The Safe System Approach

Developing and Implementing Data-Driven Safety Plans in Alignment with the Safe System Approach

TexITE 2026 - Concurrent Session 2B

Kimley»Horn

Expect More. Experience Better.

Trivia Questions

- How many people die **each day** on roadways in **Texas**?
- Of motor vehicle deaths in Texas, **what percent** occur within the Houston-Galveston region?
- Which **emphasis areas** are the most common factors in MV deaths within the H-GAC region?

Trivia Answers

- How many people die **each day** on roadways in **Texas**?

  →*11-12 people per day*

- Of motor vehicle deaths in Texas, **what percent** occur within the Houston-Galveston region?

  →*About 17% to 20%*

- Which **emphasis areas** are the most common factors in MV deaths within the H-GAC region?

  →*Impaired Driving (35%), Occupant Protection (30%), Roadway Departure (30%), Speed Related (28%), Pedestrian Involved (27%), Intersection Related (26%)*

The Safe System Approach

Developing and Implementing Data-Driven Safety Plans in Alignment with the Safe System Approach

TexITE 2026 - Concurrent Session 2B

Kimley»Horn

Expect More. Experience Better.

Speaker Introductions

Payton Arens

Kimley»Horn

Nicole Waldheim

FEHR PEERS

Susan Jaworski

H-GAC Houston-Galveston Area Council

Kendall Nunez

Kimley»Horn

Tariq Shihadah

TOOLE DESIGN

Agenda

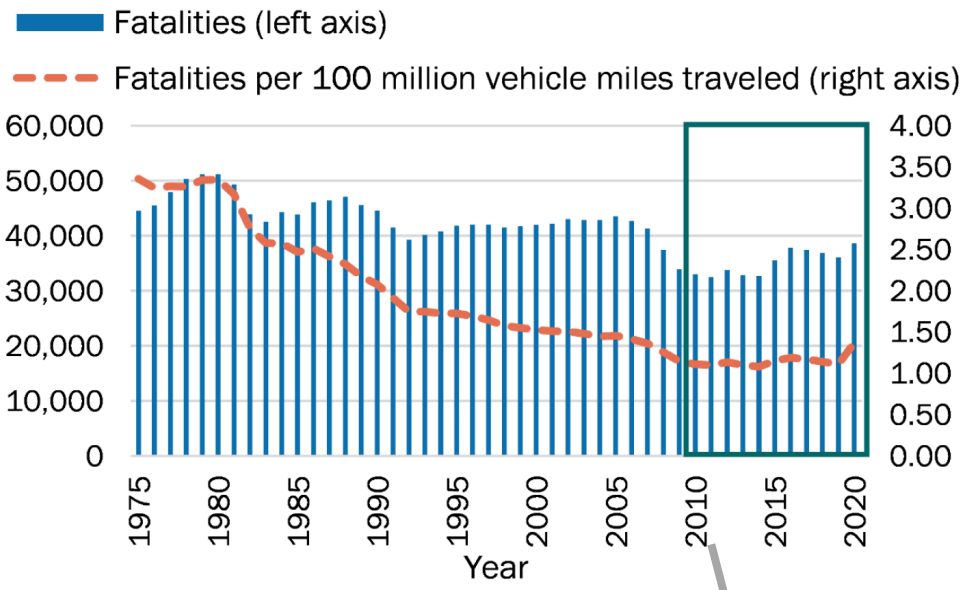
1. Road Safety Fundamentals
2. Safety Analysis
3. Infrastructure Countermeasures
4. Non-Infrastructure Strategies
5. MPO Role in Road Safety
6. Q&A

Road Safety Fundamentals

Kimley»Horn

Expect More. Experience Better.

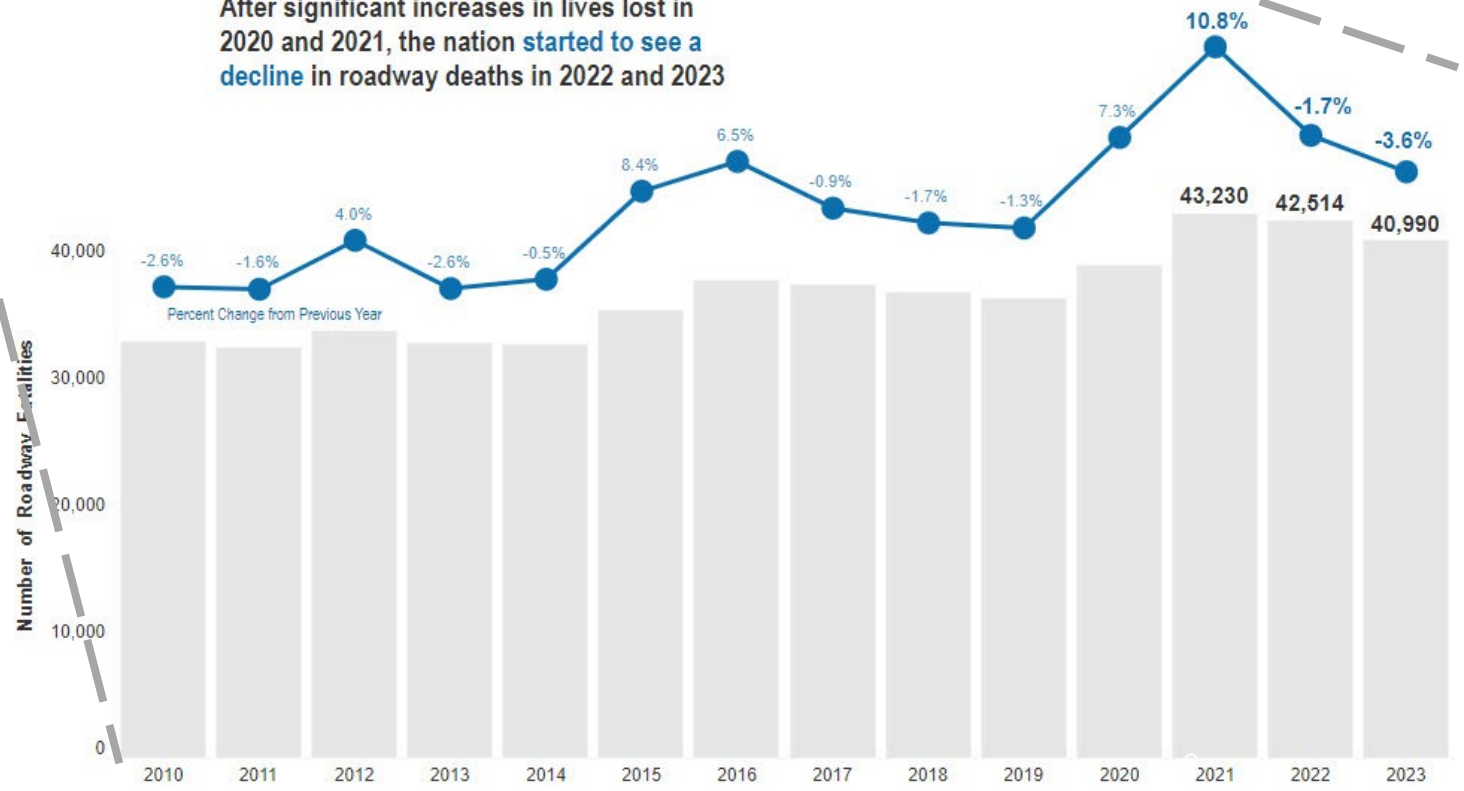
The Road Safety Problem



Kimley»Horn

"Roadway fatalities and the fatality rate declined consistently for 30 years, but progress has stalled over the last decade and went in the wrong direction in 2020."

Source: *USDOT National Roadway Safety Strategy*



"Our priority at the Department of Transportation is to make our transportation system safe for all people. Right now, we face a crisis on our roadways."

Regional Road Safety Trends

Deaths annually:

- → **US:** 42,000 (115 people each day)
- → **Texas:** 4,200 (12 people each day)
- → **Houston:** 750 (2 people each day)

The Houston Region accounts for about 20% of MV deaths in Texas

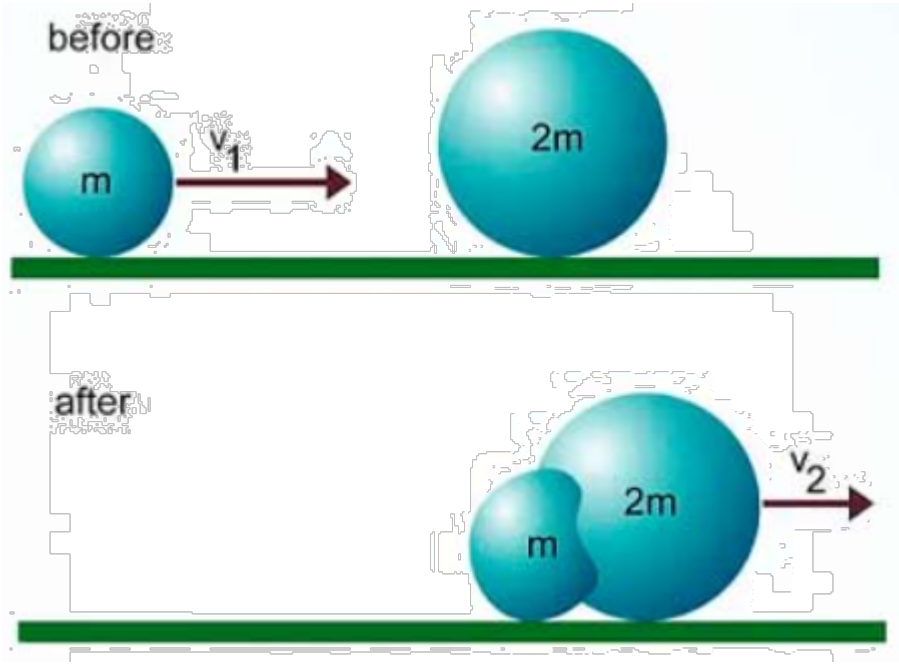
End the Streak – Last deathless day on Texas roads:

- → November 7, 2000

In our region, 1 of 40 (2.5%) of male deaths are caused by motor vehicle crashes

The Problem – What

- **What** is a crash?
- A **collision** occurs when two objects occupy the **same space** at the **same time**



The Problem – How

- **How** does a fatal crash occur?
- Collision impact > survivable force

Source: Tenor
See also, iihs.org

The Solution – Physics

Separate road users in **space**

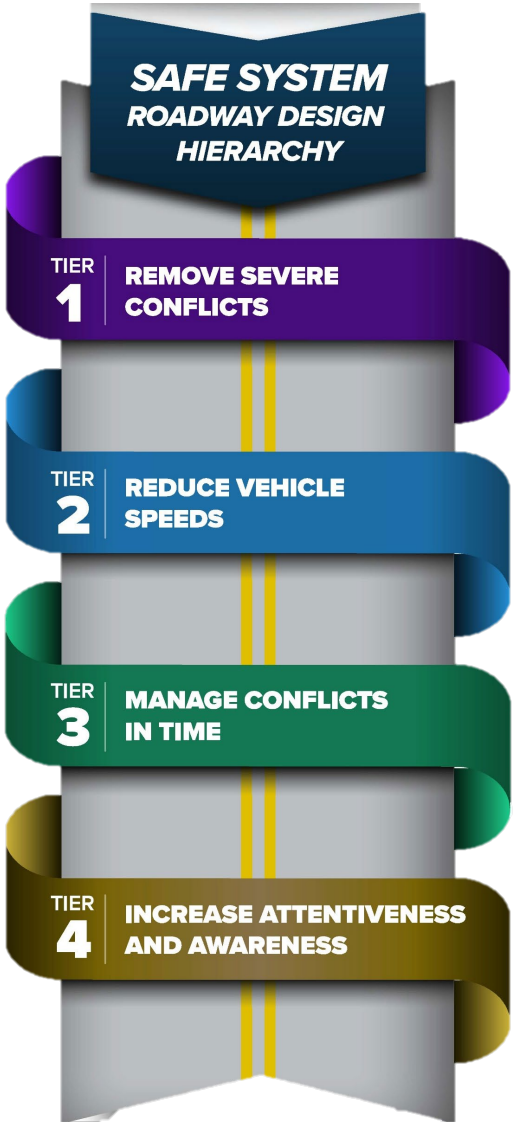
- Non-motorized users
- Intersections
- At-grade crossings

Reduce **speed**

- Reduce energy/force

Separate road users in **time**

- Traffic signal phasing
- Hybrid beacons

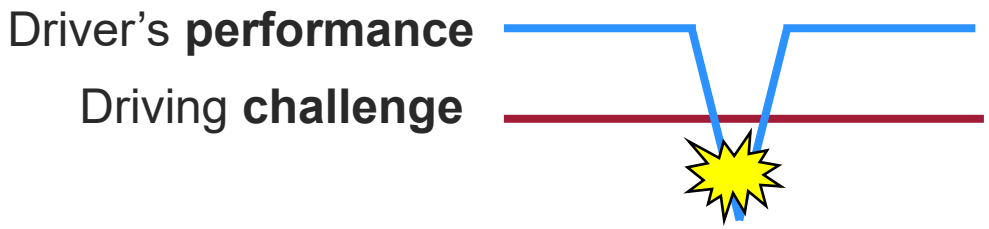


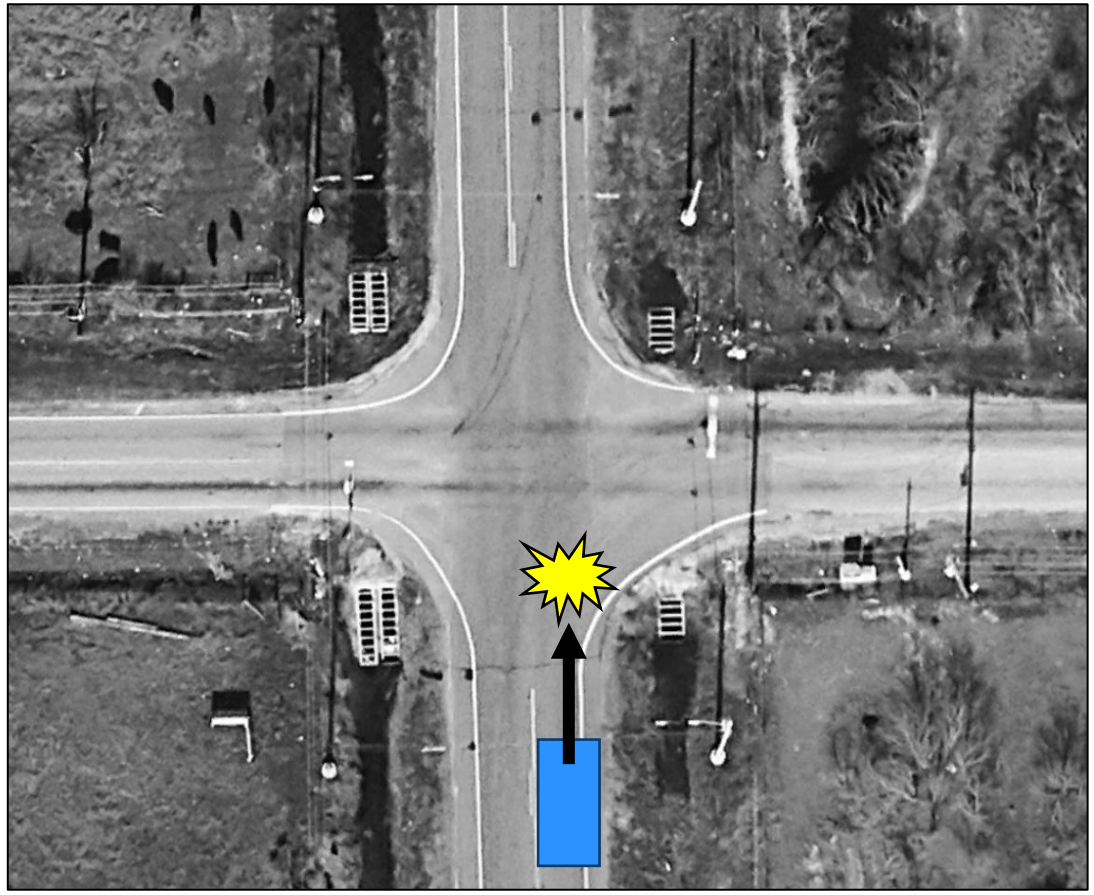
Source: Safe System Roadway Design Hierarchy

The Problem – Why, Binary

- **Why** do crashes occur?

Driving **challenge** >>> Driver's **performance**

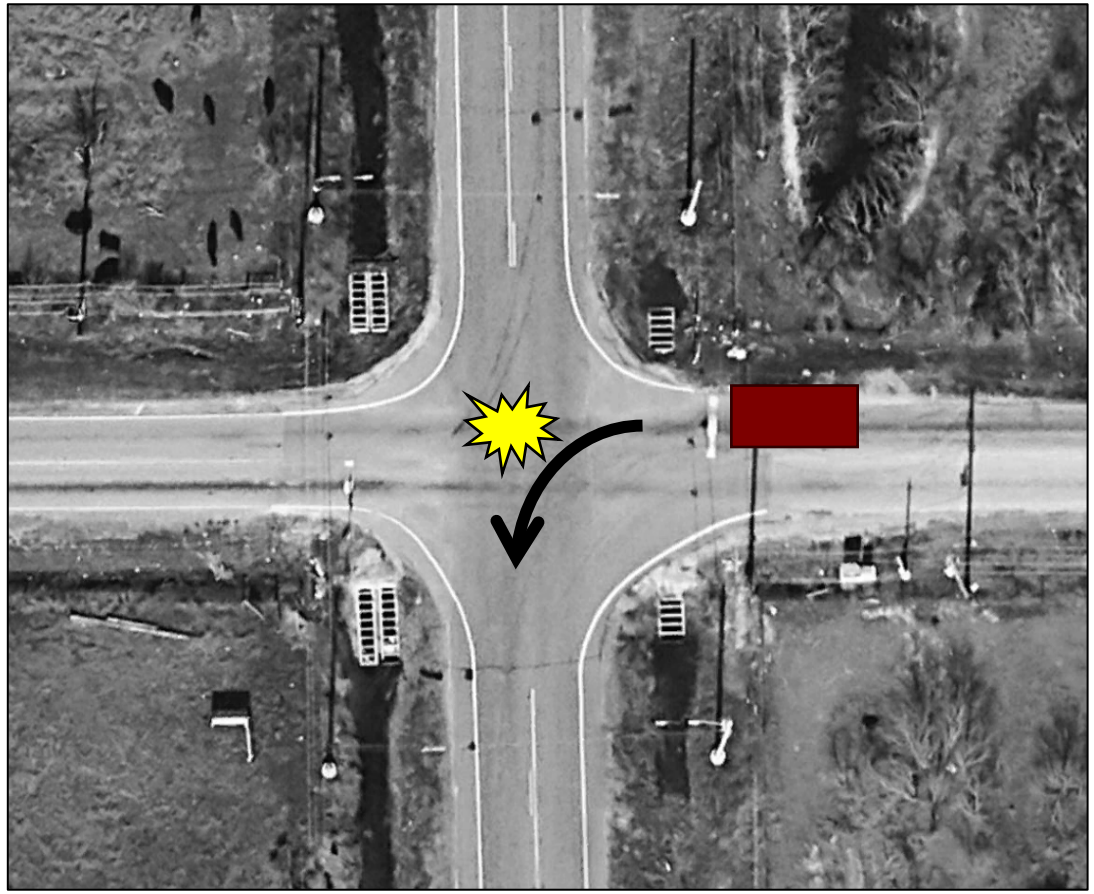




The Problem – Why, Binary

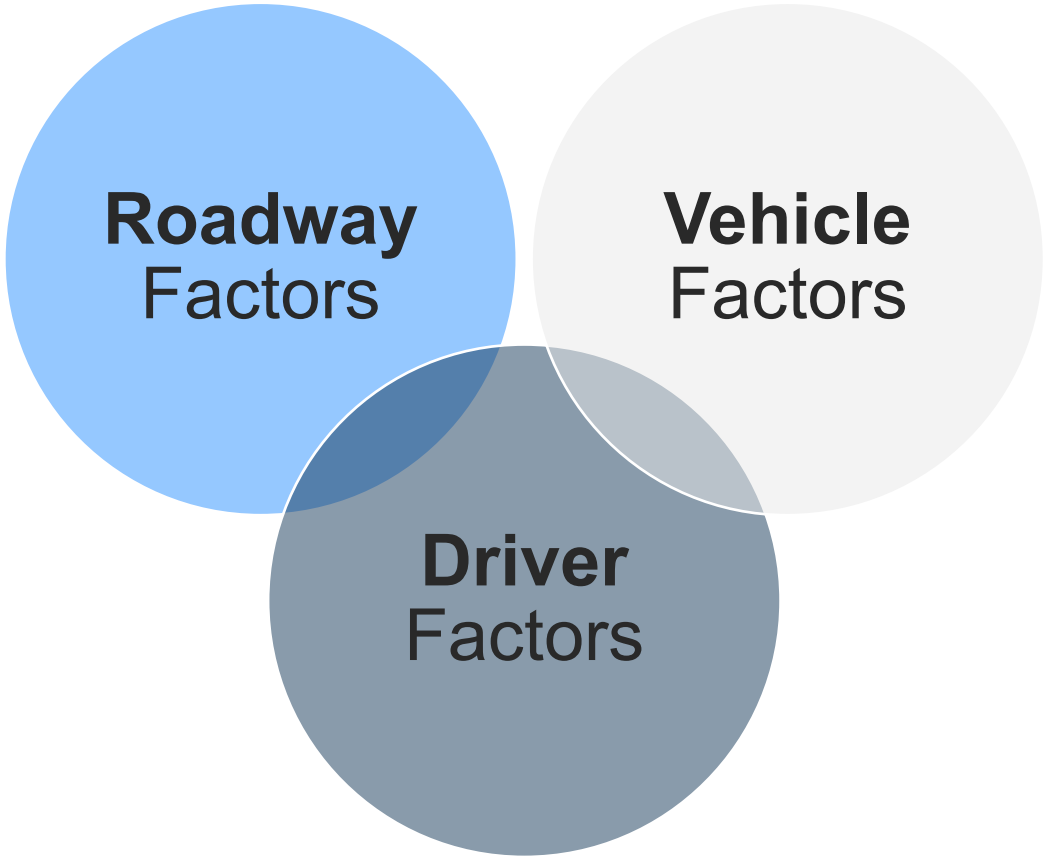
- **Why** do crashes occur?

Driving **challenge** >>> Driver's **performance**



The Problem – Why, Ternary

- **Why** do crashes occur?
  - →Driver factors
  - →Roadway factors
  - →Vehicle factors



See NCHRP Research Report 1111/BTSCRP Research Report 12, Figure 5. (originally adapted from Treat et al., 1979).

The Problem – Why, The System

- **Why** do crashes occur?
  - →Driver factors
  - →Roadway factors
  - →Vehicle factors

The System

Source: FHWA

"Every system is perfectly designed for the outcomes it produces."

- Dr. Paul Batalden

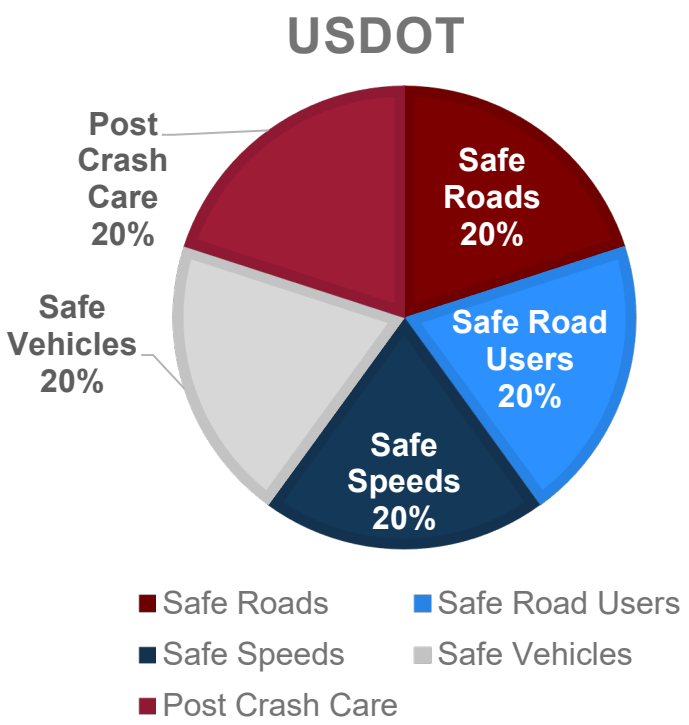
The Solution – A Safe System

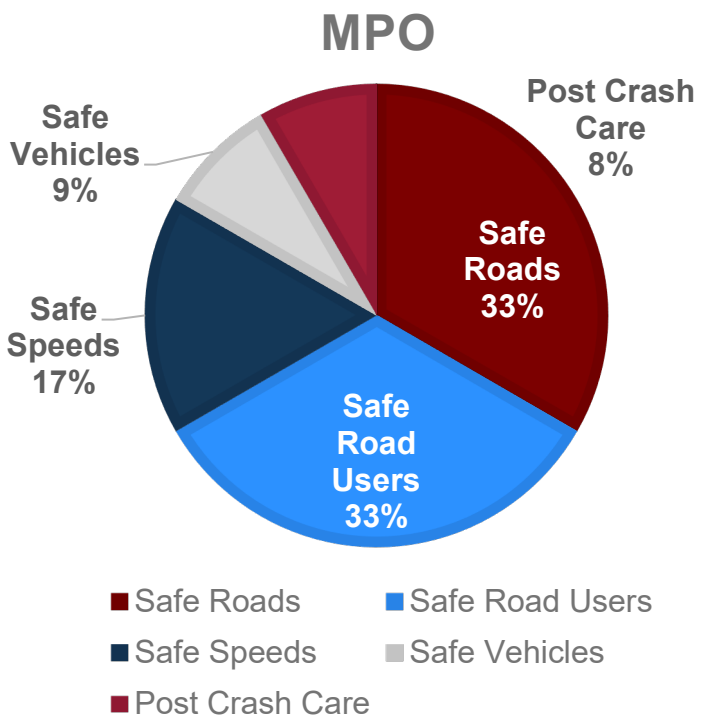
- **Elements of the safe system**
  - →Safer People
  - →Safer Roads
  - →Safer Vehicles
  - →Safer Speeds
  - →Post-Crash Care

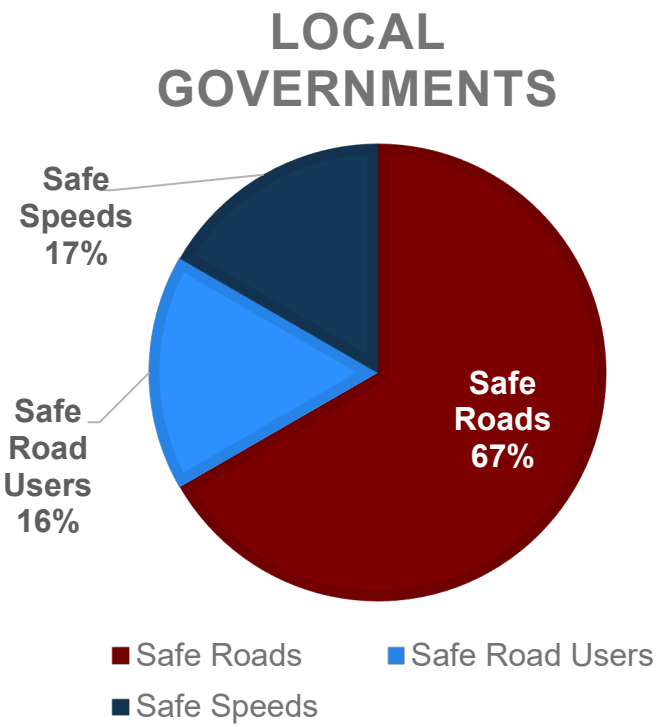
Source: FHWA

The Solution – Shared Responsibility

- **Shared responsibility ≠ Same responsibility**

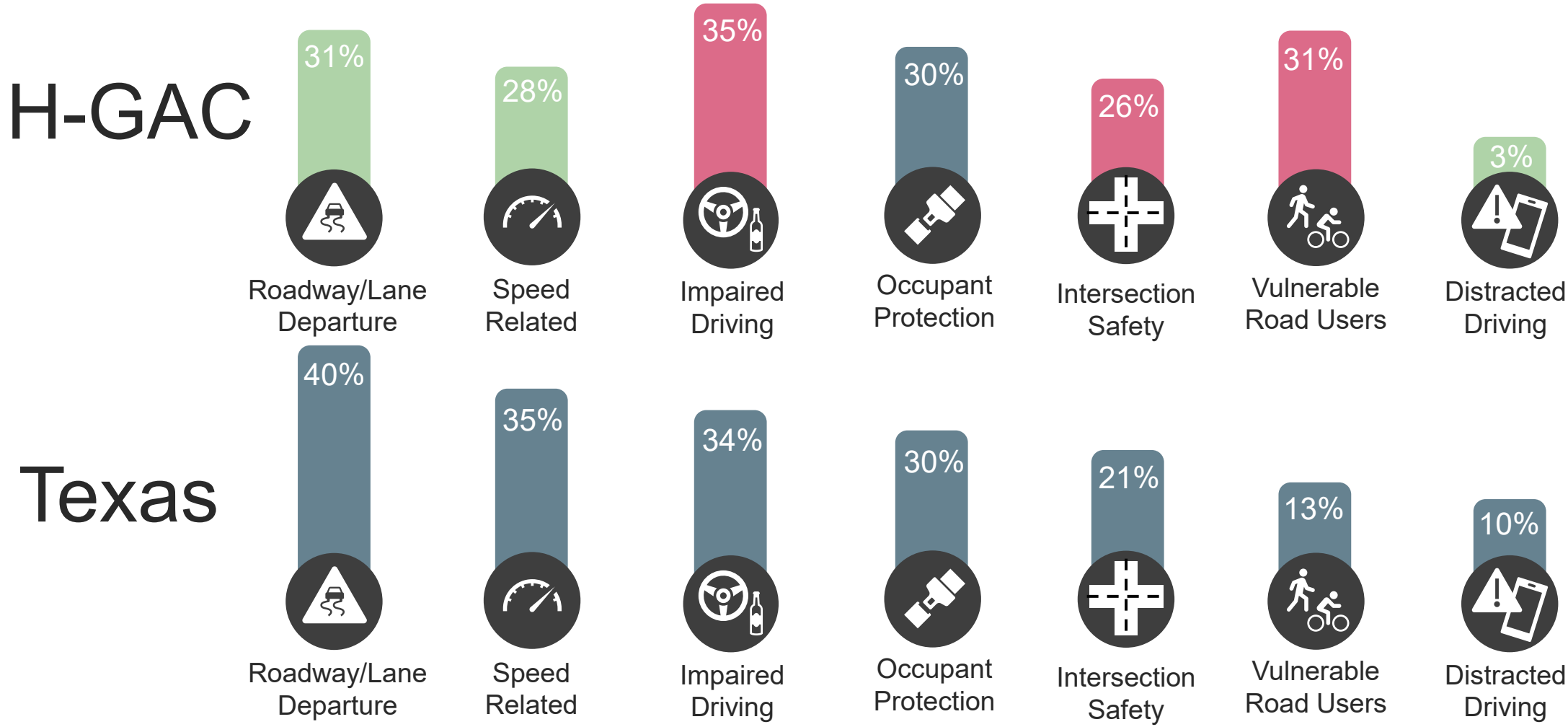






Kimley»Horn

The Problem – Why, Emphasis Areas



Kimley»Horn

Mentimeter

What is your experience with road safety?

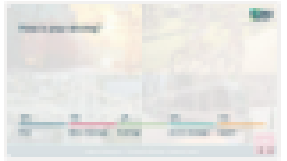
0	0	0	0
Capacity analysis is my jam!	I've heard of Vision Zero/SS4A. What's the HSM?	I've used the Roadway Safety Management Process (HSM Part B).	I wrote the HSM. I calculate SPFs in my sleep.

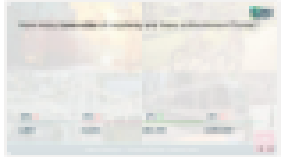
menti.com
9893 1640

Waiting for participants

Menti

Select which slide to add



Mentimeter

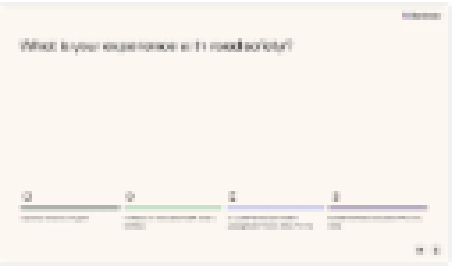
In your opinion, what are the primary causes of traffic fatalities and serious injuries within your area?

menti.com
9893 1640

Waiting for participants

Menti
TexITE

Select which slide to add



Mentimeter

How is your driving?

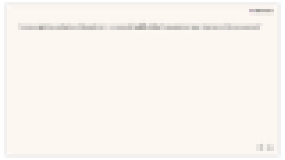
0%	0%	0%	0%	0%
Poor	Below Average	Average	Above Average	Expert

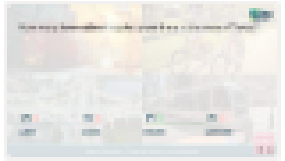
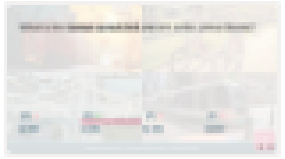
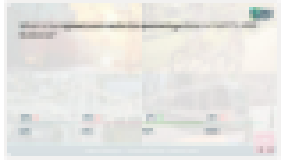
menti.com
9893 1640

Waiting for participants

Menti

Select which slide to add

Safety Analysis

Kimley»Horn
Expect More. Experience Better.

Where do we begin?

Effective Safety Planning Requires…

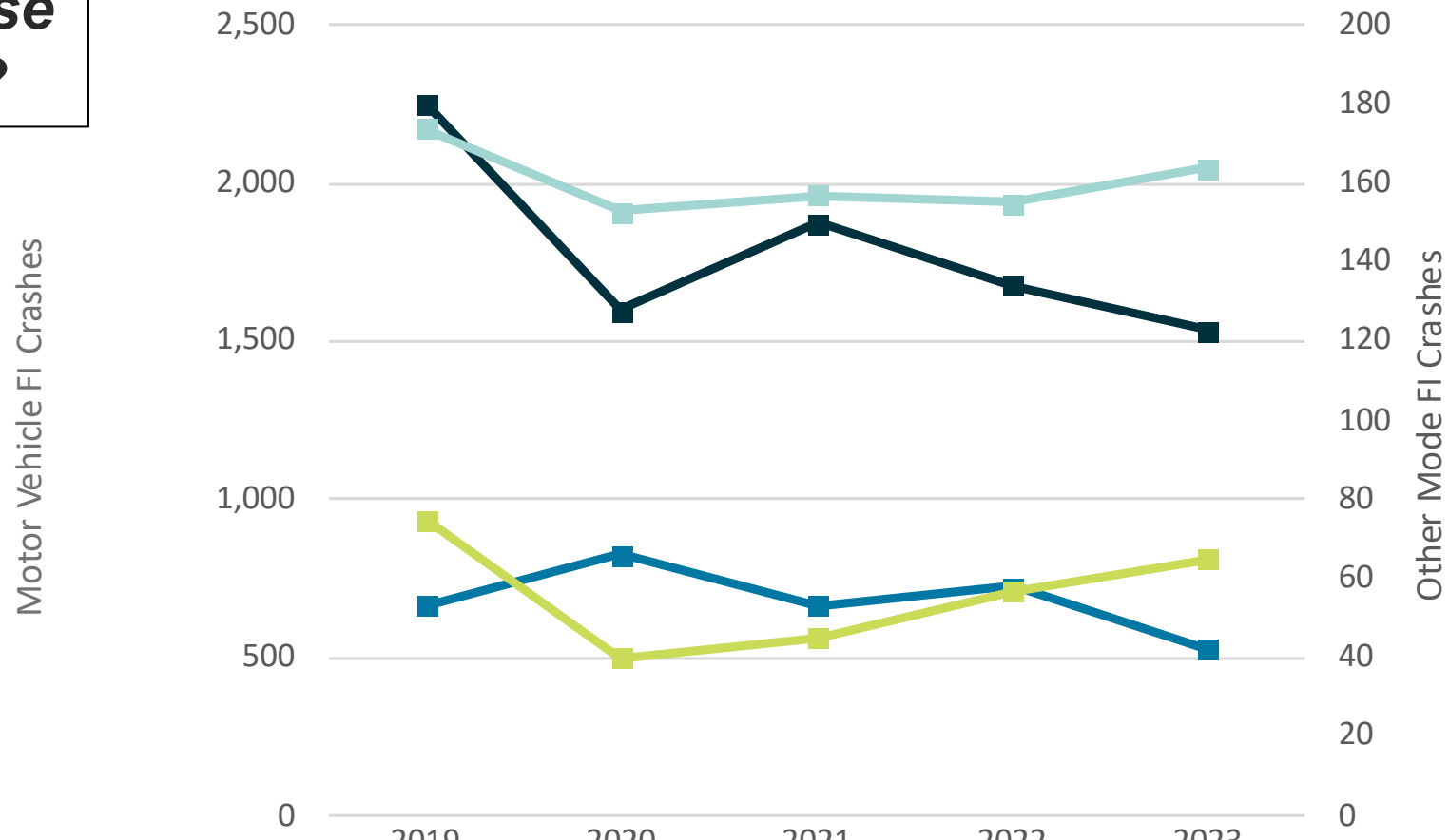
- **Shared understanding** of community safety conditions
- **Clear vision** for ending fatal and serious injury crashes
- **Multidisciplinary leadership** & safety champions


Find your community's *Safety Story*
Kimley»Horn
Expect More. Experience Better.

Safety Over Time

What's driving these changes?

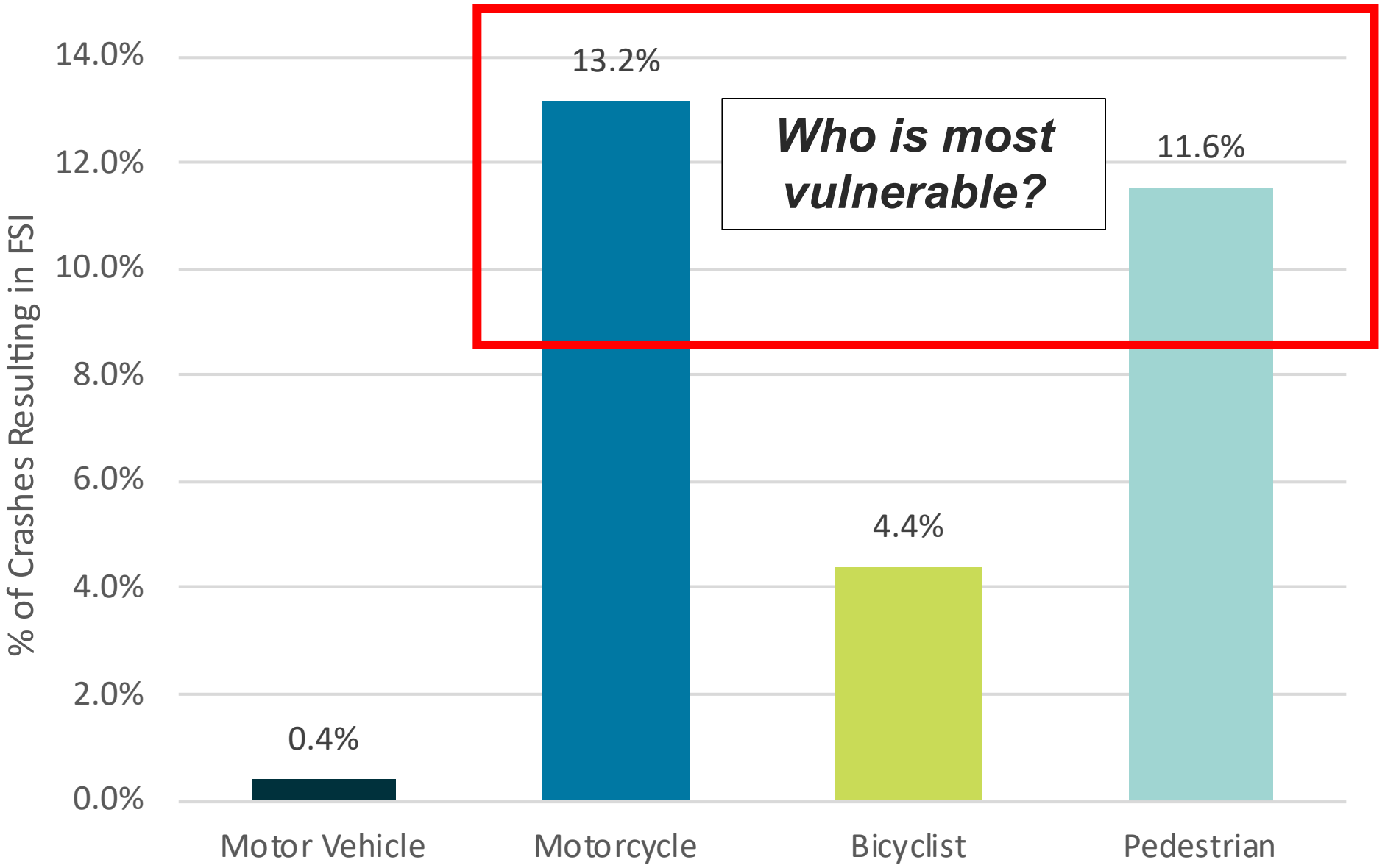
Crashes by Year by Mode



	2019	2020	2021	2022	2023
Motor Vehicle	2,252	1,596	1,876	1,674	1,534
Motorcycle	53	66	53	58	42
Bicyclist	75	40	45	57	65
Pedestrian	174	153	157	155	164

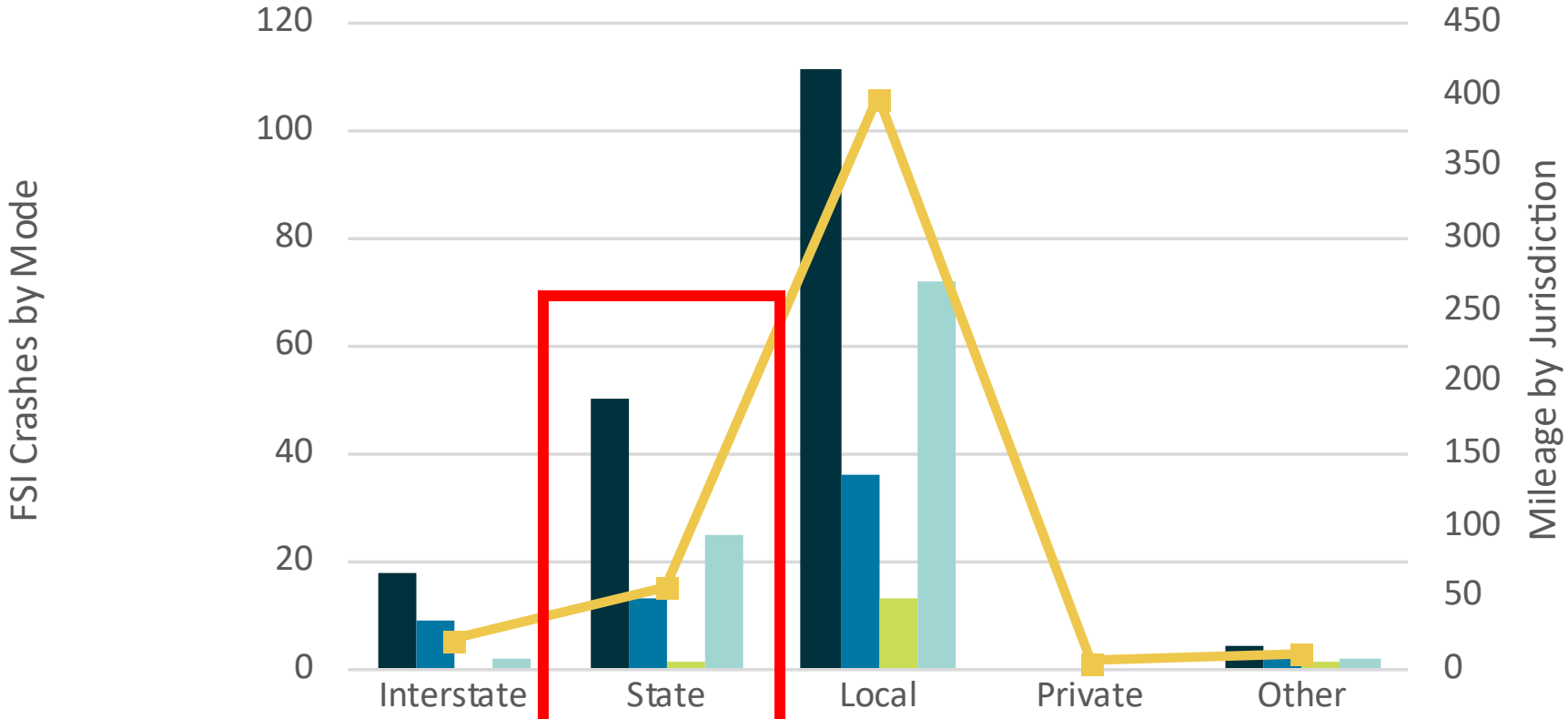
(Figures are from an example mid-sized city)

Modal Patterns



Safety by Jurisdiction

Who do we need at the table?

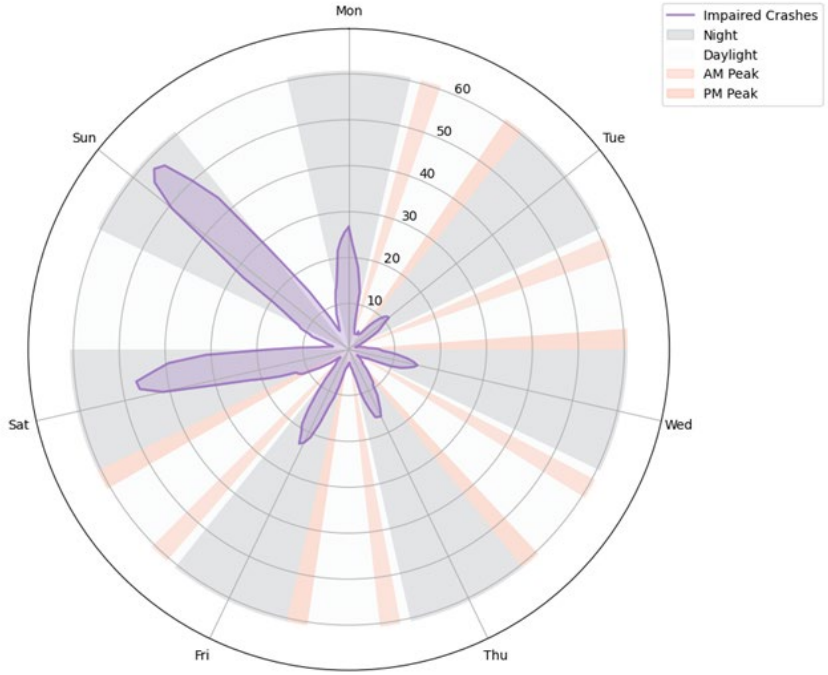


	Interstate	State	Local	Private	Other
Motor Vehicle	18	50	111	0	4
Motorcycle	9	13	36	0	2
Bicyclist	0	1	13	0	1
Pedestrian	2	25	72	0	2
Mileage	21	57	398	6	10

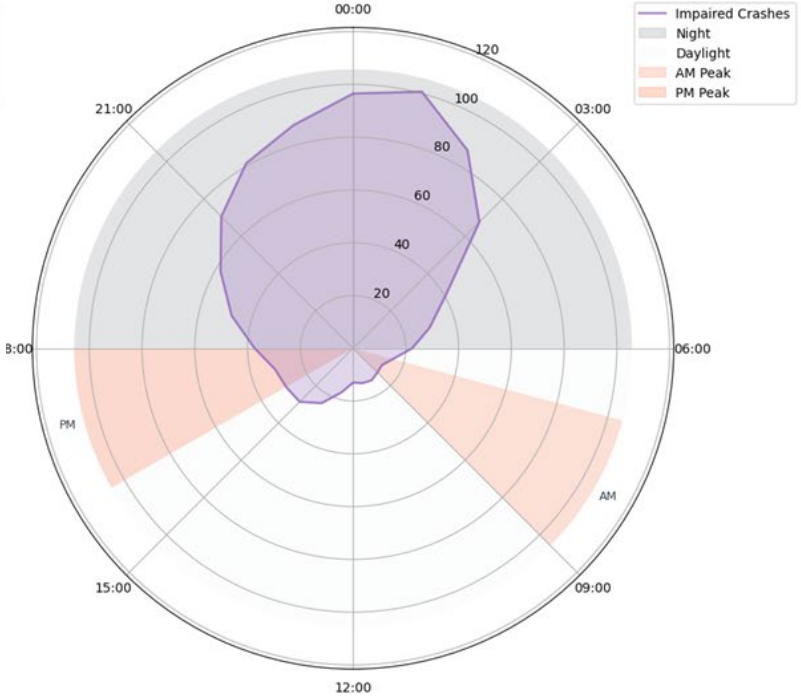
Temporal Patterns

Temporal Pattern of Impaired Crashes

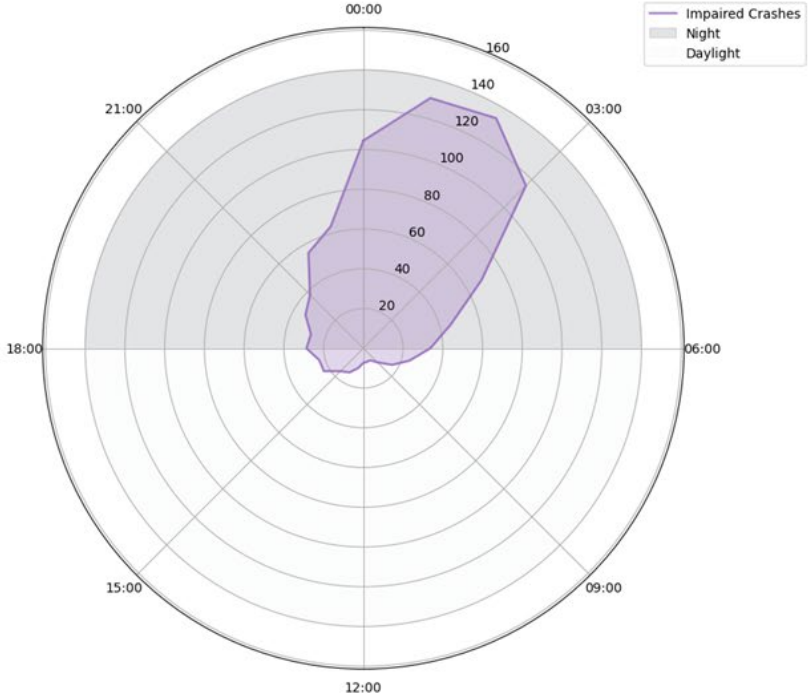
Day of Week



Hour of Workday



Hour of Weekend



Kimley»Horn

How do we respond to human behaviors?

Now that we understand our safety story, let's…

Find <u>opportunities</u> to *make things better*

Kimley»Horn

Expect More. Experience Better.

Road Safety Management Process

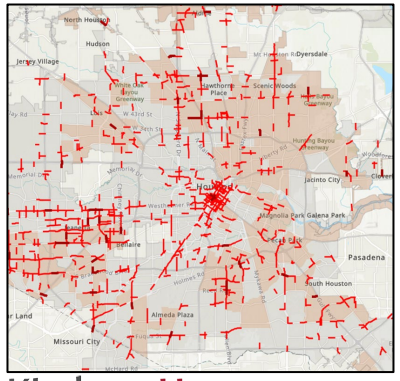
STEP 1 — **Network Screening** — *Where?*

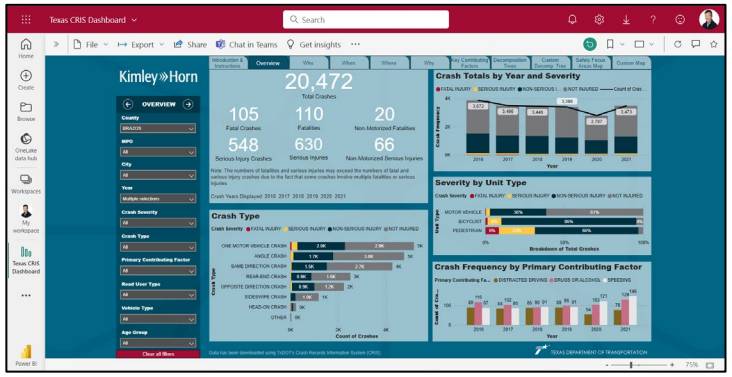
STEP 2 — **Diagnosis** — *Why?*

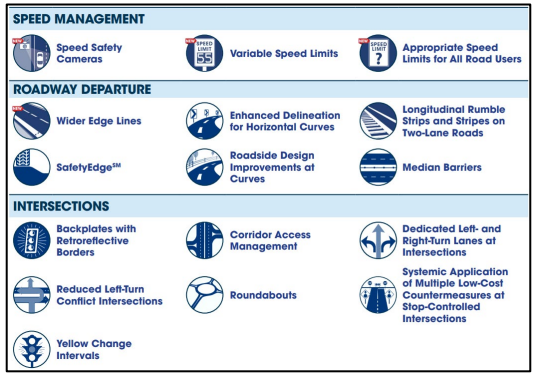
STEP 3 — **Countermeasure Selection** — *What?*

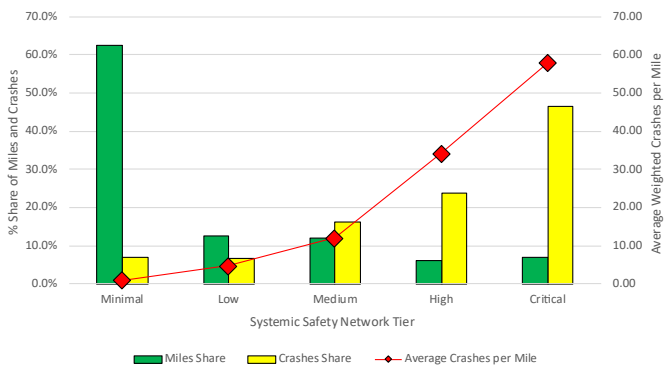
STEP 4 — **Economic Appraisal** — *How?*

STEP 5 — **Prioritize Projects** — *When?*







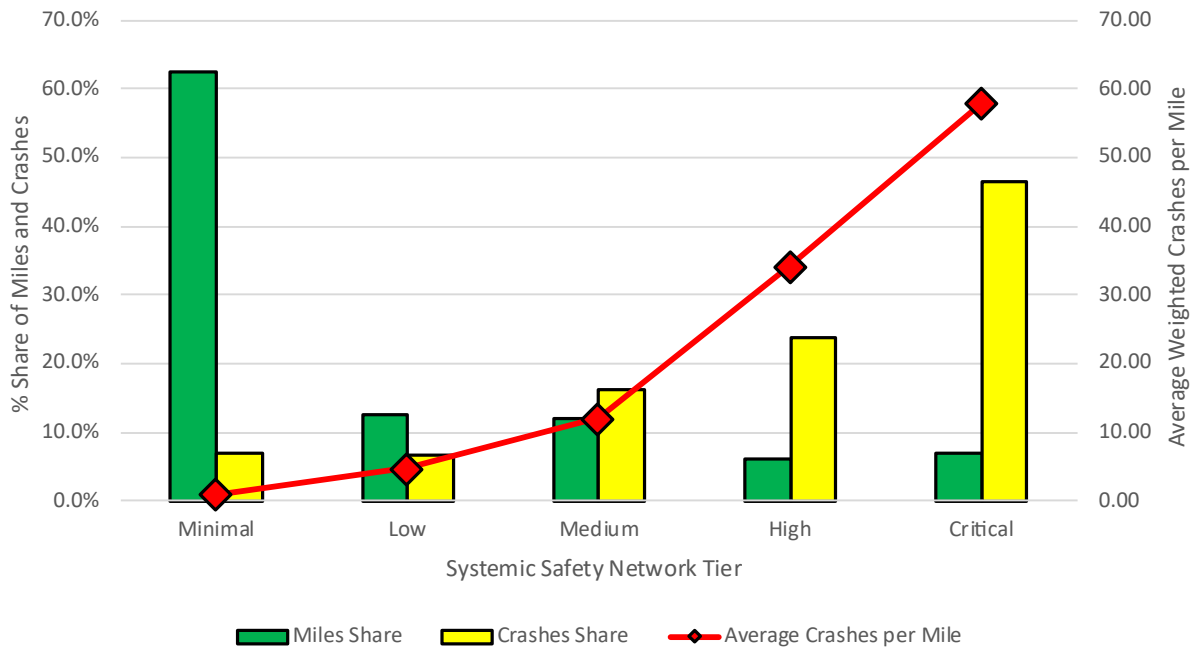


Kimley»Horn

Big Network, Limited Funds

Where can we save the most lives?

- **Reactive**: Where have crashes occurred recently?
- **Proactive**: Where might crashes occur next?



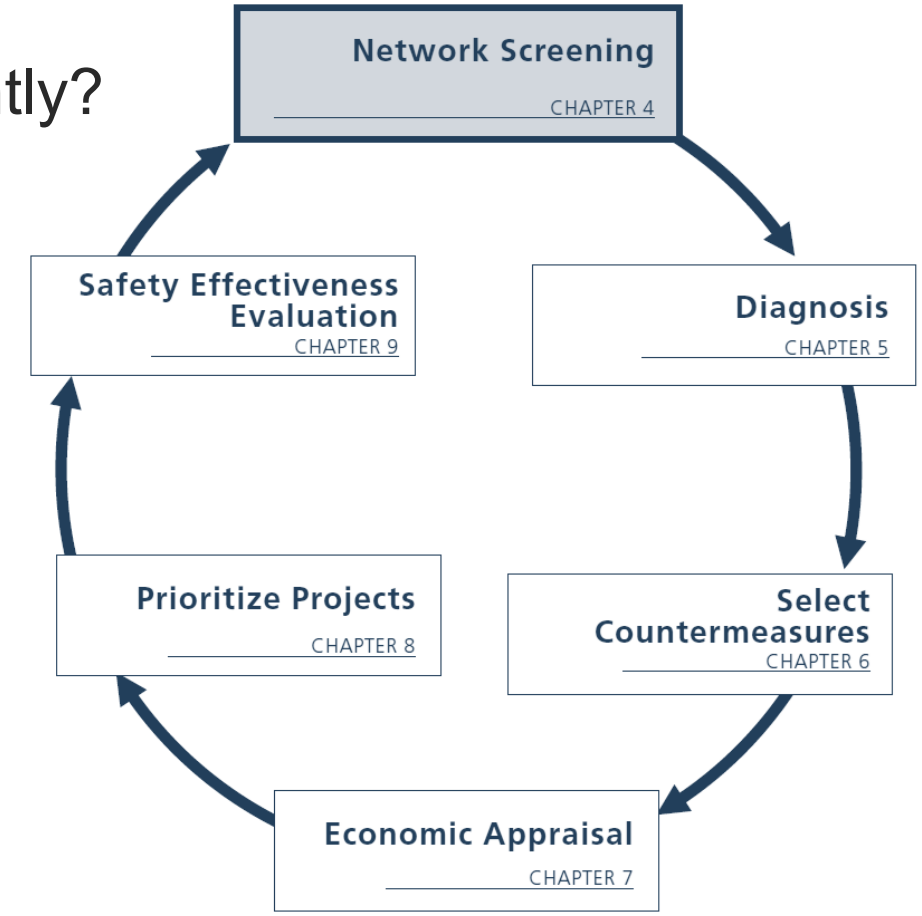
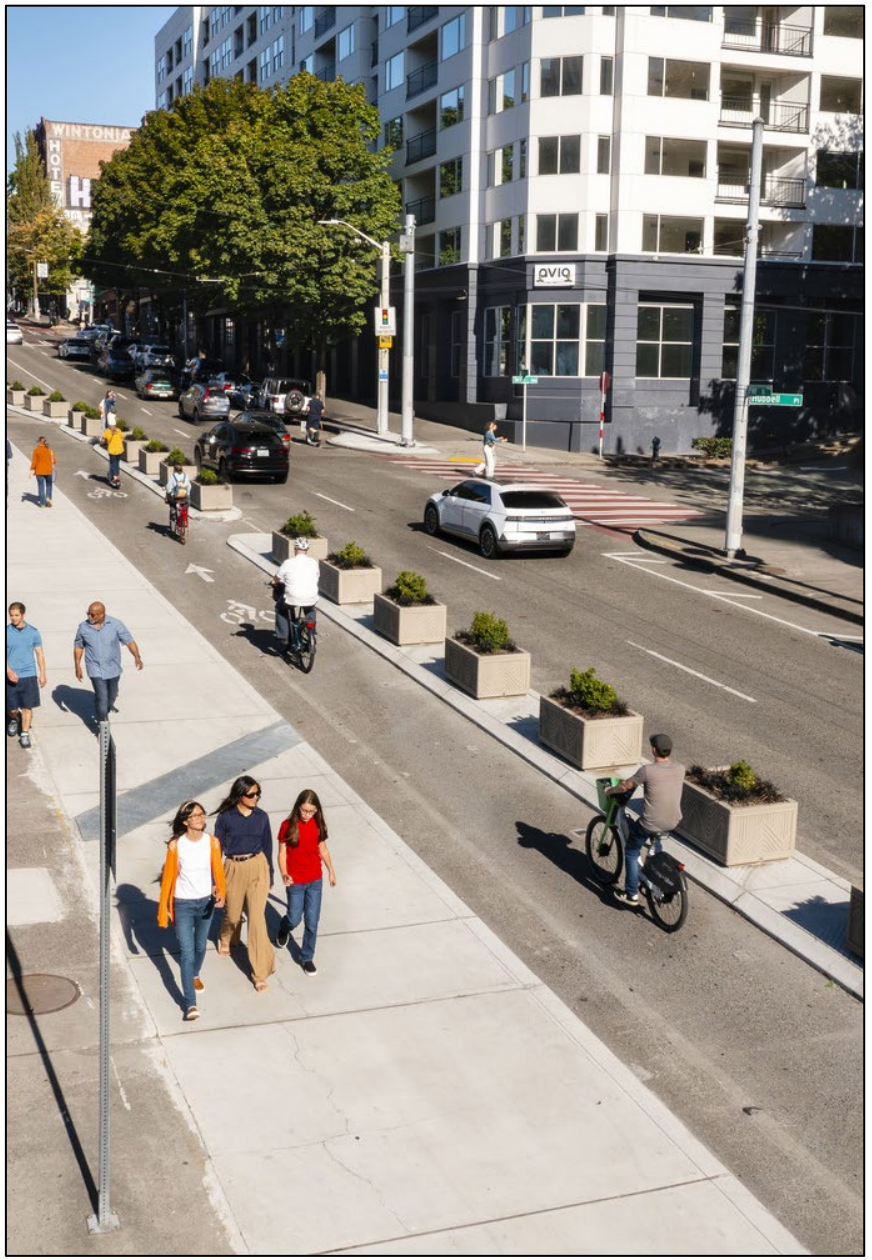


Figure 4-1. Roadway Safety Management Process

Kimley»Horn

Measuring Safety Performance

1. Not all crashes are equal
2. Different modes, different solutions
3. Consider the context



Severity Tells a Story

Fatal & All Injury

Day of Week	Time of Day: From 12 AM To 3 AM	From 3 AM To 6 AM	From 6 AM To 9 AM	From 9 AM To 12 PM	From 12 PM To 3 PM	From 3 PM To 6 PM	From 6 PM To 9 PM	From 9 PM To 12 AM
Mon	82	41	160	197	258	**331**	182	131
Tues	51	27	176	208	288	**353**	223	130
Wed	59	31	182	212	287	**383**	222	114
Thu	38	30	159	211	257	**347**	192	154
Fri	88	37	163	206	304	**360**	269	218
Sat	186	58	76	172	305	276	247	240
Sun	248	83	66	107	239	269	196	160
	Dark Conditions		AM Peak	Light Conditions		PM Peak	Dark Conditions	

FI Crashes All Modes

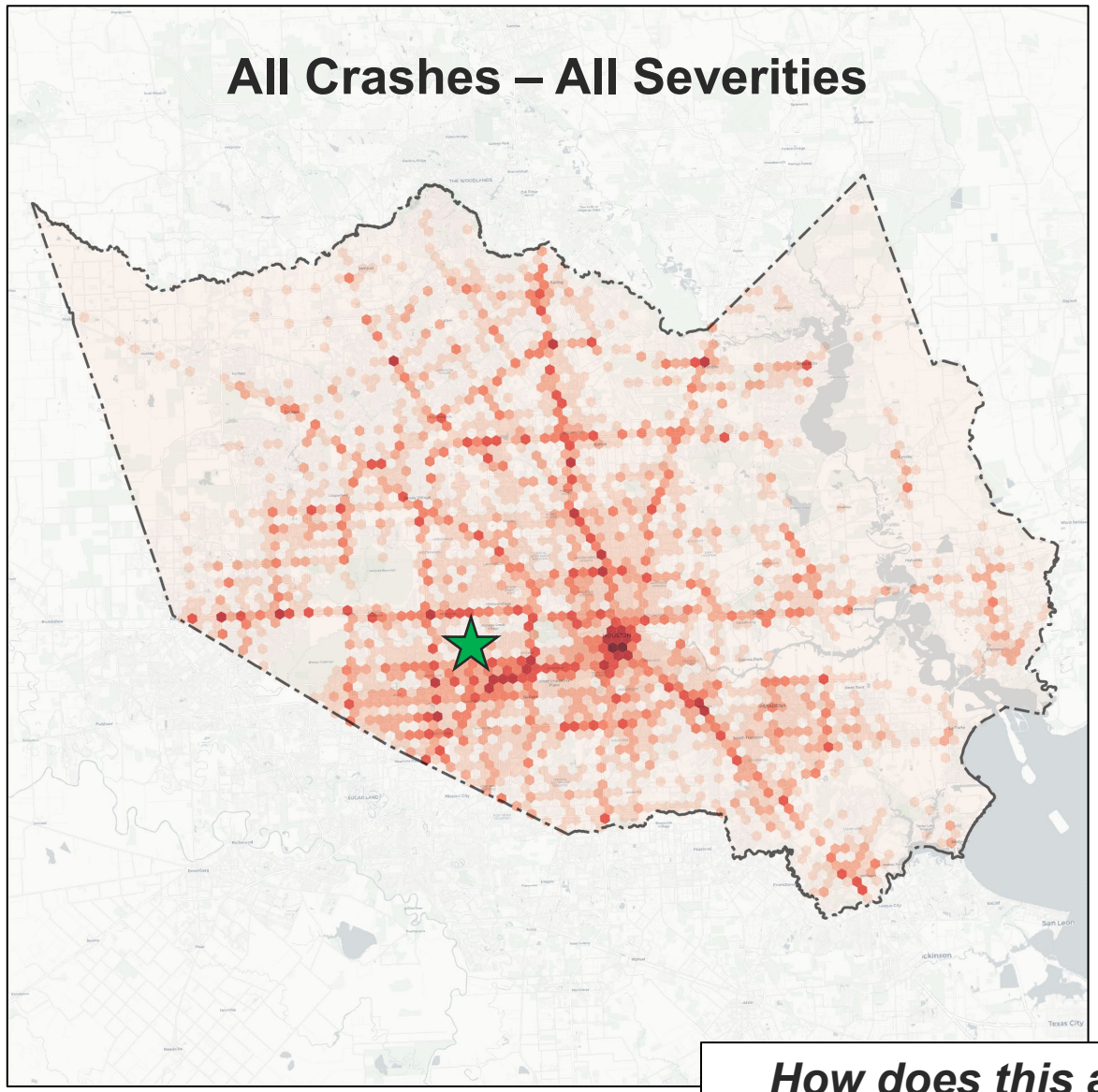
Fatal & Serious Injury

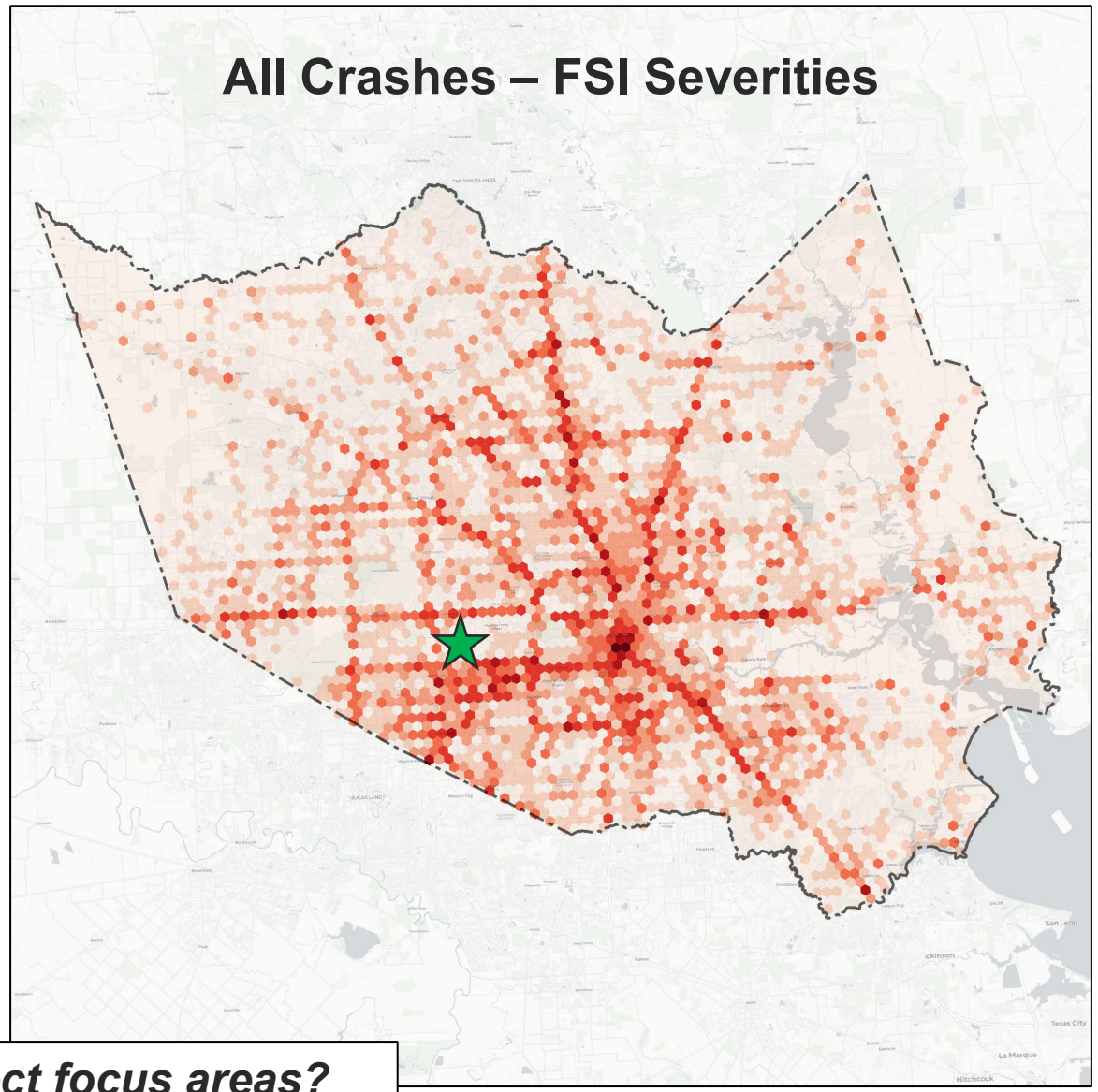
Day of Week	From 12 AM To 3 AM	From 3 AM To 6 AM	From 6 AM To 9 AM	From 9 AM To 12 PM	From 12 PM To 3 PM	From 3 PM To 6 PM	From 6 PM To 9 PM	From 9 PM To 12 AM
Mon	11	6	3	3	4	6	6	**14**
Tues	3	3	4	3	2	7	**15**	8
Wed	5	1	7	4	5	6	9	5
Thu	4	2	1	2	3	5	11	5
Fri	11	3	6	5	4	11	6	**13**
Sat	**13**	5	2	2	8	9	12	**15**
Sun	**23**	3	3	2	6	7	9	8
	Dark Conditions		AM Peak	Light Conditions		PM Peak	Dark Conditions	

FSI Crashes All Modes

Kimley»Horn

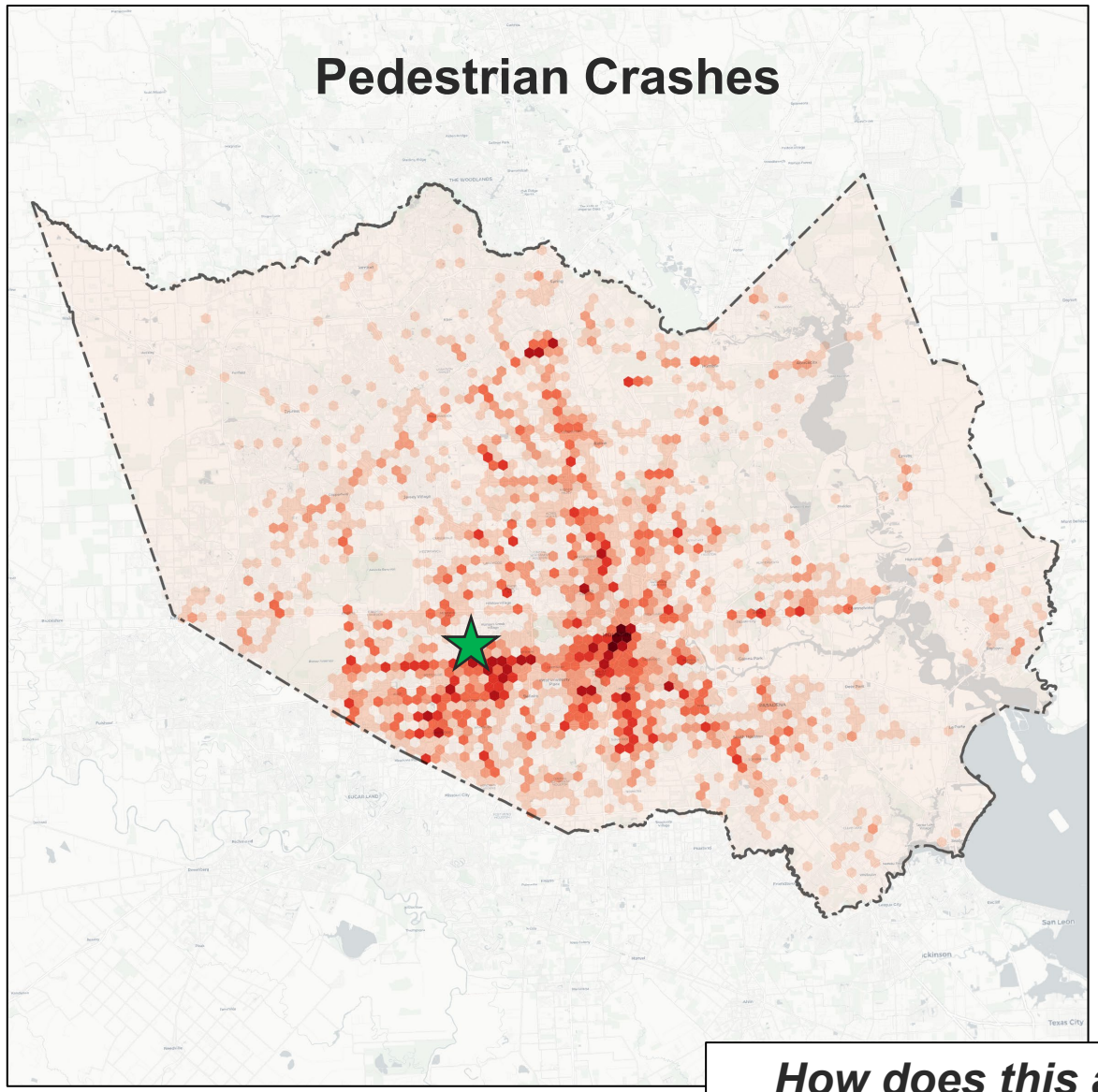
The Network Looks Different Depending on the Question

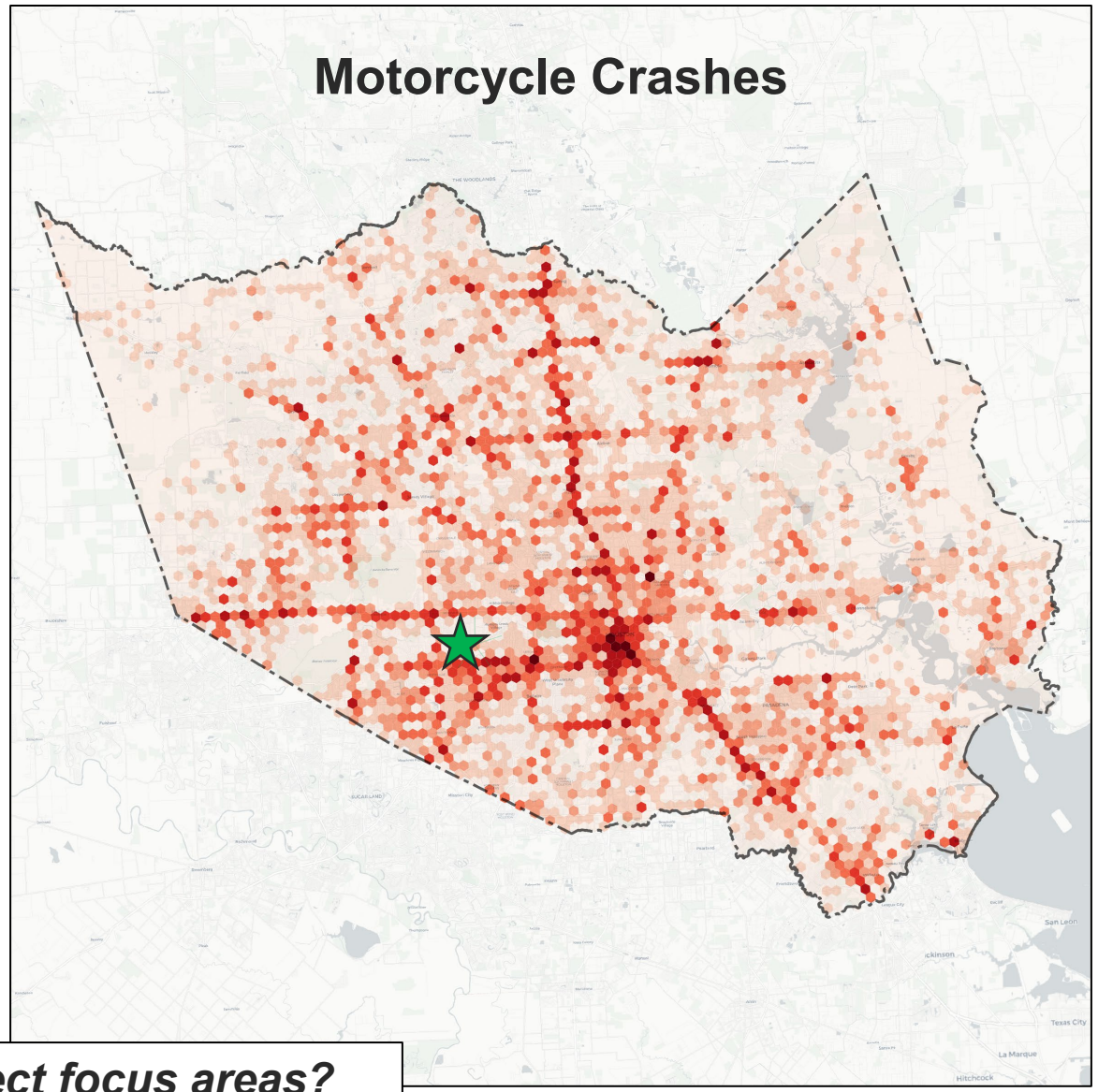




How does this affect focus areas?

The Network Looks Different Depending on the Question





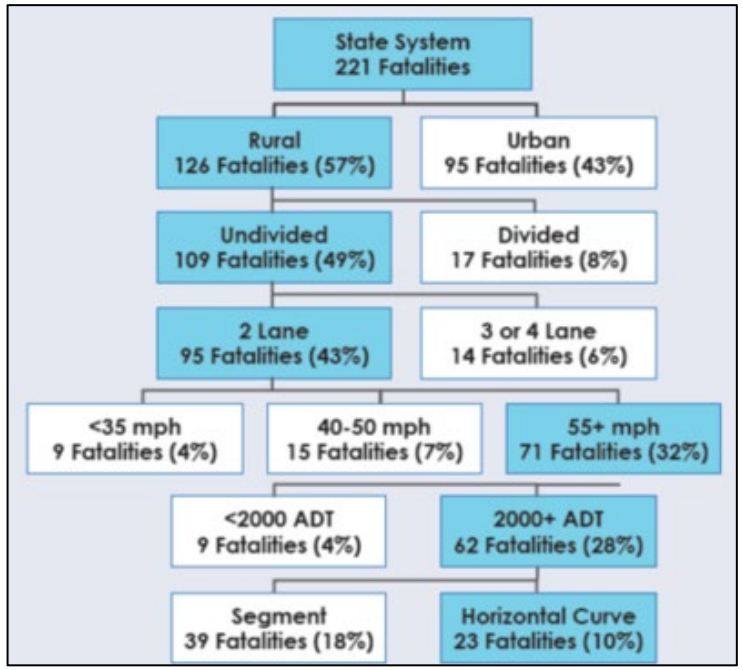
How does this affect focus areas?

Digging Deeper

Kimley»Horn

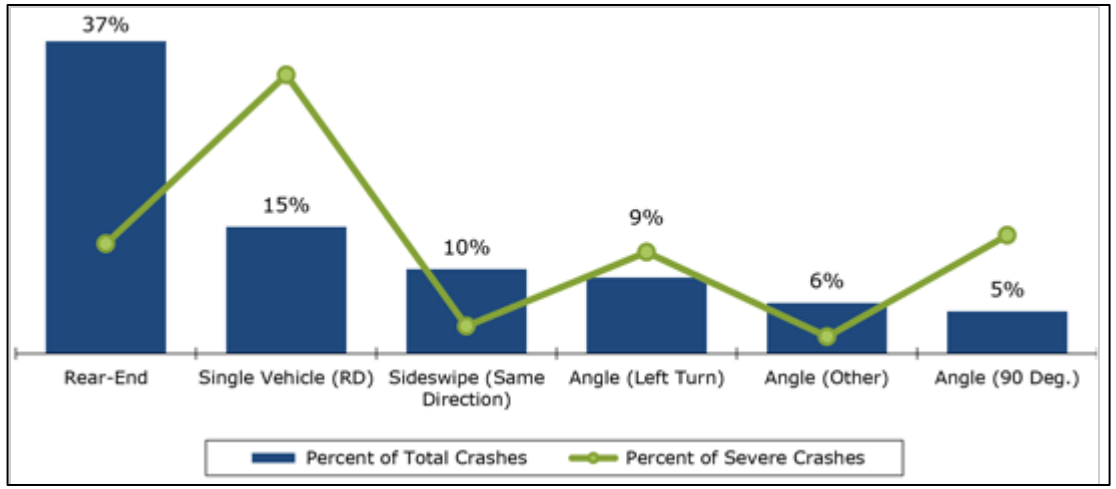
Facility Type

- Arterial vs. Neighborhood
- Signalized vs. Unsignalized
- Balancing the program
- E.g., crash trees

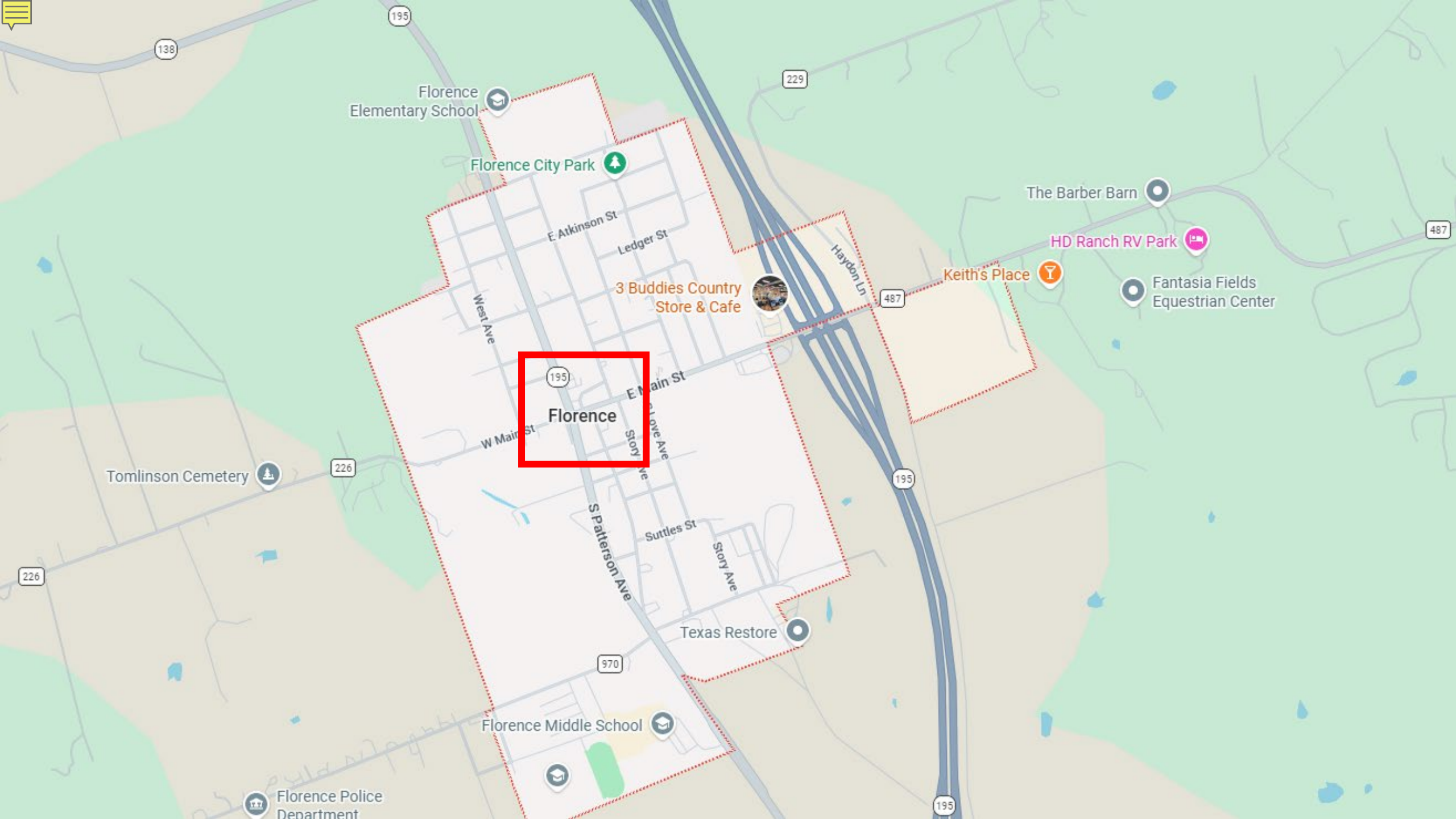


Crash Type Overrepresentation

- Identify actionable patterns
- Consider collision type, mode, emphasis areas
- E.g., HSM 4.4.2.9



Crosstimbers Street


Florence
Elementary School
Florence City Park
E Atkinson St
Ledger St
West Ave
3 Buddies Country
Store & Cafe
Haydon Ln
The Barber Barn
HD Ranch RV Park
Keith's Place
Fantasia Fields
Equestrian Center
E Main St
W Main St
Florence
Story Ave
Love Ave
Tomlinson Cemetery
S Patterson Ave
Suttles St
Story Ave
Texas Restore
Florence Middle School
Florence Police
Department
138
195
229
487
226
970


Main St, Eastbound
VERABANK
VERABANK
87


LEFT TURN
YIELD
ON GREEN
N Patterson Ave
Patterson Ave, Northbound

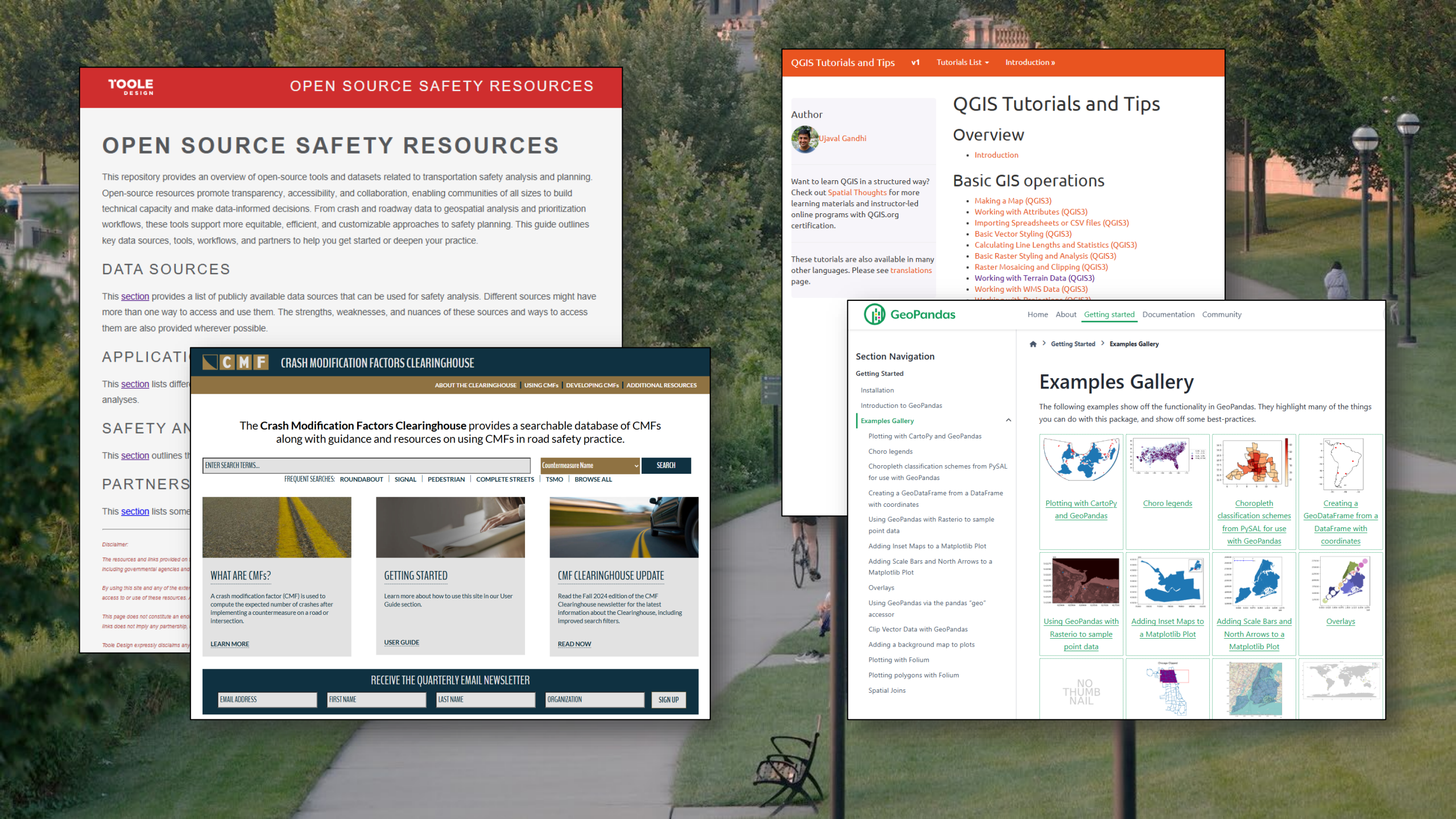
Resources – Network Screening

Network Screening

- HSM Chapter 4
- City of Houston Vision Zero
- City of Houston Vision Zero High Injury Map
- H-GAC Transportation Safety Program
- Texas Pedestrian Safety Action Plan
- Safer Streets Priority Finder
- Open-Source Safety Analysis Tools

Systemic Approach

TxDOT SHSP
FHWA Systemic Approach to Safety
Quick Start Guide Systemic Safety Analysis (FHWA-SA-17-009)


TOOLE DESIGN
OPEN SOURCE SAFETY RESOURCES
OPEN SOURCE SAFETY RESOURCES
This repository provides an overview of open-source tools and datasets related to transportation safety analysis and planning. Open-source resources promote transparency, accessibility, and collaboration, enabling communities of all sizes to build technical capacity and make data-informed decisions. From crash and roadway data to geospatial analysis and prioritization workflows, these tools support more equitable, efficient, and customizable approaches to safety planning. This guide outlines key data sources, tools, workflows, and partners to help you get started or deepen your practice.
DATA SOURCES
This section provides a list of publicly available data sources that can be used for safety analysis. Different sources might have more than one way to access and use them. The strengths, weaknesses, and nuances of these sources and ways to access them are also provided wherever possible.
APPLICATI
This section lists differ
analyses.
SAFETY AN
This section outlines t
PARTNERS
This section lists some
Disclaimer:
The resources and links provided on
including governmental agencies and
By using this site and any of the exte
access to or use of these resources.
This page does not constitute an end
links does not imply any partnership,
Toole Design expressly disclaims any
CMF
CRASH MODIFICATION FACTORS CLEARINGHOUSE
ABOUT THE CLEARINGHOUSE | USING CMFs | DEVELOPING CMFs | ADDITIONAL RESOURCES
The Crash Modification Factors Clearinghouse provides a searchable database of CMFs along with guidance and resources on using CMFs in road safety practice.
ENTER SEARCH TERMS...
Countermeasure Name
SEARCH
FREQUENT SEARCHES: ROUNDABOUT | SIGNAL | PEDESTRIAN | COMPLETE STREETS | TSMO | BROWSE ALL
WHAT ARE CMFs?
A crash modification factor (CMF) is used to compute the expected number of crashes after implementing a countermeasure on a road or intersection.
LEARN MORE
GETTING STARTED
Learn more about how to use this site in our User Guide section.
USER GUIDE
CMF CLEARINGHOUSE UPDATE
Read the Fall 2024 edition of the CMF Clearinghouse newsletter for the latest information about the Clearinghouse, including improved search filters.
READ NOW
RECEIVE THE QUARTERLY EMAIL NEWSLETTER
EMAIL ADDRESS
FIRST NAME
LAST NAME
ORGANIZATION
SIGN UP
QGIS Tutorials and Tips
v1
Tutorials List
Introduction »
Author
Ujaval Gandhi
Want to learn QGIS in a structured way? Check out Spatial Thoughts for more learning materials and instructor-led online programs with QGIS.org certification.
These tutorials are also available in many other languages. Please see translations page.
QGIS Tutorials and Tips
Overview
Introduction
Basic GIS operations
Making a Map (QGIS3)
Working with Attributes (QGIS3)
Importing Spreadsheets or CSV files (QGIS3)
Basic Vector Styling (QGIS3)
Calculating Line Lengths and Statistics (QGIS3)
Basic Raster Styling and Analysis (QGIS3)
Raster Mosaicing and Clipping (QGIS3)
Working with Terrain Data (QGIS3)
Working with WMS Data (QGIS3)
GeoPandas
Home
About
Getting started
Documentation
Community
Section Navigation
Getting Started
Installation
Introduction to GeoPandas
Examples Gallery
Plotting with CartoPy and GeoPandas
Choro legends
Choropleth classification schemes from PySAL for use with GeoPandas
Creating a GeoDataFrame from a DataFrame with coordinates
Using GeoPandas with Rasterio to sample point data
Adding Inset Maps to a Matplotlib Plot
Adding Scale Bars and North Arrows to a Matplotlib Plot
Overlays
Using GeoPandas via the pandas "geo" accessor
Clip Vector Data with GeoPandas
Adding a background map to plots
Plotting with Folium
Plotting polygons with Folium
Spatial Joins
Getting Started
Examples Gallery
Examples Gallery
The following examples show off the functionality in GeoPandas. They highlight many of the things you can do with this package, and show off some best-practices.
Plotting with CartoPy and GeoPandas
Choro legends
Choropleth classification schemes from PySAL for use with GeoPandas
Creating a GeoDataFrame from a DataFrame with coordinates
Using GeoPandas with Rasterio to sample point data
Adding Inset Maps to a Matplotlib Plot
Adding Scale Bars and North Arrows to a Matplotlib Plot
Overlays
NO THUMB NAIL

Menti

TexITE

Select which slide to add

Menti

TexITE

Select which slide to add

Infrastructure Countermeasures

Kimley»Horn
Expect More. Experience Better.

Road Safety Management Process

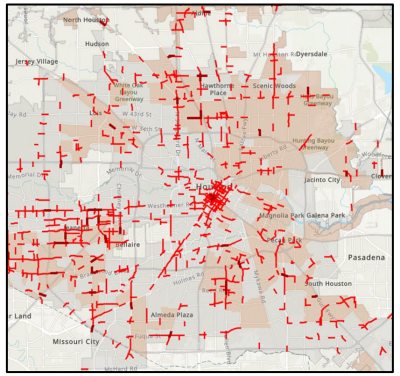
STEP 1 — **Network Screening** — *Where?*

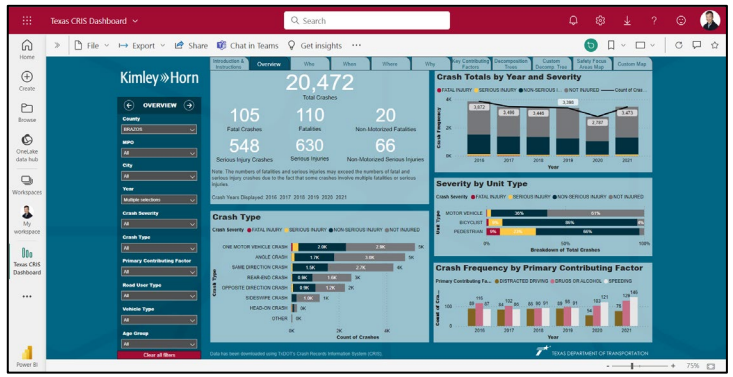
STEP 2 — **Diagnosis** — *Why?*

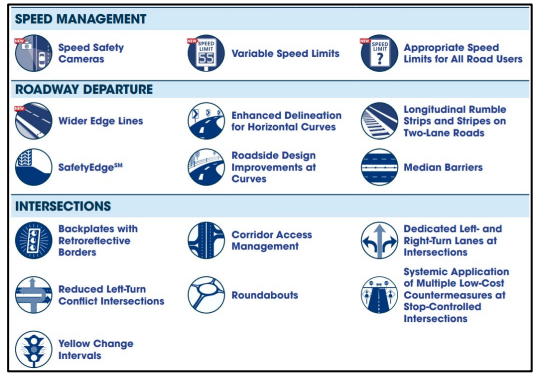
STEP 3 — **Countermeasure Selection** — *What?*

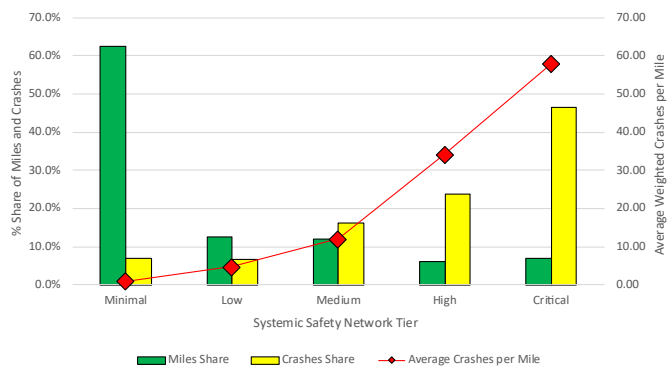
STEP 4 — **Economic Appraisal** — *How?*

STEP 5 — **Prioritize Projects** — *When?*







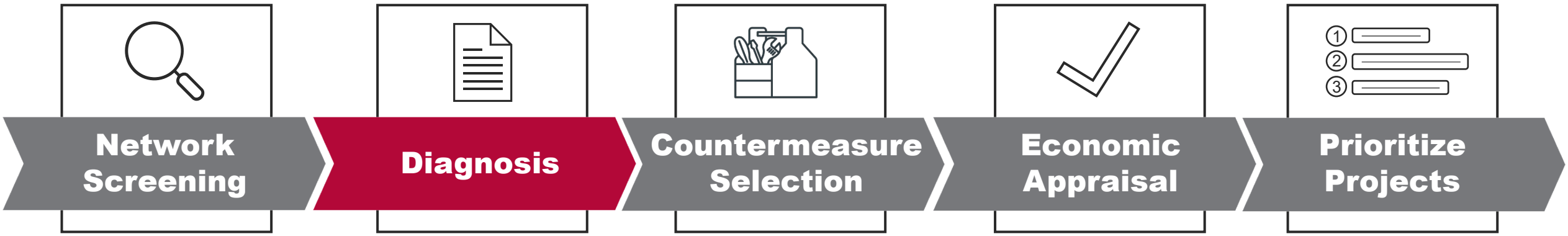


Kimley»Horn

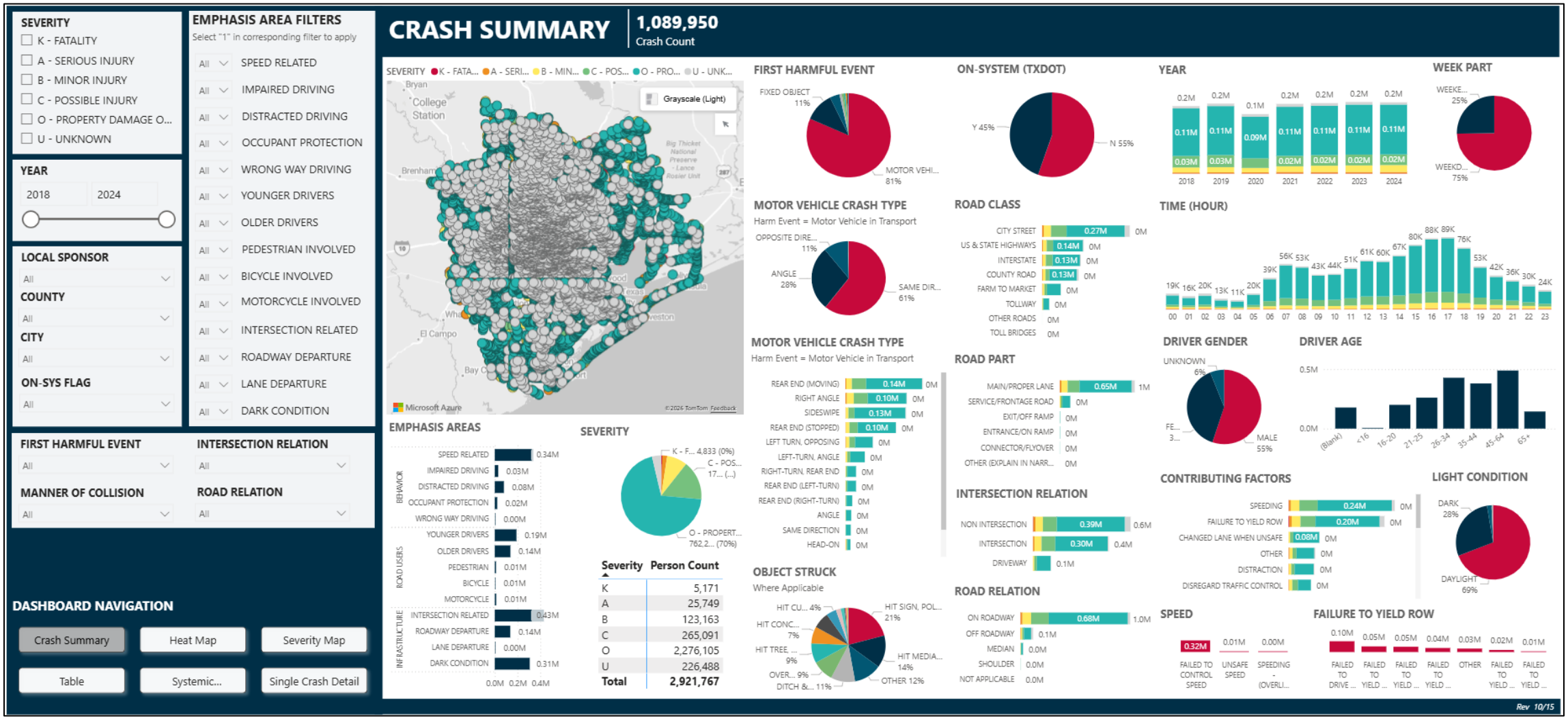
Diagnosis

"…the **identification of the causes** of the collisions and potential safety concerns or **crash patterns** that can be evaluated further."

***What** is happening, and **why**?*



Diagnosis



Kimley»Horn

Emphasis Areas

Texas Strategic Highway Safety Plan

ABOUT | EMPHASIS AREAS | RESOURCES | ANNUAL CRASHES
PROGRAMS | CALENDAR | CONTACT | TELEMATICS DATA

Home — Emphasis Areas

Emphasis Areas


Roadway & Lane Departures


Intersection Safety


Occupant Protection


Impaired Driving

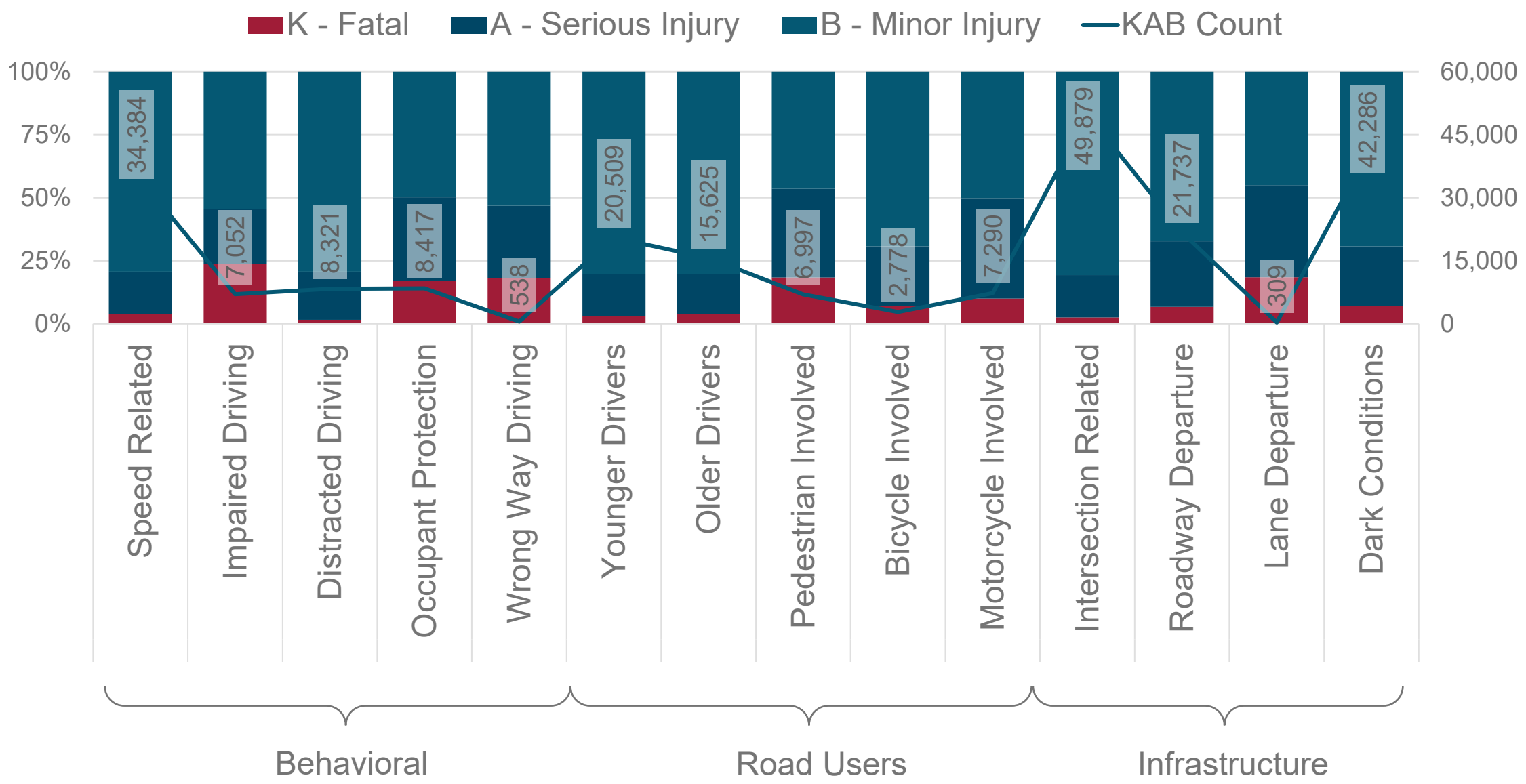

Speed Related


Distracted Driving


Vulnerable Road Users


Post-Crash Care

Emphasis Areas



Crash Over-representation

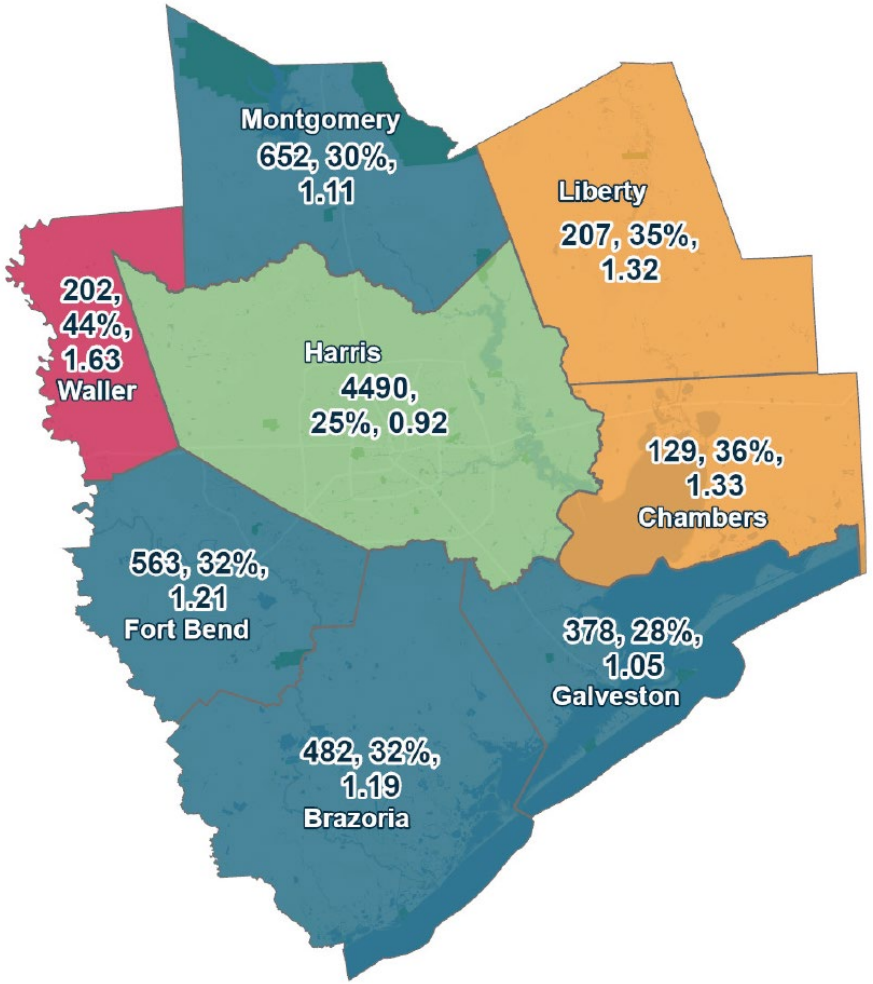
Category	Emphasis Area	Texas	H-GAC	
			Percent	Ratio to State
Behavioral	Speed Related	32%	28%	0.86
	Impaired Driving	18%	12%	0.68
	Distracted Driving	15%	7%	0.45
	Unrestrained Occupant	19%	16%	0.84
	Wrong Way Driving	-	1%	-
Road User	Younger Drivers	16%	15%	0.96
	Older Drivers	13%	12%	0.89
	Pedestrian Involved	11%	14%	1.29
	Bicycle Involved	2%	3%	1.62
	Motorcycle Involved	-	14%	-
Infrastructure	Intersection Related	32%	36%	1.14
	Roadway Departure	35%	27%	0.79
	Lane Departure		1%	
	Dark Conditions	-	49%	-

Key

- **Low** over-representation **(>1.0x)**
- **Moderate** over-representation **(>1.25x)**
- **High** over-representation **(>1.5x)**

Crash Over-Representation

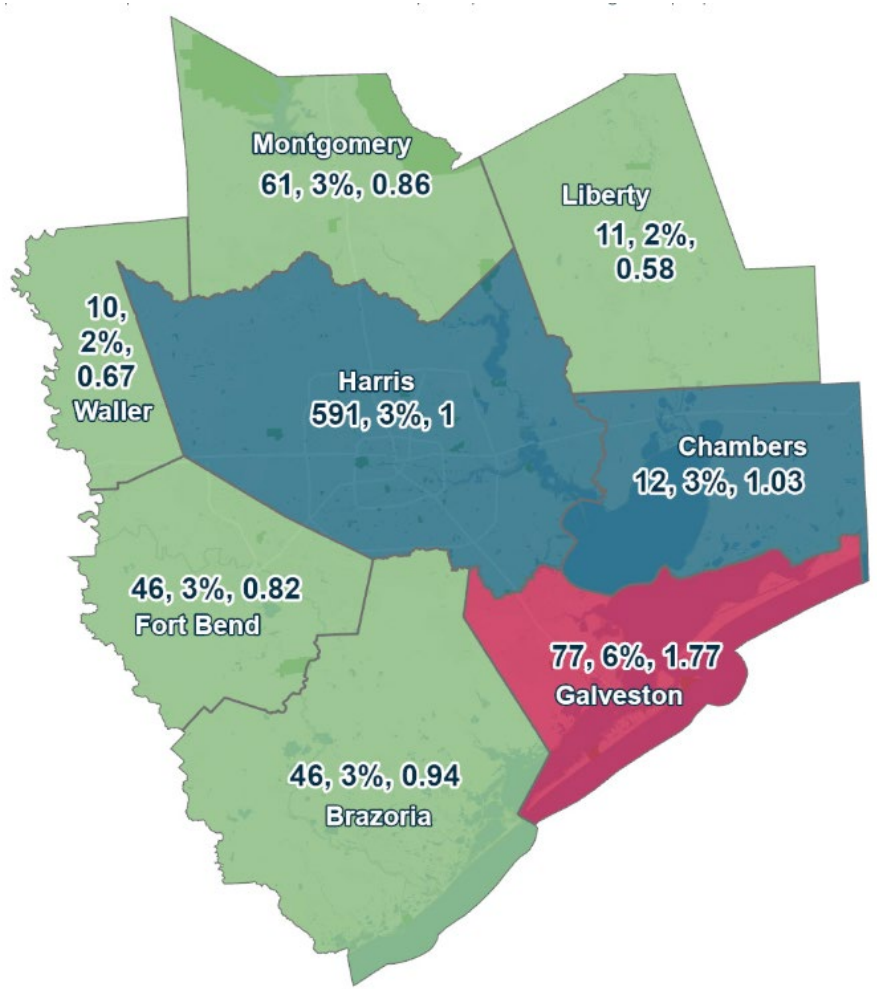
Roadway Departure Crashes



Degree of Over Representation

- **<1.00** None
- **>1.00** Low
- **>1.25** Moderate
- **1.50+** High

Bicycle-Involved Crashes



Kimley»Horn

Crash Over-Representation

GENERAL MCMULLEN DRIVE

Crash Cost by Crash Type

VISION ZERO SAN ANTONIO
Drive safe. Bike safe. Walk safe.

Crash Type	S General McMullen Drive	1-01: West Commerce Street	1-10: El Paso Street	1-13: Wallace Street	1-14: Castroville Road	1-15: Morelia Street	1-20: Ceralvo Street
% of Corridor Crash Cost		20%	8%	9%	6%	2%	13%
Two Motor Vehicles in Transport	**65%**	**65%**	**30%**	**90%**	**89%**	**83%**	**94%**
Right Angle	7%	7%	6%	3%	12%	23%	7%
Angle	0.8%	0.3%	0.6%	0.0%	3%	6%	0.7%
Opposite Direction	0.7%	0.7%	0.0%	2%	0.1%	0.1%	1.1%
Head-On	0.4%	0.0%	0.6%	0.0%	0.8%	0.0%	0.0%
Left Turn, Opposing	21%	16%	5%	65%	17%	7%	38%
Left-Turn, Angle	7%	1.9%	6%	4%	8%	17%	2%
Same Direction	0.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Rear End (Stopped)	13%	23%	1.9%	7%	25%	19%	29%
Rear End (Moving)	5%	8%	5%	3%	13%	7%	3%
Rear End (Left-Turn)	0.9%	0.2%	0.0%	0.5%	0.1%	0.0%	0.3%
Rear End (Right-Turn)	0.9%	0.5%	1.2%	0.5%	3%	0.0%	0.4%
Right-Turn, Rear End	1.3%	1.9%	1.3%	0.6%	1.4%	0.1%	1.7%
Sideswipe	6%	4%	2%	4%	7%	4%	9%
Other Crash Type	**35%**	**35%**	**70%**	**10%**	**11%**	**17%**	**6%**
Pedestrian	21%	22%	67%	8%	2%	9%	4%
Bicycle	11%	12%	0.9%	0.5%	0.8%	4%	0.4%
Fixed Object	3%	0.4%	2%	0.8%	8%	4%	1.7%
Parked Car	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Overturned	0.3%	0.0%	0.0%	0.5%	0.0%	0.0%	0.2%
Other	0.2%	0.2%	0.0%	0.0%	0.0%	0.1%	0.3%

Indicates emphasis areas slightly overrepresented (>1.5x) compared to Corridor

Indicates emphasis areas overrepresented (>2x) compared to Corridor

Crash history from TxDOT CRIS 2015-Q1 2025

HSM – Type Distribution

Kimley»Horn

Table 12-11. Distribution of Multiple-Vehicle Collisions for Intersections by Collision Type

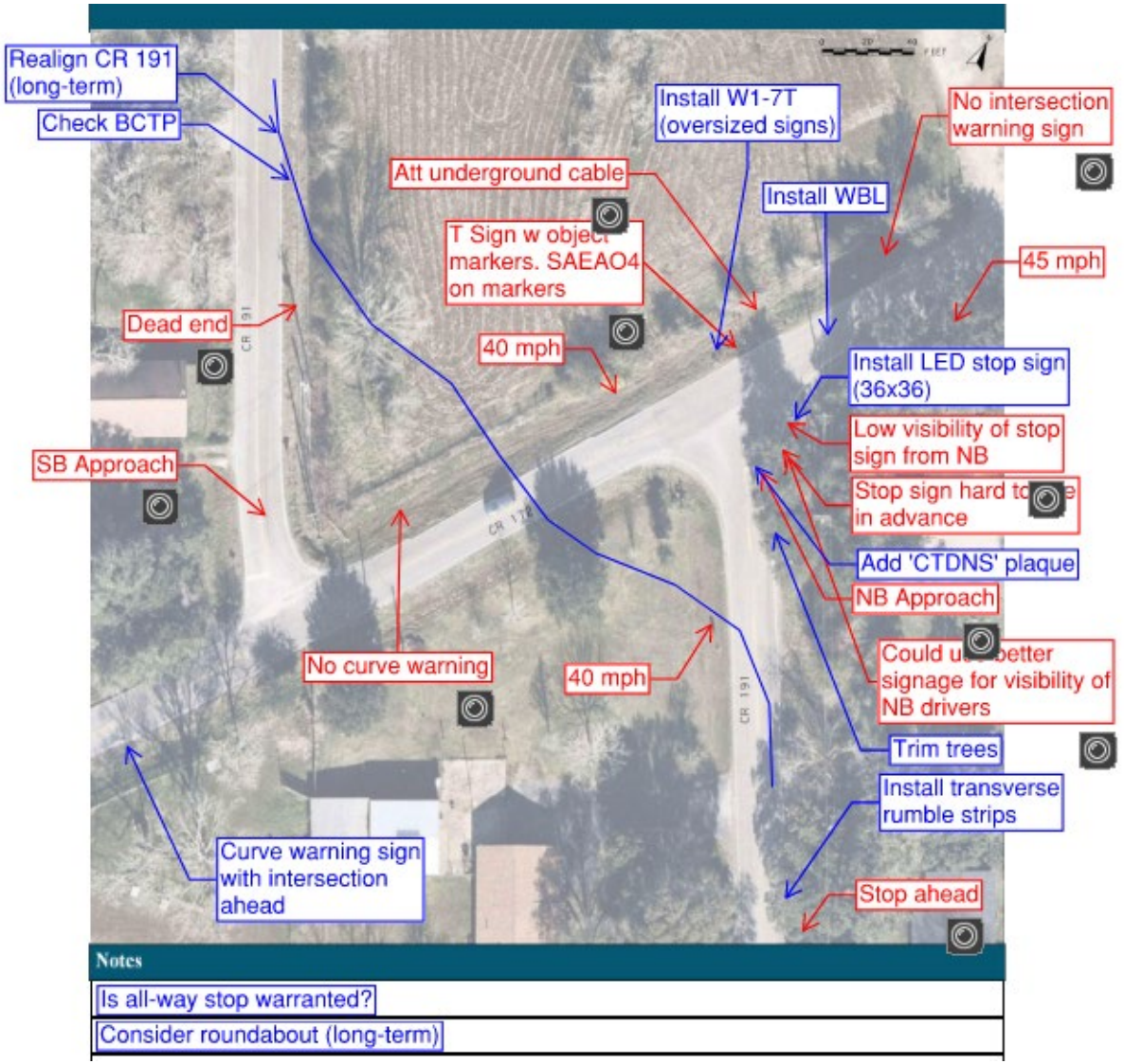
	Proportion of Crashes by Severity Level for Specific Intersections Types							
	3ST		3SG		4ST		4SG	
Manner of Collision	**FI**	**PDO**	**FI**	**PDO**	**FI**	**PDO**	**FI**	**PDO**
Rear-end collision	0.421	0.440	0.549	0.546	0.338	0.374	0.450	0.483
Head-on collision	0.045	0.023	0.038	0.020	0.041	0.030	0.049	0.030
Angle collision	0.343	0.262	0.280	0.204	0.440	0.335	0.347	0.244
Sideswipe	0.126	0.040	0.076	0.032	0.121	0.044	0.099	0.032
Other multiple-vehicle collisions	0.065	0.235	0.057	0.198	0.060	0.217	0.055	0.211

Table 12-1. Urban and Suburban Arterial Site Type SPFs included in Chapter 12

Site Type	Site Types with SPFs in Chapter 12
Intersections	Unsignalized three-leg intersection (stop control on minor-road approaches) (3ST)
	Signalized three-leg intersections (3SG)
	Unsignalized four-leg intersection (stop control on minor-road approaches) (4ST)
	Signalized four-leg intersection (4SG)

Field Reviews

- Confirm existing conditions
- Supplement crash reports with observations
- Identify feasibility challenges



Countermeasure Selection

The **identification of improvements** to address the respective contributing factors (observed during diagnosis).

***What** can we do about it?*

Resources

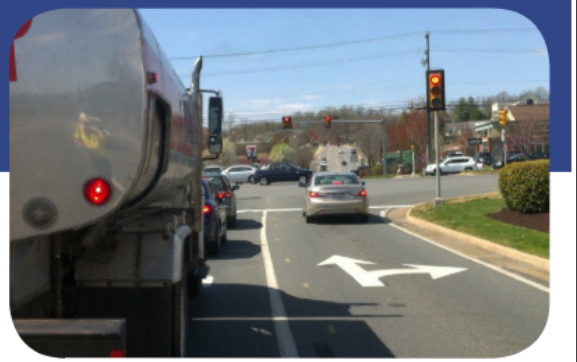
- AASHTO Highway Safety Manual (HSM)
- FHWA Intersection Safety Strategies (FHWA-SA-15-085)
- TxDOT Highway Safety Improvement Program Guidance (HSIP)
- FHWA Proven Safety Countermeasures
- NCHRP Report 500 Series, Guidance for Implementation of the AASHTO Highway Safety Plan
- FHWA Signalized Intersections Informational Guide (FHWA-SA-13-027)
- FHWA CMF Clearinghouse
- Texas Strategic Highway Safety Plan (SHSP)
- FDOT Complete Streets Explorer Tool

Countermeasure Selection - FHWA

Kimley»Horn

SIGNALIZED COST			
SAFETY CONCERN	**Low**	**Moderate**	**High**
High frequency of right-angle crashes attributed to:			
poor sight distance	A1, C1, G5	C2, G4	B3
drivers misjudging gaps	A1		
not enough gaps for drivers	A1	A4, B4	
driver unaware of intersection	D1, D2, D5, D6	C2	B4

CATEGORY D: IMPROVE DRIVER AWARENESS OF INTERSECTIONS AND SIGNAL CONTROL



D1 – Improve visibility of intersections on approach(es)

Where to use - Signalized intersections with a high frequency of crashes attributed to drivers being unaware of the presence of the intersection.

D2 – Improve visibility of signals and signs at intersections

Where to use -Signalized intersections with a high frequency of right-angle and rear-end crashes occurring because drivers are unable to see traffic signals and signs sufficiently in advance to safely negotiate the intersection being approached.

Keywords: *signal visibility*

SIG

Source: FHWA-SA-15-085

Countermeasure Selection – HSIP

Code	Item
100	Signing and Signals
200	Roadside Obstacles and Barriers
300	Resurfacing and Roadway Lighting
400	Pavement Markings
500	Roadway Work

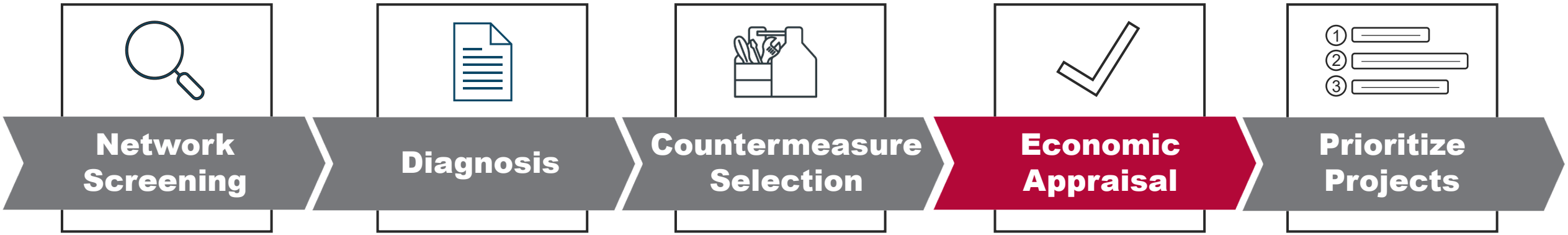
107	Install Traffic Signal		
Definition:	Provide a traffic signal where none existed previously. This does not include the installation of flashing beacons. SPICE and CAP-X analyses are required for all intersection related HSIP project submittals. See TxDOT Chief Engineer June 24, 2024 memo.		
Reduction Factor (%):	20%	Maintenance Cost:	$3,400 (Isolated) $3,900 (Interconnected) $5,400 (Diamond Interchange)
Service Life (Years):	10	G-Match:	Y
Preventable Crash:	[(Intersection Related = 1 or 2) AND (Vehicle Movements/Manner of Collision = 10-39)] OR (First Harmful Event = 1 or 5)		
Required Documents:	Overhead Intersection Layout, Traffic Signal Warrants, SPICE and CAP-X analyses.		

Source: TxDOT HSIP Guidelines, 2026

Economic Appraisal

The **evaluation** of improvements based on their expected safety **benefits** and associated **costs**.

***Which** are the **best** solutions?*



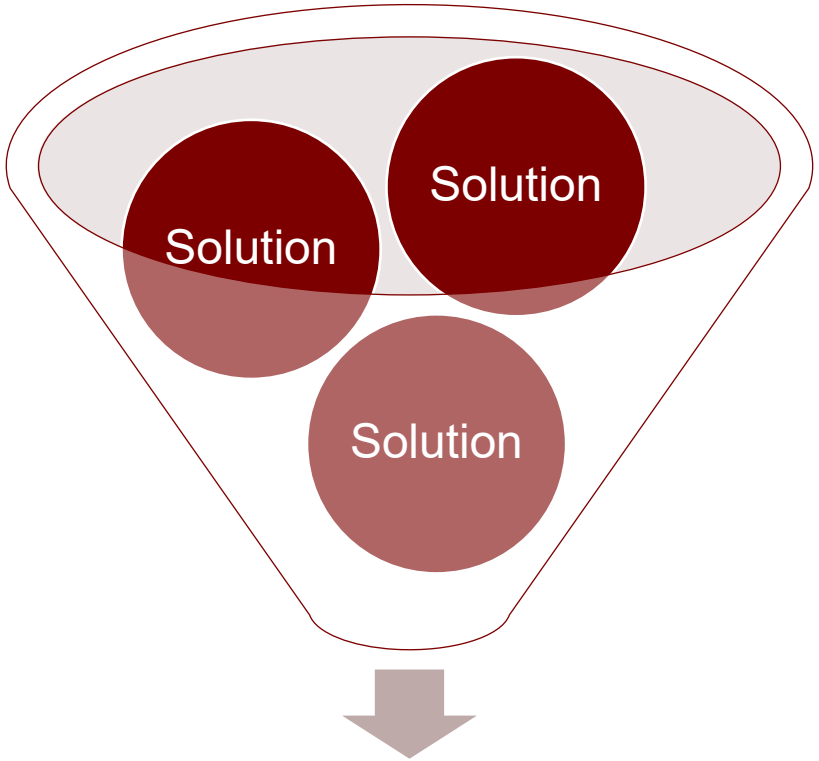
Economic Appraisal

$$\text{Benefit Cost Ratio} = \frac{\text{Expected Crash Cost Savings}}{\text{Project Cost}} = \frac{\left(\text{Monetized Preventable Crash Cost} \times \text{Expected Crash Reduction}\right)}{\left(\begin{array}{c}\text{Construction Cost} \\ + \text{Design Cost} \\ + \text{Right-of-Way} \\ + \text{Maintenance}\end{array}\right)}$$

Appraisal

Preliminary countermeasures should be refined based on:

- Crash Reduction Potential
- Benefit-Cost Ratio
- Implementation Feasibility
- Operational Impacts
- Community Preference and Priorities



Preferred Solution

Menti

TexITE

Select which slide to add

Mentimeter

Which of the following is ***both*** an FHWA Proven Safety Countermeasure has a dedicated TxDOT HSIP Work Code?

0%	0%	0%	0%
Bike Lanes	Speed Safety Cameras	SafetyEdge	Retroreflective Backplates

menti.com
9893 1640

Waiting for participants

Responses are hidden

Show responses

Menti
TexITE

Select which slide to add

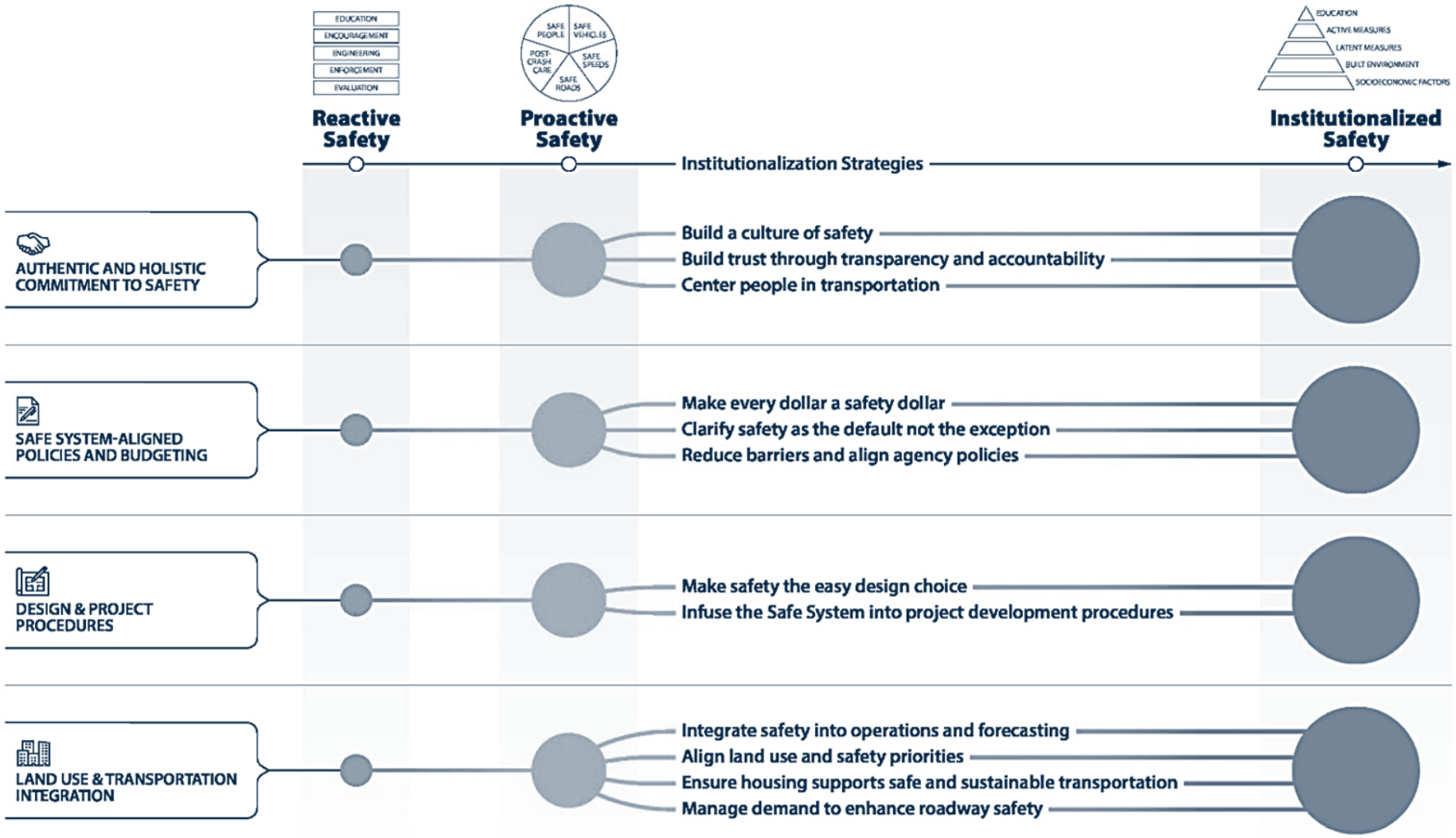





Non-Infrastructure Strategies

Kimley»Horn
Expect More. Experience Better.

Programmatic and Policy Opportunities for SSA Integration



Kimley»Horn

New Safe System Integration Tools

Theme A

Authentic and Holistic Commitment to Safety

- **Train elected officials and agencies**
- Align emergency services goals
- Ensure accountability and monitoring
- Leverage public health expertise and co-benefits
- **Consider upstream conditions**

Theme B

Safe System-Aligned Policies and Budgeting

- **Expanded funding sources**
- Treatment specific policy and legislation
- **System speed management**
- ROW Reallocation framework
- Set safety floors to ID treatments
- Revise or remove LOS
- Contextual speed limit setting
- ATE
- Promote safe vehicles

Theme C

Design and Project Procedures

- **Review design guidelines**
- Create proactive transition plan
- Expand functional classification
- **Establish hierarchy of treatment selection**
- Implement TSMO
- Update TIA guidelines

Theme D

Land Use / Transportation Integration

- Capacity analysis for alternative development
- **Right size infrastructure with demand forecasting**
- Assess system wide risk during scenario planning
- **Multimodal network design**
- Remove parking minimums
- Partner with unhoused resources
- Implement mixed use TOD

Theme A: Authentic and Holistic Commitment to Safety

A ***strong safety culture*** ensures all roles that touch transportation understand their impact on roadway safety

Example Tools Discussed Today:

1. Train Elected Officials and Agencies
2. Align Emergency Services Goals

Kimley»Horn

Expect More. Experience Better.

Train Elected Officials and Agencies to Build Safe System Understanding

Training elected officials and agencies builds Safe System understanding among decision-makers

Train elected officials, agency leaders, and commissioners on how their decisions affect roadway safety

This includes decisions about policy, budgets, land use, and priorities, not just projects.

Use role-based and experiential training approaches

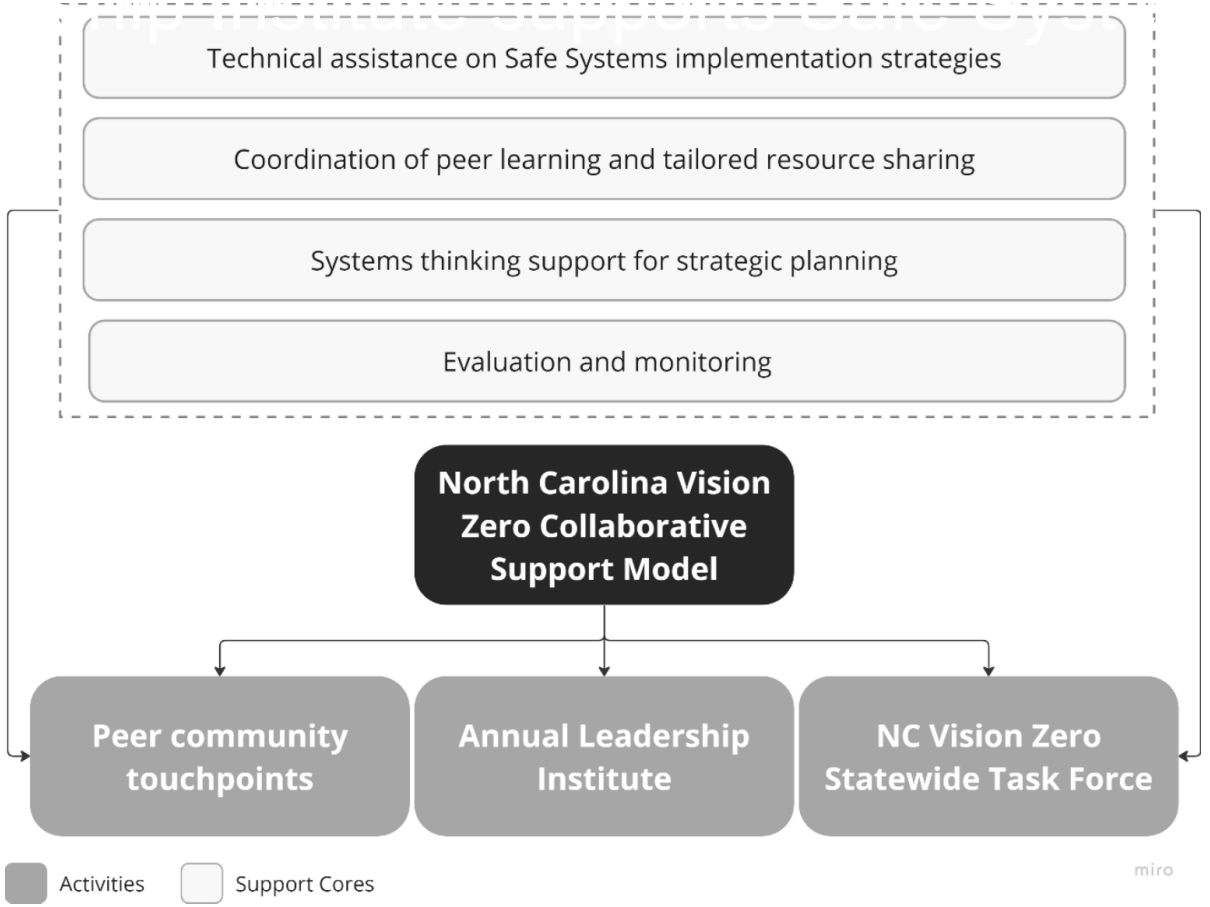
Hands-on activities, tailored content, and train-the-trainer models expand reach and impact.

Support culture change needed to institutionalize the Safe System Approach

Leadership understanding helps embed safety into everyday decision making.

Example: North Carolina Vision Zero Leadership Institute

- Annual, team-based Vision Zero trainings are tailored to community readiness
- Cross-sector teams build shared understanding and ownership
- Expert instruction is combined with facilitated local action planning
- Technical support is offered to sustain progress beyond the Institute



Source: North Carolina Vision Zero Leadership Institute

Consider upstream consideration to understand root causes for severe injuries

Shift from analyzing collisions as isolated events

Use proactive "W" questions to uncover how transportation is shaped by land use, mobility options, and housing access

Enables mitigation strategies that go beyond the siloed categories of E's

Follow a public health hierarchy for greatest population impact with the least individual effort

A focus on prevention

Illustrates the importance of time travel and a shift to prevention instead of treatment.

Example: Using the "W's" to understand a more complete crash picture

Who was involved in a crash?

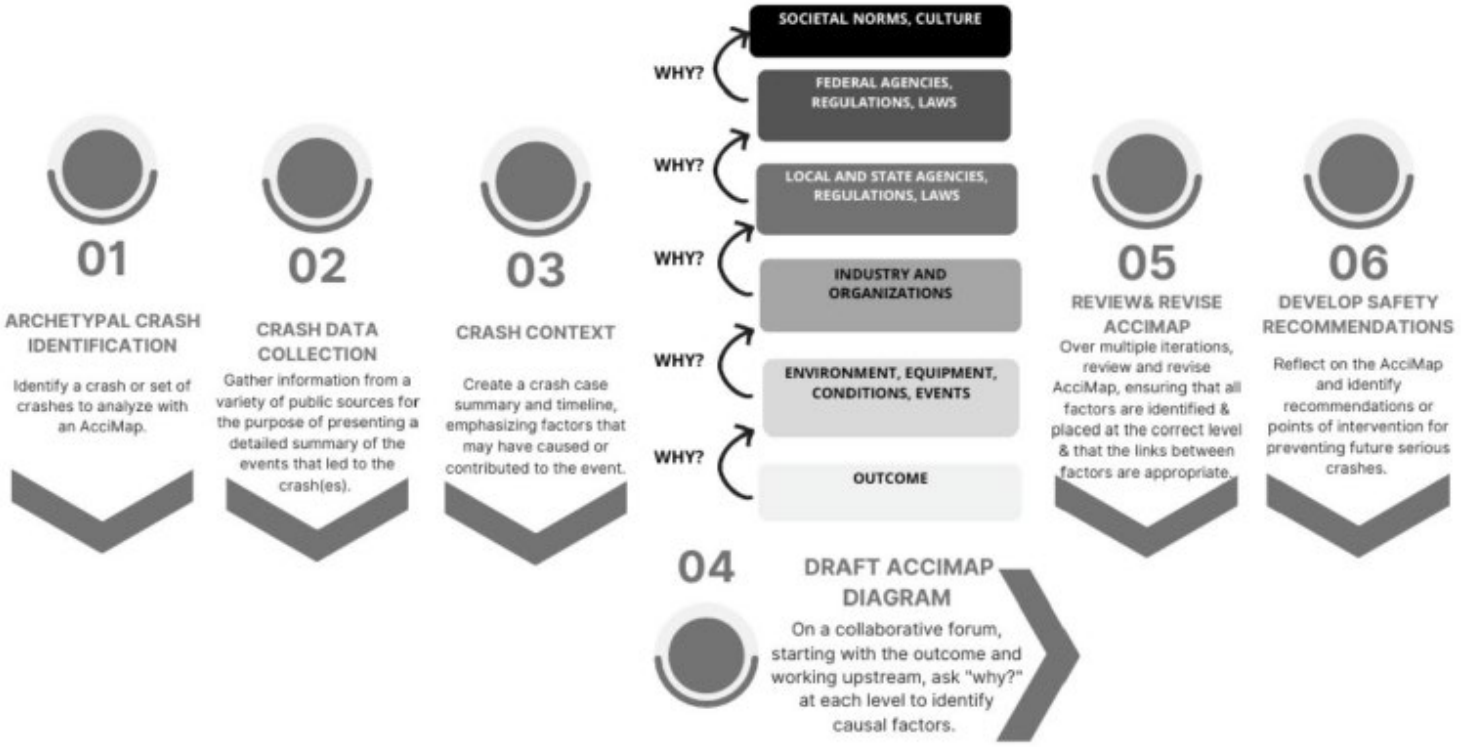
What other options were available for their trip?

When were they traveling?

Where were they traveling to and from?

Why were they traveling in this location?

Which policies and practices influence their travel choices and environment?



Theme B: Safe System-Aligned Policies and Budgeting

Coordinating policy and funding decisions around the SSA supports ***proactive investment*** in safety

Example Tools Discussed Today:

1. Expand Funding Sources and Allocations for Safety
2. Implement Safe System Speed Management Program

Kimley»Horn

Expect More. Experience Better.

Expand Funding Sources and Allocations for Safety

Treat every dollar as a potential safety dollar

Instead of relying on competitive safety grants, audit all funding sources and projects to proactively embed Safe System principles.

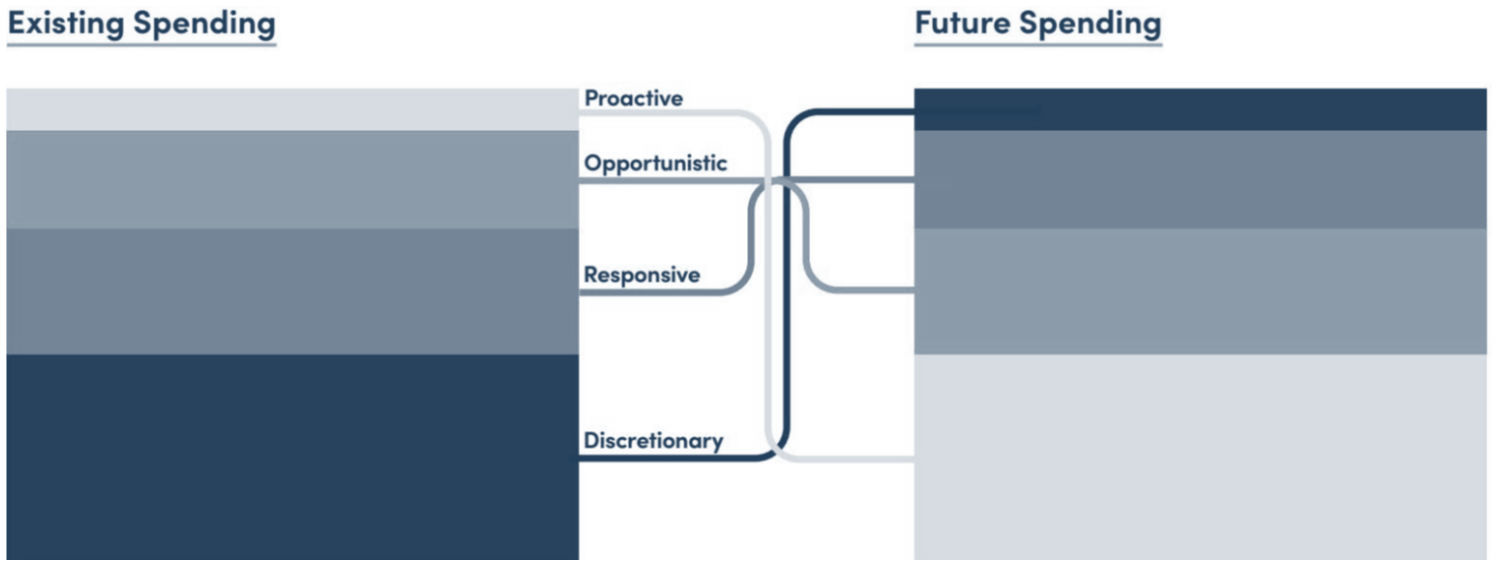
Align budgets and project selection with safe system outcomes

Applying SSA alignment checks and supplementing Benefit-Cost Ratios with proactive risk analysis helps agencies prioritize systemic projects.

Focus resources on high-impact, systemic safety investments

Limiting discretionary funding and redirecting staff time towards proactive, equitable, and high-impact initiatives supports faster progress.

Example: Nashville DOT Funding Re-Allocation



Proactive Funding
Sources include Safe Streets for All grants, Safe Routes to School grants, Highway Safety Improvement Plan, and Capital Spending Plan

Opportunistic Funding
Sources include repaving, agency collaboration and cost sharing, developer contributions, and other capital projects

Responsive Funding
Sources include Highway Safety Improvement Plan grants, and Vision Zero High Injury Network project funds

Discretionary Funding
Sources include Annual Capital Plan surplus budget and other annual/ongoing funding sources

Making Every Dollar a Complete Streets Dollar
Source: Fehr and Peers for Nashville DOT

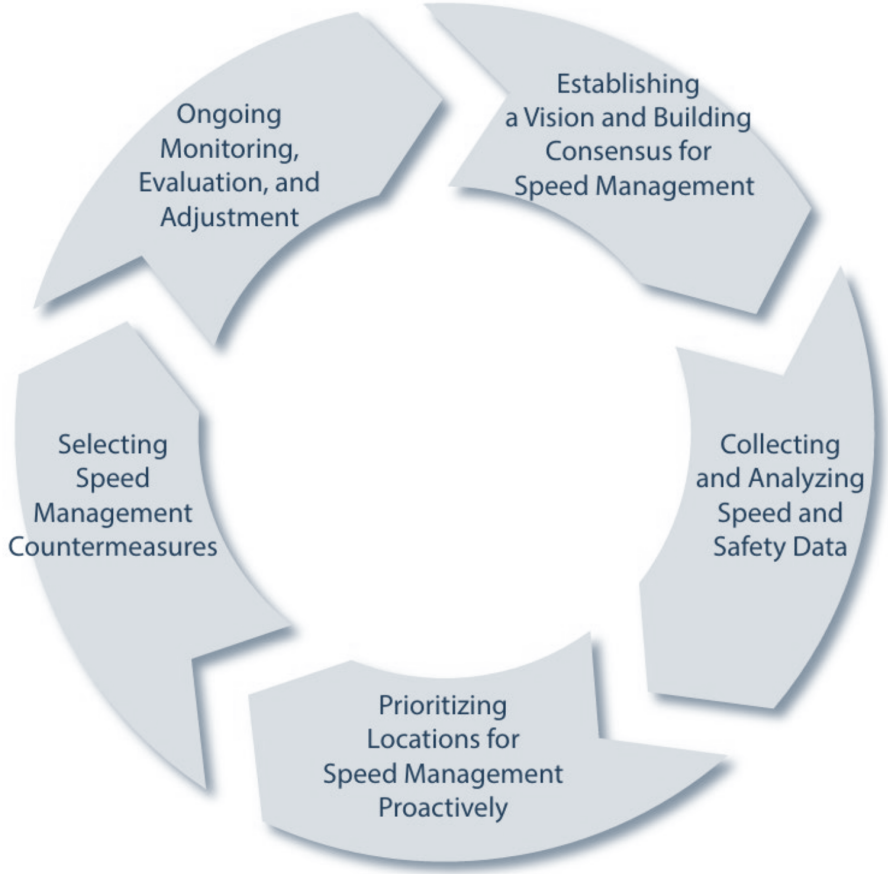
Implement Safe System Speed Management Program

Use a multidisciplinary, redundant approach to achieve target speeds

Combining roadway design, vehicle design, operations, education, and enforcement leads to self-enforcing environments.

Institutionalize speed management through planning, partnerships, and monitoring

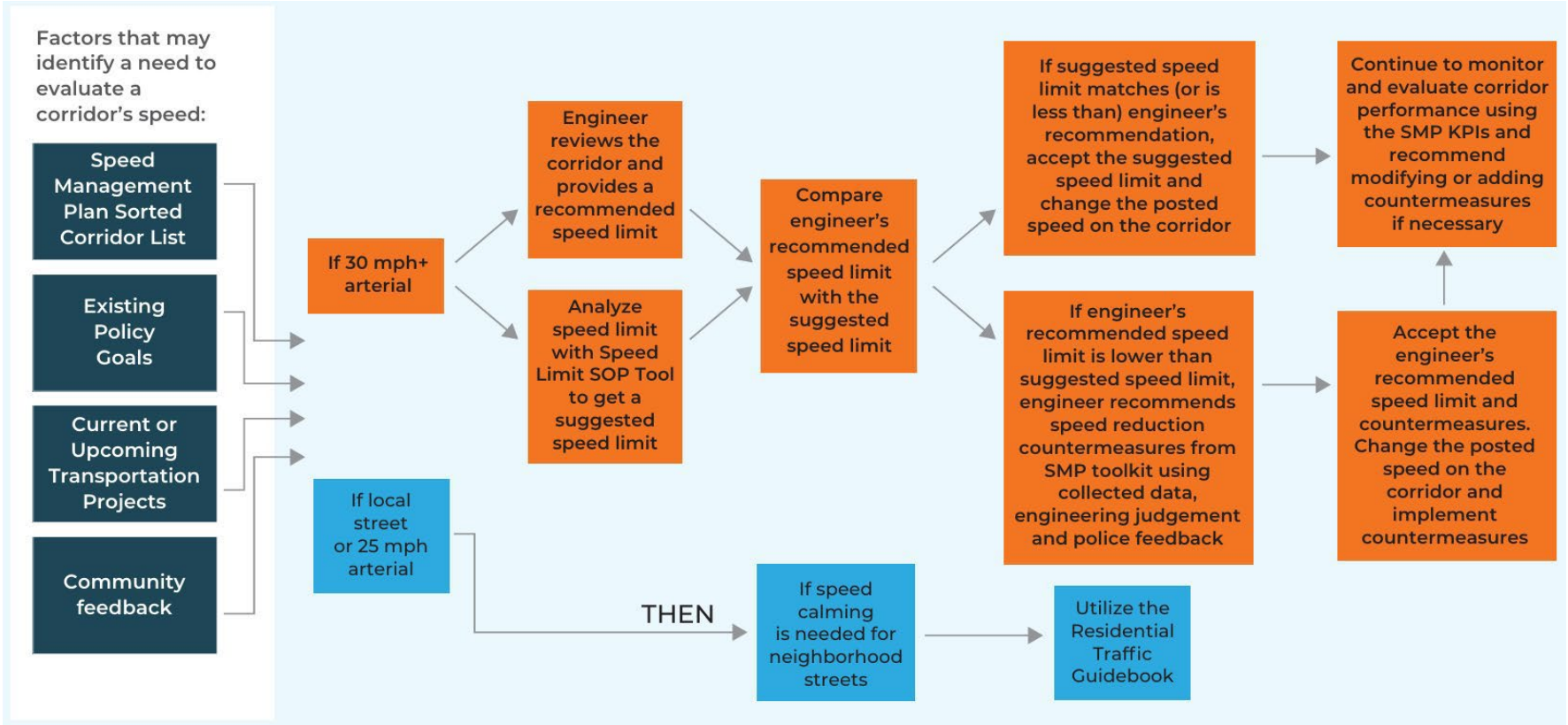
Speed Management Programs and Action Plans help align agencies, elected officials, and communities around shared goals.



The Safe System Approach for Speed Management Framework, FHWA

Example: Bellevue Speed Management Plan

- Prioritized arterial corridors using context-based classifications based on speed limits and surrounding land use
- Refined speed management countermeasures over time using system-wide and corridor-level KPIs



Source: Process for Speed Limit Setting and Speed Management by Corridor from the City of Bellevue's Speed Management Plan

Theme C: Design and Project Procedures

Integrating safety into ***design standards*** and ***project procedures*** makes safer choices the default

Example Tools Discussed Today:

1. Review of Design Guidelines and Standards
2. Establish a Hierarchy of Treatment Selection

Kimley»Horn

Expect More. Experience Better.

Review of Design Guidelines and Standards

Align design standards with safe system risk reduction

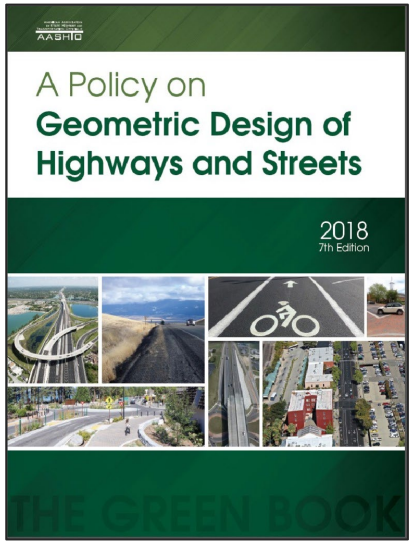
Updating design guidelines reduces crash exposure, likelihood, and severity by addressing kinetic energy risk and context.

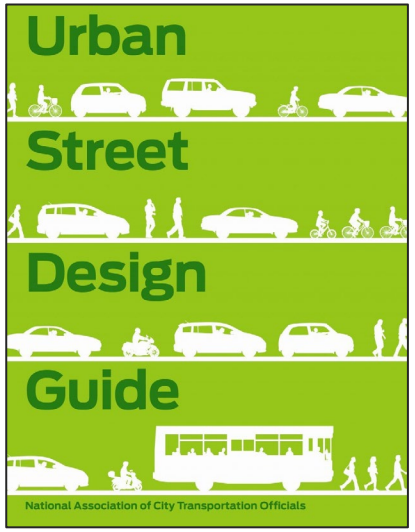
Apply context-sensitive decisions consistently

Embedding Safe System design hierarchies and target speeds ensures that safer choices are applied routinely.

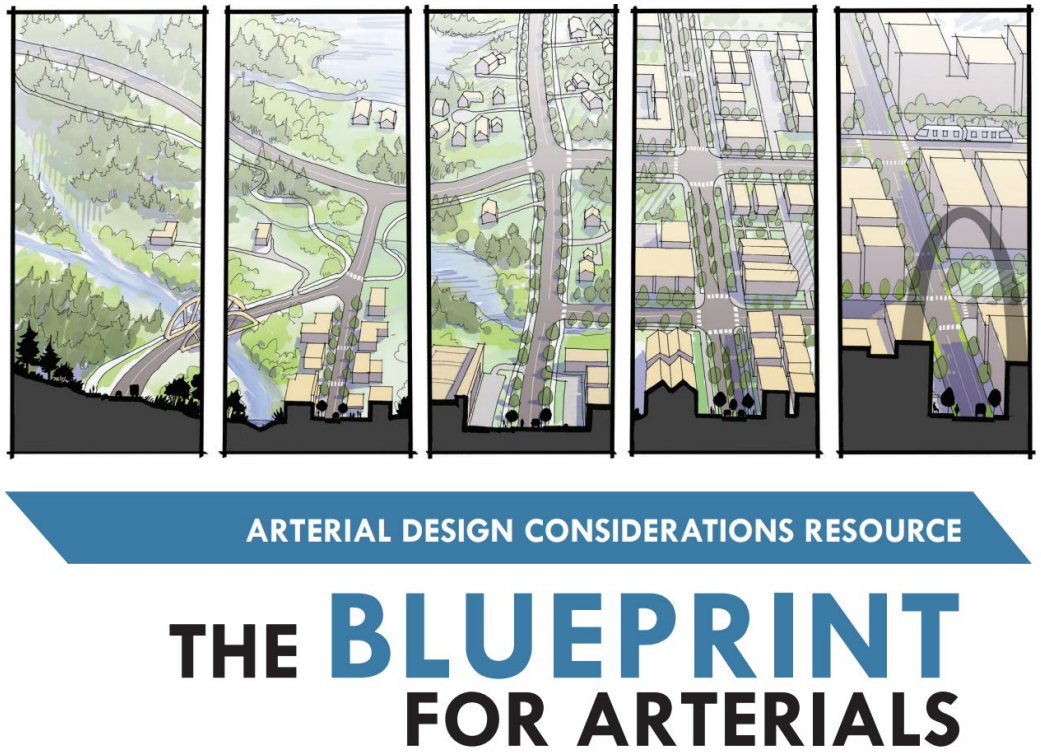
Institutionalize safety through policy, guidance, and training

Aligning standards with leading guidance and equipping staff to apply SSA principles at all project phases institutionalizes change.





Example: Missouri's Blueprint for Arterials Embeds Safe System Principles



- **Integration** - integrates SSA concepts directly into existing arterial planning and design workflows so safer design choices become the default
- **Risk Reduction** - uses lower design speeds, conflict management strategies, and demand management tools to systematically reduce exposure, likelihood, and severity of crashes
- **Consistency** – ensures each design consideration includes when to use it, how to apply it, and how it aligns with AASHTO and NACTO guidance

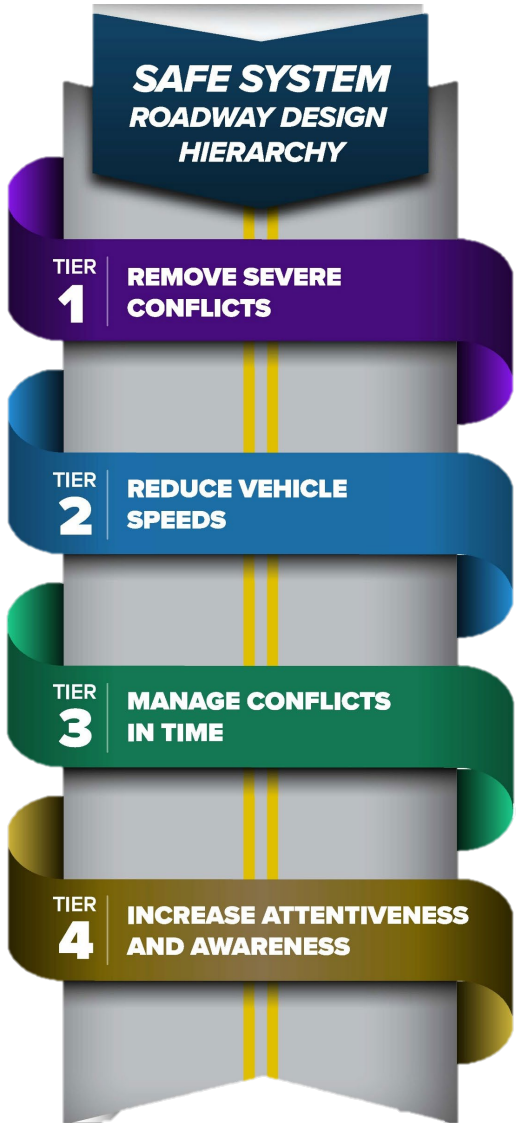
Establish a Hierarchy of Treatment Selection

Prioritize treatments that provide the greatest risk reduction for serious crashes

The Safe System Design Hierarchy (left) systematically incorporates SSA into the Highway Safety Improvement Program.

Apply the hierarchy only after target speeds and movement vs. place context are established

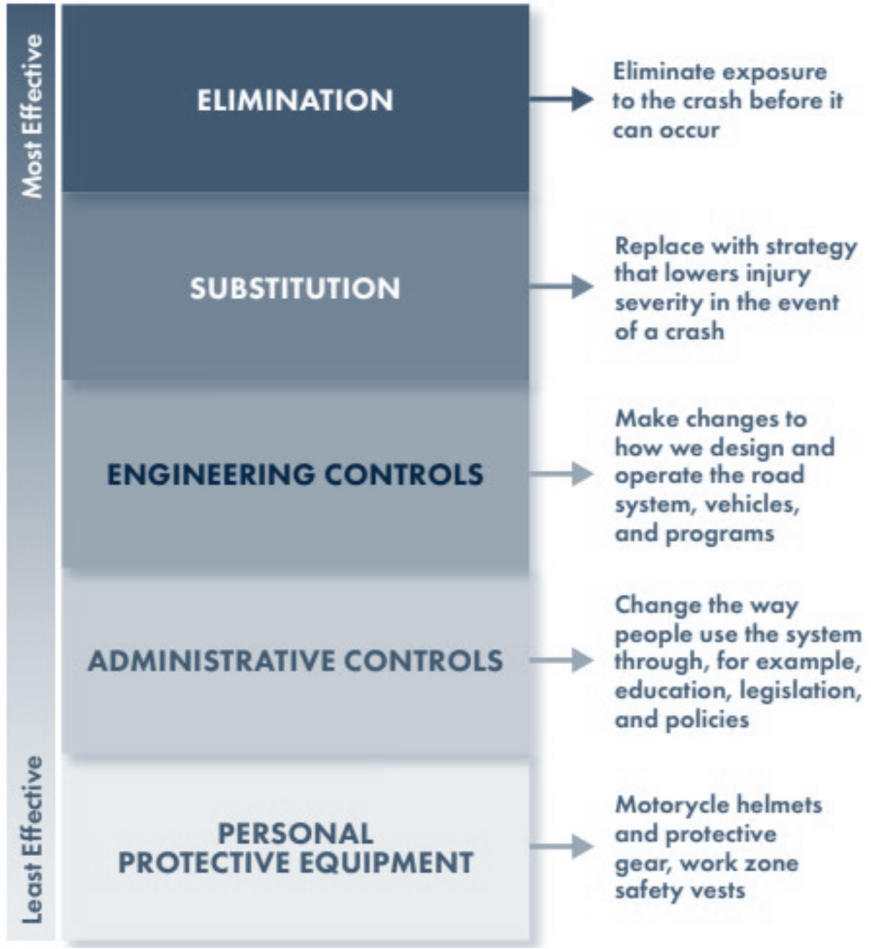
Using the hierarchy alongside upstream and equity considerations helps avoid restricting access for vulnerable road users while reducing severe crash risk.



Source: FHWA

Example: Washington DOT Establishes a Hierarchy of Safe System Treatment Selection

- **Prioritization** - prioritizes policies and countermeasures based on their effectiveness in reducing serious crash risk
- **Mitigation** - emphasizes upstream interventions such as trip reduction, mode shift, and route choices before engineering and operational controls
- **Integration** - Washington's 2024 Strategic Highway Safety Plan formally applies the hierarchy to guide design and operational decisions statewide



Source: WSDOT Safe System Hierarchy of Controls

Theme D: Land Use and Transportation Integration

Integrating ***land use*** and ***transportation planning*** provides more travel options while reducing safety risk

Example Tools Discussed Today:

1. Right-Size Infrastructure with Demand Forecast Adjustments
2. Promote Multimodal Network Design and Application

Kimley»Horn

Expect More. Experience Better.

Right-Size Infrastructure with Demand Forecast Adjustments

Transportation Demand Management (TDM) and Transportation Systems Management and Operations (TSMO) reduce vehicle demand and improve system performance without adding roadway capacity.

Integrate TDM and TSMO into future-year forecasts to reduce overreliance on vehicle growth assumptions that drive unnecessary capacity expansion

Apply TDM and TSMO strategies to mitigate LOS or VMT impacts instead of increasing speeds, exposure, or conflict points for vulnerable road users

Right-sizing infrastructure with these strategies supports safety and efficiency over time, avoiding induced demand or overbuild facilities

Example: CAPCOA Handbook to Quantify Managed Demand

CAPCOA developed lookup tables to estimate how TDM strategies reduce VMT

- Moves forecasting beyond fixed growth assumptions
- Supports safer, right-sized infrastructure decisions
- Better aligns infrastructure with long-term safety and land use goals

Table T-19.1. Active Transportation Adjustment Factors

Average Daily Traffic (vehicle trips per day)	One-way Facility Length[1]	Adjustment Factor for a Population > 250,000 or a Non-university Town with Population < 250,000	Adjustment Factor for a University Town with Population <250,000
1 to 12,000	≤1	0.0019	0.0104
	1.02 to 2	0.0029	0.0155
	>2	0.0038	0.0207
12,001 to 24,000	≤1	0.0014	0.0073
	1.02 to 2	0.0020	0.0109
	>2	0.0027	0.0145
24,001 to 30,000	≤1	0.0010	0.0052
	1.02 to 2	0.0014	0.0078
	>2	0.0019	0.0104

Source: California Air Resources Board. 2020. Quantification Methodology for the Strategic Growth Council's Affordable Housing and Sustainable Communities Program. September. Available: https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/auctionproceeds/draft_sgc_ahsc_qm_091620.pdf. Accessed: January 2021.

< = less than; > = greater than; ≤ = less than or equal to

[1]Measurements of bike facilities should not include the length of crosswalks.

Source: California Air Pollution Control Officers Association (CAPCOA)

Promote Multimodal Network Design and Application

Use Movement and Place to Assign Network Priorities

This tool applies a layered network approach that distinguishes between corridors focused on movement and those focused on place, based on context and user needs.

Design Corridors to Match Function, Context, and Risk

By tailoring cross sections, target speeds, and user separation to each corridor's role, agencies can reduce kinetic energy risk while supporting multimodal travel.

Shift from Vehicle Throughput to People-Centered Performance

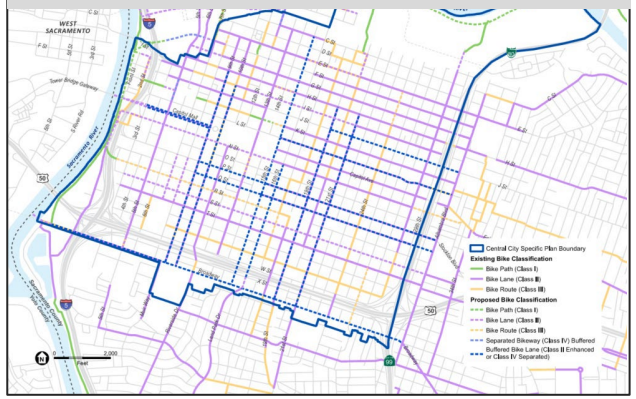
Layered networks emphasize person-throughput, access, and safety rather than maximizing vehicle speed and capacity on every corridor.

Example: Sacramento Layered Network

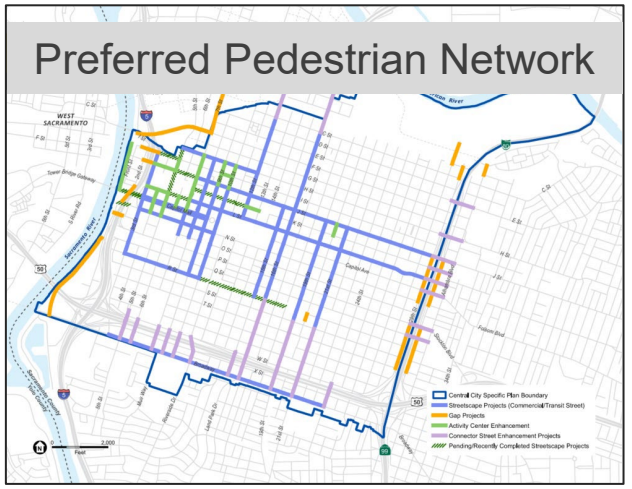
- Identifies preferred networks for pedestrians, bicyclists, transit, and vehicular travel
- Assigns corridor priorities based on function, context, and mobility needs
- Supports a walk- and transit-first vision while maintaining systemwide connectivity

Preferred Transit Network

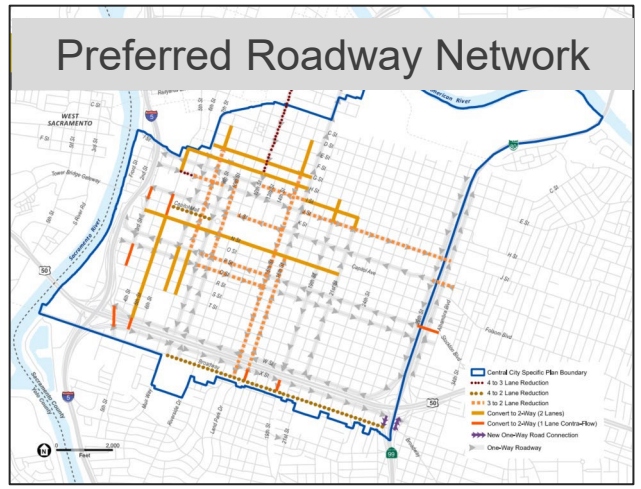
Preferred Bicycle Network



Preferred Pedestrian Network



Preferred Roadway Network



Mentimeter

In your opinion, how can your agency make the greatest impact on reducing fatal and serious injury crashes in your area?

Responses can be up to 200 characters and will appear here.

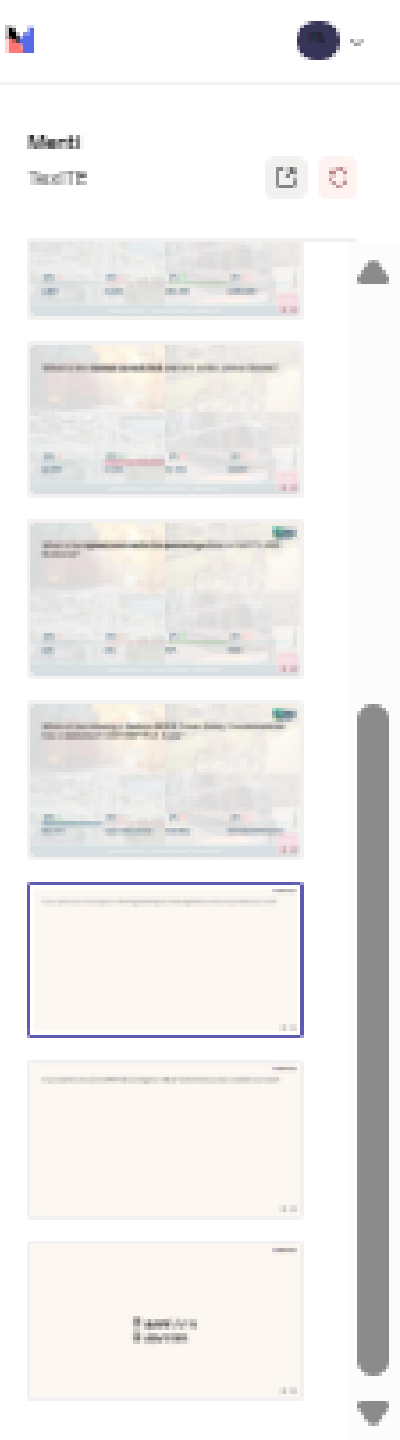
You can group responses if you get more than 10.

Turn on voting so people can flag their favorite responses.

menti.com

9893 1640

Waiting for participants



Mentimeter

In your opinion, how can an MPO help your agency reduce fatal and serious injury crashes in your area?

Responses can be up to 200 characters and will appear here.

You can group responses if you get more than 10.

Turn on voting so people can flag their favorite responses.

menti.com

9893 1640

Waiting for participants

Menti

TexITE

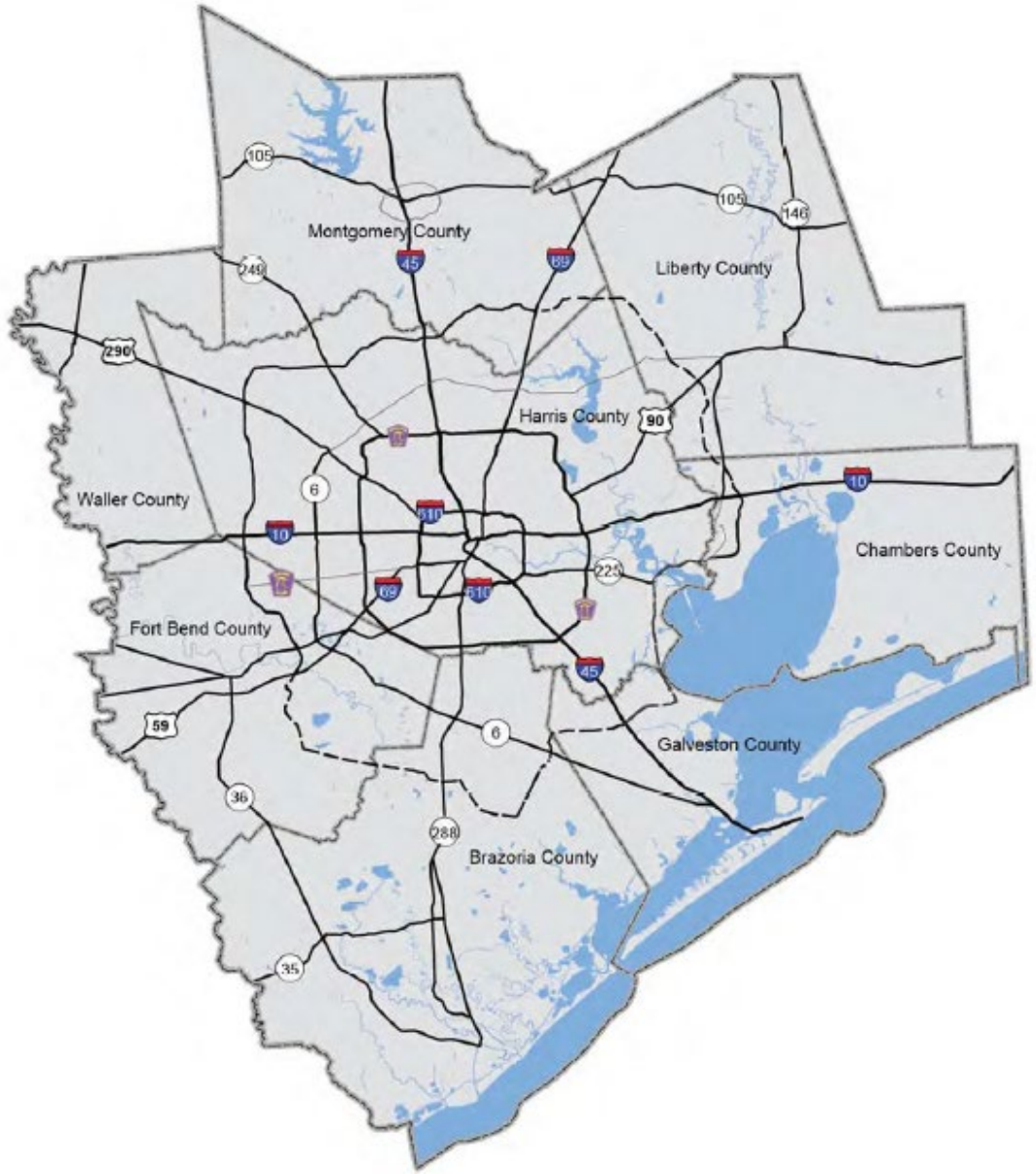
Select which slide to add

MPO Role in Road Safety

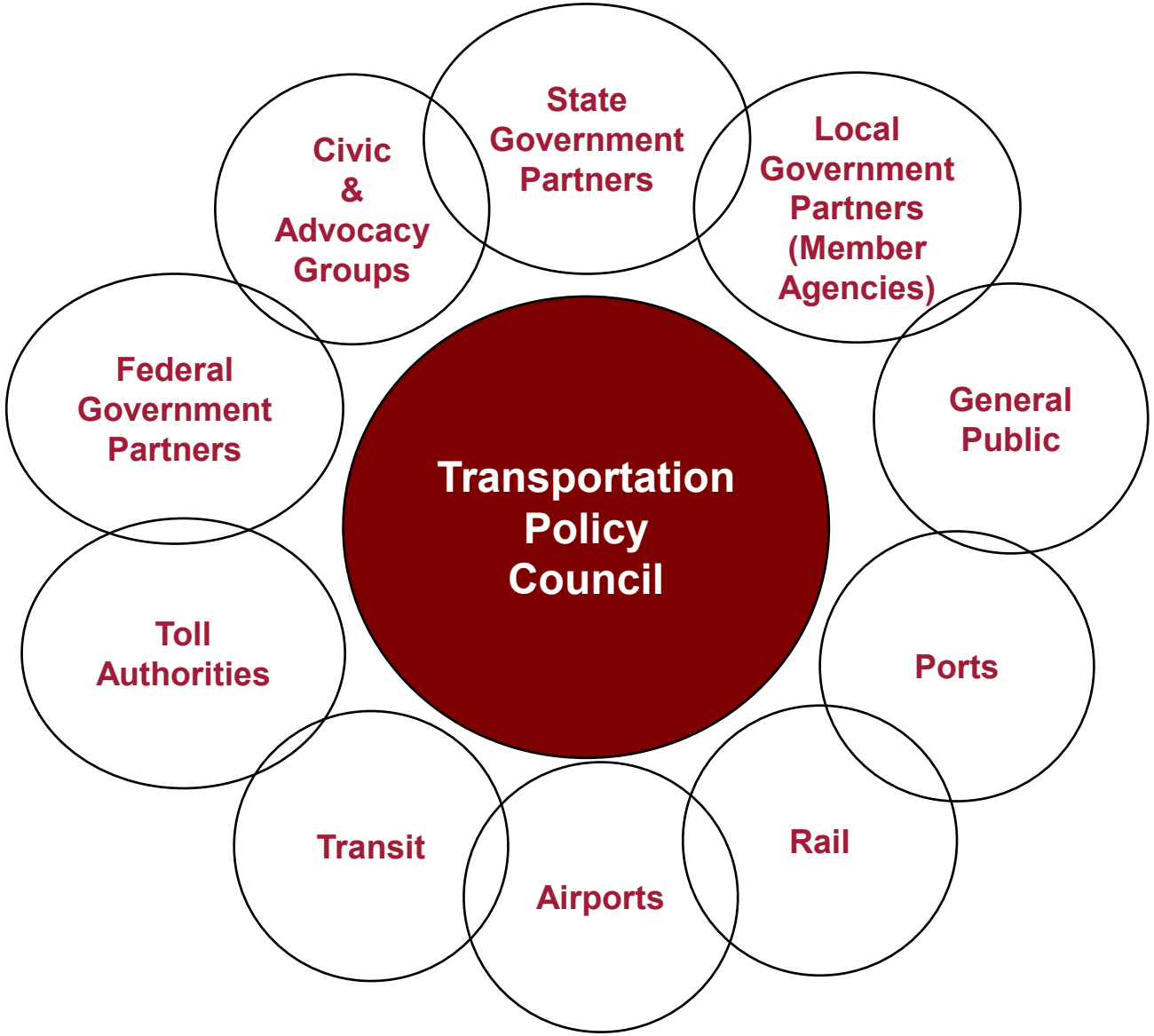
Kimley»Horn
Expect More. Experience Better.

What is an MPO? What is Houston-Galveston Area Council (H-GAC)?

The **policy board** of an agency created and designated to carry out the metropolitan transportation planning process for urbanized areas with populations greater than 50,000 and designated by local officials and the Governor of the State.



Community Partnerships

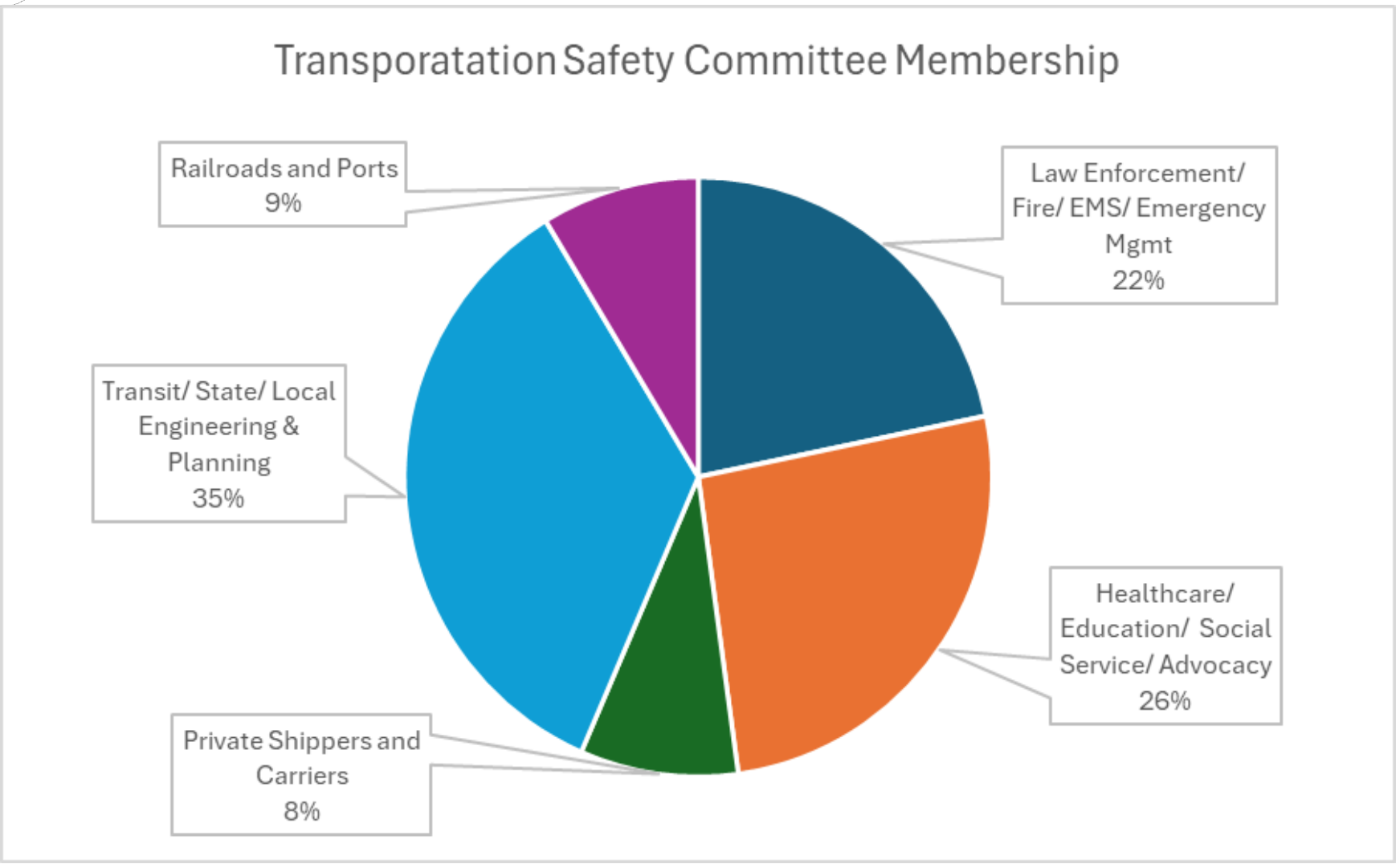


Kimley»Horn

What Do We Offer to Improve Safety?

- Collaboration & Technical Assistance
- TSMO & Congestion Management
- Data Accessibility
- Planning Studies
- Educational Campaigns
- Funding

Collaboration



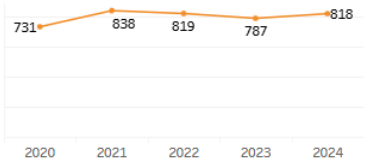
- One of two committees that report directly to TPC
- Transportation Safety Committee has 11 established goals
- Close collaboration with member agencies, municipalities, advocates

Data

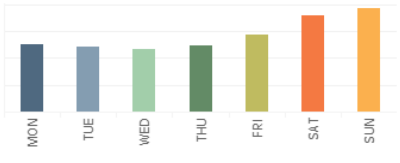
Regional Crash Data (2020-2024)

Introduction | Crash Data Dashboard | Crash Hotspot Map | Crash Data Viewer | More Info.

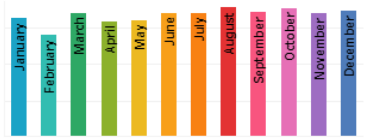
Year



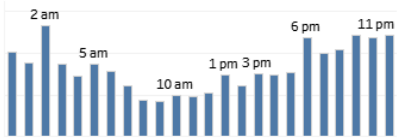
Day of Week



Month



Hour



First Harmful Event *

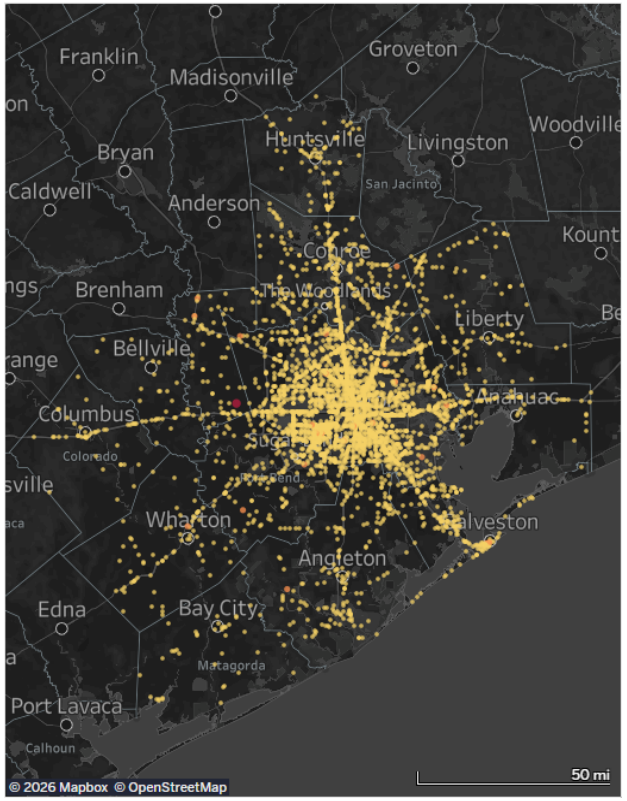
TOTAL CRASHES	3,993
MOVING VEHICLE	1,560
FIXED OBJECT	1,009
PEDESTRIAN	967
OVERTURNED	188
CYCLIST	156
PARKED CAR	43
OTHER NON COLLISION	31
OTHER OBJECT	20
TRAIN	12
ANIMAL	7

Crash Severity *

TOTAL CRASHES	3,993
FATALITY	3,993

Injury Summary

	Total	2020	2021	2022	2023	2024
FATALITY	4,281	793	893	883	842	870
SERIOUS INJURY	759	141	161	180	144	133
NON-SERIOUS INJURY	860	133	185	178	179	185
POSSIBLE INJURY	725	138	163	128	144	152
NOT INJURED	3,276	649	623	681	692	631
UNKNOWN	417	64	89	95	86	83



No. of Crashes

1 — 4

Primary Crash Contributing Factor *(scroll down to see more)*

YEAR/MO

Year

Month (All)

Day of Week (All)

GEOGRAPHY

Region 13 Counties

County (All)

In/Unincorporated Area (All)

Co. Commissioner Precinct (All)

City (All)

City Council District (All)

Zip Code (All)

SPECIFIC CONDITION

First Harmful Events (All)

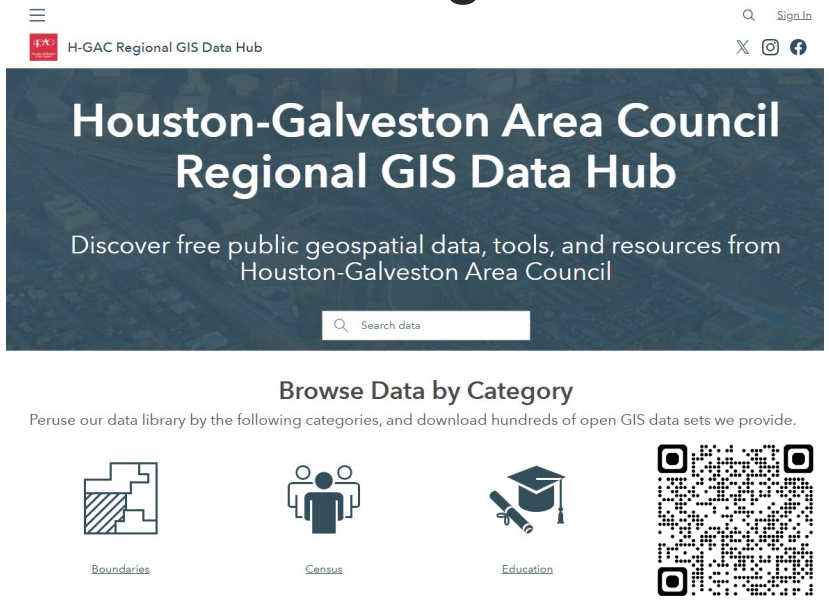
Crash Severity FATALITY

Intersection Related (All)

Commerical Truck Related (All)

Transit Bus Related (All)

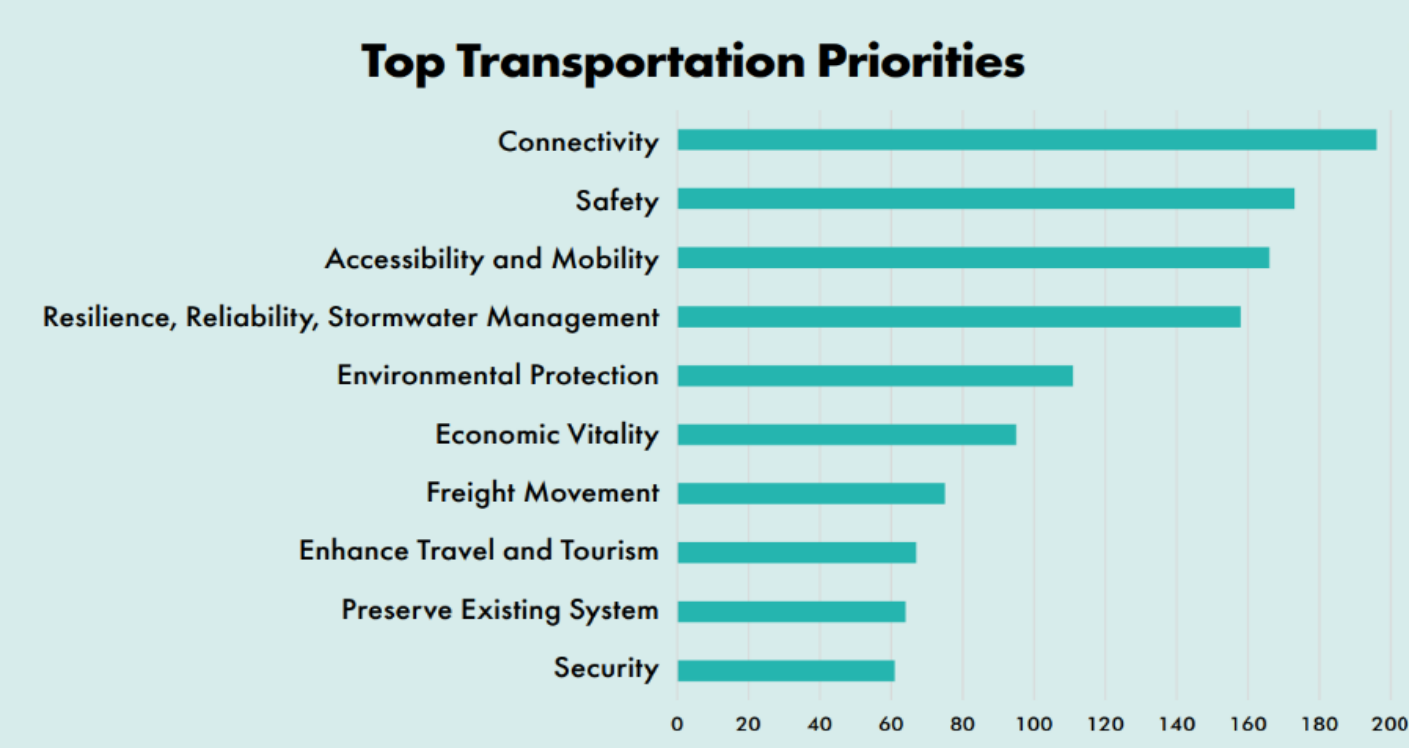
- Walk/Bike audits
- RSAs
- Crash data
- Analyses
- Brainstorming solutions



Kimley»Horn

Planning Studies - Short & Long Range

- Early planning
- Long range planning
- Shorter range planning
- Regional
- Subregional or Focused



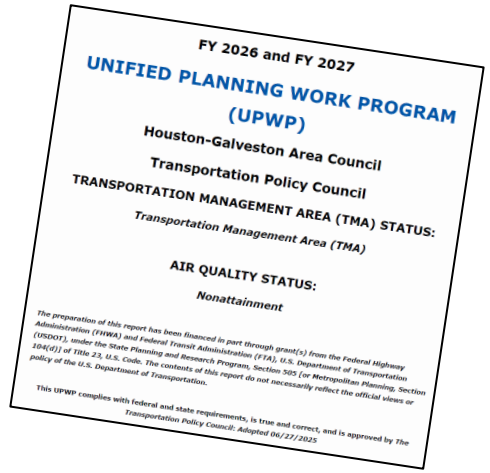
Kimley»Horn

Educational Campaigns

Kimley»Horn

Funding - Planning Studies & Construction

Investment Category	Rehab/ Restoration	Traffic Signals	Capacity Expansion	New Road	Intersection Improvements	ITS	Sidewalks/ Bike Lanes	Transit Facilities
Regional Goods Movement								
Operational Improvements								
High-Growth Area Needs								
Active Transportation								
Transit								
Major Projects								
Resiliency								
Safety								


FY 2026 and FY 2027

UNIFIED PLANNING WORK PROGRAM (UPWP)

Houston-Galveston Area Council

Transportation Policy Council

TRANSPORTATION MANAGEMENT AREA (TMA) STATUS:

Transportation Management Area (TMA)

AIR QUALITY STATUS:

Nonattainment

The preparation of this report has been financed in part through grant(s) from the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), U.S. Department of Transportation (USDOT), under the State Planning and Research Program, Section 505 [or Metropolitan Planning, Section 104(d)] of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

This UPWP complies with federal and state requirements, is true and correct, and is approved by The Transportation Policy Council: Adopted 06/27/2025

Kimley»Horn

Key Takeaways

- Safety is a high priority for H-GAC as evidenced through a comprehensive safety program.
- H-GAC is there to help and assist you with existing and new programs.
- H-GAC has data sets and technical assistance to encourage and enhance safety programs
- H-GAC has funding sources to help with planning studies, infrastructure projects, educational campaigns, etc.

Thank You
Q&A

Kimley»Horn
Expect More. Experience Better.

PA

Menti

TexITE

Select which slide to add