APPENDIX G - Lane Departure Action Plan

Introduction

Lane Departure is one of nine emphasis areas of the North Carolina Strategic Highway Safety Plan. This emphasis area targets the following crashes:

- Ran Off Road – Left
- Ran Off Road – Right
- Ran Off Road – Straight
- Overturn/Rollover
- Fixed Object
- Head On
- Sideswipe – Opposite Direction

State of the Problem

Lane departure crashes comprised 24 percent of all crashes and 57 percent of all fatalities in 2012 on North Carolina roadways. Table G-1 offers a basic summary of lane departure-related crashes by severity on North Carolina's highways from 2004 – 2013. Also included are the number of injuries and fatalities resulting from lane departure crashes. Injuries are classified into four levels of severity as defined below:

- **Fatal** – Crash-related injuries result in a death within twelve months of the crash.
- **Type A Injury** – Crash-related injuries serious enough to prevent normal activity for at least one day such as a massive loss of blood, broken bones, etc.
- **Type B Injury** – Crash-related injuries that are not fatal or Type A but are evident at the scene such as bruises, swelling, limping, etc.
- **Type C Injury** – There is no visible injury but there are complaints of pain or has been momentarily unconsciousness.

Table G-1 shows trends for lane departure crashes in North Carolina from 2004 – 2013. The figures for total crashes also include crashes that did not result in injury or fatality.

The number of lane departure crashes has fluctuated over the years, with a general decline from approximately 60,000 crashes ten years ago to just above 50,000 crashes in recent years, consistent with a decline in all crashes statewide. However, the percent of all crashes that are lane departure crashes has remained consistent over the ten-year period. The number of fatalities peaked within this time period at 1,040 fatalities in 2007, but fatalities have steadily declined since that time to 737 in 2013.

There are many challenges to reducing lane departure crashes and the fatalities and serious injuries that result, including the following:

- Determining the best use of resources in areas with countermeasures of widely varied costs and effectiveness.
- Determining the right combination of system-wide countermeasures versus site-specific applications.
- Determining root cause or causes of lane departure events.

In 2009, as part of the Focused Approach to Safety, the Federal Highway Administration (FHWA) worked with the North Carolina Department of Transportation (NCDOT) to address lane departure crashes through data analyses and the development of a straw man roadway departure safety implement plan. This plan provided insight for several efforts in North Carolina. Additionally, North Carolina has

Table G-1: *North Carolina Lane Departure Crash Trends (2004 – 2013).*

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Lane Departure Crashes	61,239	57,520	56,243	56,435	54,999	56,475	55,498	50,022	51,853	53,615
Fatal Crashes	823	796	846	927	803	737	708	629	671	666
A Injury Crashes	1,744	1,663	1,554	1,386	1,237	1,126	981	1,011	983	893
B Injury Crashes	9,880	9,596	9,236	9,481	9,082	8,444	8,186	7,880	8,107	7,681
C Injury Crashes	13,831	12,787	12,741	12,807	12,285	12,598	12,204	11,464	11,922	11,787
Fatalities	917	871	939	1,040	871	805	766	693	718	737
A Injuries	2,304	2,161	2,025	1,780	1,556	1,426	1,264	1,259	1,230	1,137
B Injuries	13,145	12,444	12,003	12,252	11,651	10,950	10,439	10,091	10,294	9,706
C Injuries	20,640	19,034	18,677	18,893	18,031	18,446	17,968	16,990	17,673	17,189

undertaken several related successful activities in recent years that have likely contributed to the reductions evident in Table G-1.

Notable efforts include the following successes:

- The North Carolina Highway Safety Improvement Program (HSIP) has been very successful in identifying potentially hazardous locations, performing field investigations, and developing safety recommendations to reduce lane departure crashes.
- North Carolina has been a leader in installing cable median barriers, which help reduce the severity of cross-median (head-on) crashes on freeways.
- NCDOT has undertaken an effort to upgrade rural two-lane roads to modern roadway design standards, which includes adding shoulders.
- Statewide, enforcement personnel have undertaken several high-visibility enforcement efforts focusing on driver behaviors that contribute to lane departure crashes, including impaired driving, speeding, and distracted driving. Additionally, their efforts to increase occupant protection have reduced the severity of crashes that result.

Although these successful efforts have had a positive impact on lane departure crashes, additional actions are needed to reduce these crashes.

Emphasis Area Goal

In 2013, there were 737 fatalities and 1,137 serious injuries from lane departure crashes. The goal for this emphasis area is to reduce lane departure-related fatalities and serious injuries.

Strategies and Supporting Actions

The following strategies are needed to achieve the goals of the Lane Departure emphasis area. Listed below each strategy are several recommended actions to support it, as well as one or more North Carolina agencies identified as having a potentially significant role in its implementation and the current status of the action.

Strategy 1

Keep vehicles on the roadway.

The first objective to designing safe roads is to keep drivers on roadways and, more specifically, in their appropriate directional lane. The use of improved delineation techniques and other positive guidance measures minimize vehicle lane departures.

Supporting Actions

1. Conduct a pilot program to evaluate the safety and operational performance of white edgelines with various widths and levels of reflectivity.
Potential Implementing Agencies: NCDOT
Status: Underway

2. Increase the use of longitudinal rumble strips (shoulder, edgeline, and centerline).
Potential Implementing Agencies: NCDOT
Status: Underway

3. Increase the use of paved shoulders and wider outside lanes.
Potential Implementing Agencies: NCDOT
Status: Underway

4. Conduct field safety evaluation of targeted curve locations that have experienced crashes. Identify proper treatment measures such as enhanced signs, pavement markings, or other low-cost systemic treatments at each location.
Potential Implementing Agencies: NCDOT
Status: Planned

5. Continue to use evidence-based countermeasures to reduce collisions, including strategies identified in the FHWA Crash Modification Factors (CMF) Clearinghouse maintained by HSRC and from NCDOT evaluations of countermeasure effectiveness.
Potential Implementing Agencies: NCDOT
Status: Underway

6. Coordinate with other emphasis areas where the root cause of lane departure is related to driver behavior instead of or in addition to an engineering issue.
Potential Implementing Agencies:
NCDOT and Other Emphasis Area Leads
Status: Needed

Strategy 2

Reduce potential for crashes when vehicles leave the roadway.

Once a vehicle leaves the roadway, it is important to provide the driver with an opportunity to recover safely and re-enter the roadway once the vehicle is under control. Pavement edge drop-offs contribute to drivers overcorrecting, which may lead to severe head-on or rollover crashes.

Supporting Actions

1. Apply Safety Edge technology to paving projects. Conduct before-and-after evaluations to

test effectiveness of the treatment.
Potential Implementing Agencies: NCDOT
Status: Underway

2. Lessen impacts of leaving the lane with low-cost clear zone treatments, including the removal of fixed objects and tripping mechanisms.
Potential Implementing Agencies: NCDOT
Status: Underway

Strategy 3

Reduce severity of crashes that do occur when vehicles leave the roadway.

The first and second strategies are intended to prevent crashes. This strategy includes actions to lessen the severity of a lane departure crash once it occurs.

Supporting Actions

1. Increase use of median barriers statewide. Cable barriers in particular provide a cost-effective means of shielding the median and reducing severity of impacts.
Potential Implementing Agencies: NCDOT
Status: Underway

2. Shield motorists from trees, poles, or other fixed objects using guardrail or other barrier types.
Potential Implementing Agencies: NCDOT
Status: Underway

Strategy 4

Support and enhance driver education and awareness programs.

This strategy provides motorists with training and tools to avoid lane departure crashes. Both classroom and behind-the-wheel training are important so that drivers understand the dangers of lane departure crashes, as well as learn how to avoid them.

Supporting Actions

1. Continue support for education and awareness programs and ensure that the curriculum and behind-the-wheel training addresses emergency lane departure situations.
Potential Implementing Agencies:
NCDOT, GHSP, NCDPI
Status: Underway

2. Continue support for information and outreach efforts that target highway safety messaging related to lane departure situations not solely caused by engineering issues.
Potential Implementing Agencies:
NCDOT, GHSP, NCDPI
Status: Underway

Working Group Members

The working group for this emphasis area includes the following representatives from nine agencies committed to achieving the goals of this Action Plan:

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- Catherine Bryant, North Carolina Department of Transportation
- Greg Burns, North Carolina Department of Transportation
- Julian Council, , North Carolina Division of Motor Vehicles

- Haywood Daughtry, North Carolina Department of Transportation
- Daniel Findley, NCSU Institute for Transportation Research and Education
- Reginald Flythe, North Carolina Department of Public Instruction
- Bucky Galloway, North Carolina Department of Transportation
- David Harkey, UNC Highway Safety Research Center
- Terry Hopkins, North Carolina Department of Transportation
- Chris Howard, North Carolina Department of Transportation
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- Brian Mayhew, North Carolina Department of Transportation
- David Morton, North Carolina Department of Transportation
- Brian Murphy, North Carolina Department of Transportation
- Barak Myers, Eastern Band of Cherokee Indians
- Chris Oliver, North Carolina Department of Transportation
- Mark Scaringelli, Governor's Highway Safety Program
- Eric Schaberg, North Carolina State Highway Patrol
- Matthew Springer, North Carolina Department of Transportation
- Shawn Troy, North Carolina Department of Transportation
- Robert Willcox. Eastern Band of Cherokee Indians
- Tony Wyatt, North Carolina Department of Transportation

Supporting Material

The following are considered valuable resources to the implementation of the Lane Departure Emphasis Area Action Plan:

- FHWA, North Carolina Roadway Departure Safety Implementation Plan: Data Analysis and Straw Man Outline, July 9, 2009
- NCHRP, Best Practices In Lane-Departure Avoidance and Traffic Calming. http://bit.ly/1AXU2nE
- North Carolina Department of Transportation Crash Data Tool and Reports. http://bit.ly/1u2vHeu
- North Carolina Department of Transportation Complete Streets Policy http://www.completestreetsnc.org/
- NHTSA's Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices. http://bit.ly/1AbynCV
- NCHRP, Centerline Rumble Strips http://bit.ly/1wbo5k2
- Crash Modification Factors Clearinghouse http://bit.ly/1wVVK2x
- Institute of Transportation Engineers Designing Urban Walkable Thoroughfares http://bit.ly/1z7ShUi
- Safety Impacts of Pavement Edge Drop-offs http://bit.ly/1AXUmTh
- FHWA, Proven Safety Countermeasures http://1.usa.gov/1HvhEBv