Clark County, WA
Systemic Safety Improvement Program (SSIP)

Washington Traffic Safety Summit

Spokane, WA

July 16, 2025

Agenda

- Background
- Purpose of Systemic Safety Program
- Systemic Safety Improvement Framework
- Goals
- Development of Systemic Safety Improvement Program (SSIP)
  - Crash and Roadway Characteristic Analysis
  - Identify Priority Locations
  - Treatment Toolbox
  - Model Projects

Background

- County's initial Safety Management Program, developed in collaboration with Kittelson & Associates.
- The initial Safety Management Program focused on identification of hot spot locations based on safety performance utilizing the Highway Safety Manual
- The County wanted to address high risk crash locations in addition to hot spot crash locations.
- Systemic safety methodology was chosen as the approach to address high risk locations.

Safety Program

Safety Management

- Evaluation of safety performance countywide
- Location specific evaluation
- Identify high-priority locations for potential safety improvements
- Identify potential countermeasures for individual sites

Systemic Safety

- Evaluation of countywide crash patterns
- Non-location specific
- Identify crash risk factors to proactively address potential sites for safety improvements
- Develop model projects for addressing risk factors

Purpose of Systemic Safety Improvement

- The Systemic Safety is based upon the Safe System principle that is Proactive.
- Crashes generally occur at random locations however, the factors associated with severe crashes are constant.
- The probability of a crash is higher if the driver encounters an unexpected roadway characteristic such as a horizontal curve.
- The adverse impact of the crash is likely to be more severe where there are additional risk factors such as steep roadside embankments and fixed objects as compared to a flat and clear roadside.

Systemic Safety Improvement Framework

- Crash Type
- Facility Type
- Risk factor

- Identify system elements to analyze.
- Calculate Risk Score
- Prioritize locations for systemic treatment based on presence of crash risk factors

- Identify potential systemic countermeasures to address the established roadway risk factors

- Develop model projects and implement across the board systemic treatment

Goals

The Clark County Systemic Safety Improvement Program was established with the following goal:

Take a proactive approach to traffic safety and address potential sites.

The potential sites were addressed via

- Identification of crash risk factors on county roadways
- Identification of locations with crash risk characteristics
- Prioritizing high risk corridors for low-cost safety treatments.

Development of Clark County SSIP

- Analyze crash data merged with roadway characteristic data
- Identify risk factors for crashes on county roadways

- Prioritize locations for systemic treatment based on presence of crash risk factors

- Identify potential systemic countermeasures to address the established roadway risk factors

- Develop model projects for systemic and site-specific treatments for corridors selected from the priority locations
- Provides a template for how systemic treatments can be applied for each risk factor

Crash and Roadway Characteristic Analysis

Data located in County's GIS database:

- Crash data
  - Date
  - Severity
  - Crash type
- Roadway inventory data
  - County road log number and mileposts
  - Functional classification
- Traffic volume data (ADT)
- Posted speed (miles per hour)
- Number of lanes
- Lane width
- Shoulder width
- Intersection traffic control
- Sidewalk presence

Crash and Roadway Characteristic Analysis

- Systemic evaluation is an open-ended process
- The approach was designed to reflect County goals, using the following criteria:
  - What characteristics are associated with more reported crashes?
  - What characteristics are associated with more reported fatal and severe crashes?
  - What types of roads are crashes concentrated on?
  - What types of crashes are more likely to result in a fatal or severe injury crash?

Crash and Roadway Characteristic Analysis

Table 3: Total Reported Crash Trends by Location and Facility Type, 2013-2017

Location and Facility Type	Crashes			Crashes per Mile		Crashes per 1,000 VMT	
	Total	Fatal or Severe Injury Crash	Percent Fatal or Severe Injury	Total	Fatal or Severe Injury	Total	Fatal or Severe Injury
Total Rural	1,772	99	5.6%	3.2	0.2	2.7	0.15
Local Access	248	17	6.9%	0.9	0.1	2.4	0.16
Arterial or Collector	1,524	82	5.4%	5.6	0.3	2.7	0.15
Total Urban	3,134	106	3.4%	5.6	0.2	2.8	0.09
Local Access	575	22	3.8%	1.4	0.1	3.2	0.12
Arterial or Collector	2,559	84	3.3%	17.9	0.6	2.7	0.09

Data Source: WSDOT and Clark County Public Works, 2018.

- More crashes occurred on urban roads, but rural crashes were more likely to result in a severe injury or fatality

Crash and Roadway Characteristic Analysis

Table 4: Total Reported Crashes by Vehicle Movement and User Factors, 2013-2017

Total Crashes

Location and Facility Type	Under the Influence	Fixed Object	At Angle	Opposite Direction	Pedestrian-Involved	Bicycle-Involved	Motorcycle-Involved	Large Truck	Total
Total Rural	256	1,011	204	110	8	6	57	27	1,772
Local Access	50	176	19	9	4	1	7	3	248
Arterial or Collector	206	835	185	101	4	5	50	24	1,524
Total Urban	347	633	735	396	79	62	92	45	3,134
Local Access	104	151	132	54	20	17	19	6	575
Arterial or Collector	243	482	603	342	59	45	73	39	2,559

Crashes per Mile of Road Group

Location and Facility Type	Under the Influence	Fixed Object	At Angle	Opposite Direction	Pedestrian-Involved	Bicycle-Involved	Motorcycle-Involved	Large Truck	Total
Total Rural	0.5	1.8	0.4	0.2	0.0	0.0	0.1	0.0	3.2
Local Access	0.2	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.9
Arterial or Collector	0.8	3.1	0.7	0.4	0.0	0.0	0.2	0.1	5.6
Total Urban	0.6	1.1	1.3	0.7	0.1	0.1	0.2	0.1	5.6
Local Access	0.2	0.4	0.3	0.1	0.0	0.0	0.0	0.0	1.4
Arterial or Collector	1.7	3.4	4.2	2.4	0.4	0.3	0.5	0.3	6.1

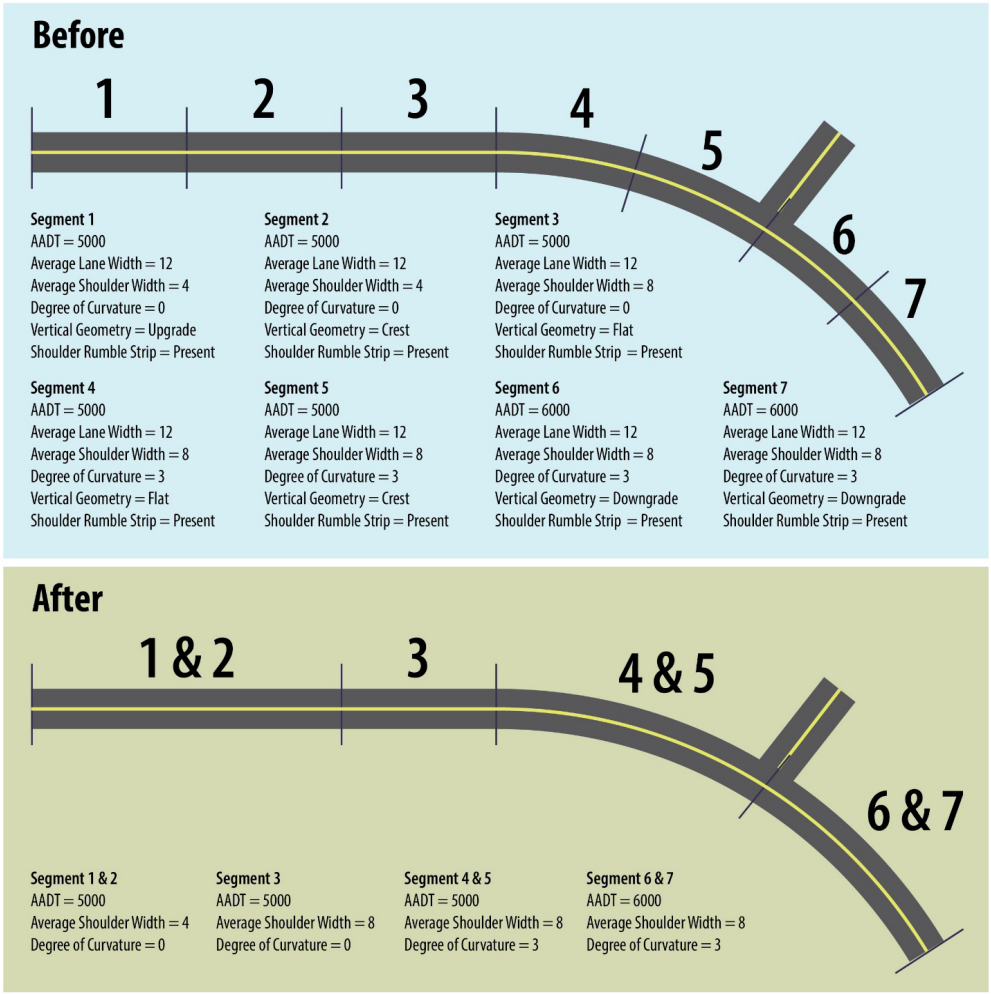
Data Source: WSDOT and Clark County Public Works, 2018.

Systemic Risk Factors

- Rural road curves and grades on high-speed roadways
- Rural road fixed objects
- Pedestrian crossings on multi-lane urban roadways
- Rural two-way stop-controlled intersections
- Urban signalized intersections

NEXT STEP: Identify priority locations for each risk factor

Identification of Priority Location



Example creation of segment elements through dissolve. (Source: FHWA).

Rural Road Curves & Grades

- Curves and slopes are not in the roadway inventory
- Identified curves and slopes:
  - Split road network into short segments
  - Calculate sinuosity of roads and slope
  - Identify significant curves
  - Grouped short segments into longer corridors
  - Prioritized corridors using crash history

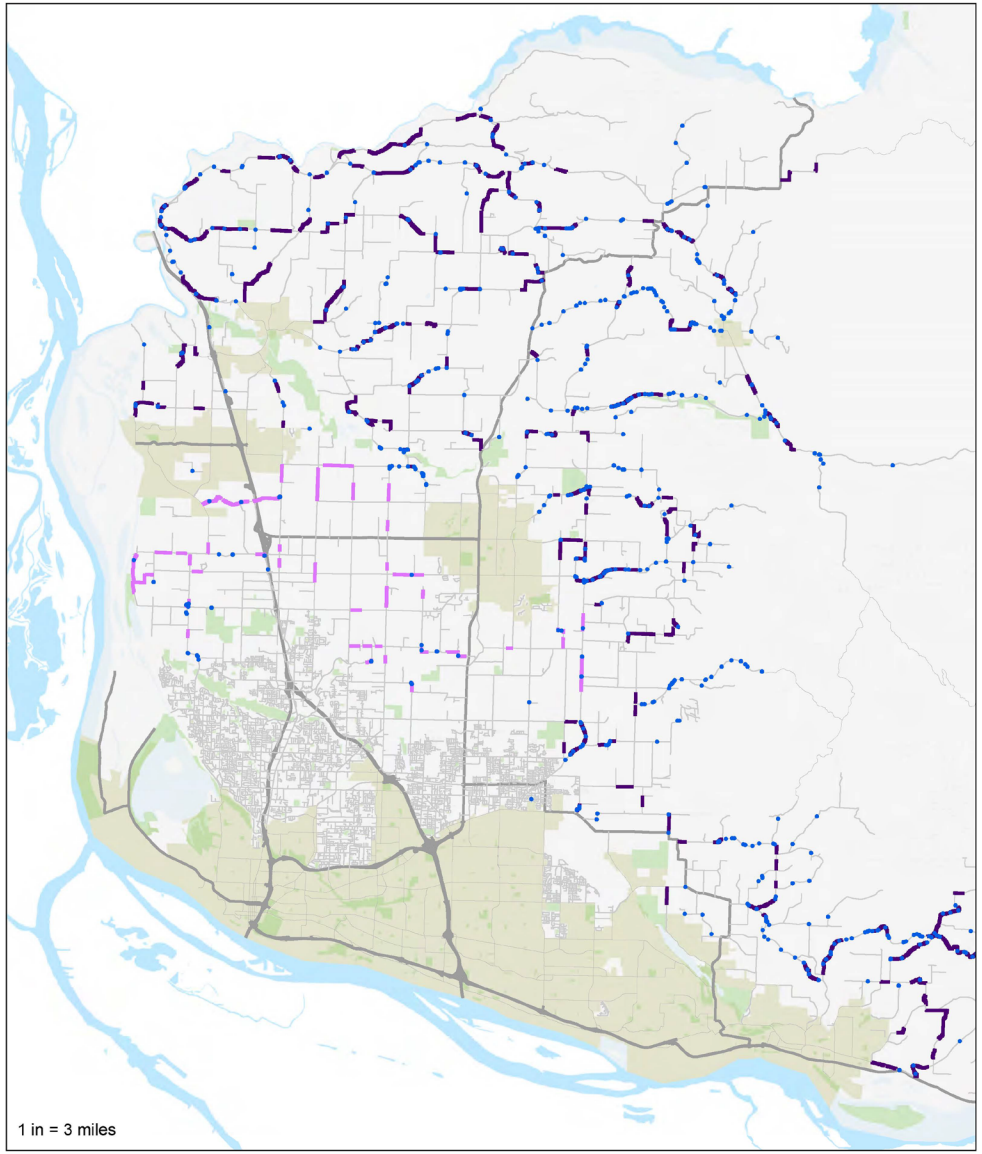


Figure 2: Curved Segments on Rural Roadways 2013 - 2017

Data Source: WSDOT and Clark County Public Works

Rural Road Fixed Objects

- More than half of the crashes on rural roads were fixed object related
- Identified road segments with concentration of fixed object crashes
- Half were rural major collectors
- “S”-turns on higher-speed roads with trees close to the roadway
- Sharper turns on approaches to intersections
- Prioritized locations with crash history (fatal and severe crashes)

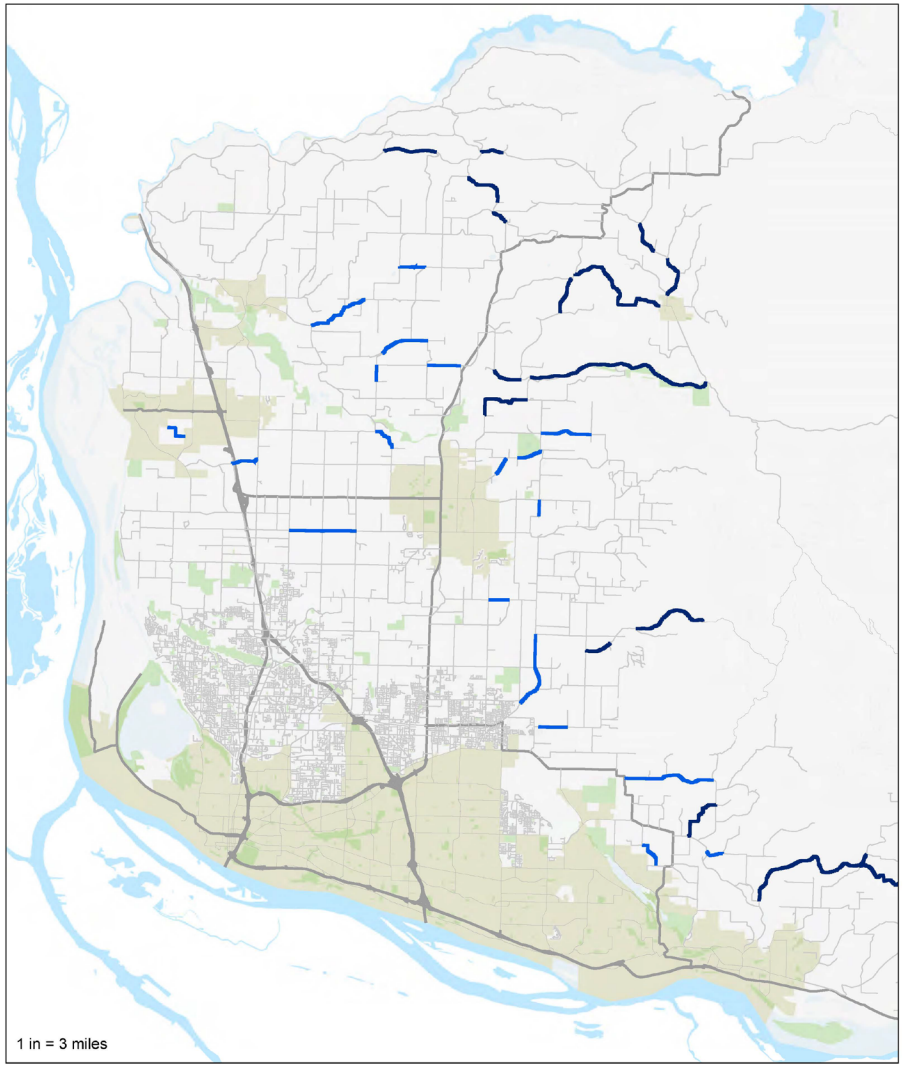


Figure 5: Prioritizing Corridors for Fixed Object Crashes on Rural Roadways 2013 - 2017

Data Source: WSDOT and Clark County Public Works

Pedestrian Crossings on Multi-lane Urban Roads

- Half of the pedestrian collisions occurred on a major multi-lane urban roadway
- Identified multi-lane urban roadways with a concentration of pedestrian crashes
- Concentration of commercial businesses

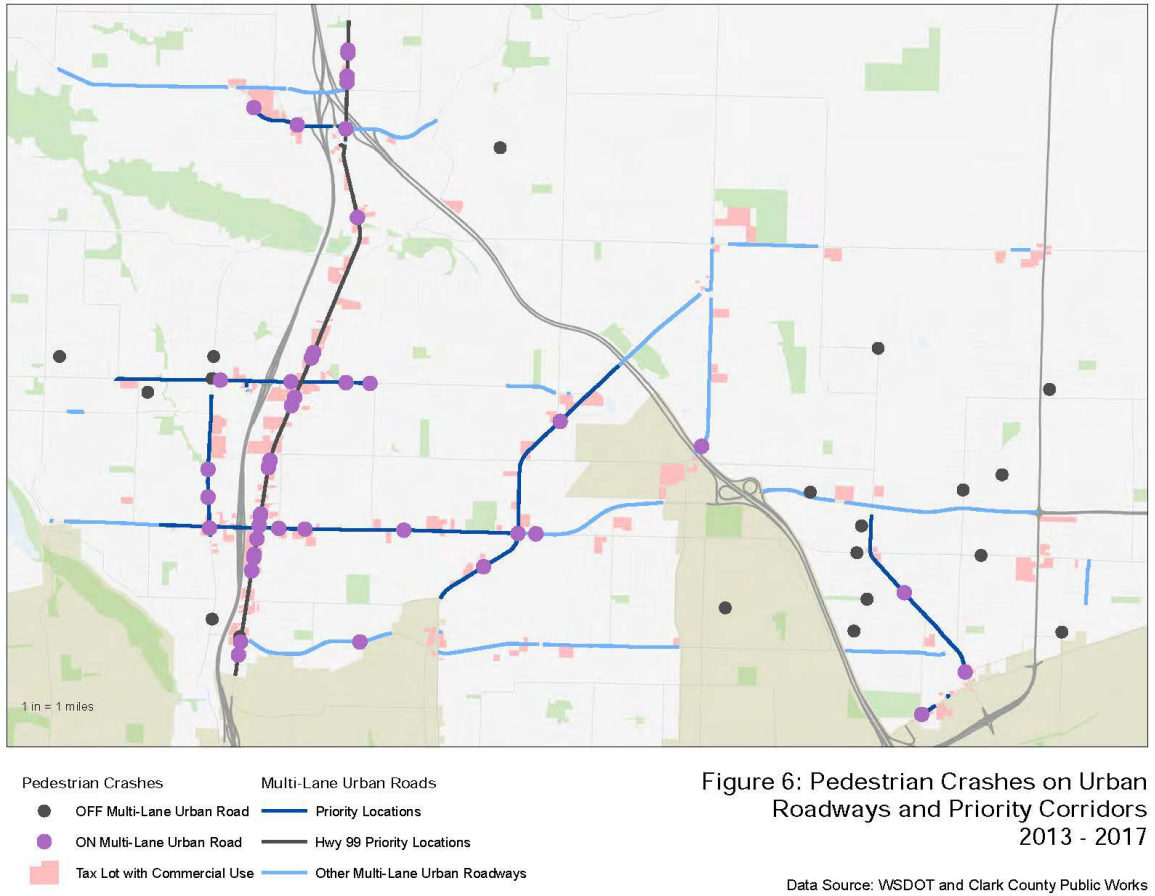


Figure 6: Pedestrian Crashes on Urban Roadways and Priority Corridors 2013 - 2017

Data Source: WSDOT and Clark County Public Works

Rural Two-Way Stop Controlled Intersections

- Simple to identify locations
- Number of intersections (343) makes further prioritization critical
- Identified intersections with highest crash frequency
- Prioritized corridors with multiple higher crash intersections

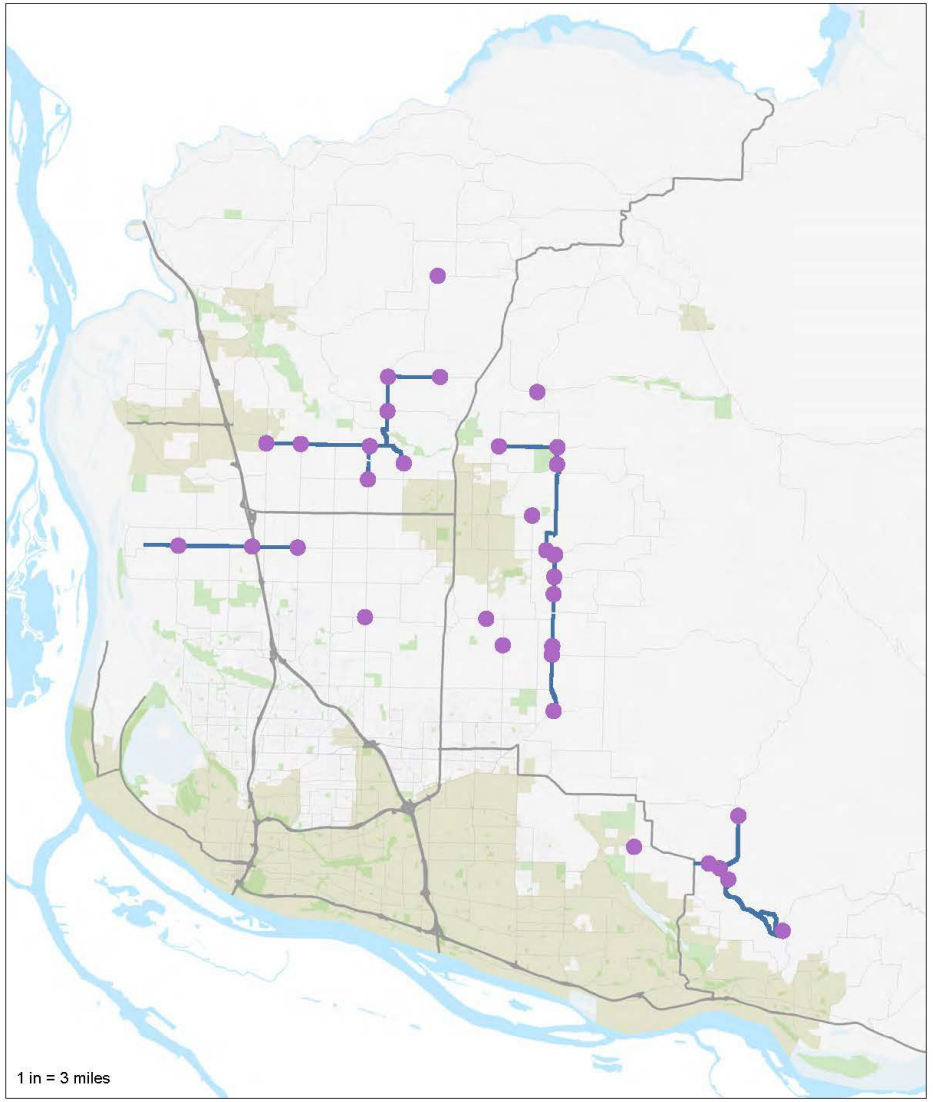


Figure 8: Priority Corridors for Two-Way Stop-Controlled Rural Intersections 2013 - 2017

Data Source: WSDOT and Clark County Public Works

Urban Signalized Intersections

- Simple to identify locations
- Number of intersections (90) makes further prioritization critical
- Identified intersections with highest crash frequency
- Prioritized corridors with multiple higher crash intersections and roads with higher traffic volumes

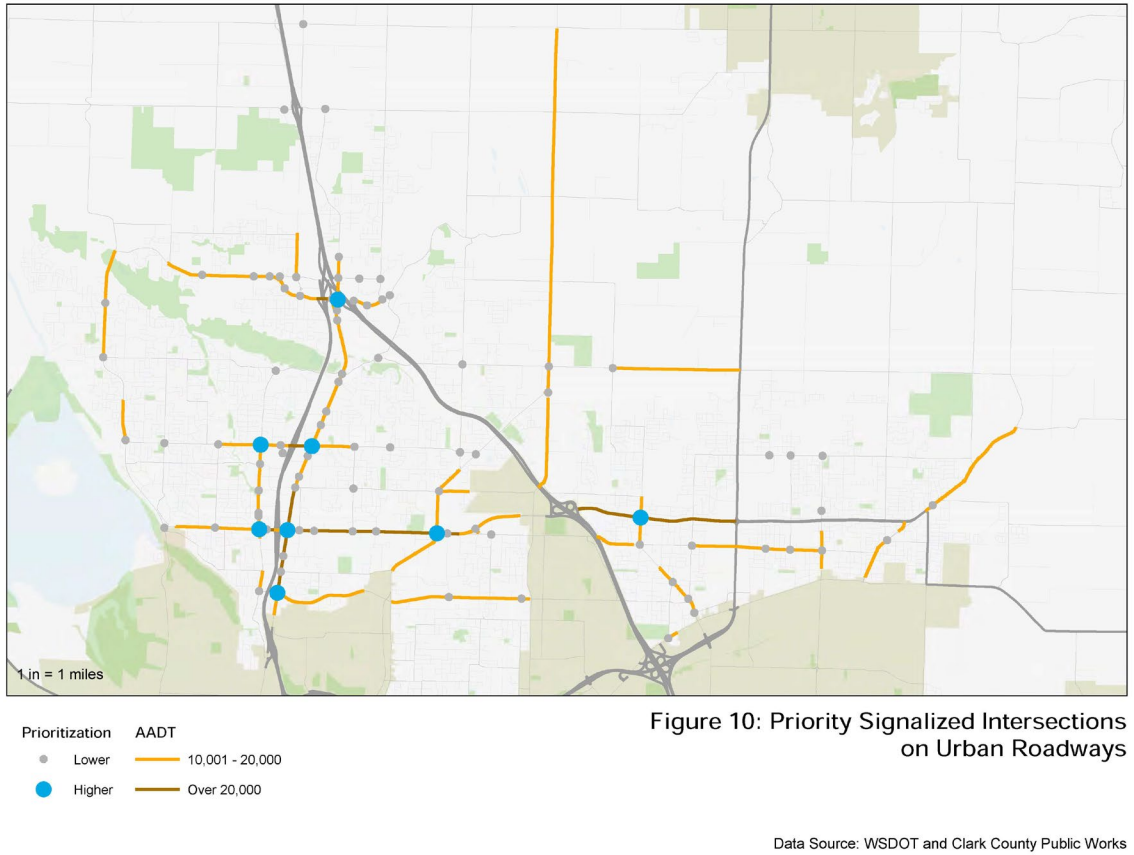


Figure 10: Priority Signalized Intersections on Urban Roadways

Data Source: WSDOT and Clark County Public Works

Treatment Toolbox

Type	Countermeasure Name	CRF
Rural Road Curves	Install Centerline Rumble Strips	20%
	Increase Pavement Friction[1]	24%
	Widen Paved Shoulder (0-4 feet)	31%
	Install Chevron Signs on Horizontal Curves	43%
	Install Dynamic Feedback Sign on Curves	25%
Fixed Object and Run-off Road	Install Continuous Milled-in Shoulder Rumble Strips	79%
	Increase Pavement Friction	24%
	Remove, Relocate, or Protect Fixed Objects Adjacent to Road	38%
	Install Wider Edge-lines (From 4 to 6 inches)	37%
Pedestrian Crossings on Multi-lane Urban Roadways	Pedestrian Refuge Island	32%
	Parking Restriction on Approach to Crosswalk	30%
	Rectangular Rapid Flashing Beacon	47%
	Pedestrian Hybrid Beacon	57%
Rural Two-way Stop-Controlled Intersections	FHWA Basic Set of Sign and Marking Improvements for Unsignalized Intersections	40%
	Provide "Stop Ahead" Pavement Markings	56%
	Transverse Rumble Strips on Stop-controlled Approaches	25%
Urban Signalized Intersections	FHWA Basic Set of Signal and Sign Improvements for Signalized Intersections	30%
	Increase All-red Clearance Interval	20%
	Convert Left turn Permissive to Protected Phasing	16%
	Leading Pedestrian Interval (4 lane principal arterial)	59%
	Install pedestrian Countdown Timer	70%

Source: Developed by Kittelson & Associates, Inc., CRF sources are cited in the body of the section.

Treatment Toolbox

Increase Pavement Friction

Description: High friction surface treatments are the application of aggregate to the pavement to increase or maintain the pavement friction at a site.

Potential Crash Reduction: 24%*	**Crash Types Addressed:** All	**Crash Severity Addressed:** All
Reason for Application: Increasing or maintaining appropriate pavement friction through a curve can reduce the potential for motorists to lose control of their vehicle or skid when navigating a curve. Increased pavement friction has been shown to reduce crash frequency during wet conditions and in locations with high friction demand due to vehicle speeds or roadway geometrics.	**Design Life:** 10 Years	**Cost:** $1,000 per square foot

Photo Source: FHWA

** Merritt, D., C. Lyon, and B. Persaud. "Evaluation of Pavement Safety Performance". Report No. FHWA-HRT-14-065, Federal Highway Administration, February 2015*

Treatment Toolbox

Figure 6. Curve Warning Signing for Winding Roads

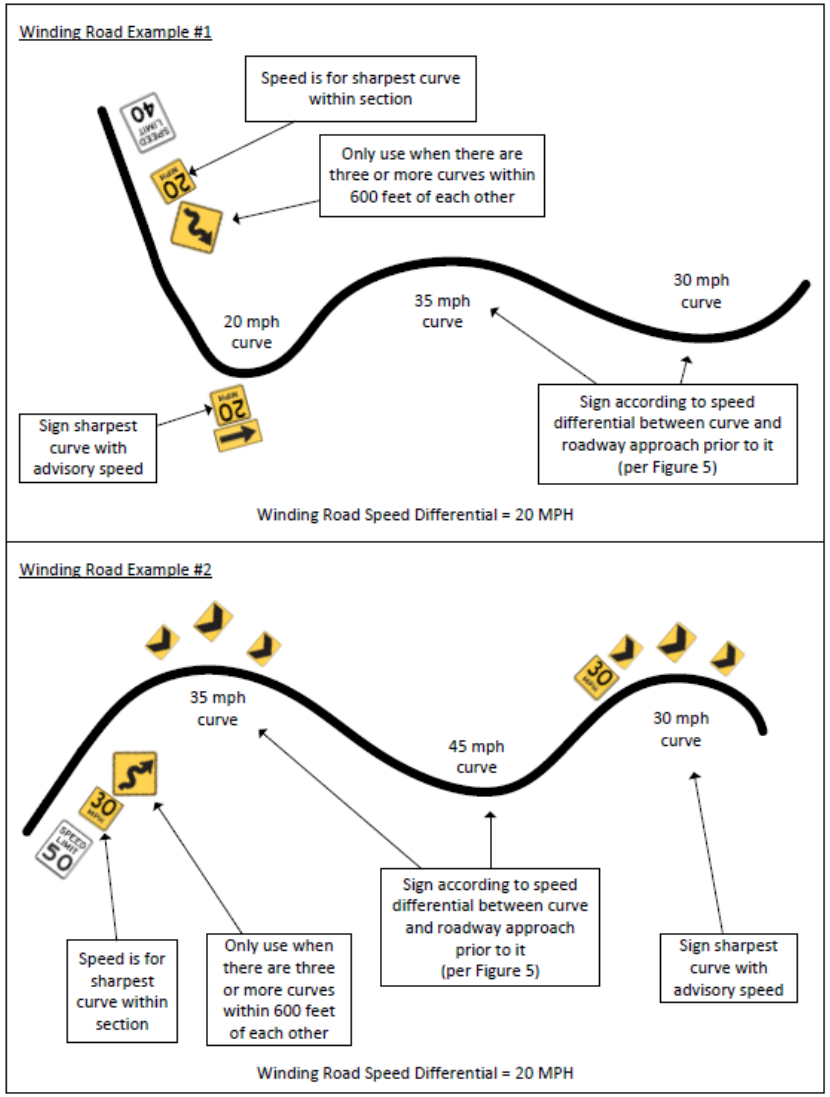
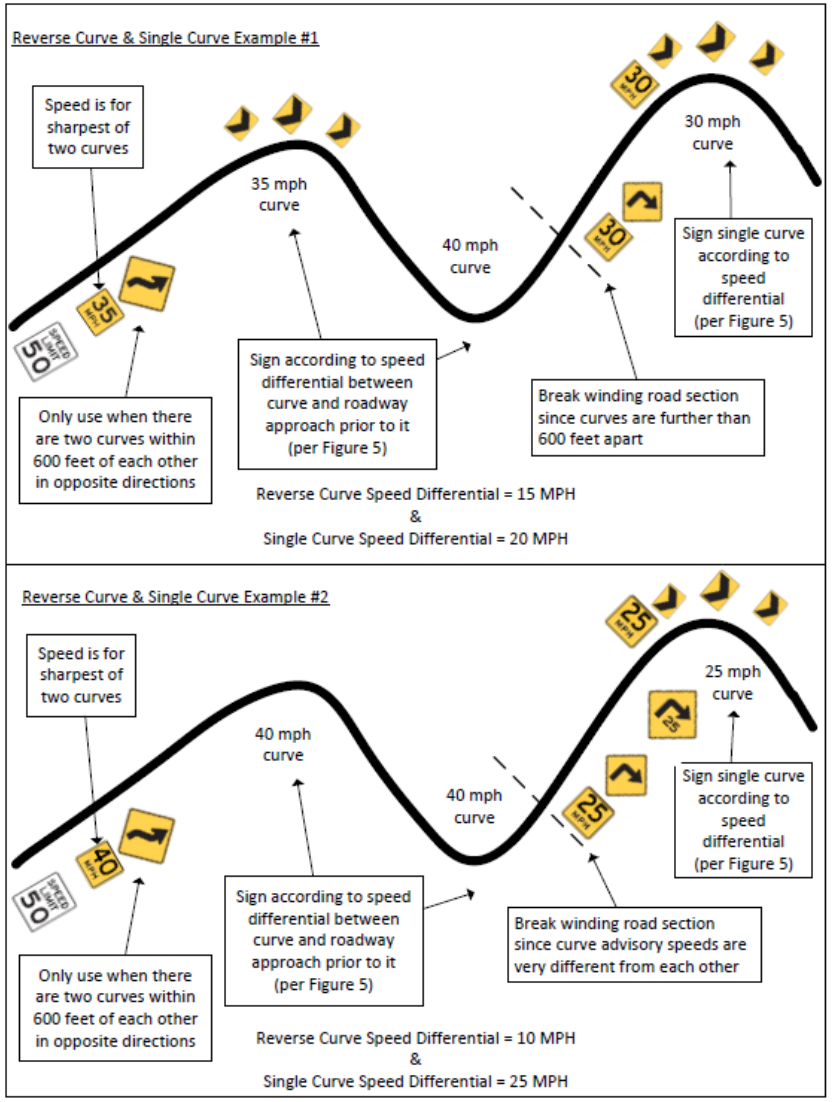


Figure 7. Curve Warning Signing for Reverse Curve & Single Curve

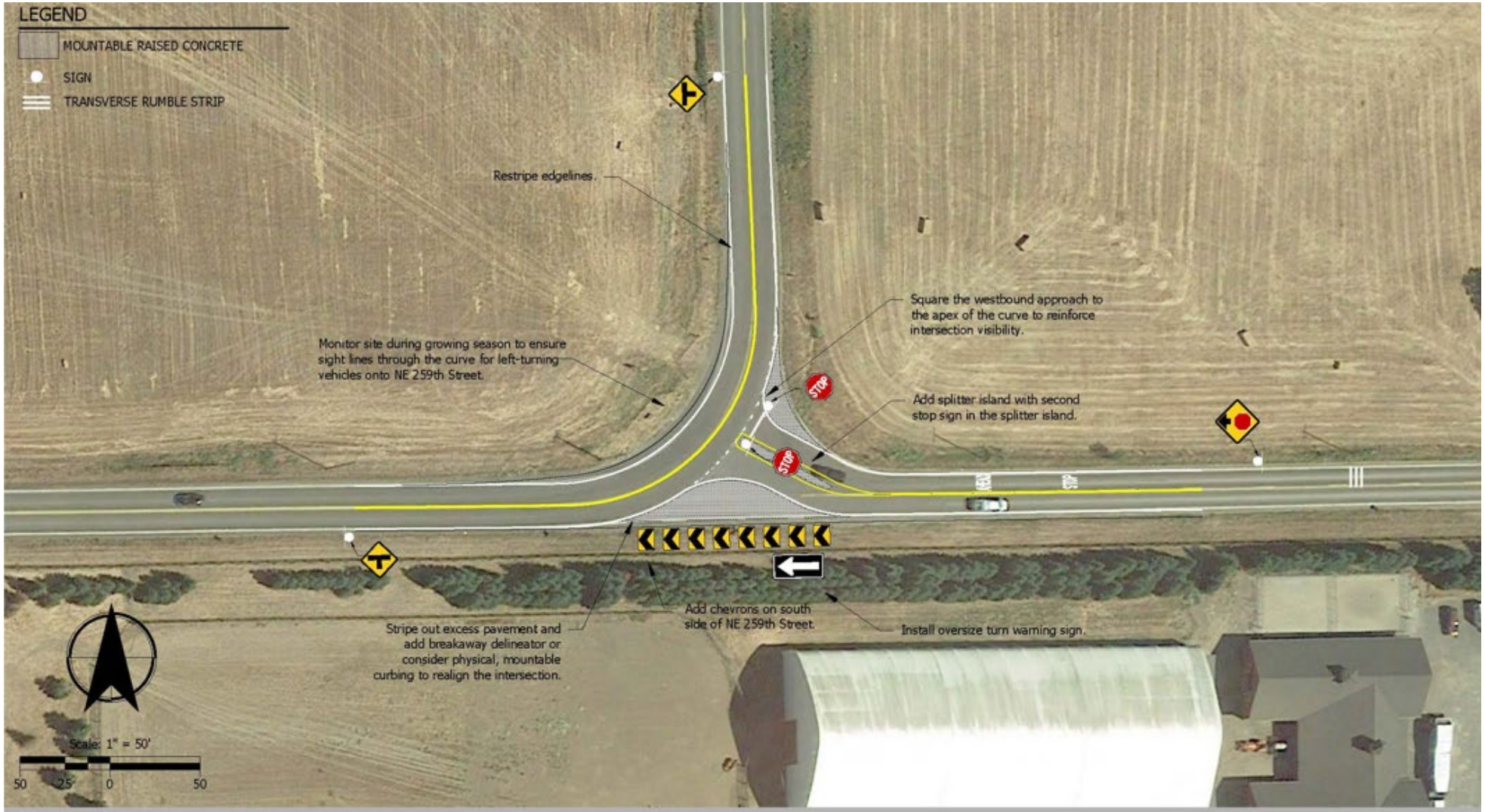


Model Projects

- Model projects were developed for one priority location for each risk factor
- The model projects provide a framework for applying systemic treatments across the county

Model Projects

Model Projects



Questions?

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