

Spot Safety Project Evaluation

Project Log # 200512161

Spot Safety Project # 05-96-028

Spot Safety Project Evaluation of the Installation of a Two-Phase Traffic Signal At the Intersection of SR 2049 (Forestville Rd) and SR 2224 (Mitchell Mill Rd) Wake County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Brad Robinson, EI

2/12/2007
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-96-028 – The Intersection of SR 2049 (Forestville Rd) at SR 2224 (Mitchell Mill Rd) in Wake County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of two-phase traffic signal and the reduction of the speed limit to 45 mph on the southern leg of SR 2049 (Forestville Rd). SR 2049 (Forestville Rd) and SR 2224 (Mitchell Mill Rd) were both 2-lane roads with no left-turn lanes in the study period and speed limits of 55 mph and 45 mph, respectively. The subject intersection is a 4-leg intersection which was controlled by a flasher and stop signs on SR 2049 (Forestville Rd) in the before period. Left turn lanes have recently been added to SR 2049, but were not in the time period analyzed for this study.

A North Carolina Representative originally submitted the request for the traffic signal and reduction of speed limit. After conducting an investigation it was found that the intersection met MUTCD volume warrants 9 and 11.

The initial crash analysis was completed from May 1, 1993 to April 30, 1996 with 20 reported crashes, including 14 angle type collisions. The final completion date for the improvement at the subject intersection was on March 12, 1997 with a total cost of \$35,000.00.

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 was from February 1, 1997 to April 30, 1997. The before period consisted of reported crashes from January 1, 1990 through January 31, 1997 (7 years and 1 month) and the after period consisted of reported crashes from May 1, 1997 through May 31, 2004 (7 years and 1 month). The beginning date for this analysis was determined by the available crash data at the time the analysis was completed.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle. One Ran-Off-Roadway Crash (Before Period #25) was included as a Target Crash in the before period due to it resulting from the driver swerving to avoid a Frontal Impact Crash. In addition, one

Head On Crash (After Period #21) was not included as a Target Crash in the after period because it did not appear to be related to the intersection.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	39	26	-33.3
Total Severity Index	9.3	6.19	-33.4
Target Crashes	25	11	-56.0
Target Crash Severity Index	10.02	9.91	-1.1
Volume	8,000	10,700	33.8
<u>Crash Severity Summary</u>			
Fatal Crashes	0	0	N/A
Class A Crashes	3	1	-66.7
Class B Crashes	9	1	-88.9
Class C Crashes	4	7	75
PDO Crashes	23	17	-26.1

The naive before and after analysis at the treatment location resulted in a 33 percent decrease in Total Crashes, a 56 percent decrease in Target Crashes, a 33 percent decrease in the Total Severity Index, and a 34 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1993 and the after period ADT year was 2000.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 33 percent decrease in Total Crashes and a 56 percent decrease in Target Crashes, with a 34 percent increase in ADT. The Total Severity Index decreased by 33 percent and the Target Crash Severity Index stayed relatively constant. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

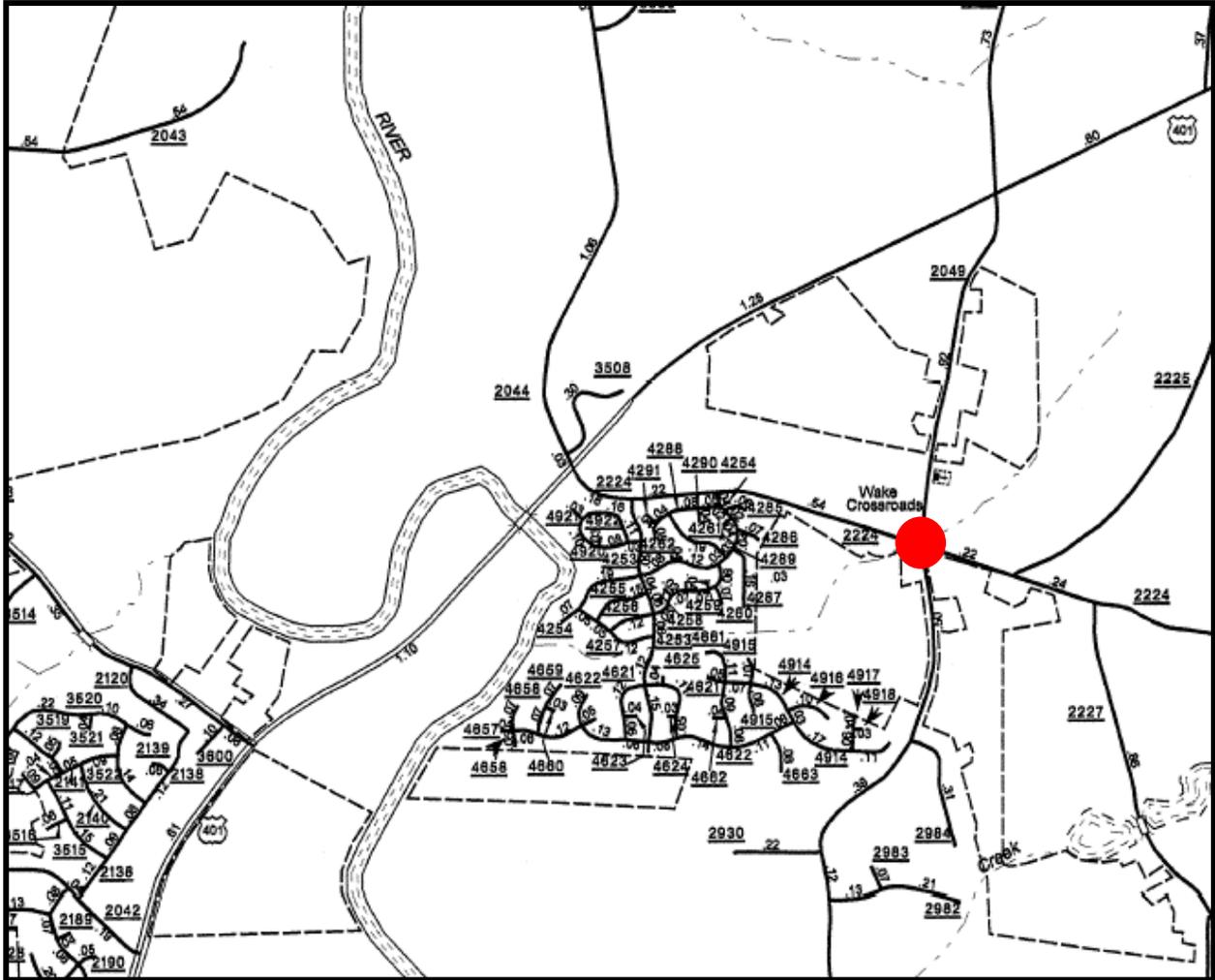
Referencing the *Collision Diagrams*, all crash patterns in the before period were either reduced or eliminated by the installation of the traffic signal. There is still a crash pattern between vehicles entering the intersection from the southern leg of SR 2049 and the western leg of SR 2224, although it has been reduced 29 percent (from 7 to 5).

Rear-End Crashes have experienced a large increase after the signal was installed. In the before period there were no true Rear-End Crashes, although there were two Ran-Off-Roadway Crashes that were the result of drivers swerving to avoid Rear-End Crashes. In the after period there were 12 Rear-End Crashes, an increase of 500 percent (from 2 to 12). Most of the Rear-End Crashes (67%) occurred on westbound SR 2224 (Mitchell Mill Rd).

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection.

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 intersection.

Location Map
Wake County
Evaluation of Spot Safety Project 05-96-028



Treatment Location: SR 2049 (Forestville Rd) and SR 2224 (Mitchell Mill Rd)

Treatment Site Photos Taken October 11, 2006
SR 2049 (Forestville Rd) did not have turn lanes in study period



Looking Eastbound on SR 224 (Mitchell Mill Rd)



Looking Eastbound on SR 224 (Mitchell Mill Rd)



Looking Westbound on SR 2224 (Mitchell Mill Rd)



Looking Westbound on SR 2224 (Mitchell Mill Rd)



Looking Northbound on SR 2049 (Forestville Rd)



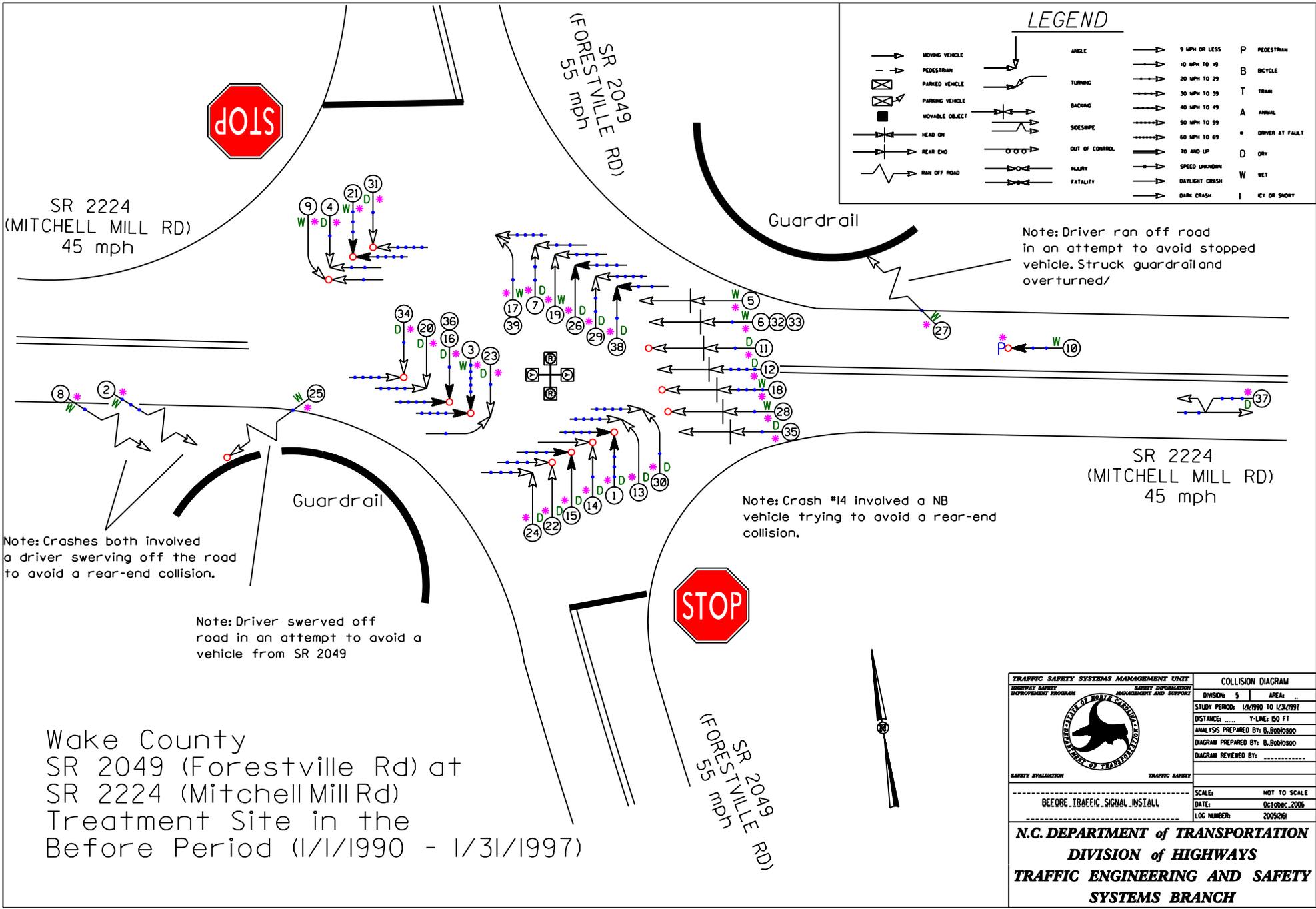
Looking Northbound on SR 2049 (Forestville Rd)



Looking Southbound on SR 2049 (Forestville Rd)



Looking Southbound on SR 2049 (Forestville Rd)



LEGEND

- | | | | |
|------------------|------------------|------------------|-------------------|
| → MOVING VEHICLE | ↘ ANGLE | → 9 MPH OR LESS | P PEDESTRIAN |
| → PEDESTRIAN | ↘ TURNING | → 10 MPH TO 19 | B BICYCLE |
| ☒ PARKED VEHICLE | ↘ BACKING | → 20 MPH TO 29 | T TRAM |
| ☒ MOVABLE OBJECT | ↘ SHOULDER | → 30 MPH TO 39 | A ANIMAL |
| → HEAD ON | ↘ OUT OF CONTROL | → 40 MPH TO 49 | * DRIVER AT FAULT |
| → REAR END | ↘ HURRY | → 50 MPH TO 59 | D DRY |
| ↘ RAN OFF ROAD | ↘ FATALITY | → 60 MPH TO 69 | W WET |
| | | → 70 AND UP | I KEY OR SHORT |
| | | → SPEED UNKNOWN | |
| | | → DAYLIGHT CRASH | |
| | | → DARK CRASH | |

Note: Driver ran off road in an attempt to avoid stopped vehicle. Struck guardrail and overturned/

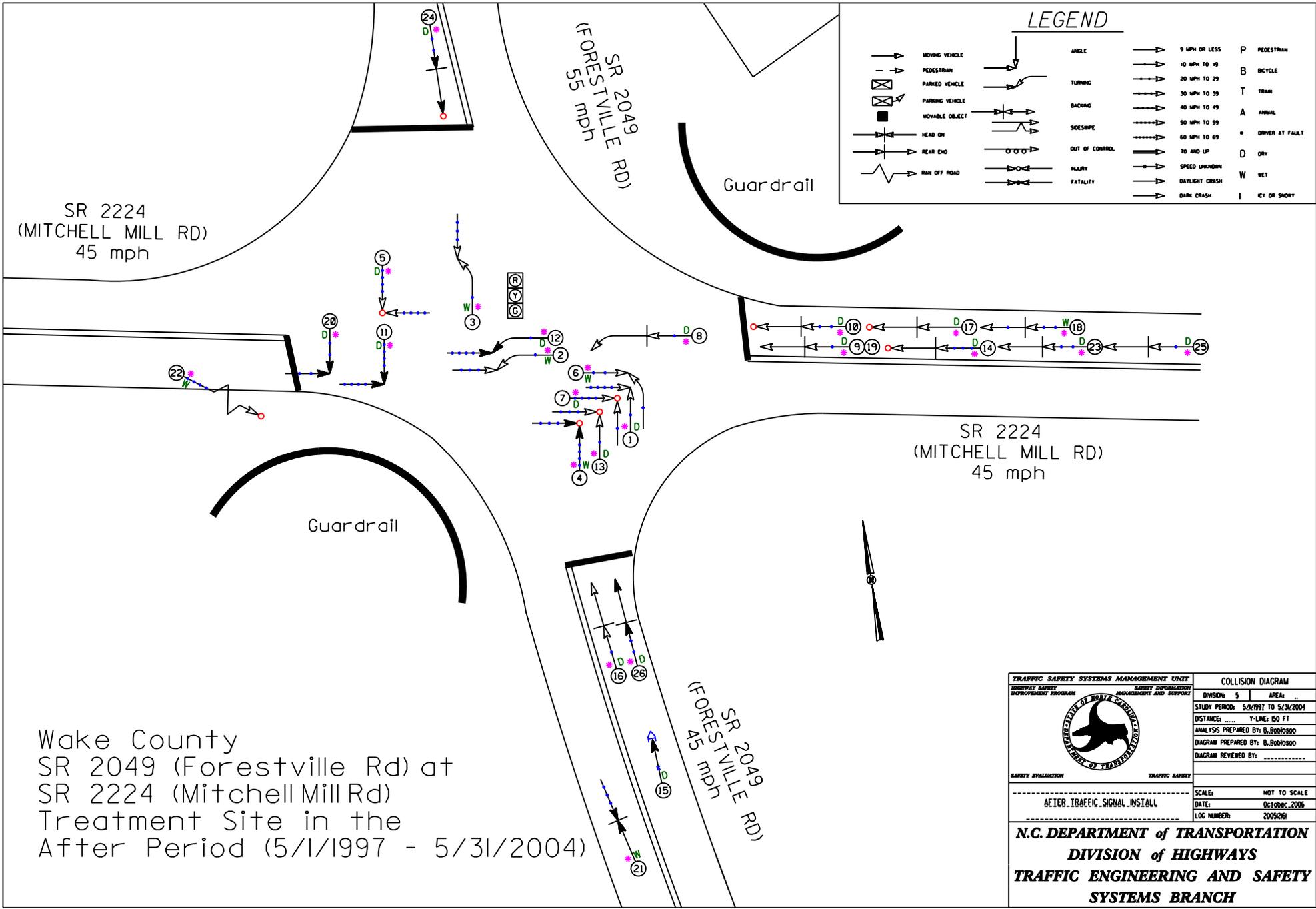
Note: Crash #14 involved a NB vehicle trying to avoid a rear-end collision.

Note: Crashes both involved a driver swerving off the road to avoid a rear-end collision.

Note: Driver swerved off road in an attempt to avoid a vehicle from SR 2049

Wake County
 SR 2049 (Forestville Rd) at
 SR 224 (Mitchell Mill Rd)
 Treatment Site in the
 Before Period (1/1/1990 - 1/31/1997)

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT <small>HIGHWAY SAFETY IMPROVEMENT PROGRAM SAFETY INFORMATION MANAGEMENT AND SUPPORT</small>		COLLISION DIAGRAM	
		DIVISION: 5	AREA: ..
		STUDY PERIOD: 1/1/1990 TO 1/31/1997	
		DISTANCE:	T-LINE: 150 FT
		ANALYSIS PREPARED BY: B. BOBROSIO	
		DIAGRAM PREPARED BY: B. BOBROSIO	
		DIAGRAM REVIEWED BY:	
<small>SAFETY EVALUATION TRAFFIC SAFETY</small>		SCALE:	NOT TO SCALE
BEGORE, TRAFFIC SIGNAL INSTALL		DATE:	October, 2006
		LOG NUMBER:	20050261
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH			



Wake County
 SR 2049 (Forestville Rd) at
 SR 2224 (Mitchell Mill Rd)
 Treatment Site in the
 After Period (5/1/1997 - 5/31/2004)

LEGEND

→ MOVING VEHICLE	↘ ANGLE	→ 9 MPH OR LESS	P PEDESTRIAN
- PEDESTRIAN	↙ TURNING	→ 10 MPH TO 19	B BICYCLE
☒ PARKED VEHICLE	↔ BACKING	→ 20 MPH TO 29	T TRAM
☒ MOVABLE OBJECT	↗ SHOULDER	→ 30 MPH TO 39	A ANIMAL
→ HEAD ON	↖ OUT OF CONTROL	→ 40 MPH TO 49	* DRIVER AT FAULT
→ REAR END	↔ HURRY	→ 50 MPH TO 59	D DRY
↘ RAN OFF ROAD	↔ FATALITY	→ 60 MPH TO 69	W WET
		→ 70 AND UP	I ICE OR SNOW
		→ SPEED UNKNOWN	
		→ DAYLIGHT CRASH	
		→ DARK CRASH	

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT <small>ROADWAY SAFETY IMPROVEMENT PROGRAM SAFETY INFORMATION MANAGEMENT AND SUPPORT</small>		COLLISION DIAGRAM	
		DIVISION: 5	AREA: ..
		STUDY PERIOD: 5/1/1997 TO 5/31/2004	
		DISTANCE:	T-LINE: 150 FT
		ANALYSIS PREPARED BY: B. BOBROSIO	
		DIAGRAM PREPARED BY: B. BOBROSIO	
		DIAGRAM REVIEWED BY:	
SAFETY EVALUATION TRAFFIC SAFETY		SCALE: NOT TO SCALE	DATE: Oct06oc_2006
AFTER TRAFFIC SIGNAL INSTALL		LOG NUMBER: 200505H	
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH			