



# Eastern Shore Safety Study

*Citizen Information Meeting*

November 17, 2015



# Study Scope

- 2002 vs. 2014 Comparative Analysis
- Corridor Safety Assessment
  - Site Specific “Focus Locations” Analysis
  - Systemic Analysis

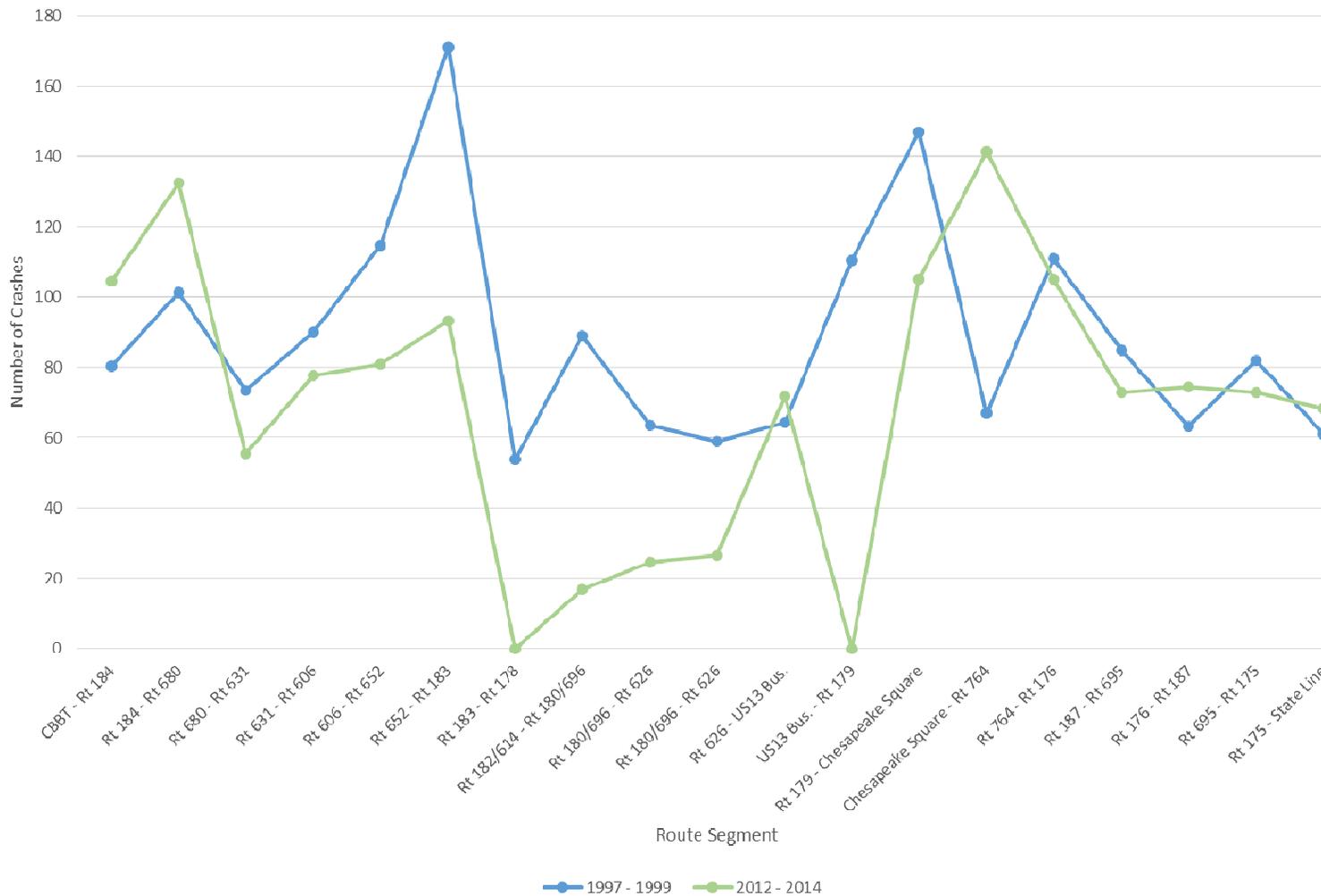


# Comparative Analysis



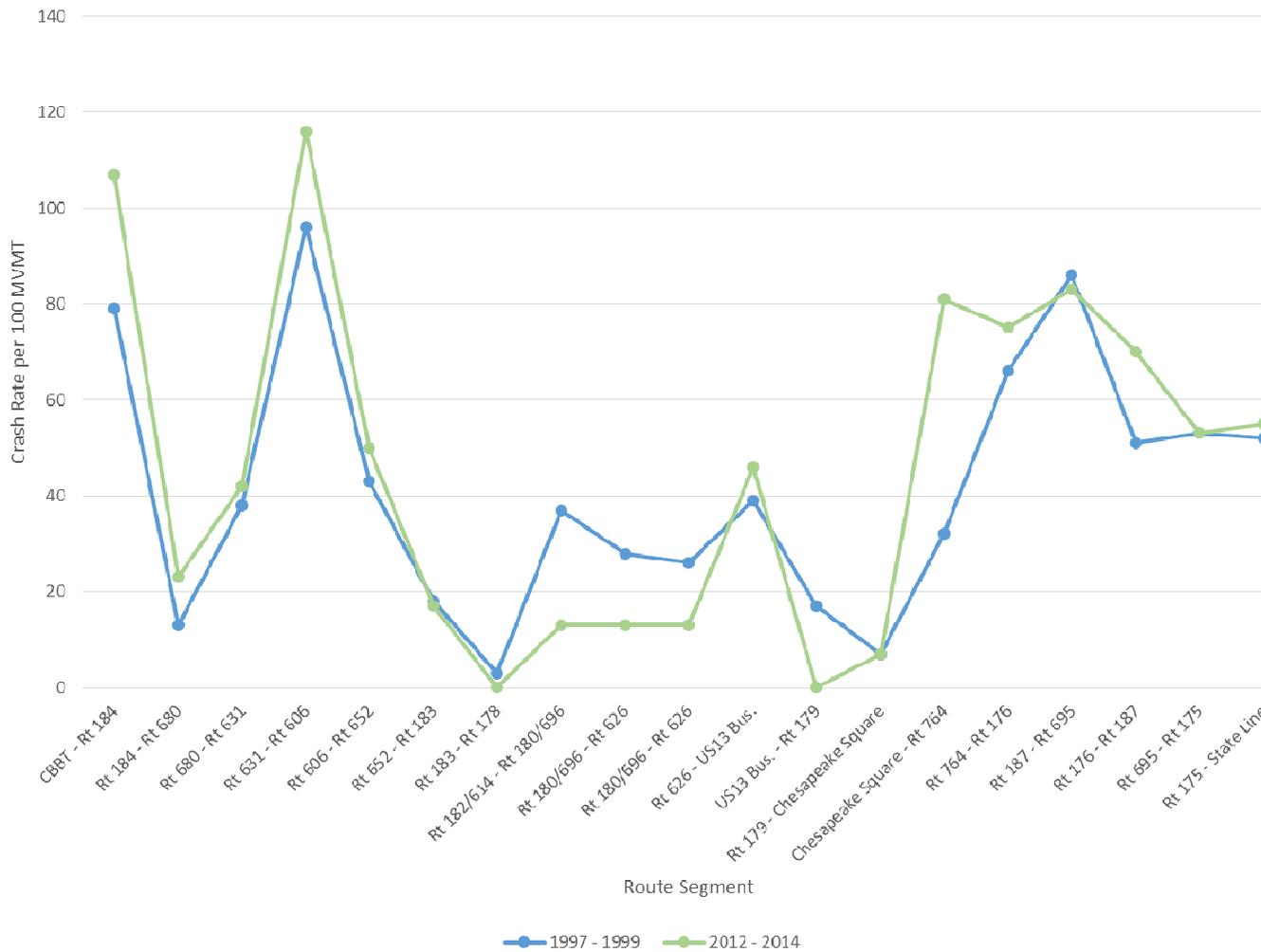
# Comparative Analysis

Route 13 Safety Study  
Number of Crashes



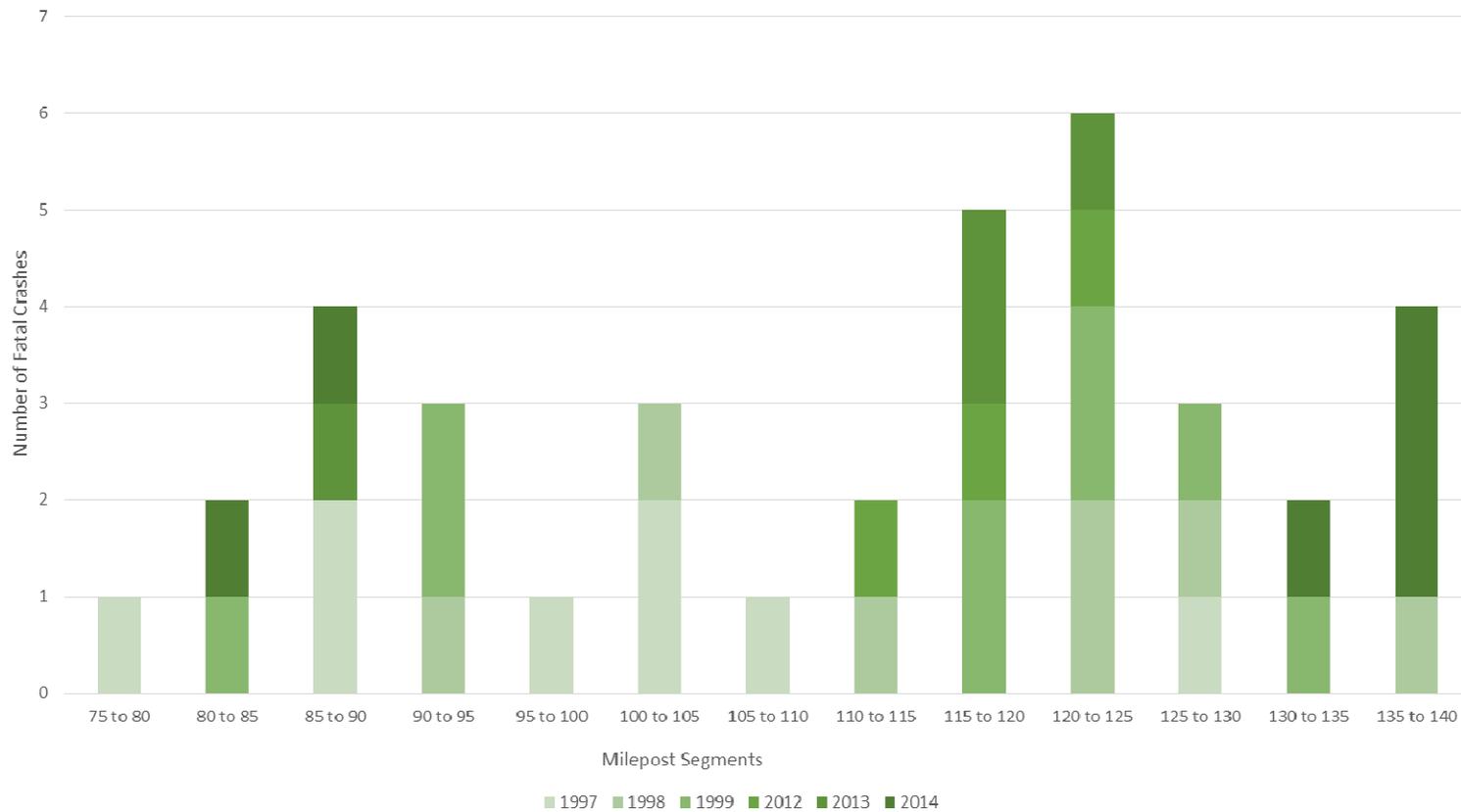
# Comparative Analysis

Route 13 Safety Study  
Crash Rates



# Comparative Analysis

Route 13 Safety Study  
Fatal Crashes by Segment



# Comparative Analysis Next Steps

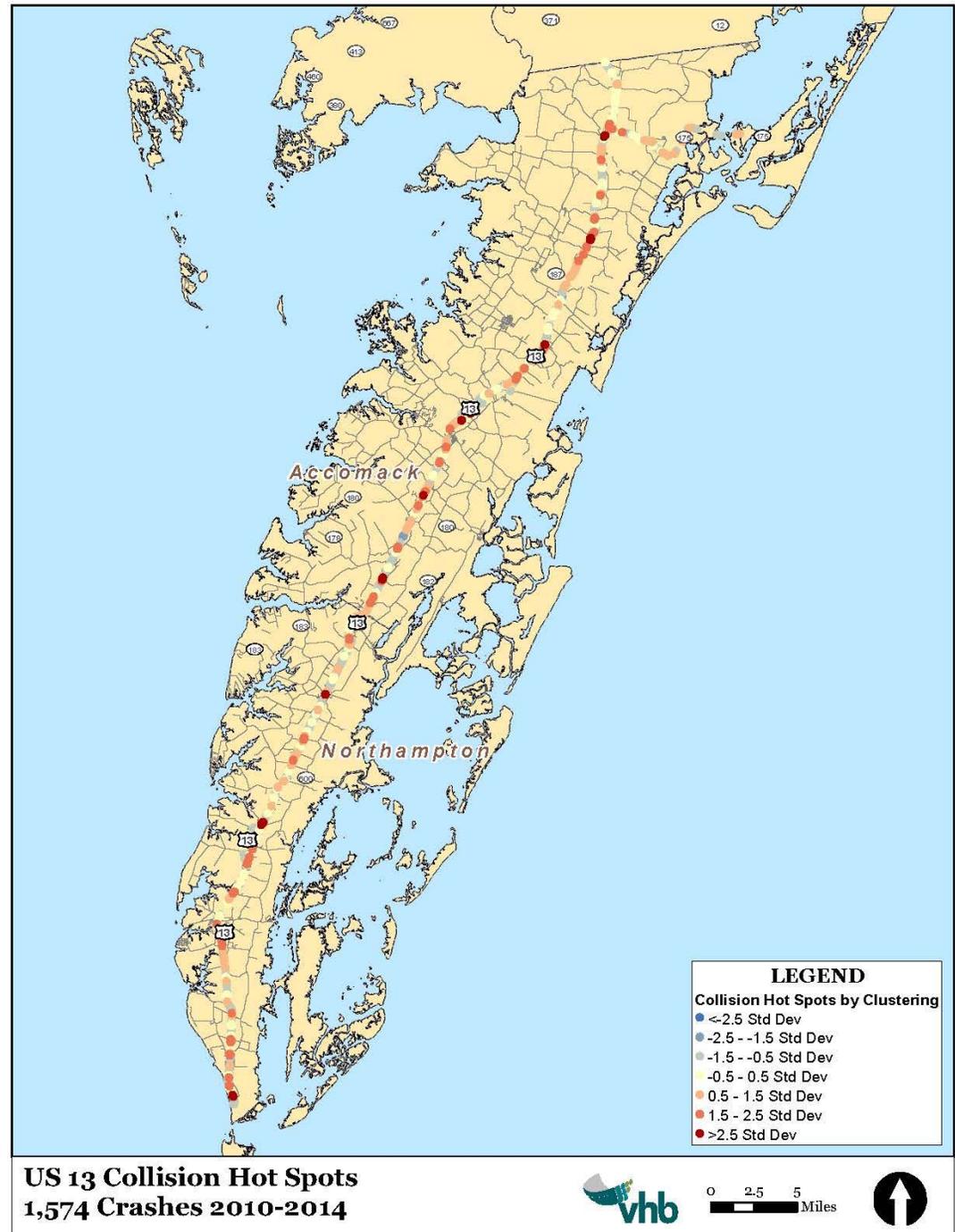
- Review the implemented treatments since 2002
- Determine if additional treatments could aid in prevention and how they align with the other sections of the study



# Site Specific Analysis



# Site Specific Location Analysis

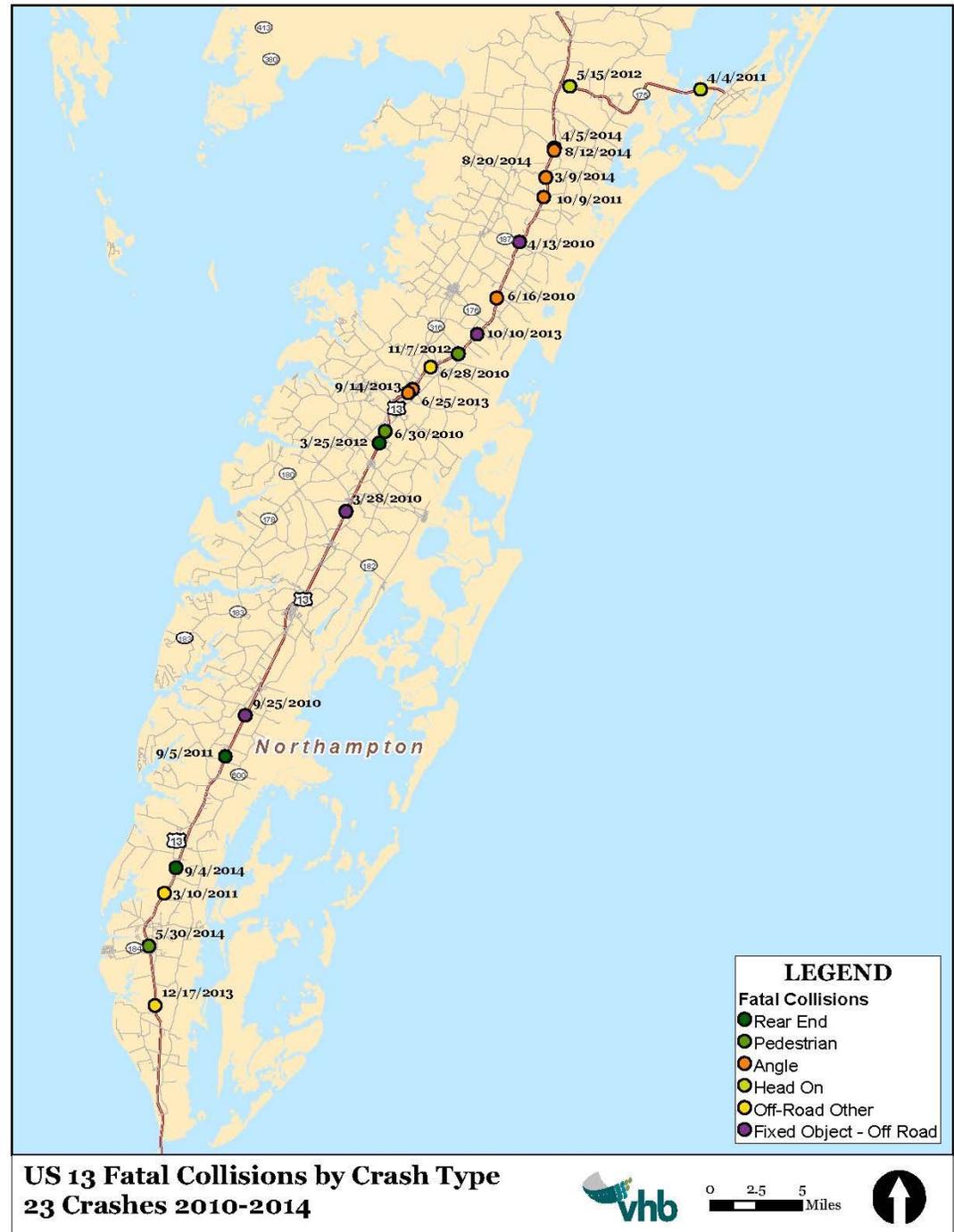


# Site Specific Location Analysis

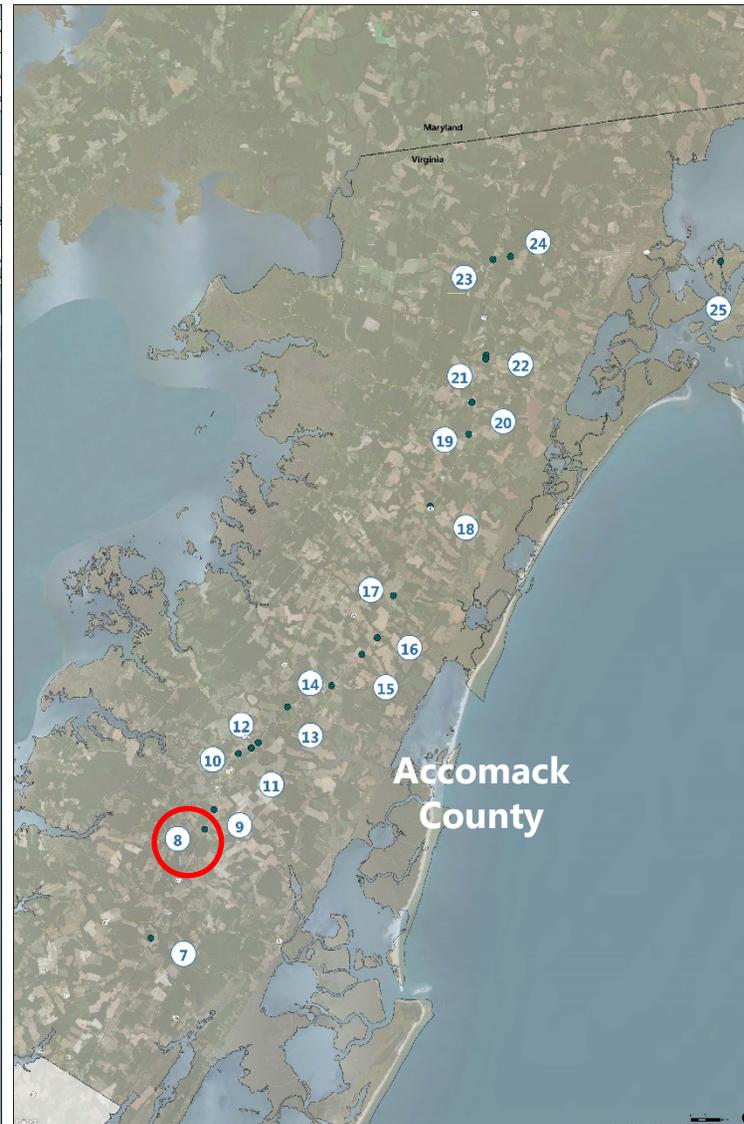
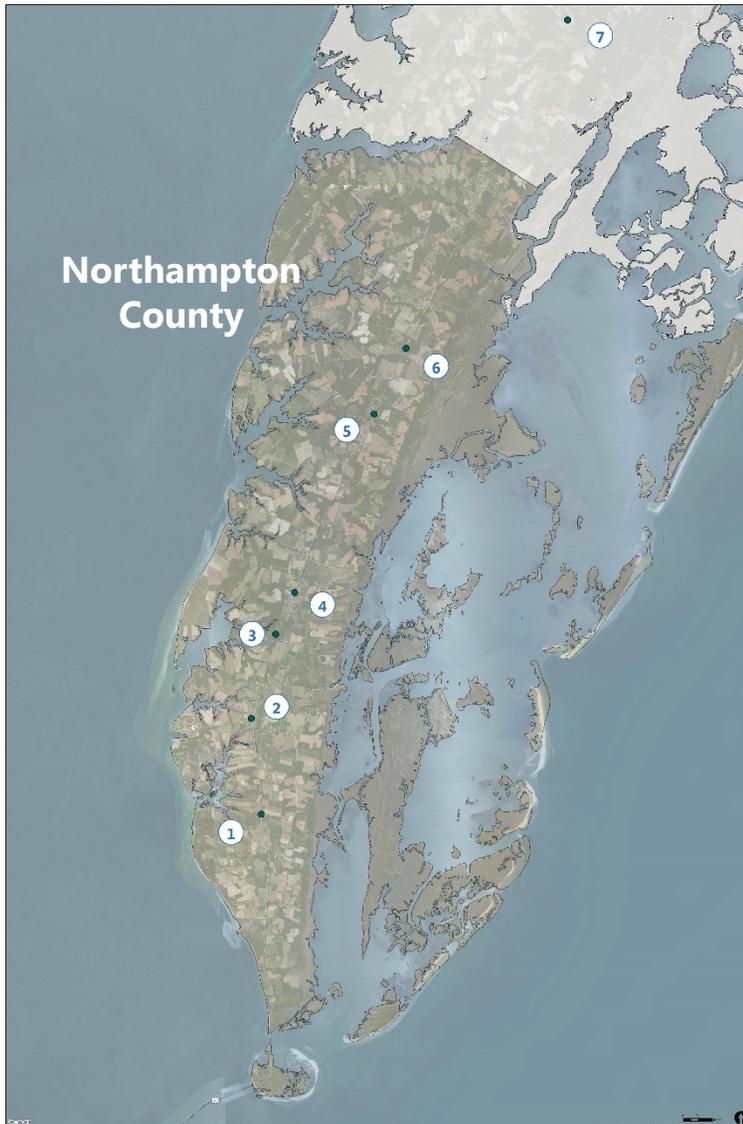
- KAB
  - K = Fatal
  - A = Incapacitating Injury
  - B = Non-incapacitating Injury



# Site Specific Location Analysis



# Site Specific Location Analysis



# Location #8 – Route 13 and Dogwood Drive

## Existing Conditions:

Intersection of:

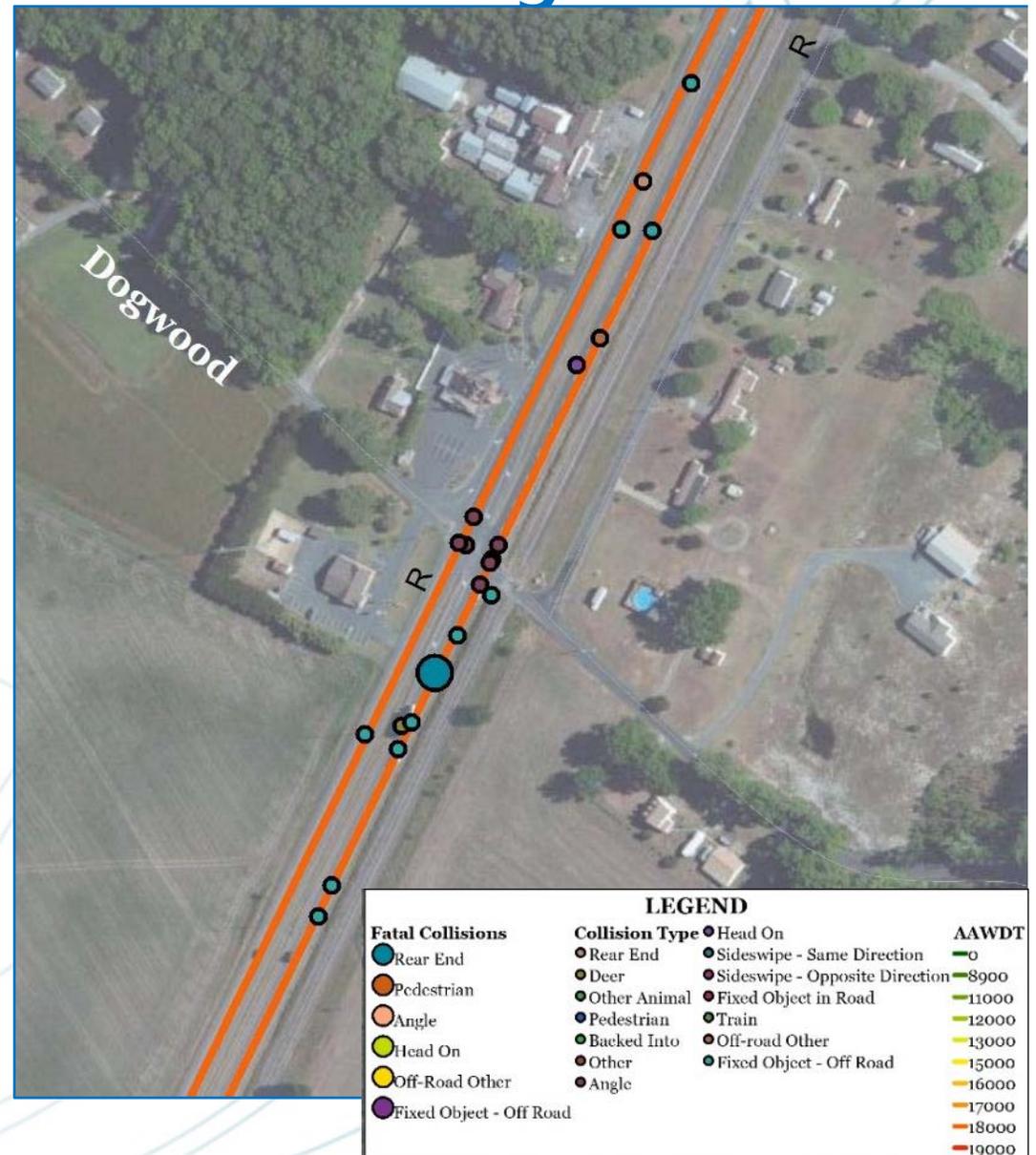
- Dogwood/Phillips Drive (two-lane road)
- Route 13 (four-lane median divided road)
- Texaco Town Road (two-lane road)
- Railroad crossing
- Virginia State Police area office
- Tammy and Johnny's Restaurant
- Other businesses
- Residential area



# Location #8 – Route 13 and Dogwood Drive

## Crash Data:

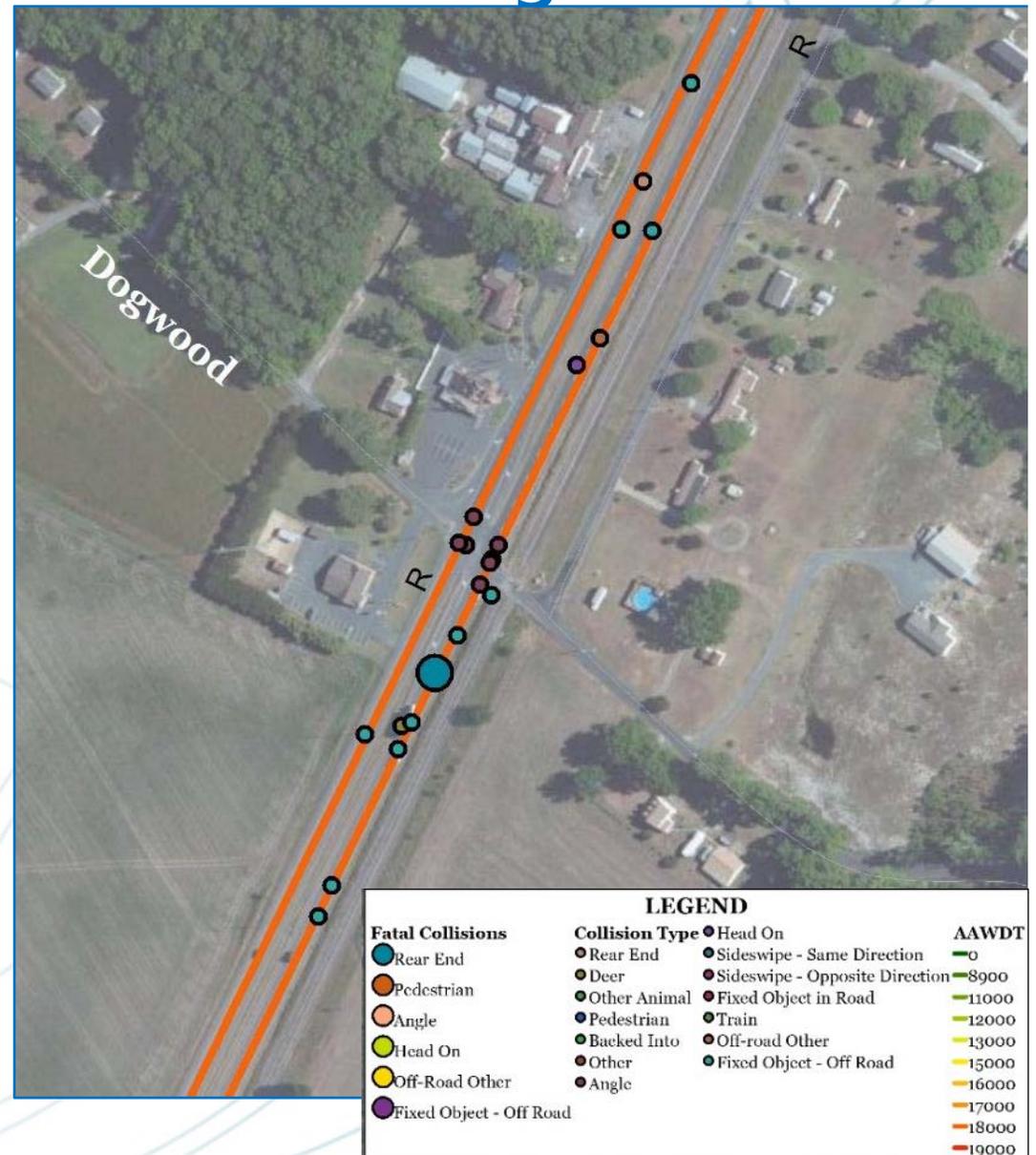
- 23 crashes within the vicinity of the intersection
- Peak periods:
  - Afternoon (12-5 PM) (35%)
  - Night (8 PM-5 AM) (31%)
- Crash type:
  - Roadway departure (52%)
  - Angle (31%)
  - Animal (4%)
  - Head-on (4%)
- Crash severity:
  - 1 Fatality
  - Fatal + injury (52%)
  - Property Damage Only (44%)



# Location #8 – Route 13 and Dogwood Drive

## Crash Data:

- General Trends:
  - Northbound approach: primarily roadway departure crashes,
  - Within the intersection: primarily angle crashes
  - Most of the fatal + injury crashes occurred during the afternoon (38%) and night (31%)
  - Most of the fatal + injury crashes were roadway departure (54%) and angle (31%) crash types.



# Location #8 – Route 13 and Dogwood Drive

## Key Safety Concerns:

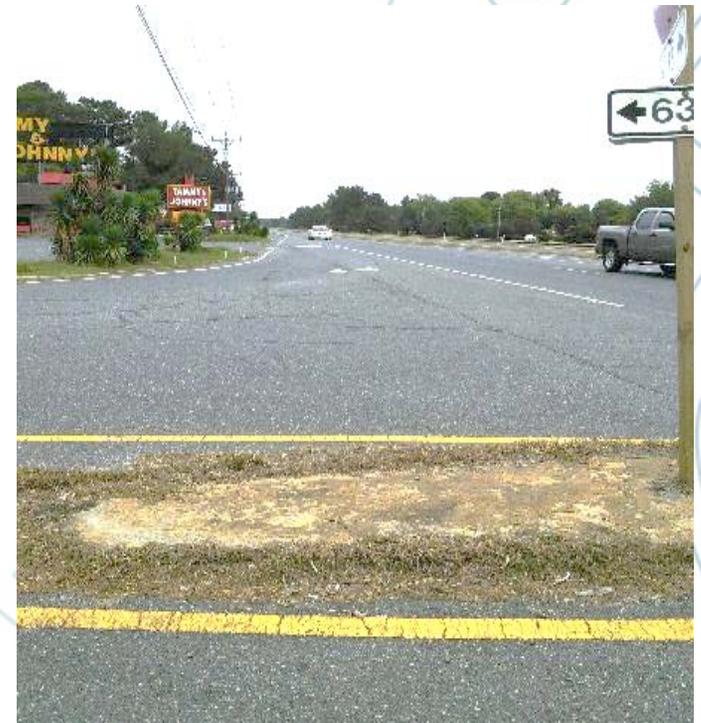
- High number of conflict points due the numerous intersections and driveways
- Wide access points/driveway entrances
  - Reduces driver expectancy



# Location #8 – Route 13 and Dogwood Drive

## Key Safety Concerns:

- High speeds on Route 13
  - Difficult for drivers entering Route 13 to determine sufficient gaps
  - Difficult for drivers on Route 13 to slow down to enter driveways or intersecting roads
  - Increased potential for higher severity crashes
- Limited ability for drivers to slow down before turning onto intersecting streets or parking lot entrances
  - Short southbound right turn lane
  - No northbound right turn lane



View of southbound right turn lane.



# Location #8 – Route 13 and Dogwood Drive

## Key Safety Concerns:

- Nighttime crashes
  - 31% of fatal + injury crashes
- No U-turn permitted due to narrow median and speeds. Signage is present but vehicles still conduct maneuver.
- Signage:
  - Some of the signs or sign posts are bent/damaged
  - Street signs are difficult to see traveling at speed on Route 13

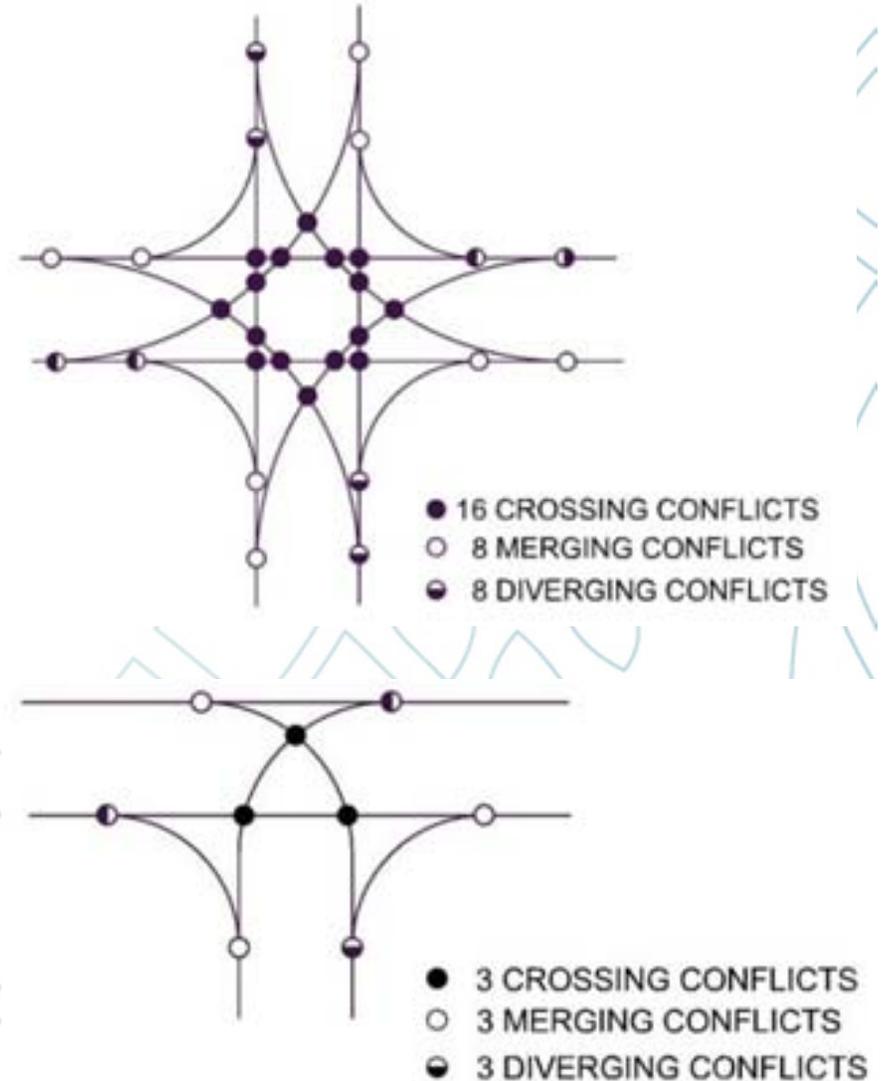


# Location #8 – Route 13 and Dogwood Drive

## Potential Countermeasures

- Access Management – reduce the number of conflict points
  - *FHWA Proven Countermeasure*

**More conflict points =  
increased crash risk**



# Location #8 – Route 13 and Dogwood Drive

## Examples of access management measures

### Potential Countermeasures

- Access Management – reduce the number of conflict points

#### Defining access points

- Reduce the width through use of curbing, landscaping, etc.

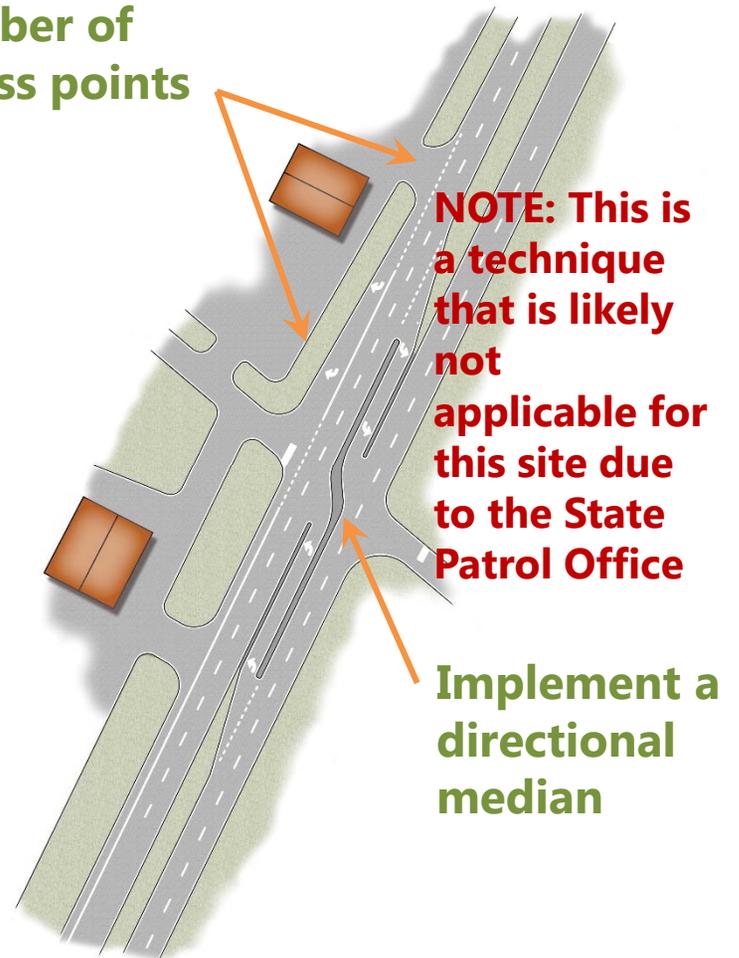
#### Closing access points

- Locating driveways on the appropriate roadway.
- Limiting driveways within the functional area of an intersection
- Closing/reducing median access

### Condense the number of access points

**NOTE: This is a technique that is likely not applicable for this site due to the State Patrol Office**

**Implement a directional median**



Time Frame: Mid – Long Term

# Location #8 – Route 13 and Dogwood Drive

## Potential Countermeasures

- High speeds/limited ability for drivers to slow down before turning onto intersecting streets or parking lot entrances:
  - Evaluate opportunity to provide full width/length right turn lanes on Route 13
  - Provide advance intersection warning
  - Reduce the amount of direct access onto Route 13 through driveway consolidation and using side streets for access
- Nighttime crashes:
  - Improve intersection expectancy and visibility through advance intersection warning signs, flashing/dynamic warning beacons on warning signs or at intersection, reflective strips on signs posts, reflective post mounted delineators on intersection approaches and median
  - Install intersection lighting

### Time Frame:

Short Term: intersection warning signage, reflective delineation, warning beacons, increased enforcement

Mid – Long Term: changes to/addition of right turn lane, driveway consolidation, lighting

# Location #8 – Route 13 and Dogwood Drive

## Potential Countermeasures

- Signage:
  - Repair or replace damaged signs and sign posts
  - Consider replacing street signs with 12" signs to improve both day and night time visibility
- U-turn maneuver:
  - Strategically identify potential locations to widen median and provide U-turn opportunities
  - Consider partial/full median closure
  - Increased/targeted enforcement during peak periods

### Time Frame:

Short Term: repair/replace damaged signage, increased enforcement

Mid – Long Term: changes to median/U-turn access

# Location #8 – Route 13 and Dogwood Drive

## Crash Modification Factors

Countermeasure	CMF	Notes	Source
Corridor Access Management	0.77 - 0.95 (5-23% reduction)		FHWA Proven Countermeasures
Directional medians to allow left-turns and U-turns	0.49 (51% reduction)	All crash types and severities.	CMF Clearinghouse
Replace a direct left turn with a right-turn/U-turn	0.8 (20% reduction)	All crash types and severities.	CMF Clearinghouse
Intersection lighting	0.62 - 0.881 (38 - 11.9% reduction)	Nighttime crashes, injury crashes - all severities.	CMF Clearinghouse



# Location #8 – Route 13 and Dogwood Drive

## Example:

- Corridor Access Management:
  - CMF 0.86
  - 23 crashes experienced over a 5 year period

$0.86 \times 23 \text{ crashes} = 19.78 \text{ crashes over 5 year period}$



# Site Specific Analysis - Next Steps

- Identify applicable treatments for each site
- Review with VDOT

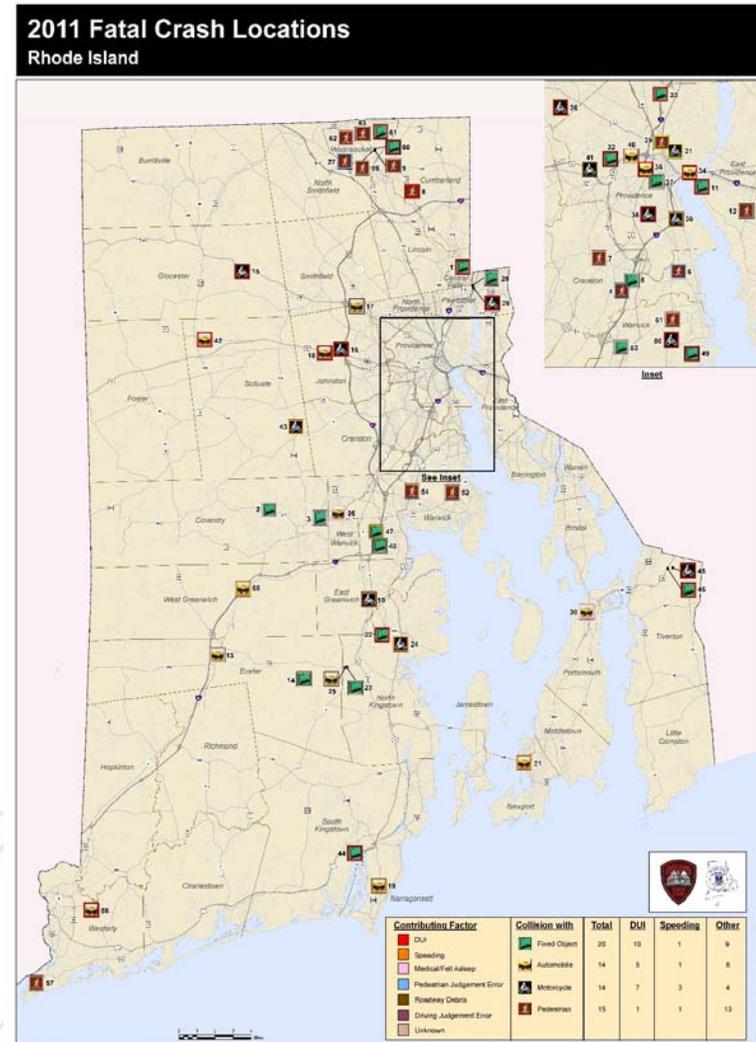


# Systemic Analysis



# Systemic Network Screening

- Why systemic?
  - Fatalities are a moving target



# Systemic Network Screening

- Why systemic?
  - Trends are consistent
    - Crash type
    - Facility type
    - Road user

Crash Type	2008	2009	2010	2011
Run-off-road	45%	46%	44%	47%
Angle	28%	27%	29%	27%
Rear-end	13%	12%	13%	14%
Head-on	9%	8%	10%	8%
Pedestrian	5%	7%	4%	4%
Total	100%	100%	100%	100%



# Systemic Analysis

Step 1: Establish focus crash types

Step 2: Establish focus facilities

Step 3: Identify risk factors

Step 4: Screen and prioritize candidate locations



# Systemic Analysis

Step 1: Establish focus crash types

<b>Crash Severity</b>	Rear End	Deer	Ped	Other	Angle	<i>Percent of Total</i>	Head On	Sideswipe - Same Direction	Fixed Object in Train Road	Roadway Departure	<i>Percent of Total</i>	<b>Grand Total</b>	
<b>B. Non-Incapacitating Injury</b>	48	9	6	2	76	30%	3	9	1	1	99	39%	<b>254</b>
<b>A. Incapacitating Injury</b>	24	2	4	3	45	30%	5	2			63	43%	<b>148</b>
<b>K. Fatal Injury</b>	3		3		8	35%	2				7	30%	<b>23</b>
<b>Grand Total</b>	<b>75</b>	<b>11</b>	<b>13</b>	<b>5</b>	<b>129</b>	<b>30%</b>	<b>10</b>	<b>11</b>	<b>1</b>	<b>1</b>	<b>152</b>	<b>36%</b>	<b>425</b>



# Systemic Analysis

Step 2: Establish focus facilities

- Intersections: signalized/unsignalized
- Corridor segments



# Systemic Analysis

Step 3: Identify risk factors

## Roadway departure

- Speeds/speed limits
- Median presence
- Number of lanes
- Shoulder width (outside/inside)
- Rumble strips
- Lighting (light condition)
- Weather/pavement condition



# Systemic Analysis

Step 3: Identify risk factors

## Angle Crashes at Unsignalized Intersections:

- Vertical/horizontal curvature
- Traffic volume
- Approach speeds
- Unexpected crossings (median crossovers that are between intersections, minor intersections, nighttime angle crashes at dark unlit locations)
- Drivers running stop sign (that may be characterized as failure to yield or obey traffic sign)
- Slippery pavement (wet conditions)



# Systemic Analysis

Step 3: Identify risk factors

## Angle Crashes at Signalized Intersections:

- Poor visibility of signals (adverse weather conditions such as rain, snow, or fog; horizontal and vertical curvature)
- Inadequate signal timing.
- Approach speeds
- Slippery pavement (wet conditions)
- Drivers running red light
- Right-turn on red vehicles misjudging speed



# Systemic Analysis

## Step 3: Establish focus crash types

### Roadway Departure Crashes by Speed (speed limit as noted in crash report)

Segment Description	0	25	35	45	50	55	Grand Total	
Unknown	2	2	1	5	20	3	288	321
0.Two-way, non-divided		1			11	2	12	26
1.Divided, no access control		5			7	3	155	170
3.Divided, full access control							1	1
<b>Grand Total</b>	<b>2</b>	<b>8</b>	<b>1</b>	<b>5</b>	<b>37</b>	<b>8</b>	<b>438</b>	<b>518</b>



# Systemic Analysis

Step 4: Screen and prioritize candidate locations



# Systemic Templates

- The templates are a set of documents containing specific sets of sign, pavement marking, or other TCD applications that correspond to various roadway sections (i.e., intersection, curve, and corridor segment).

**Edge Line Application\*** (Source: MUTCD Chapter 3B)

Functional Class	Pavement Width	AADT
Rural Arterials & Collectors	≥= 20'	≥= 3,000
Local	Where curb/s is not present	≥= 3,000

\*If edge line on all approaches where speed is greater than 40 mph, apply a minimum of 10' from intersection or the length of the run-out. (Appendix)

**Center Line Application** (Source: MUTCD Chapter 3E)

Functional Class	Pavement Width	AADT
Urban Arterials & Collectors	≥= 20'	≥= 4,000
Rural Arterials & Collectors	≥= 18'	≥= 3,000
Local	≥= 18'	N/A

**Template 1 - Unsignalized Intersection - 4-leg (2-way stop controlled), unseparated (3 Tiers)**

**Notes:**

- 1 Upgraded signs with current MUTCD standards (font, size, reflectivity, placement, message, etc.)
- 2 Fluorescent yellow sheathing on change of direction warning signs
- 3 Street name sign (D3-1a or D3-1 for local roads)
- 4 Large 12" street name sign (D3-1a)
- 5 Control sign (R1 Series)
- 6 Second control sign (R1 Series) on left if median present and 4' or more from R1 sign
- 7 Large control sign (R3 Series)
- 8 Intersecting route and directional sign (M1, M3, & M5 Series) include signs for through movements only where through movement is a different route number
- 9 Advance intersecting route and directional sign (M1, M3, & M5 Series)
- 10 Confirmation route signs (M1 and M3 series) on primary routes
- 11 Direction/guide sign (D1 series) on CoDS
- 12 Advance intersection lane control signs (R5-4 Series) on approaches with turn lanes
- 13 Initial turn warning sign (R92 series) on approaches that are not stop controlled
- 14 Street name (W1-8 series) signs on CoDS approaches
- 15 Stop ahead sign (W97-7) on stop controlled approaches

**Pavement Markings**

- 1 Stop bar/stop line (MUTCD Section 3B.14)
- 2 Green/white-hatched edge line on CoDS (see Corridor Template)
- 3 White RT edge line approaching intersection and around intersection corner radius on approaches whose speed is greater than 45 mph
- 4 Edge line on non-CoDS roads (see table for application guidance)
- 5 Center line pavement markings (see table for application guidance)
- 6 Solid line and center line approaching intersection
- 7 Skidmarks when dual turn lanes are present
- 8 Lane use pavement markings (MUTCD Section 3B.20)
- 9 "Stop Ahead" or "Yield Ahead" pavement markings (MUTCD Section 3B.2)

**Other**

- 1 If pedestrian accommodations are present, ensure minimum requirements for crossing SP solid lines offset minimum 6' and placed 4' in advance of the stop bar and crosswalk warning sign
- 2 ReflectORIZED (glazed) or with panel sign posts (MUTCD Section 3A.15)
- 3 Trim vegetation to provide adequate sight distance
- 4 Mark obstructions within clear zone (M4-1, 2, or 3 series)
- 5 Remove or provide a warning of obstructions within clear zone

NOTE: Signage and pavement marking placement is not to scale. Actual placement will be determined on a site by the base based on MUTCD and AAS Supplemental design standards and guidance.

Legend:  
● Tier 1 Recommendations  
● Tier 2 Recommendations  
● Tier 3 Recommendations

Implementation details and/or installation notes for some measures are included.

The template may include call out boxes showing treatments for alternative geometric configurations

The template includes a graphical depiction of improvement measures (not to scale).

The template contains a listing & description of measures by tier. The tier is identified by the number listed on the left.



# Systemic Templates

- Most templates have three (3) tiers or levels of measures.
  - The first tier is the application of sign and pavement markings to be installed to bring the road section in compliance with the MUTCD and minimum expectations for control on the CoSS.
  - Each subsequent tier includes additional signs, markings, TCD, or other safety mitigation measures that builds upon the base nature of Tier 1 in degree of investment.



## Template 2 – Unsignalized Intersection – 4-leg (2-way stop controlled), median separated (3 Tiers)

### Edge Line Application\* (Source: MUTCD Chapter 3B)

Functional Class	Pavement Width	AADT
Rural Arterials & Collectors	>= 20'	>= 3,000
Local	Where curb is not present	>= 3,000

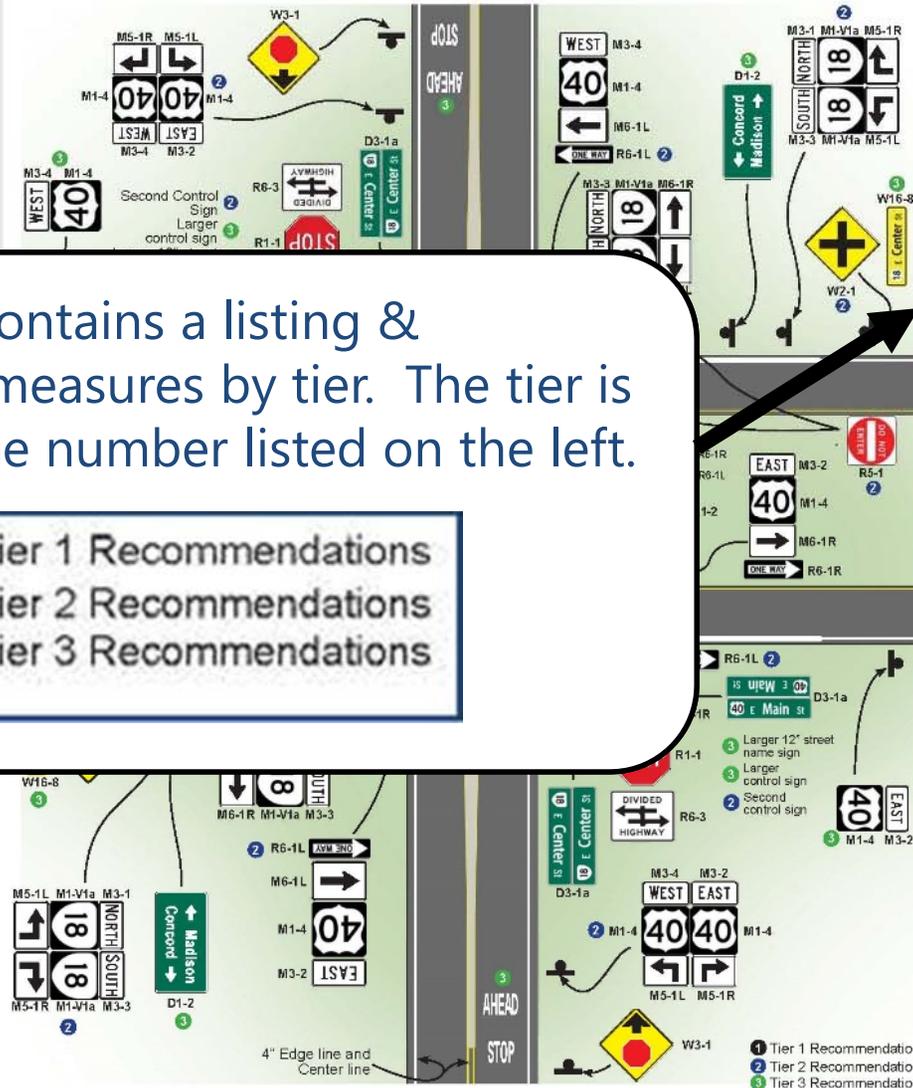
\* 8" edge line: on all approaches where speed is greater than 45 mph, apply a minimum of 100' from intersection or the length of the turn lane, if present.

### Center Line Application (Source: MUTCD Chapter 3B)

Functional Class	Pavement Width	AADT
Urban Arterials & Collectors	>= 20'	>= 4,000
Rural Arterials & Collectors	>= 18'	>= 3,000
Local		

The template contains a listing & description of measures by tier. The tier is identified by the number listed on the left.

- 1 Tier 1 Recommendations
- 2 Tier 2 Recommendations
- 3 Tier 3 Recommendations



### NOTES:

#### Signage

- 1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
- 1 Fluorescent yellow sheeting on change of direction warning signs
- 1 Control sign (R1 Series)
- 2 Second control sign (R1 series) if median is present and is greater than 8' (MUTCD Section 2A.15)
- 3 Larger control sign (R1 Series)
- 1 Street name sign (D3-1a or D3-1 for local roads)
- 3 Larger 12" street name sign (D3-1a)
- 1 Intersecting route and directional sign (M1, M3, & M6 Series). Include signs for through movement only where through movement is a different route number.
- 2 Advance intersecting route and directional sign (M1, M3, & M5 Series)
- 3 Confirmation route signs (M1 & M3 Series) on primary routes
- 3 Destination/guide sign (D1 Series) on CoSS
- 2 Advance Intersection lane control signs (R3-8 Series) on approaches with turn lanes
- 2 Intersection warning sign (W2 series) on approaches that are not controlled
- 3 Street name (W16-B) signs on CoSS approaches
- 1 Stop ahead sign (W3-1) on stop controlled approaches
- 2 "One Way" and "Do Not Enter" (R6 Series & R5-1) signs per VA Supplement
- 1 "Keep Right" sign and median object marker (OM-3 Series) on raised medians where it is not readily apparent that traffic is required to keep to the right (MUTCD Figure 2B-10)
- 1 Divided highway (R6 Series) (see application details)

#### Pavement Markings

- 1 Stop bar/yield line on all stop/yield controlled approaches, including median crossovers greater than 30 feet in width (MUTCD Section 3B.16)
- 1 6" grooved/in-laid edge line on CoSS (see corridor template)
- 1 Wide (8") edge line approaching intersection and around intersection corner radius on approaches where speed is greater than 45 mph
- 1 4" edge line on non-CoSS roads (see table for application guidance)
- 1 4" center line pavement markings (see table for application guidance)
- 1 Solid lane and center line approaching intersection
- 1 Skip marks when dual turn lanes are present
- 2 Lane use pavement markings (MUTCD Section 3B.20)
- 3 "Stop Ahead" or "Yield Ahead" pavement markings (MUTCD Section 3B.20)

#### Other

- 1 If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6' and placed 4' in advance of the stop bar) and crosswalk warning sign
- 3 ReflectORIZED (painted or with panel) sign posts (MUTCD Section 2A.15)
- 1 Trim vegetation to provide adequate sight distance
- 2 Mark obstructions within clear zone
- 3 Remove or provide a barrier for obstructions within clear zone
- 3 Reflective delineators around nose of median (if present) (Chapter 3F-MUTCD VA Supplement)

NOTE: Signage and pavement marking placement is not to scale. Actual placement will be determined on a site by site basis based on MUTCD and VA Supplement design standards and guidance.

#### Divided Highway Crossing Sign Application (R6-3, R6-3a)

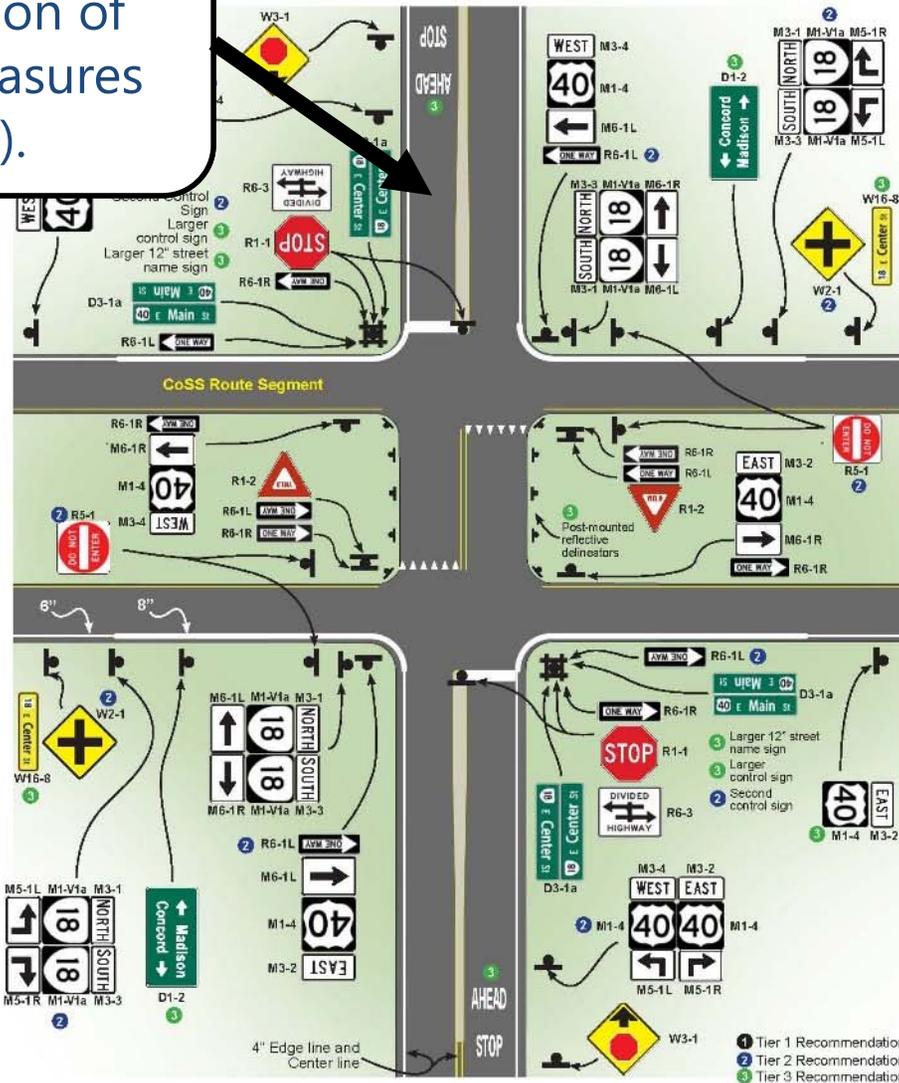
When to use:

- Unsignalized minor-street approaches from which both left turns and right turns are permitted onto a divided highway with a median width of > 30'
- May be omitted if:
  - If divided highway traffic volume > 400 AADT & Speed limit > 25 MPH

The template includes a graphical depiction of improvement measures (not to scale).

Collectors		
Rural Arterials & Collectors	>= 18'	>= 3,000
Local	>= 16'	N/A

### Template 2 - Unsignalized Intersection - (Two-way stop controlled), median separated (3 Tiers)



- NOTES:**
- Signage**
- 1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
  - 1 Fluorescent yellow sheeting on change of direction warning signs
  - 1 Control sign (R1 Series)
  - 2 Second control sign (R1 series) if median is present and is greater than 8' (MUTCD Section 2A.15)
  - 3 Larger control sign (R1 Series)
  - 1 Street name sign (D3-1a or D3-1 for local roads)
  - 3 Larger 12" street name sign (D3-1a)
  - 1 Intersecting route and directional sign (M1, M3, & M6 Series). Include signs for through movement only where through movement is a different route number.
  - 2 Advance intersecting route and directional sign (M1, M3, & M5 Series)
  - 3 Confirmation route signs (M1 & M3 Series) on primary routes
  - 3 Destination/guide sign (D1 Series) on CoSS
  - 2 Advance intersection lane control signs (R3-8 Series) on approaches with turn lanes
  - 2 Intersection warning sign (W2 series) on approaches that are not controlled
  - 3 Street name (W16-B) signs on CoSS approaches
  - 1 Stop ahead sign (W3-1) on stop controlled approaches
  - 2 "One Way" and "Do Not Enter" (R6 Series & R5-1) signs per VA Supplement
  - 1 "Keep Right" sign and median object marker (OM-3 Series) on raised medians where it is not readily apparent that traffic is required to keep to the right (MUTCD Figure 2B-10)
  - 1 Divided highway (R6 Series) (see application details)
- Pavement Markings**
- 1 Stop bar/yard line on all stop/yield controlled approaches, including median crossovers greater than 30 feet in width (MUTCD Section 3B.16)
  - 1 6" grooved/In-laid edge line on CoSS (see corridor template)
  - 1 Wide (8") edge line approaching intersection and around intersection corner radius on approaches where speed is greater than 45 mph
  - 1 4" edge line on non-CoSS roads (see table for application guidance)
  - 1 4" center line pavement markings (see table for application guidance)
  - 1 Solid lane and center line approaching intersection
  - 1 Skip marks when dual turn lanes are present
  - 2 Lane use pavement markings (MUTCD Section 3B.20)
  - 3 "Stop Ahead" or "Yield Ahead" pavement markings (MUTCD Section 3B.20)
- Other**
- 1 If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6' and placed 4' in advance of the stop bar) and crosswalk warning sign
  - 1 ReflectORIZED (painted or with panel) sign posts (MUTCD Section 2A.15)
  - 1 Trim vegetation to provide adequate sight distance
  - 2 Mark obstructions within clear zone (OM-1, 2, or 3 series)
  - 3 Remove or provide a barrier for obstructions within clear zone
  - 3 Reflective delineators around nose of median (if present) (Chapter 3F-MUTCD VA Supplement)
- NOTE: Signage and pavement marking placement is not to scale. Actual placement will be determined on a site by site basis based on MUTCD and VA Supplement design standards and guidance.
- Divided Highway Crossing Sign Application (R6-3, R6-3a)**
- When to use:
- Unsignalized minor-street approaches from which both left turns and right turns are permitted onto a divided highway with a median width of > 30'
- May be omitted if:
- If divided highway traffic volume > 400 AADT & Speed limit > 25 MPH
- Legend:
- 1 Tier 1 Recommendations
  - 2 Tier 2 Recommendations
  - 3 Tier 3 Recommendations

## Template 2 – Unsignalized Intersection – 4-leg (2-way stop controlled), median separated (3 Tiers)

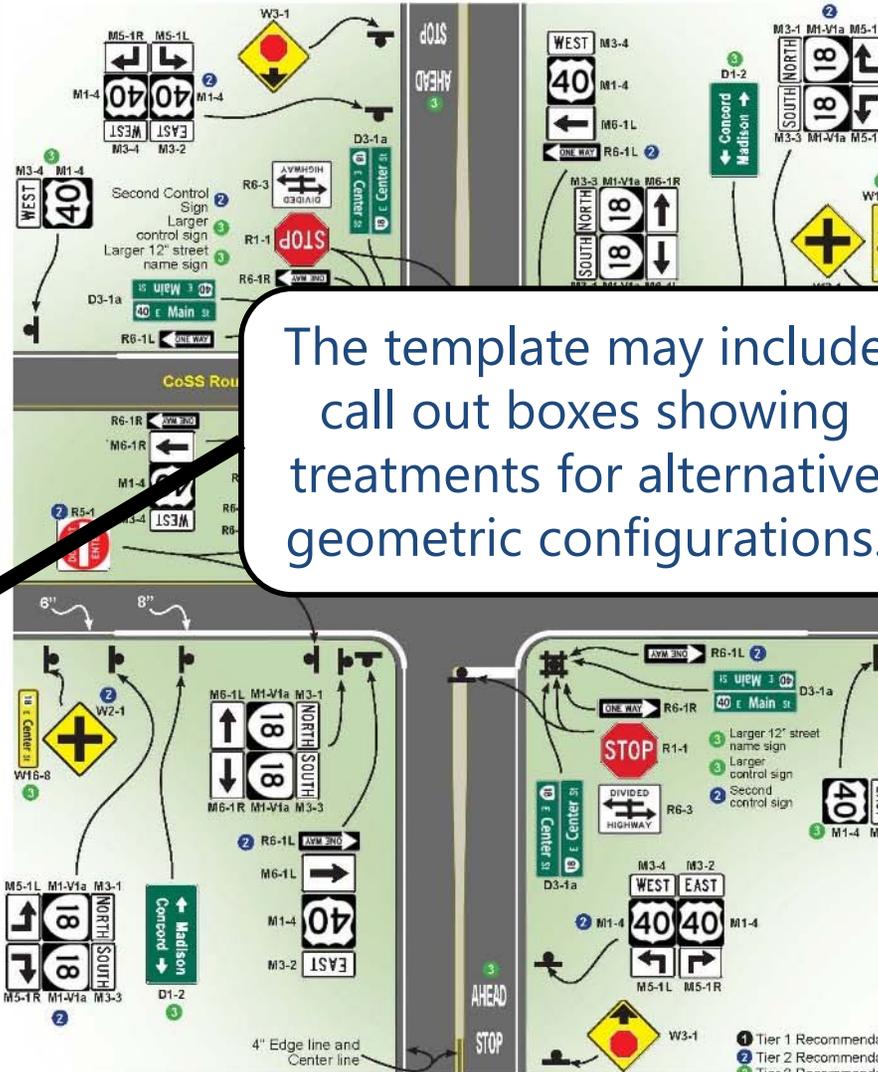
### Edge Line Application\* (Source: MUTCD Chapter 3B)

Functional Class	Pavement Width	AADT
Rural Arterials & Collectors	>= 20'	>= 3,000
Local	Where curb is not present	>= 3,000

\* 8" edge line: on all approaches where speed is greater than 45 mph, apply a minimum of 100' from intersection or the length of the turn lane, if present.

### Center Line Application (Source: MUTCD Chapter 3B)

Functional Class	Pavement Width	AADT
Urban Arterials & Collectors	>= 20'	>= 4,000
Rural Arterials & Collectors	>= 18'	>= 3,000
Local	>= 16'	N/A



### NOTES:

#### Signage

- 1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
- 1 Fluorescent yellow sheeting on change of direction warning signs
- 1 Control sign (R1 Series)
- 2 Second control sign (R1 Series) if median is present and is greater than 8' (MUTCD Section 2A.15)
- 3 Larger control sign (R1 Series)
- 1 Street name sign (D3-1a or D3-1 for local roads)
- 3 Larger 12" street name sign (D3-1a)
- 1 Intersecting route and directional sign (M1, M3, & M6 Series). Include signs for through movement only where through movement is a different route number.
- 2 Advance intersecting route and directional sign (M1, M3, & M5 Series)
- 3 Confirmation route signs (M1 & M3 Series) on primary routes
- 3 Destination/guide sign (D1 Series) on CoSS
- 2 Advance intersection lane control signs (R3-8 Series) on approaches with turn lanes
- 2 Intersection warning sign (W2 series) on approaches that are not controlled
- 3 Street name (W16-B) signs on CoSS approaches
- 1 Stop ahead sign (W3-1) on stop controlled approaches
- 2 "One Way" and "Do Not Enter" (R6 Series & R5-1) signs per VA Supplement
- 1 "Keep Right" sign and median object marker (OM-3 Series) on raised medians where it is not readily apparent that traffic is required to keep to the right (MUTCD Figure 2B-10)
- 1 Divided highway (R6 Series) (see application details)

#### Pavement Markings

- 1 Stop bar/yield line on all stop/yield controlled approaches, including median crossovers greater than 30 feet in width (MUTCD Section 3B.16)
- 1 6" grooved/in-laid edge line on CoSS (see corridor template)
- 1 Wide (8") edge line approaching intersection and around intersection corner radius on approaches where speed is greater than 45 mph
- 1 4" edge line on non-CoSS roads (see table for application guidance)
- 1 4" center line pavement markings (see table for application guidance)
- 1 Solid lane and center line approaching intersection
- 1 Skip marks when dual turn lanes are present
- 2 Lane use pavement markings (MUTCD Section 3B.20)
- 3 "Stop Ahead" or "Yield Ahead" pavement markings (MUTCD Section 3B.20)

#### Other

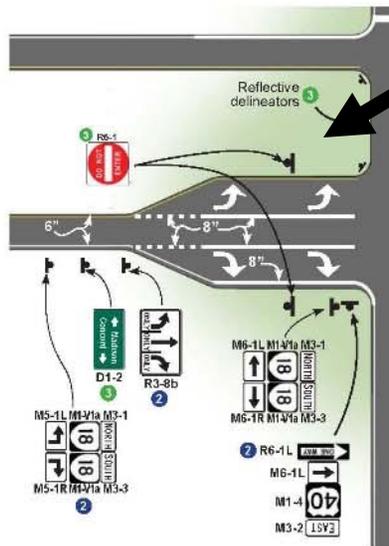
- 1 If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6' and placed 4' in advance of the stop bar) and crosswalk warning sign
- 1 Reflectized (painted or with panel) sign posts (MUTCD Section 2A.15)
- 1 Trim vegetation to provide adequate sight distance
- 2 Mark obstructions within clear zone (OM-1, 2, or 3 series)
- 3 Remove or provide a barrier for obstructions within clear zone
- 3 Reflective delineators around nose of median (if present) (Chapter 3F-MUTCD VA Supplement)

NOTE: Signage and pavement marking placement is not to scale. Actual placement will be determined on a site by site basis based on MUTCD and VA Supplement design standards and guidance.

#### Divided Highway Crossing Sign Application (R6-3, R6-3a)

When to use:

- Unsignalized minor-street approaches from which both left turns and right turns are permitted onto a divided highway with a median width of > 30'
- May be omitted if:
  - If divided highway traffic volume > 400 AADT & Speed limit > 25 MPH



## Template 2 – Unsignalized Intersection – 4-leg (2-way stop controlled), median separated (3 Tiers)

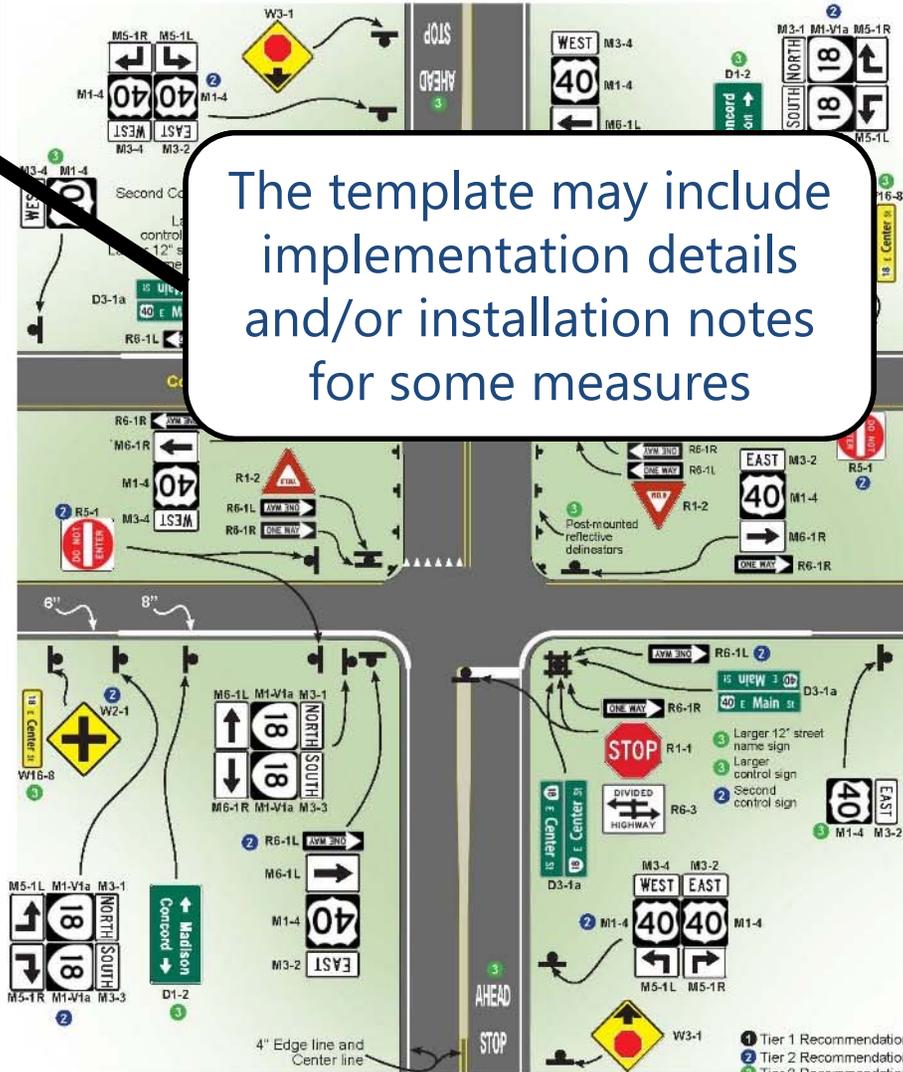
### Edge Line Application\* (Source: MUTCD Chapter 3B)

Functional Class	Pavement Width	AADT
Rural Arterials & Collectors	>= 20'	>= 3,000
Local	Where curb is not present	>= 3,000

\* 8" edge line: on all approaches where speed is greater than 45 mph by a minimum of 100' from intersection or the length of the turn lane, if applicable.

### Center Line Application (Source: MUTCD Chapter 3B)

Functional Class	Pavement Width	AADT
Urban Arterials & Collectors	>= 20'	>= 4,000
Rural Arterials & Collectors	>= 18'	>= 3,000
Local	>= 16'	N/A



### NOTES:

#### Signage

- 1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
- 1 Fluorescent yellow sheeting on change of direction warning signs
- 1 Control sign (R1 Series)
- 2 Second control sign (R1 series) if median is present and is greater than 8' (MUTCD Section 2A.15)
- 3 Larger control sign (R1 Series)
- 1 Street name sign (D3-1a or D3-1 for local roads)
- 3 Larger 12" street name sign (D3-1a)
- 1 Intersecting route and directional sign (M1, M3, & M6 Series). Include signs for through movement only where through movement is a different route number.
- 2 Advance intersecting route and directional sign (M1, M3, & M5 Series)
- 3 Confirmation route signs (M1 & M3 Series) on primary routes
- 3 Destination/guide sign (D1 Series) on CoSS
- 2 Advance intersection lane control signs (R3-8 Series) on approaches with turn lanes
- 2 Intersection warning sign (W2 series) on approaches that are not controlled
- 3 Street name (W16-B) signs on CoSS approaches
- 1 Stop ahead sign (W3-1) on stop controlled approaches
- 2 "One Way" and "Do Not Enter" (R6 Series & R5-1) signs per VA Supplement
- 1 "Keep Right" sign and median object marker (OM-3 Series) on raised medians where it is not readily apparent that traffic is required to keep to the right (MUTCD Figure 2B-10)
- 1 Divided highway (R6 Series) (see application details)

#### Pavement Markings

- 1 Stop bar/yield line on all stop/yield controlled approaches, including median crossovers greater than 30 feet in width (MUTCD Section 3B.16)
- 1 6" grooved/in-laid edge line on CoSS (see corridor template)
- 1 Wide (8") edge line approaching intersection and around intersection corner radius on approaches where speed is greater than 45 mph
- 1 4" edge line on non-CoSS roads (see table for application guidance)
- 1 4" center line pavement markings (see table for application guidance)
- 1 Solid lane and center line approaching intersection
- 1 Skip marks when dual turn lanes are present
- 2 Lane use pavement markings (MUTCD Section 3B.20)
- 3 "Stop Ahead" or "Yield Ahead" pavement markings (MUTCD Section 3B.20)

#### Other

- 1 If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6' and placed 4' in advance of the stop bar) and crosswalk warning sign
- 1 ReflectORIZED (painted or with panel) sign posts (MUTCD Section 2A.15)
- 1 Trim vegetation to provide adequate sight distance
- 2 Mark obstructions within clear zone (OM-1, 2, or 3 series)
- 3 Remove or provide a barrier for obstructions within clear zone
- 3 Reflective delineators around nose of median (if present) (Chapter 3F-MUTCD VA Supplement)

NOTE: Signage and pavement marking placement is not to scale. Actual placement will be determined on a site by site basis based on MUTCD and VA Supplement design standards and guidance.

#### Divided Highway Crossing Sign Application (R6-3, R6-3a)

When to use:

- Unsignalized minor-street approaches from which both left turns and right turns are permitted onto a divided highway with a median width of > 30'

May be omitted if:

- If divided highway traffic volume > 400 AADT & Speed limit > 25 MPH

# Systemic Templates

- Most templates have three (3) tiers or levels of measures.
  - Some templates, such as the rural village template or the full-access control template, consist of only one tier.
  - Any additional improvement measure would be considered on a site-by-site basis (in the hot spot analysis). Traffic, geometric, and crash information for the corridor should be used to determine which tier to apply to each CoSS route segment, curve, and intersection.



# Systemic Template Application

## Application Methodology:

- Tier 1 templates applied to entire corridor.
- Tier 2 & 3 templates can be applied using the following factors:
  1. Elevated PSI
  2. Systemic Risk Factors
  3. Increased Exposure



# Systemic Template Application

## 1. PSI Locations

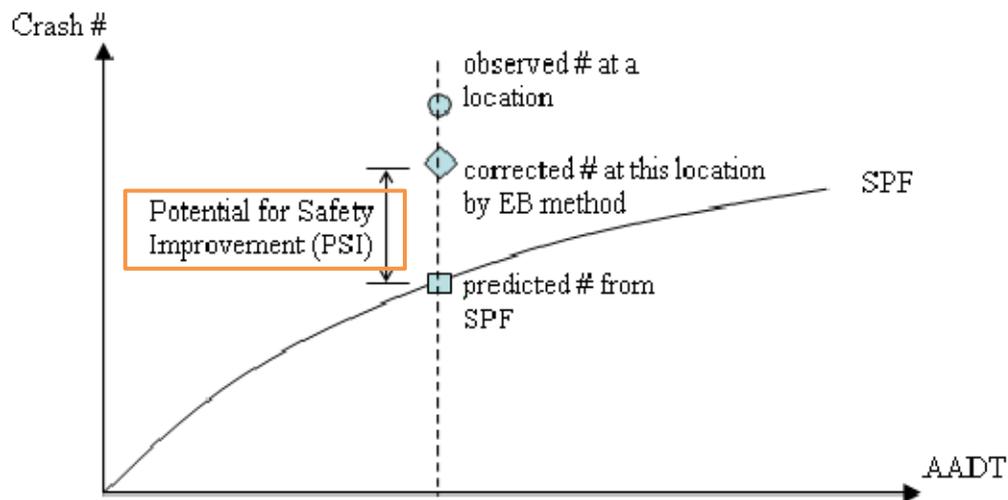
What is a Potential for Safety Improvement (PSI)?

- A methodology used to determine the predicted number of crashes at each of the locations
- This predicted number is compared to the expected number of crashes based on crash history to determine those locations with the greatest potential for safety improvement



# Systemic Template Application

What is a Potential for Safety Improvement (PSI)?



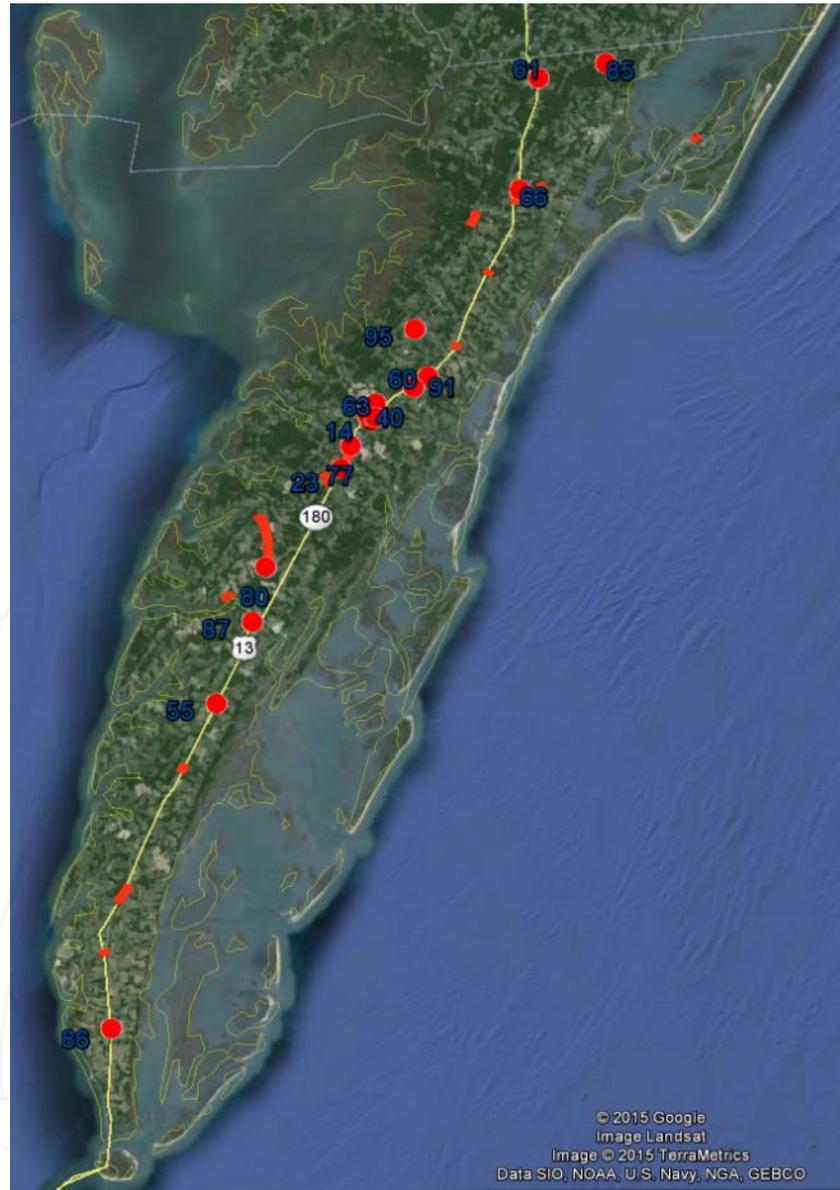
**PSI = observed modified crashes – typical crashes**

- observed modified crashes (“expected”)
- typical crashes (“predicted”)



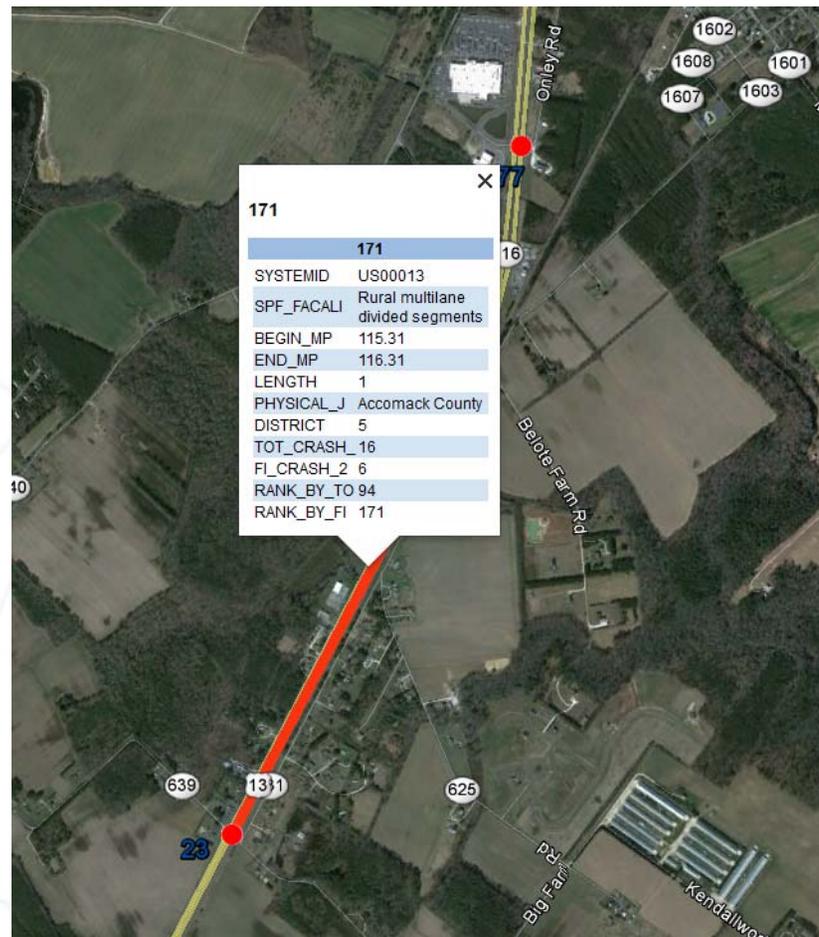
# Systemic Template Application

- PSI Locations
- Intersections
- Segments



# Systemic Template Application

- PSI Locations
  - May overlap with focus locations



# Systemic Template Application

- PSI Locations
  - May overlap with site specific locations



# Systemic Template Application

## 2. Systemic Risk Factors

- In process of identifying
- Examples could include:
  - Locations with no/minimal shoulder
  - Median crossover locations on horizontal curves



# Systemic Template Application

## 3. Exposure

Segment	Miles	97-99 Crash Rate (crashes per 100 million VMT)	10-14 Crash Rate (crashes per 100 million VMT)	Change in CR	% Change
Rt 175 - State Line	4.09	61	64	3	4.7%
Rt 695 - Rt 175	3.69	82	69	-13	-18.8%
Rt 187 - Rt 695	5.77	85	86	1	1.2%
Rt 176 - Rt 187	4.76	63	68	5	7.4%
Rt 764 - Rt 176	3.62	111	93	-18	-19.4%
Chesapeake Square - Rt 764	2.91	67	117	50	42.7%
Rt 179 - Chesapeake Square	0.29	147	90	-57	-63.3%
US13 Bus. - Rt 179	0.74	110	106	-4	-3.8%
Rt 626 - US13 Bus.	2.92	64	66	2	3.0%
Rt 180/696 - Rt 626	2.37	59	38	-21	-55.3%
Rt 180/696 - Rt 626	2.68	64	35	-29	-82.9%
Rt 182/614 - Rt 180/696	3.91	89	19	-70	-368.4%
Rt 183 - Rt 178	0.52	54	6	-48	-800.0%
Rt 652 - Rt 183	0.98	171	102	-69	-67.6%
Rt 606 - Rt 652	3.53	115	66	-49	-74.2%
Rt 631 - Rt 606	9.75	90	74	-16	-21.6%
Rt 680 - Rt 631	4.93	73	60	-13	-21.7%
Rt 184 - Rt 680	1.22	101	135	34	25.2%
CBBT - Rt 184	9.34	80	107	27	25.2%



# Systemic Template Application

## Summary:

- Systemic analysis on-going
- Template selection based on roadway geometry and intersection control
- Proposed method for application of tiers:
  - Tier 1 countermeasures applied to entire corridor.
  - Tier 2 countermeasures applied where 1-2 of the following conditions is present:
    - *Elevated PSI*
    - *Systemic Risk Factors*
    - *Increased Exposure*
  - Tier 3 countermeasures may be applied when all three factors are present or when engineering judgement indicates need.



# Systemic Analysis - Next Steps

- Determine Risk Factors to be Treated
- Refine the Templates for Route 13 and 175
- Determine Applicable Countermeasures
- Review with VDOT



# Next Steps



# Next Steps

- Gather public input
- Finalize analyses
  - Comparative
  - Site Specific Locations
  - Systemic
- Develop draft recommendations and cost estimates
- Prepare draft report
- Present to stakeholders and citizens
- Finalize recommendations and report



## Eastern Shore Route 13 Safety Study




VDOT has a safety study underway evaluating the section of U.S. Route 13 from the Chesapeake Bay Bridge-Tunnel to the Maryland State Line, and Route 175 from U.S. Route 13 to the town of Chincoteague. The study includes two parts: 1) providing an evaluation of the effectiveness of the safety treatments installed as a result of the 2002 Route 13 / Wallops Island Access Management Study; and 2) a two-phase safety assessment with evaluation of focus locations and a systemic corridor review.

The study team seeks your comments relative to safety concerns you have along the corridor. A list of the 25 focus locations is provided below. Please select two locations from the list and provide comments in the space provided.

Use the third space on the reverse side for additional areas or a specific condition or operation for which you have a comment.

**Route 13**

<p><b>1</b> Approximately 615 ft north of Jonathans Landing Lane</p> <p><b>2</b> Stone Road (Food Lion)</p> <p><b>3</b> Fyre Hall Drive</p> <p><b>4</b> Captain Howe Lane</p> <p><b>5</b> Sylvan Scene Drive</p> <p><b>6</b> Bayford Road</p> <p><b>7</b> Approximately 1,700 ft south of West Street</p> <p><b>8</b> Dogwood Drive</p> <p><b>9</b> Approximately 3,375 ft north of Dogwood Drive</p> <p><b>10</b> Approximately 855 ft north of Chesapeake Square Shopping Center</p> <p><b>11</b> Taylor Road</p> <p><b>12</b> Daugherty Road</p>	<p><b>13</b> Courthouse Avenue</p> <p><b>14</b> Mary N. Smith Road / Front Street</p> <p><b>15</b> Evans Road</p> <p><b>16</b> Parksley Road</p> <p><b>17</b> Approximately 1,000 ft south of Whites Neck Road</p> <p><b>18</b> Nelsonia Road</p> <p><b>19</b> Groton Town Road</p> <p><b>20</b> Hallwood Drive</p> <p><b>21</b> Temperanceville Road</p> <p><b>22</b> New Temperanceville Road</p> <p><b>23</b> Chincoteague Road</p> <p style="text-align: center;"><b>Route 175</b></p> <p><b>24</b> Approximately 2,700 ft east of Route 13</p> <p><b>25</b> At the bridge crossing Wire Narrows</p>
---	--

COMMENTS

LOCATION #	
LOCATION #	



# Questions?

