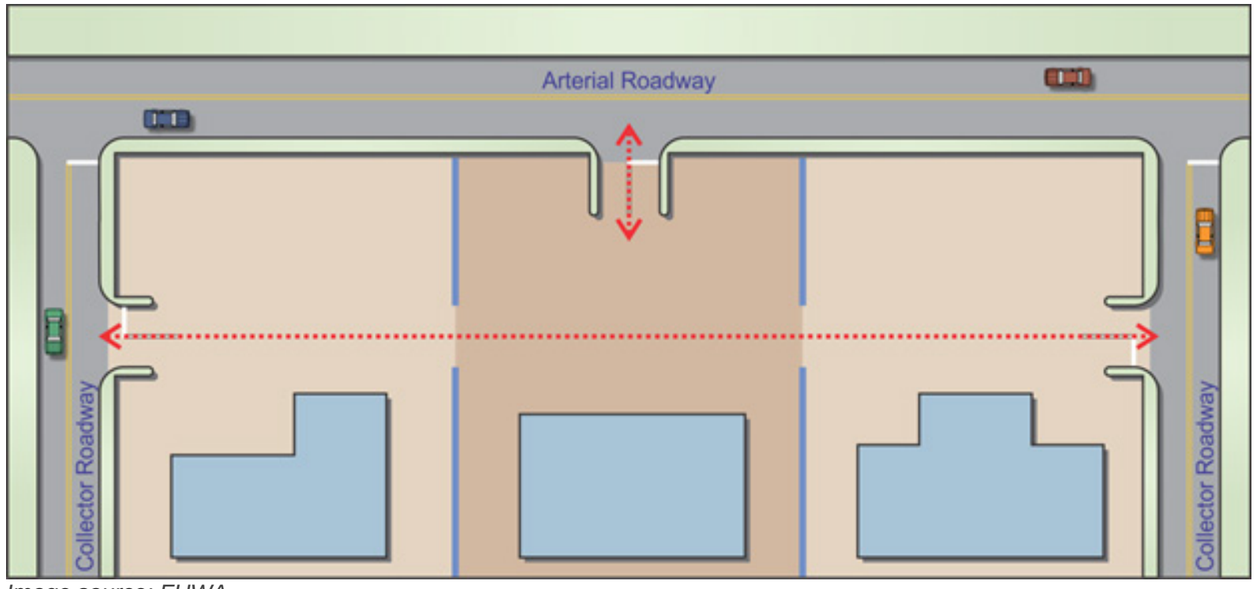


Image source: FHWA

Feasibility: Medium

Likely requires stakeholder coordination, shared access agreements, and public outreach.

Safety Benefits: Decreases the number of vehicle access points, reducing opportunities for conflicts along the corridor.

Targets: Angle, left-turn, rear-end, and sideswipe crashes (26-48 to 10-24 per mile, 10-24 to less than 10 per mile)

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** Safer People Post-Crash Care

Sources:

FHWA Corridor Access Management

FHWA Proven Safety Countermeasures

Considerations and Applicability:

» Evaluate opportunities along corridors with frequent access and turning activity and in locations with history of turning, angle, or rear-end crash history.

» Coordinate with landowners and local agencies, as access changes may affect adjacent properties.

Location Type: Mid-Block

Multimodal Impacts and Benefits: High

Reduces conflict points and improves comfort for people walking, biking, and rolling.

CRF: 25-31%

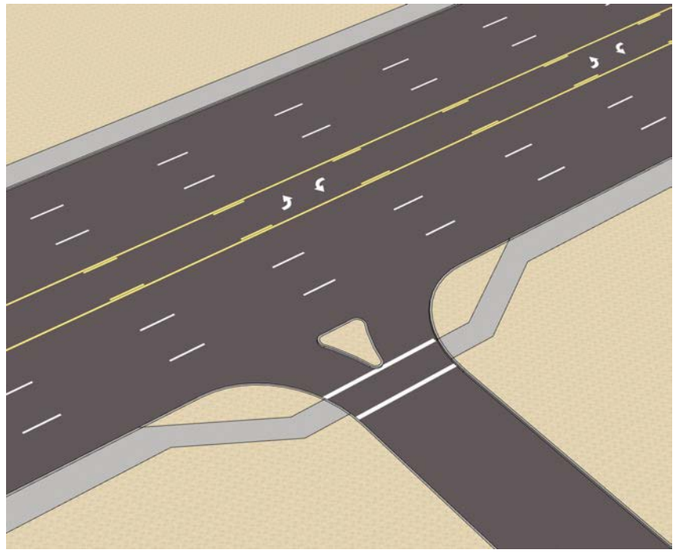
CMF ID: 178, 179

Right-In/Right-Out (RIRO) Only Site Access

ACCESS MANAGEMENT

Description:

Restriction of driveway entry and exit to right turn movements only, eliminating thru movements and left turn maneuvers across multiple lanes of traffic.





Considerations and Applicability:

- » Evaluate opportunities along multilane arterials with frequent driveway access and where left turn access creates operational or safety concerns.
- » Consider impacts to adjacent access points and circulation patterns.
- » Consider median spacing, driveway spacing, and corridor operations.
- » Consider opportunities to reduce corner radii to control turning speeds.
- » Evaluate potential for unintended consequences, as it may increase out-of-direction travel and U-turn activity.

Location Type: Mid-Block

Multimodal Impacts and Benefits: Medium

May reduce network connectivity and safety for people walking, biking, and rolling since raised medians can create longer distances between crossings.

CRF: 45%

CMF ID: 9821

Feasibility: Medium

Requires a raised median; may require stakeholder coordination, shared access agreements, and/or public outreach.

Safety Benefits: Reduces crossing and left-turn conflicts by simplifying driveway access.

Targets: All crash types

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** Safer People Post-Crash Care

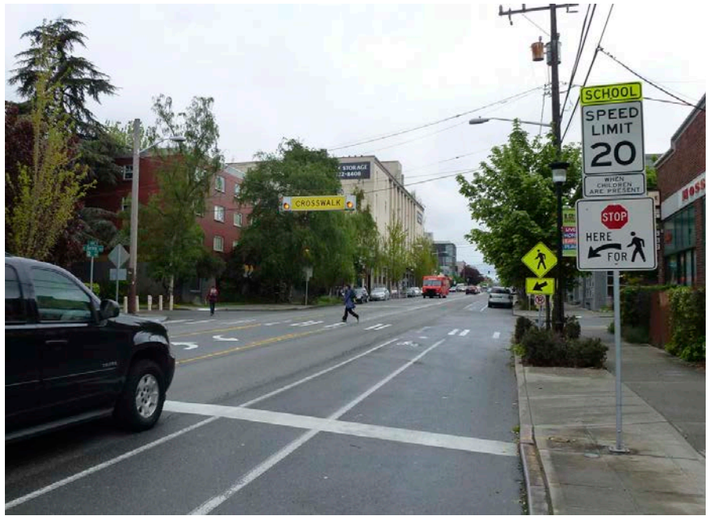
Sources:

FHWA Corridor Access Management

Advanced Signs and Pavement Markings
INTERSECTIONS AND CROSSINGS

Description:

Signs and pavement markings to increase driver awareness and visibility of crossing locations.





Feasibility: High

Requires clear visibility and compliance with MUTCD standards.

Safety Benefits: Increases motorist awareness and yielding compliance at crossing locations. Advanced warning signs provide additional reaction time, helping users anticipate and respond to conditions. 80 percent yielding compliance and traffic calming effect.

Targets: Pedestrian-involved and angle crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

AASHTO Innovative Initiative

FHWA Proven Safety Countermeasures

PEDSAFE

FHWA STEP Program

MUTCD

Considerations and Applicability:

- » Evaluate opportunities at uncontrolled pedestrian crossings and multilane roadways.
- » Consider visibility, lighting, and sign placement.
- » Regularly maintain in-street pedestrian signs, which may experience vehicle strikes.
- » Apply alongside RRFBs, refuge islands, curb extensions, or high-visibility crosswalks where applicable.

Location Type: Intersection/Mid-Block

Multimodal Impacts and Benefits: High

Improves driver yielding and crossing visibility.

CRF:

Advanced yield/stop markings and signs: 25%

Advanced warning signs: 35%

CMF ID:

Advanced yield/stop markings and signs: 9017

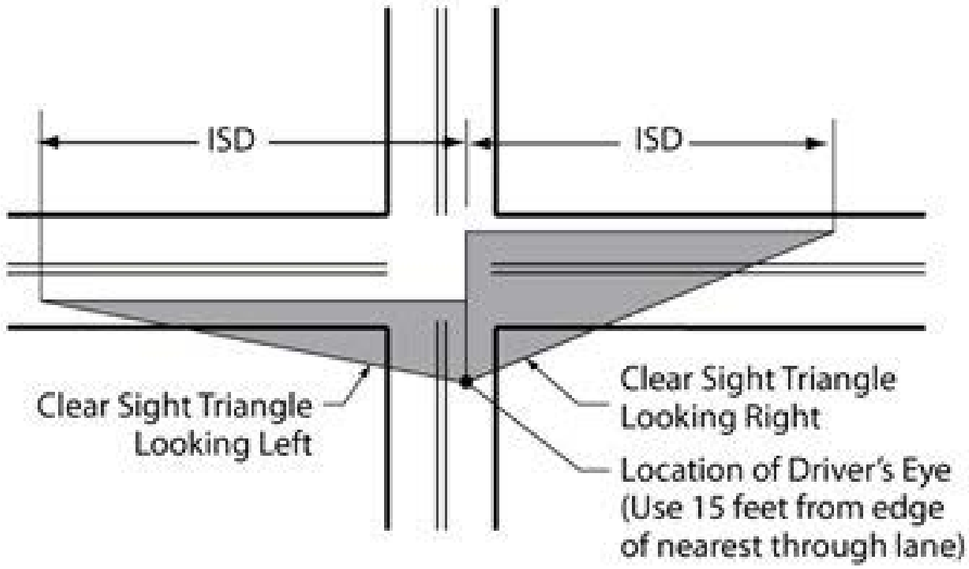
Advanced warning signs: 1684

Clear Intersection Sight Distance Triangles

INTERSECTIONS AND CROSSINGS

Description:

Removes visibility obstructions at intersections and driveways to ensure drivers and people walking, biking, and rolling can see each other.



Considerations and Applicability:

- » Evaluate opportunities at intersections and driveways with limited visibility due to landscaping, signage, utilities, parked vehicles, etc.
- » Consider physically enforcing existing parking restrictions with curb extensions.
- » Evaluate approach speeds, grades, and intersection geometry.
- » Consider both pedestrian and bicyclist visibility as well as driver sight lines.
- » Regularly revisit need to trim back vegetation and enforce parking restrictions.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Improves safety without affecting routing.

CRF: 11-22%

CMF ID: 12106, 12107, 12108

Feasibility: High

Requires field visit and evaluation.

Safety Benefits: Enhances visibility between road users, reducing the likelihood of turning or crossing conflicts.

Targets: All crash types

Safe System Goals: Safer Vehicles | Safer Speeds | **Safer Roads** | Safer People | Post-Crash Care

Sources:

AASHTO Green Book

FHWA Intersection Safety Program

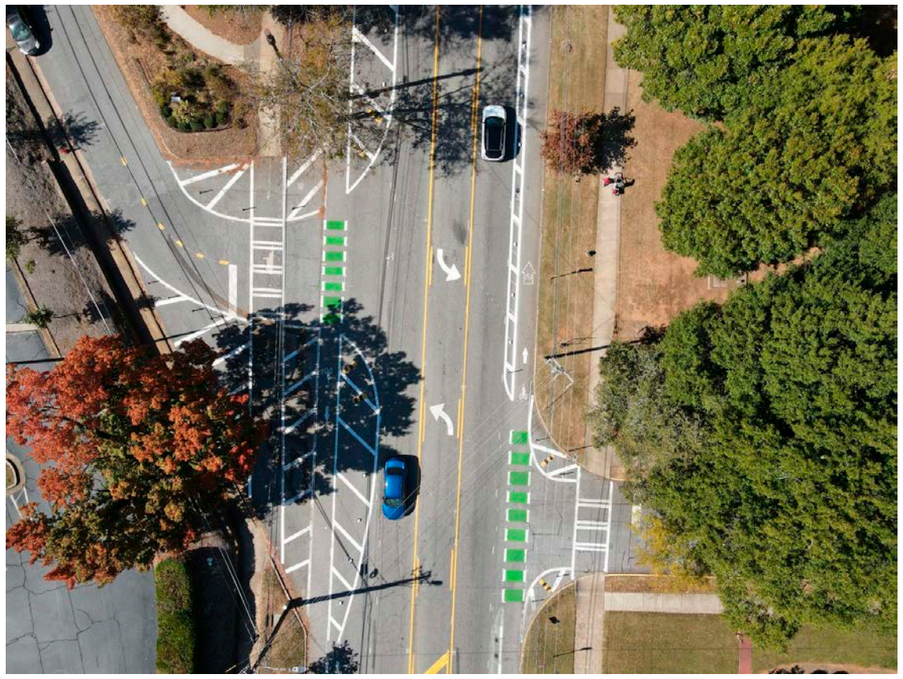
FHWA Signalized Intersections Informational Guide

MUTCD

Marked Conflict Areas
INTERSECTIONS AND CROSSINGS

Description:

Pavement markings to highlight areas where bicyclists and drivers may cross paths.



Considerations and Applicability:

- » Evaluate opportunities on roads with bicycle facilities at intersections, driveways, and merge areas.
- » Regularly maintain colored pavement markings.
- » Apply alongside bicycle lane markings, signage, and geometric treatments, i.e., reduced corner radii.
- » Consistently apply at bicyclist crossings for drivers to become familiar with the treatment and yield uniformly.

Location Type: Intersection/Mid-Block

Multimodal Impacts and Benefits: Medium

Improves awareness but does not reduce exposure.

CRF: Not in CMF Clearinghouse

CMF ID: n/a

Feasibility: High

Requires bikeways that cross intersections or driveways.

Safety Benefits: Improves visibility of bicycle merging and crossing locations, encouraging cautious and predictable behavior.

Targets: Bicycle-involved, turning, and angle crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** Safer People Post-Crash Care

Sources:

FHWA Bikeway Selection Guide

NACTO Urban Bikeway Design Guide

AASHTO Bike Guide

MUTCD

NCHRP Report 926

Retroreflective Signal Head Treatments

INTERSECTIONS AND CROSSINGS

Description:

Addition of reflective borders to traffic signal heads to improve their visibility to oncoming drivers.



Image source: FHWA

Feasibility: High

Safety Benefits: Enhances signal visibility and motorist awareness, reducing the likelihood of missed or late responses and related crashes.

Targets: Rear-end and angle crashes at signalized intersections

Safe System Goals: Safer Vehicles | Safer Speeds | **Safer Roads** | Safer People | Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

FHWA Signalized Intersections Informational Guide

MUTCD

Considerations and Applicability:

- » Evaluate opportunities on higher speed roadways or high-volume intersections.
- » Apply alongside signal timing and intersection illumination improvements.
- » Revisit installation locations and reapply retroreflectivity as needed.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Improves signal visibility without multimodal tradeoffs.

CRF: 15%

CMF ID: 1410*

**CMF refers to reflective signal backplates*

Active Pedestrian Crossing Treatments

INTERSECTIONS AND CROSSINGS

Description:

Pedestrian-activated beacons (Rectangular Rapid Flashing Beacons (RRFB) or Pedestrian Hybrid Beacons (PHB)) that improve visibility of crossings and require drivers to yield to or stop for people walking, biking, or rolling.



Feasibility: Medium

Requires access to power and minimum spacing from existing signals; may require nearby signal coordination; must support ADA access.

Safety Benefits: Increases pedestrian visibility and driver yielding compliance at uncontrolled crossings.

Targets: Pedestrian-involved crashes

(highest PHB CRF represents install with advanced yield or stop markings and signs)

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

Considerations and Applicability:

- Evaluate opportunities at uncontrolled pedestrian crossings on multilane or high-speed roadways and at locations with limited crossing opportunities.
- Select treatment(s) based on vehicle speed, traffic volume, and crossing distance - multilane, high speed, and high-volume crossings may require more substantial treatments (mid-block pedestrian signal or PHB).
- Apply alongside refuge islands, illumination, high-visibility crosswalk markings, and advance markings to improve effectiveness.

Location Type: Mid-Block

Multimodal Impacts and Benefits: High

Improves driver yielding and crossing visibility.

CRF:

PHB: 55-69%

RRFB: 47%

CMF ID:

PHB: 2922, 9020, 9021

RRFB: 9024

FHWA Guide for Uncontrolled Crossing Locations

MUTCD

High-Visibility Crosswalk Markings

INTERSECTIONS AND CROSSINGS

Description:

Enhanced pavement markings that increase visibility of pedestrian crossing locations.



Considerations and Applicability:

- » Evaluate opportunities at marked pedestrian crossings and multilane roadways with high pedestrian activity or pedestrian crash history.
- » Regularly maintain markings and restripe as needed.
- » Apply alongside PHBs, RRFBs, refuge islands, or mid-block pedestrian signals.
- » Prioritize implementation at higher-risk locations based on traffic volume, speed, crash history and the HIN, equity considerations, and pedestrian demand.

Location Type: Intersection/Mid-Block

Multimodal Impacts and Benefits: High

Improves crossing visibility and safety.

CRF: 40%

CMF ID: 4123

Feasibility: High

Must support ADA access.

Safety Benefits: Enhances recognition of crossing locations, supporting driver yielding and pedestrian exposure.

Targets: Pedestrian-involved crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

FHWA STEP Program

MUTCD

AASHTO Pedestrian Facility Guidance

Median Refuge Islands

INTERSECTIONS AND CROSSINGS

Description:

A horizontally and/or vertically separated area in the center of the roadway that provides a space for pedestrians to pause and safely cross the road in two stages.





Feasibility: Medium

Requires the presence of TWLTLs, raised medians, or a reconfiguration of roadway space.

Safety Benefits: Reduces pedestrian exposure and crossing complexity by allowing users to cross one direction at a time.

Targets: Pedestrian-involved crashes at unsignalized locations.

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

Pedsafe Guide

GDCI Global Street Design Guide

Considerations and Applicability:

- Evaluate opportunities near schools, hospitals, senior living centers, and downtown areas.
- Align the island with intersections, driveways, and turning lanes.
- Coordinate with the Fire Department and School Districts to maintain access for emergency vehicles, school buses, and public transit.
- Design islands according to ADA/PROWAG guidance.

Location Type: Intersection/Mid-Block

Multimodal Impacts and Benefits: High

Creates safer crossings on wide roadways.

CRF: 46%

CMF ID: 175

Right Turn on Red Restrictions

INTERSECTIONS AND CROSSINGS

Description:

A prohibition or right turns during the red signal phase to avoid conflicts between turning drivers and pedestrians or bicyclists crossing the street.



Feasibility: Medium

Requires signing for new operations; may require targeted enforcement immediately following implementation.

Safety Benefits: Reduces conflicts between vehicles turning and pedestrians or bicyclists while crossing.

Targets: Pedestrian-and bicycle-involved, right-turn and angle crashes

Safe System Goals: Safer Vehicles | Safer Speeds | **Safer Roads** | **Safer People** | Post-Crash Care

Sources:

ITE Walkable Thoroughfares

Pedsafe Guide

Considerations and Applicability:

- » Evaluate opportunities near schools, hospitals, senior living centers, and Downtown, as well as locations with regular pedestrian activity or pedestrian-involved crash history.
- » Apply alongside additional signing and enforcement, as needed.
- » Consider option to implement only during periods of peak daily pedestrian activity.
- » Consider impacts to transit access and operations.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Improves crossing safety conditions and comfort.

CRF: 10% to 60%

CMF ID: 376

*These crash modification factors indicate an **increase** in crashes with permitted right turn on red.*

Leading Pedestrian Intervals

INTERSECTIONS AND CROSSINGS

Description:

An adjustment to pedestrian signal phasing that provides pedestrians with a few second head start to begin crossing before parallel vehicle movements receive a green signal, to further separate drivers and pedestrians in time and space.



Feasibility: Medium

Requires modern signal controller.

Safety Benefits: Reduces conflicts by increasing visibility and establishing pedestrian presence in crossings before turning movements are allowed.

Targets: Pedestrian-involved left-turn and angle crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

FHWA STEP Program

Considerations and Applicability:

- Evaluate opportunities at locations with permissive left turning movements and with regular pedestrian activity or pedestrian-involved crash history.
- Consider option to implement only during periods of daily peak pedestrian activity.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Improves pedestrian visibility when crossing.

CRF: 19% - 46%

CMF ID: 9903, 9915

NACTO Urban Street Design Guide

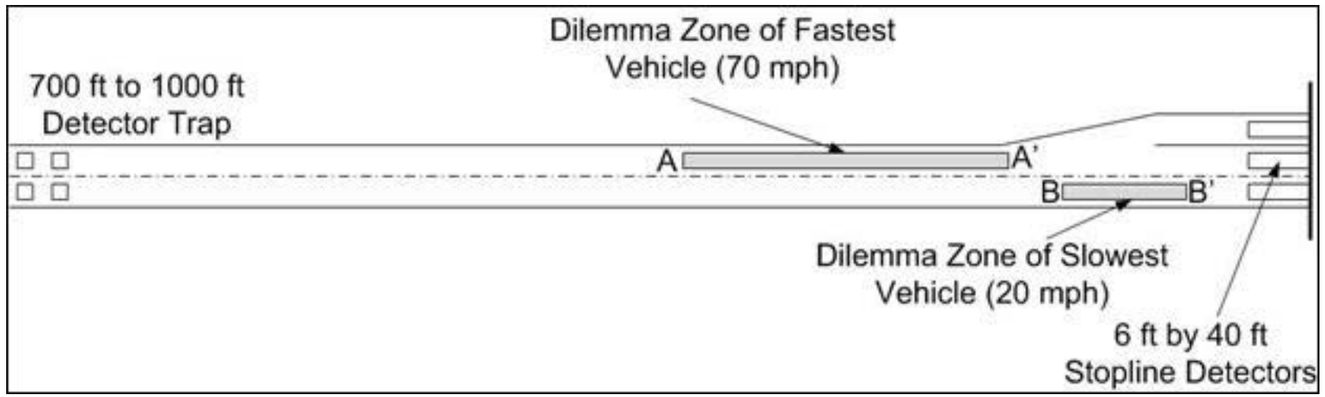
Pedsafe Guide

Dilemma Zone Protection

OPERATIONS STRATEGIES

Description:

Signal timing strategy that uses advanced detection to extend green time or all-red time to reduce rear-end crashes and red light running.



Considerations and Applicability:

- » Verify technology is present to perform advanced vehicle detection.
- » Coordinate signal with adjacent signalized intersections and consider potential delay from signal configuration.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Improves vehicle operations without impacting multimodal space and exposure.

CRF: 44%

CMF ID: 4854

Feasibility: Medium

Requires modern signal controller and advanced vehicle detection.

Safety Benefits: Reduces abrupt stopping and red-light running, lowering rear-end crash risk.

Targets: Rear-end and angle crashes

Safe System Goals: Safer Vehicles Safer Speeds **Safer Roads** Safer People Post-Crash Care

Sources:

FHWA Traffic Signal Timing Manual

NCHRP Report 812

FHWA Signalized Intersections Informational Guide

Protected Only Left-Turn Signal Phasing

OPERATIONS STRATEGIES

Description:

Signal phasing that provides a dedicated phase that separates left-turn turning traffic from opposing through traffic.



Feasibility: Medium

May require modern signal controller, appropriate left-turn signal heads, and additional vehicle detectors for left-turn lanes.

Safety Benefits: Separates conflicting movements, reducing left-turn crash risk.

Targets: Bicycle-involved and angle crashes

Safe System Goals: Safer Vehicles | Safer Speeds | **Safer Roads** | Safer People | Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

ITE Guidelines for Determining Traffic Signal Change and Clearance Intervals

NACTO

FHWA Traffic Signal Timing Manual

Considerations and Applicability:

- Evaluate opportunities at signalized intersections with high left-turn volumes, with a history of left-turn crashes and/or conflicts, and with limited visibility.
- Consider potential delay or increase in signal cycle length from signal configuration.
- Replace signal heads and detection systems as needed.
- Consider option to implement during peak hours only or using protected-permissive phasing (flashing yellow arrow).

Location Type: Intersection

Multimodal Impacts and Benefits: Medium

Improves safety but may increase pedestrian delay.

CRF: 31% - 98%

CMF ID: 2252, 10233

Signal Clearance Interval (Yellow + All-Red)

OPERATIONS STRATEGIES

Description:

Signal timing strategy that adjusts the length of yellow clearance and all-red intervals to minimize the potential for rear-end crashes and redlight running.



Considerations and Applicability:

- » Consider potential delay or increase in signal cycle length from signal configuration.
- » Consider option to implement different timing plans during different times of day, tailored to traffic conditions.
- » Verify no other detection or signal timing updates required.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Improves safety with minimal impact on pedestrians and bicyclists.

CRF: 20% - 36%

CMF ID: 4211, 4221

Feasibility: High

Requires signal controller adjustments.

Safety Benefits: Aligns timing with real-world conditions, reducing intersection conflict risk.

Targets: Rear-end crashes

Safe System Goals: Safer Vehicles | Safer Speeds | **Safer Roads** | Safer People | Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

ITE Guidelines for Determining Traffic Signal Change and Clearance Intervals

NCHRP Report 731

Lane Reconfiguration

ROADWAY RECONFIGURATION

Description:

A reassignment of roadway space that changes the number or arrangement of travel and/or turn lanes.

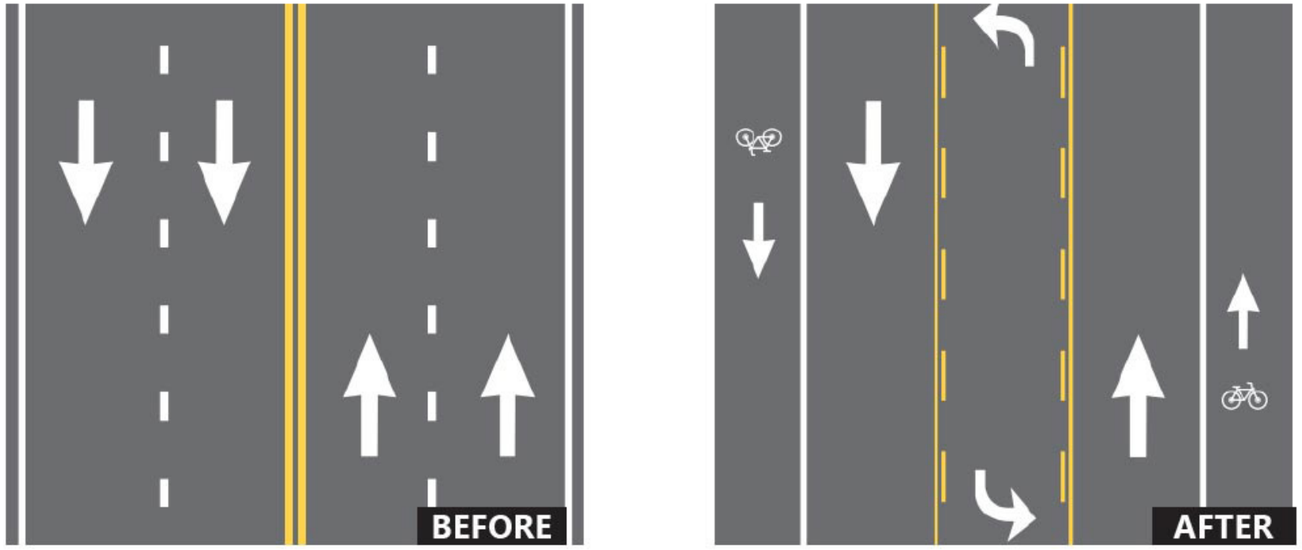


Image source: FHWA

Considerations and Applicability:

- » Ensure widths align with local regulations.
- » Consider capacity and operational needs.
- » Coordinate with the Fire Department and School Districts to maintain access for emergency vehicles, school buses, and public transit.
- » Include multimodal facility enhancements as possible.

Location Type: Mid-Block/Intersection

Multimodal Impacts and Benefits: High

Manages driver speeds while creating opportunities for multimodal improvements.

CRF: 29% - 47%

CMF ID: 10376, 199, 11135

Feasibility: Medium

Dependent on available roadway width and traffic volumes.

Safety Benefits: Encourages slower traffic speeds and simplifies traffic patterns, minimizes crash frequency and severity.

Targets: All crash types

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

FHWA Road Diet Desk Reference

Narrow Travel Lanes
ROADWAY RECONFIGURATION

Description:

A reduction in travel lane width to support speed management and allow for roadway reassignment for other uses; narrow lanes are considered to be 10 feet wide.



Feasibility: High

Requires suitable pavement conditions.

Safety Benefits: Encourages lower operating speeds, contributing to reduced likelihood and severity of crashes.

Targets: All crash types

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

FHWA Proven Safety Countermeasures

NACTO Urban Street Design Guide

Considerations and Applicability:

- Ensure that lane widths align with local regulations (nine-foot travel lanes are usually only feasible where striping, mountable features, or operational treatments are provided to accommodate larger vehicles such as emergency responders and transit vehicles).
- Coordinate with the Fire Department and School Districts to maintain access for emergency vehicles, school buses, and public transit.
- Consider capacity and operational needs.
- Include multimodal facility enhancements as possible.

Location Type: Mid-Block

Multimodal Impacts and Benefits: High

Manages driver speeds, reduces crossing exposure, and creates opportunities for multimodal improvements.

CRF: 24% when converting 12’ lanes to 11’; 42% when converting 12’ to 10’ lanes

CMF ID: 7825; 7827

Corner Redesign
ROADWAY RECONFIGURATION

Description:

Modifications to intersection geometry that reduce curb radii and/or installs curb extensions at corners to limit turning speeds, narrow crossing distances, and enhance visibility between drivers and people walking, biking, and rolling.



Feasibility: Medium

Dependent on available right-of-way; requires ADA-compliant design.

Safety Benefits: Slows turning vehicles, improves visibility and crossing conditions, while reducing pedestrian and bicyclist exposure to vehicle conflicts.

Targets: Intersection-related pedestrian involved crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

Pedsafe Guide

NCHRP 926 Guidance to Improve Pedestrian and Bicyclist Safety at Intersections

FHWA Traffic Calming ePrimer, Module 3, Part 2

Considerations and Applicability:

- Install directional curb ramps to improve ADA accessibility concurrently.
- Determine vehicle turning needs, not every corner needs to be designed for the largest design vehicle.
- Consider the presence of bicycle facilities.
- Avoid large curb radii at local street intersections.
- Consider at locations with on-street parking or with long crossing distances.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Manages driver turning speeds and reduces crossing exposure.

CRF: 18% to 59% (20 ft. radius to 70 ft. radius)

CMF ID: 11215, 11216, 11217, 11218, 11219, 11220

*These crash modification factors indicate an **increase** in crashes with radii larger than 10 feet.*

AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities

FHWA Traffic Calming e-Primer: Corner Extension/Bulbout

NACTO Urban Street Design Guide: Curb Extensions

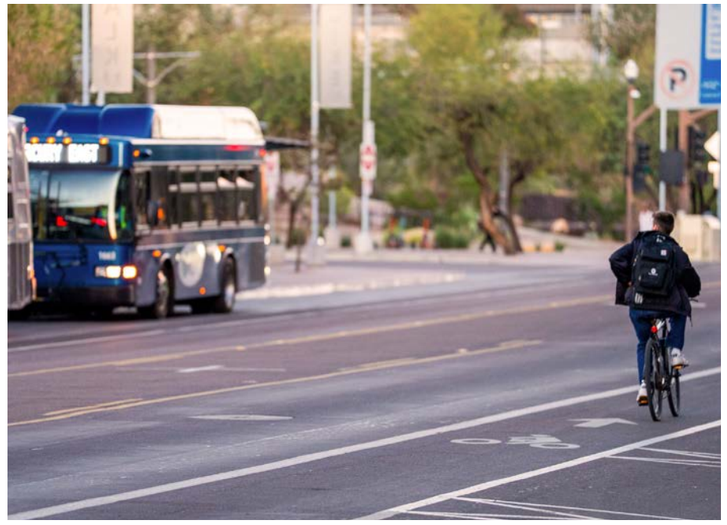
NACTO Urban Street Design Guide: Corner Radii

Separated Bicycle Lanes and Shared Use Paths

INFRASTRUCTURE FOR ALTERNATIVE MODES

Description:

Dedicated space for bicyclists, physically separated from motor vehicle traffic.





Considerations and Applicability:

- » Evaluate opportunities along multilane urban corridors.
- » Consider right-of-way width, driveway density, transit operations, and intersection spacing.
- » Mark conflict areas through intersections and driveways.
- » Coordinate with the Fire Department and School Districts to maintain access for emergency vehicles, school buses, and public transit.

Location Type: Mid-Block

Multimodal Impacts and Benefits: High

Separates drivers and people biking, reducing exposure.

CRF: 45%

CMF ID: 11552

Feasibility: Medium

Dependent on available right-of-way; requires low driveway density.

Safety Benefits: Minimizes interaction between modes, reducing conflict frequency and severity.

Targets: Bicycle-involved, sideswipe, and angle crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

FHWA Bikeway Selection Guide

NACTO Urban Bikeway Design Guide

AASHTO Bike Guide

FHWA Separated Bike Lane Guide

Bicycle Network Gap Completion

INFRASTRUCTURE FOR ALTERNATIVE MODES

Description:

Completion of missing segments of bicycle facilities to create a complete and predictable network.



Feasibility: Medium

Dependent on available right-of-way.

Safety Benefits: Improves multimodal connectivity, clarifies expected movement associated with abrupt facility transitions.

Targets: Bicycle-involved, sideswipe, and angle crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

NACTO Don't Give Up at the Intersection

NACTO Urban Street Design Guide

AASHTO Bike Guide

Considerations and Applicability:

- » Evaluate opportunities at intersections where bicycle lanes end in advance of an intersection and bicyclists must abruptly merge into mixed traffic and at intersections with bicycle-involved crash history.
- » Evaluate the safest alignment with dedicated left- and right turn lanes and transit pull-outs.
- » Consider network connectivity and desire paths.
- » Complete gaps identified in existing multimodal plans.

Location Type: Mid-Block

Multimodal Impacts and Benefits: High

Improves connectivity and bicyclist comfort.

CRF: 20-37%

CMF ID: 3247, 3248

Protected Intersections

INFRASTRUCTURE FOR ALTERNATIVE MODES

Description: An intersection design that continues a separated bikeway through the intersection using physical barriers and bicycle signals to separate drivers and people biking in time and space.



Feasibility: Medium

Dependent on available right-of -way and presence of protected bikeways on all approaches.

Safety Benefits: Reduces crash severity and likelihood by enhancing visibility and reducing conflicts between modes through clear separation.

Targets: Pedestrian- and bicycle-involved, angle, and left-turn crashes

Safe System Goals: Safer Vehicles **Safer Speeds** **Safer Roads** **Safer People** Post-Crash Care

Sources:

NACTO Urban Street Design Guide

AASHTO Bike Guide

Considerations and Applicability:

- » Evaluate opportunities where separated bicycle lanes cross.
- » Verify that adequate space is available for the redesign of the intersection.
- » Modify signal timing and phasing.
- » Coordinate with the Fire Department and School Districts to maintain access for emergency vehicles, school buses, and public transit.

Location Type: Intersection

Multimodal Impacts and Benefits: High

Improves safety and comfort for people walking, biking, and rolling.

CRF: Not in CMF Clearinghouse

CMF ID: n/a

SPEED MANAGEMENT AND EMERGENCY RESPONSE

PERFORMANCE AND SYSTEM LEVEL CONSIDERATIONS

Emergency response time is a critical performance measure for transportation networks. Delays in emergency vehicle travel can negatively affect the ability of fire departments to suppress fires quickly, emergency medical services (EMS) to provide life-saving care, and law enforcement to respond in a crisis. The geometric design of roadways must balance daily traffic calming needs, travel by large buses and freight trucks, and emergency response times and reliability.

Key considerations for emergency services travel and reliability include:

» Network effects: Countermeasures that introduce additional delay or deflection should be evaluated in the context of emergency response routes.

» Temporal patterns: Peak travel demands can compound emergency response delay; designs should account for variability in travel times.

» Performance measures: Emergency response time reliability can be incorporated into project evaluation criteria alongside safety and mobility metrics.

DESIGN IMPACTS ON EMERGENCY VEHICLES

Physical speed management features and roadway geometry implemented to reduce passenger vehicle speeds and improve safety outcomes can affect larger vehicles, including fire apparatus and ambulances, by creating additional delay, vehicle handling challenges, or potential for equipment wear. Federal guidance specifically highlights the need to balance the safety benefits of geometric treatments with potential impacts on emergency mobility:

» The Federal Highway Administration's Traffic Calming ePrimer documents that geometric measures that create deflection are effective at lowering vehicle speeds but must be designed to maintain emergency vehicle access.[5] Design variants such as speed cushions, mountable curbing, or provision of bypass lanes are common design strategies to maintain access while preserving safety benefits.

» Professional safety organizations, including the Insurance Institute for Highway Safety (IIHS), emphasize that physical traffic calming treatments are effective at reducing speeds and crashes, but that coordination with emergency service providers is a recommended best practice to ensure operational compatibility.[6]

Emergency vehicle compatibility should not be assumed; instead, treatment design should explicitly account for vehicle dimensions, turning radii, and operational characteristics of local fire and EMS fleets. Early engagement with emergency service providers can establish consensus about preferred design treatments and mitigation options that reduce delay without compromising safety.

OPERATIONAL COUNTERMEASURES AND MITIGATIONS

In addition to geometric design features, operational countermeasures can mitigate potential negative impacts on emergency response. For example, traffic signal priority and preemption systems allow emergency vehicles to influence signal timing, reducing delay at signalized intersections and improving travel time reliability for responders. These systems are referenced in national signal control guidance and have been documented in public signal design manuals.[7]

Other operational strategies that should be considered in conjunction with physical countermeasures include:

» Coordination of signal timing along key emergency routes.

» Use of real-time traveler information and routing for emergency vehicles.

» Detection and priority systems for emergency responders.

IMPLICATIONS FOR COUNTERMEASURE APPLICABILITY

Incorporating emergency response considerations into countermeasure evaluation and selection supports a more balanced and context-sensitive application of traffic safety treatments. City staff selecting and implementing countermeasures should:

» Identify locations where emergency vehicle access is critical.

» Evaluate geometric and speed management measures and their potential impact on emergency travel times.

» Engage fire, EMS, and law enforcement agencies early in the planning and design phases to identify concerns and mitigation strategies.

» Consider operational enhancements such as traffic signal priority as a key strategy.

Considering emergency response alongside safety countermeasures ensure treatments improve regular travel safety and traffic operations for the public but also support essential emergency services.

[5] *FHWA Speed Management / Traffic Calming ePrimer — addresses traffic calming effects on speeds and the need for design consideration for emergency vehicles.* **https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer**

[6] *Insurance Institute for Highway Safety (IIHS), Traffic Calming Topic Page — describes safety benefits of traffic calming and best practices.* **https://www.iihs.org/topics/traffic-calming**

[7] *Traffic Signal Preemption (public overview) — explains priority signal control for emergency vehicles.* **https://en.wikipedia.org/wiki/Traffic_signal_preemption**