

Spot Safety Project Evaluation

Order # 41000013050

Spot Safety Project # 07-01-229

**Spot Safety Project Evaluation of the
Intersection Realignment & Left Turn Lane Installation
NC 87 at SR 2324 / SR 2327 / SR 2121
Alamance County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Jason B. Schronce

8-2-2011

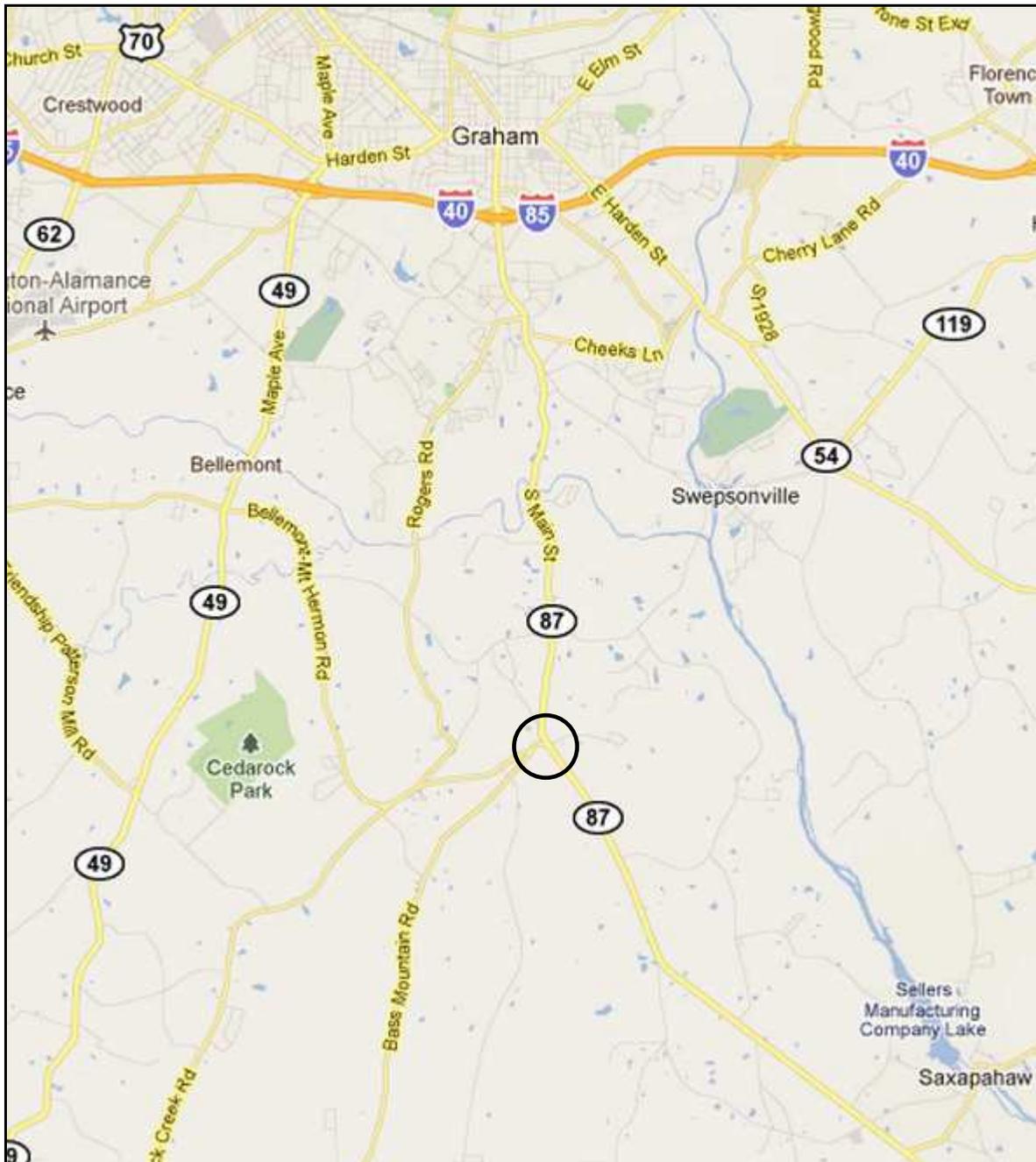
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-229 located at the Intersection of NC 87 and SR 2324 (Woods Chapel Road) / SR 2327 (Mount Hermon Church Road) / SR 2121 (Judge Sharpe Road) in Alamance County, south of the City of Graham.





Before Period Intersection Layout – BING Maps



After Period Intersection Design – BING Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the intersection realignment and NC 87 left turn lane installation. NC 87, SR 2324 (Woods Chapel Rd), and SR 2327 are all two-lane facilities at the subject intersection. Speed limits include 55-mph for NC 87 and SR 2324 (Woods Chapel Rd) but 45-mph for SR 2327 (Mt. Hermon Church Rd). The NC 87 speed limit was reduced to 50-mph in the after period.

The before period presented SR 2324 and SR 2327 intersecting NC 87 at a K-type intersection and a slip ramp to the south for SR 2327 (Mt. Hermon Church Road). The area was redesigned with improvements including: realigning Woods Chapel Road to hit NC 87 at a 90-degree angle, rerouting Mount Hermon Church Road to the south to create a four-leg intersection with SR 2121 (Judge Sharpe Road), installing left turn lanes at both intersections, and constructing a NC 87 center-turn lane to connect the left turn lanes. Southbound NC 87 was also provided with an after period right turn lane onto SR 2327 (Mt. Hermon Church Rd) and the former SR 2327 was renamed Herbert Road; now a dead end street accessing homes and businesses.

The original statement of problem was the existence of rear-end crashes caused from queuing of northbound NC 87 vehicles by motorists waiting to turn left onto SR 2327. Other concerns for this location were the strong skew angles of the side streets and the horizontal curve of NC 87 at the intersections.

The initial crash analysis was completed from July 1, 1998 to June 30, 2001 with fourteen (14) reported crashes, thirteen (13) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on May 2, 2007 with a total cost of \$150,000 Spot Safety Funds.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period were the months of February through May 2007. The before period consisted of reported crashes from March 1, 2003 through January 31, 2007 (3 years and 11 months); and the after period consisted of reported crashes from June 1, 2007 through April 30, 2011 (3 years and 11 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes along the NC 87 strip from 150 feet south of SR 2121 (milepost 12.432) to 150 feet north of SR 2324 (milepost 12.638) with a 150 foot y-line. *Please see attached location map, aerial maps, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that NC 87 Rear-End Crashes (approaching an intersection) were the target crashes for the applied countermeasure.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	37	6	- 83.8 %
Total Severity Index	3.60	3.47	- 3.6 %
Target Crashes – Rear-End approach	18	0	- 100.0 %
Target Crash Severity Index	3.88	0.00	- 100.0 %
Volume (2005, 2009)	13,100	12,100	- 7.6 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	4	0	- 100.0 %
Class C Injury Crashes	9	2	- 77.8 %
Total Injury Crashes	13	2	- 84.6 %

The naive before and after analysis at the treatment location resulted in a 84 percent decrease in Total Crashes, complete elimination of Target Crashes, and a 4 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented multiple rear-end crash patterns along this segment of roadway. There were seven (7) rear-end collisions southbound approaching Judge Sharp Road, five (5) rear-end collisions while vehicles waited to turn left at the K-intersection, and six (6) rear-end collisions in the northbound queue. Along with those patterns, there were four (4) left turn same road crashes from NC 87 vehicles accessing the side streets and four (4) left turn collisions from SR 2327 motorists attempting to enter NC 87.

After the roadway realignment and left turn lane on NC 87, all the former crash patterns were eliminated. There were zero (0) after period rear-end collisions along this segment. The newly created four-leg intersection consisted of only one (1) after period non-injury angle collision. These improvements successfully eliminated the crash history of this roadway segment.

The calculated benefit to cost ratio for this project was unable to be calculated since the Safety Evaluation Group did not have the total amount of funds collectively used to construct this project. The B-C Ratio would be a positive value since with the reduction of injury crashes from thirteen (13) to two (2) through the evaluation.

Please see the attached *Treatment Site Photos*. Photos are provided from our field visit on July 21st, 2011 for all approaches to the treatment location. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of segment.

One additional field observation was that 18-wheeler tractor trailer trucks were having to use both lanes of SR 2327 (Mount Hermon Church Road) when making the right turn onto the new alignment at the four-leg intersection. From the diagrams, no crashes have occurred at this location but in a short time-frame we observed multiple trucks use both lanes and the roadway shoulder to complete their turn successfully.



Treatment Site Photos (Field Visit 7-21-2011)



Travelling South on NC 87 approaching SR 2324 (Woods Chapel)



Travelling South on NC 87 between intersections



Travelling South on NC 87 approaching SR 2327 / SR 2121



Travelling East on SR 2327 (Mt. Hermon Church Rd) approaching new intersection



Travelling West on SR 2121 (Judge Sharpe Rd) approaching new intersection



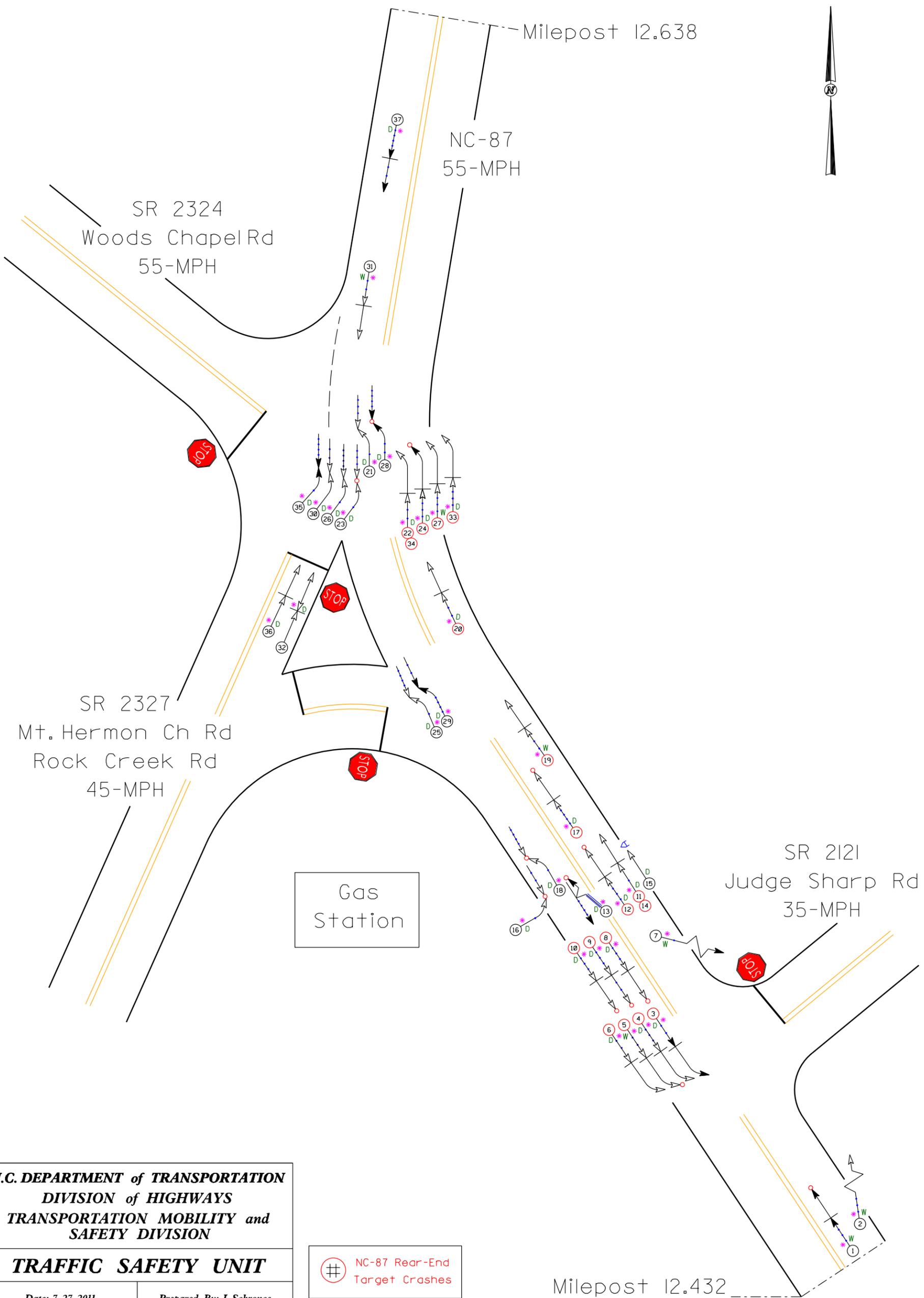
Travelling Southeast on SR 2324 (Woods Chapel Rd) approaching NC 87



Former Roadway Alignment

SS# 07-01-229
 Order# 41000013050
 Alamance County
 BEFORE Period
 3/1/03 - 1/31/07

LEGEND			
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		TURNING
	PARKED VEHICLE		BACKING
	PARKING VEHICLE		SIDESWIPE
	FIXED OBJECT		OUT OF CONTROL
	HEAD ON		INJURY
	REAR END		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN
	9 MPH OR LESS		P PEDESTRIAN
	10 MPH TO 19		T TRAIN
	20 MPH TO 29		* DRIVER AT FAULT
	30 MPH TO 39		D DRY
	40 MPH TO 49		W WET
	50 MPH TO 59		I ICY OR SNOWY
	60 MPH TO 69		O OILY
	70 AND UP		



N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 7-27-2011

Prepared By: J. Schronce

NC-87 Rear-End Target Crashes

Milepost 12.432

Milepost 12.638

SR 2324
Woods Chapel Rd
55-MPH

NC-87
50-MPH

SS# 07-01-229
Order# 41000013050
Alamance County
AFTER Period
6/1/07 - 4/30/11

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		70 AND UP		OILY
	RAN OFF ROAD		SPEED UNKNOWN				



Herbert Rd
Dead End

Gas
Station

SR 2121
Judge Sharp Rd
35-MPH

SR 2327
Mt. Hermon Ch Rd
Rock Creek Rd
45-MPH

Milepost 12.432

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 7-27-2011

Prepared By: J. Schronce

NC-87 Rear-End
Target Crashes