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
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.  
   *Potential Implementing Agencies:* NCDOT  
   *Status:* Underway

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:

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