SHSP Action Plan Development

Roadway & Lane Departures EA Team

April 5, 2018

Agenda

- Welcome and Introductions
- Review Action Plans Developed by Working Groups
- Discuss Remaining Countermeasures Identified for Action Planning
- Next Steps

STRATEGIES: ROADWAY & LANE DEPARTURES EMPHASIS AREA

Strategy #1	Analyze run off the road and head-on crashes and roadway characteristics using the new safety methodologies (e.g., Highway Safety Manual and systemic approaches)
Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Strategy #3	Minimize the consequences of vehicles leaving the road
Strategy #4	Minimize the likelihood of crashing in adverse conditions
Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Strategy #6	Improve emergency response time in rural areas

NUMBER	COUNTERMEASURE for ACTION PLANNING
1a	Improve data systems for targeting locations with a high probability for roadway departure crashes by: road type, geometric characteristics, vehicle type, and area type.
2a	Revise roadway configuration to provide additional paved recovery area (e.g., convert four lane roadways to three lane roadways with design features compatible with surrounding land use context).
2b	Provide additional positive guidance (i.e., rumble strips, stripe lines, raised pavement markings, chevrons including LED chevrons, curve delineators, speed feedback signs, edge line and center lines, wider edge lines) and conduct public information campaigns to explain the purpose and how to navigate the roadway safely.
3a	Implement barriers, median treatments and forgiving roadside objects (e.g., median barriers, safety treat fixed objects, establish safe clear policies, and improve slopes) with consideration given to land use context.
4a	Identify locations subject to nighttime crashes. Examples: Develop and use screening and systemic crash analysis tools to identify locations; provide additional roadway delineation; and provide roadway lighting
4b	Identify and address locations subject to wet weather run off the road crashes.
5a	Develop and implement strategies to encourage drivers to adjust speeds appropriately to roadway conditions: wet weather speed advisories, speed feedback signs, and speed advisories for nighttime conditions.
5b	Provide consistent curve treatments and advisory speeds for similar conditions.
5c	Encourage adoption of laws that allow automated speed enforcement.
6c	Implement measures to provide faster notification of crashes

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance (i.e., rumble strips, stripe lines, raised pavement markings, chevrons including LED chevrons, curve delineators, speed feedback signs, edge line and center lines, wider edge lines) and conduct public information campaigns to explain the purpose and how to navigate the roadway safely.

The following items are in the same category:

Effectiveness: **

Cost to implement: $

Time to implement: short

Barriers:

- Funding, many of these items not only have an initial cost, but also to keep them maintained will add cost to an overall budget.
- In locations of annual ice/snow some of these items are harder to maintain due to plowing operations.

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance – low cost continued

- RPM –CMF ranges from 33% reduction to 43 % increase in nighttime crashes - 672 6006 $2.50/EA, 672 6010 $3.00/EA
- Edge lines – HSIP WC 402 0.25, 2 years, CMF 8% reduction all crash types with 11% to 13% reduction run-off-road crashes - $0.43/LF
- Wide edge lines – 6” CMF 12% to 37% reduction in all crash types - $0.60/LF
- Center lines – HSIP WC 404 0.65, 2 years, CMF crash reduction minimal but where placed in conjunction with edgelines, approximate 24% reduction in all crash types - $0.40/LF
- Milled Edgeline rumble strip – HSIP WC 532 0.5, 10 years – CMF 16% to 17% reduction for all crash types - 533 6003 $.15, 6005 $0.59
- Profile edgeline marking - HSIP WC 533 0.6, 5 years – 666 6283 $0.38/LF (4”); $0.62/LF (6”)
- Raised edgeline rumble strips – HSIP WC 534 0.6, 2 years - 6056 6001 $2.75/LF
- Milled centerline rumble strip – HSIP WC 542 0.35, 10 years CMF 14% to 15% reduction for all crash types – 533 6004 $0.11

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance – low cost continued

- Profile centerline marking - HSIP WC 543 0.35, 5 years – 666 6287 $0.40/LF (4”); $0.64/LF (6”)
- Raised centerline rumble strips – HSIP WC 544 0.35, 2 years – 6056 6002 $2.75/LF
- Transverse rumble strips – HSIP WC 545 0.15, 5 years, CMF at approach to intersection 33% reduction to 33% increase for all crash types - 6056 6001 $2.75/LF
- Delineators – HSIP WC 113 0.3, 2 years, CMF installed in combination with edgeline and centerline marking results in 45% reduction in all crash types - 658 2292 $45/EA

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance (i.e., rumble strips, stripe lines, raised pavement markings, chevrons including LED chevrons, curve delineators, speed feedback signs, edge line and center lines, wider edge lines) and conduct public information campaigns to explain the purpose and how to navigate the roadway safely.

The following items are in the same category:

Effectiveness: **

Cost to implement: $$

Time to implement: medium

Barriers:

- Funding, many of these items not only have an initial cost, but also to keep them maintained will add cost to an overall budget.
- These devices are not needed at every location, but should be included in higher crash locations.

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance – medium cost

- Chevrons – HSIP WC 137 0.25, 10 years, CMF installed with curve warning signs results in 31% to 44% reduction in all crash types – 644 6007 $650/EA
- LED flashing chevrons – HSIP WC 136 0.35, 10 years – 6068 6001/6002 $4500/EA
- Advance warning signals - replace signs with signals HSIP WC 123 0.1, 10 years – 685 6004 $5250/EA
- Install advance warning signals and signs – HSIP WC 125 0.15, 10 years, CMF 26% to 30% reduction in all crash types – 685 6004 $5250/EA
- Install advance warning sign – HSIP WC 130 0.05, 6 years – 644 6004 $575/EA
- Driver feedback signs -

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance (i.e., rumble strips, stripe lines, raised pavement markings, chevrons including LED chevrons, curve delineators, speed feedback signs, edge line and center lines, wider edge lines) and conduct public information campaigns to explain the purpose and how to navigate the roadway safely.

The following items are in the same category:

Effectiveness: ***

Cost to implement: $$$

Time to implement: long

Barriers:

- May require ROW
- Plans more detailed including drainage, roadway items,
- More expensive

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance - high cost

- Install Median Barrier – HSIP WC 201 0.55, 20, CMF any type of median barrier can result in up to a 24% increase in total crashes, but will reduce fatal crashes by up to 43% and injury crashes by up to 30% – varies depends on concrete, cable, etc.
- Install raised median – HSIP WC 203 0.25, 20, CMF urban areas: 14% to 71% reduction in all crash types – varies depend on work
- Flatten Side Slope – HSIP WC 204 0.46, 20, CMF for cross median, fixed object, run-off-road, or other crash types in rural areas: 9% reduction up to a 9% increase in all levels of severity – varies depends on how much
- Modernize bridge rail and approach guardrail - HSIP WC 205 0.15, 10
- Improve guardrail to design standards - HSIP WC 206 0.35, 10 – estimated $110/LF
- Safety treat fixed objects – HSIP WC 209 0.5, 20, CMF remove or relocated fixed object associated with a 38% reduction in all crash types – varies depending on work items
- High friction surface treatment (curve) - HSIP WC306 0.45, 3014 6001 $28/SY

Strategy #2	Keep vehicles from encroaching on the roadside or opposite lane
Countermeasures and Programs:	
2b	Provide additional positive guidance - high cost

- Widen lane – HSIP WC 502 0.3, 10, CMF widening rural lane widths from 11 feet to 12 feet result in a 5% reduction in all crash types – depends on how much and type of work
- Widen paved shoulder (to 5ft or less) – HSIP WC 503 0.25, 20, CMF effectiveness varies by width, but generally expected to reduce all rural crash types by 18% up to 38% – depends on how much and type of work
- Construct paved shoulder (1-4ft) – HSIP WC 504 0.25, 20, CMF results in approximately a 19% reduction in all crash and injury types – depends on how much and type of work
- Widen paved shoulders (to > 5ft) – HSIP WC 536 0.4, 20, CMF from 3ft to 6ft: 7% to 18% reduction in all crash types and severity types; widening greater than 6ft results in increased reductions up to 8ft – depends on how much and type of work
- Construct paved shoulders (>= 5ft) – HSIP WC 0.4, 20 – depends on how much and type of work
- Road Diet - Revise roadway configuration to provide additional paved recovery area (e.g., convert four lane roadways to three lane roadways with design features compatible with surrounding land use context). CMF 19% to 25% reduction in urban crashes; approximate 47% reduction in suburban crashes]

Strategy #4	Minimize the likelihood of crashing in adverse conditions
Countermeasures and Programs:	
4a	Identify locations subject to nighttime crashes. Examples: Develop and use screening and systemic crash analysis tools to identify locations; provide additional roadway delineation; and provide roadway lighting.

Steps for Implementation:

- Develop program analogous to TxDOT Wet Surface Crash Reduction Program (formerly WWARP) specific to nighttime crashes
- Encourage the use of network screening techniques, such as those outlined in the *Highway Safety Manual (HSM)*, to identify locations with high rates of nighttime crashes.
    - Identify and publicize existing training materials regarding HSM usage (Highly effective at identifying high-risk locations but does not fix the problem, low cost, immediately implementable, may be inhibited by data availability, TxDOT would lead)
    - Develop new training materials, modules, etc. as needed specifically to address nighttime crashes (Highly effective at identifying high-risk locations but does not fix the problem, low cost, immediately implementable, may be inhibited by data availability, research agency/university would lead)

Strategy #4	Minimize the likelihood of crashing in adverse conditions
Countermeasures and Programs:	
4a	Identify locations subject to nighttime crashes. Examples: Develop and use screening and systemic crash analysis tools to identify locations; provide additional roadway delineation; and provide roadway lighting.

- Automate the network screening process via Excel Macro or software tool *SafetyAnalyst*
- Apply a systematic process to diminish relying on public to identify traffic safety issues

Effectiveness: *** (Automation will allow TxDOT employees to function more efficiently)

Cost: $$ (Working within an Excel framework may be cost effective but an external software tool may be more costly)

Time to implementation: ** (Need to tailor existing software to do what we need to do)

Lead agency: TxDOT hires contractor to develop software

Strategy #4	Minimize the likelihood of crashing in adverse conditions
Countermeasures and Programs:	
4b	Identify and address locations subject to wet weather run off the road crashes.

Steps for Implementation:

- Review and synthesize existing adverse condition crash countermeasures, such as high-friction pavements and high visibility markers (Highly effective at identifying possible solutions, low cost, impeded by limitations in the link between weather and safety data, around 1-2 years to implement, research agency/university would lead) District Wet Surface Crash Reduction Program, Nighttime ID
    - WSCRP is already effective
    - Obligated to fix high-crash locations with low friction
    - Increase frequency of crash review while maintaining current policy regarding friction review
- Continue to fund research focused on identifying lane markers such as paint, tape, and raised pavement markings (RPMs) that are effective in adverse weather and resilient to winter maintenance activities (Highly effective, moderate cost, research may not yield a truly effective countermeasure for specific situations, 2-3 years to implement, TxDOT has FY19 RFP for RPMs in winter weather)

Strategy #4	Minimize the likelihood of crashing in adverse conditions
Countermeasures and Programs:	
4b	Identify and address locations subject to wet weather run off the road crashes.

- Continue to deploy/use stationary and portable Dynamic Message Signs (DMS) advising motorists of weather-related roadway conditions (Effectiveness probably higher for secondary crashes, Moderate-high cost, immediately implementable, potentially inhibited by rare and random nature of crashes compared to stationary sign location, TxDOT/Counties/Cities would lead)
- Adapt methods and information to apply regionally, for on-system and city/county roads.

Lead agency: TxDOT

Time to implement: Short (review low friction crashes more frequently)

Effectiveness: High-improve already high-functioning strategy

Cost: Low (Person-hours of staff querying and reviewing crashes)

Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Countermeasures and Programs:	
5a	Develop and implement strategies to encourage drivers to adjust speeds appropriately to roadway conditions: wet weather speed advisories, speed feedback signs, and speed advisories for nighttime conditions.

Steps for Implementation:

Step 1: Identify problem locations (District Wet Surface Crash Reduction Program, Nighttime ID)
(Lead organizations: TxDOT, TTI)

Step 2: Prioritize locations by developing preliminary estimates and establishing a cut-off threshold to fund safety improvements such as surface treatments and lighting. (Lead organizations: TxDOT, cities and counties)

Step 3: Explore automotive and connected infrastructure advancements
(Lead organization: NHTSA, FHWA)

Step 4: Installation of safety devices / safety technology
(Lead organizations: TxDOT, cities, counties and vehicle manufacturers)

Step 5: Post data analysis and reporting
(Lead organizations: TTI)

Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Countermeasures and Programs:	
5a	Develop and implement strategies to encourage drivers to adjust speeds appropriately to roadway conditions: wet weather speed advisories, speed feedback signs, and speed advisories for nighttime conditions.

Effectiveness: ***
Cost to implement: $$$
Time to implement: Medium (1-5 years)
Barriers:

- Funding to construct safety improvements (surface treatments or lighting)
- Discovering new technologies
- Fleet turnover
- Technology of predicting the weather conditions within segments

Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Countermeasures and Programs:	
5b	Provide consistent curve treatments and advisory speeds for similar conditions.

Steps for implementation:

Step 1: Analyze vehicle speed data on horizontal curves (Lead organizations: TxDOT, TTI)

Step 2: Update GPS Method System for determining advisory speed and margin of safety (Lead organizations: TxDOT, TTI)

Step 3: Develop Curve Handbook and implementation tools (e.g. , Atlanta District) (refer to FHWA proven countermeasures) (Lead organizations: TxDOT, TTI)

Step 4: Present findings to TxDOT Districts, cities and counties (Lead organizations: TxDOT, TTI)

Step 5: Conduct curve studies and apply consistent treatments (Lead organizations: TxDOT, cities and counties)

Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Countermeasures and Programs:	
5b	Provide consistent curve treatments and advisory speeds for similar conditions.

Effectiveness: ***

Cost to implement: $$

Time to implement: to medium (1-5 years) to implement Curve Handbook and long- more than 5 years study and install consistent curve treatments

Barriers:

- Equipment required for curve studies
- Personnel needed to conduct curve studies
- Funds to construct curve treatments

Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Countermeasures and Programs:	
5c	Encourage adoption of laws that allow automated speed enforcement.

Steps for implementation:

Step 1: Gather data from other states that use automated speed enforcement including public opinion/acceptance, safety effectiveness, and Texas State Law. (check NTSB report) (Lead organizations: TxDOT, TTI)

Step 2: Conduct public opinion poll in relation to automated speed enforcement. (Lead organizations: TxDOT, TTI)

Step 3: Develop informational packet on benefits of automated speed enforcement. (Lead organizations: TxDOT, TTI)

Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Countermeasures and Programs:	
5c	Encourage adoption of laws that allow automated speed enforcement.

Step 4: Present findings to Legislative Affairs Office at TxDOT (Lead organizations: TxDOT, TTI)

- Legislative Affairs Office at TxDOT
- City Government Affairs departments
- Texas Municipal League
- Safety advocates
- Legislative Transportation Committee
- Legislators willing to champion a bill

(Lead organizations: TxDOT, Cities, Law Enforcement Agencies, and Safety Advocates)

Step 5: Statewide legislation (possibly as pilot program)
(Lead organizations: Texas Legislature)

Step 6: Evaluation
(Lead organizations: TxDOT, TTI)

Strategy #5	Identify and address behavioral characteristics associated with roadway departure
Countermeasures and Programs:	
5c	Encourage adoption of laws that allow automated speed enforcement.

Effectiveness: ***

Cost to implement: $$

Time to implement: medium (1-5 years)

Barriers:

- Legislative
- Privacy issues
- Need for Speed mentality

Strategy #6	Improve emergency response time in rural areas
Countermeasures and Programs:	
6c	Implement measures to provide faster crash notification.

Steps for implementation:

Step 1: Develop coalition by region between TxDOT, DPS, Local Law Enforcement, EMS, 911 System, cities and counties, and Texas Department of Health Services (DSHS) to create lines of communication between entities (Lead organizations: EMS, DSHS)

- 1a Develop a system to be used by all departments involved for reporting areas of safety concerns (EMS, DSHS)
- 1b TxDOT, cities or counties will then analyze the locations reported and implement safety measures as warranted (Lead organization: TxDOT)

Step 2: Streamline current 911 dispatch protocol (Lead organization: 911)

Step 3: Increase law enforcement presence on rural road (Lead organizations: DPS, Local Law Enforcement)

Step 4: Look into new technologies such as Onstar , Waze and/or App to notify EMS of potential crashes (Lead organization: EMS)

Step 5: Look for Grant funding to improve EMS response services (Lead organization: EMS)

Strategy #6	Improve emergency response time in rural areas
Countermeasures and Programs:	
6c	Implement measures to provide faster crash notification.

Effectiveness: EMS response will improve tremendously by having equipment and qualified personnel to respond to crash site in rural areas

Cost to Implement: $$$

Time to implement: Medium (More than 1 year but less than 5 years)

Barriers:

- Lack of funding for equipment and personnel– Apply for available Grants
- Volunteer Training - Find hospitals and other EMS agencies that will provide free training to EMS offices located in rural areas
- Volunteer Availability - Have funding necessary to have full staff available 24X7

Strategy #1	Analyze run off the road and head-on crashes and roadway characteristics using the new safety methodologies (e.g., Highway Safety Manual and systemic approaches)
Countermeasures and Programs:	
1a	Improve data systems for targeting locations with a high probability for roadway departure crashes by: road type, geometric characteristics, vehicle type, and area type.

Steps for implementation:

Step 1: Identify critical information such as position prior to crash, and position of point of impact to accurately identify the roadway departure crashes and the actions that contributed to these crash types.
(Lead organizations: TTI, TxDOT)

Step 2: Enhance the CR-3 reporting process by including the identified critical information.
(Lead organizations: TxDOT, DPS)

Step 3: Provide training to the Peace Officers about the additional information in the CR-3.
(Lead organizations: TTI, TxDOT)

Strategy #1	Analyze run off the road and head-on crashes and roadway characteristics using the new safety methodologies (e.g., Highway Safety Manual and systemic approaches)
Countermeasures and Programs:	
1a	Improve data systems for targeting locations with a high probability for roadway departure crashes by: road type, geometric characteristics, vehicle type, and area type.

Step 4: Identify a list of roadway characteristics by road type and area type to use the methodologies documented in the standard manuals such as Texas Roadway Safety Design Handbook, Highway Safety Manual, FHWA's Systemic Safety Project Selection Tool, and Roadside Design Guide.
(Lead organizations: TTI, TxDOT)

Step 5: Prepare a guidebook and provide training on how to collect the additional roadway characteristics that are not in the existing databases but are needed for using the methodologies presented in the standard manuals
(Lead organizations: TTI, TxDOT)

Step 6: Prioritize the counties and roadway types for identifying the problematic areas (consider pilot)
(Lead organizations: TTI, TxDOT)

Strategy #1	Analyze run off the road and head-on crashes and roadway characteristics using the new safety methodologies (e.g., Highway Safety Manual and systemic approaches)
Countermeasures and Programs:	
1a	Improve data systems for targeting locations with a high probability for roadway departure crashes by: road type, geometric characteristics, vehicle type, and area type.

Step 7: Collect the roadway characteristics needed for using the methodologies
(Lead organizations: TxDOT, counties)

Step 8: Analyze data by using the advanced methods to identify prioritized specific locations by vehicle type
(Lead organizations: TTI, TxDOT)

Step 9: Disseminate data analysis results
(Lead organizations: TTI, TxDOT)

Strategy #1	Analyze run off the road and head-on crashes and roadway characteristics using the new safety methodologies (e.g., Highway Safety Manual and systemic approaches)
Countermeasures and Programs:	
1a	Improve data systems for targeting locations with a high probability for roadway departure crashes by: road type, geometric characteristics, vehicle type, and area type.

Effectiveness: ***
Cost to implement: $$$
Time to implement: Long (More than 5 years)
Barriers:

- Resistance to change the CR-3 reporting process
- Personnel needed to collect required roadway characteristics data
- Inconsistent results among various methodologies for prioritizing the locations
- Funds to collect additional variables

Strategy #3	Minimize the consequences of vehicles leaving the road
Countermeasures and Programs:	
3a	Implement barriers, median treatments and forgiving roadside objects (e.g., median barriers, safety treat fixed objects, establish safe clear policies, and improve slopes) with consideration given to land use context.

Facilitated Discussion Group Notes:

Step 1: HSIP

(Lead organizations: TxDOT)

Step 2: different issues

(Lead organizations: MPOs and city governments)

Effectiveness: ***

Cost to implement: $ (currently being implemented within HSIP)

Time to implement: medium

Barriers:

- Municipalities have issues with this because they don't have the flexibility that TxDOT has

Wrap Up

- Regional Workshops
  - Houston: May 1st
  - San Antonio: May 3rd
  - DFW: May 15th
  - Midland: May 17th
- Enforcement focused Webex: April 12th
- Project inventory web survey
- Traffic Safety Conference
  - August 8-10
  - Sugar Land Marriott Town Square
- Questions
- Comments

Thanks very much!