

# Spot Safety Project Evaluation

Project Log # 200811085

Spot Safety Project # 05-99-208

## Spot Safety Project Evaluation of the Traffic Signal Installation SR 1002 (Aviation Parkway) and SR 3084 (Evans Road) Wake County, City of Morrisville

Documents Prepared By:

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

**Principal Investigator**



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Jason B. Schronce

6-17-2009

Date

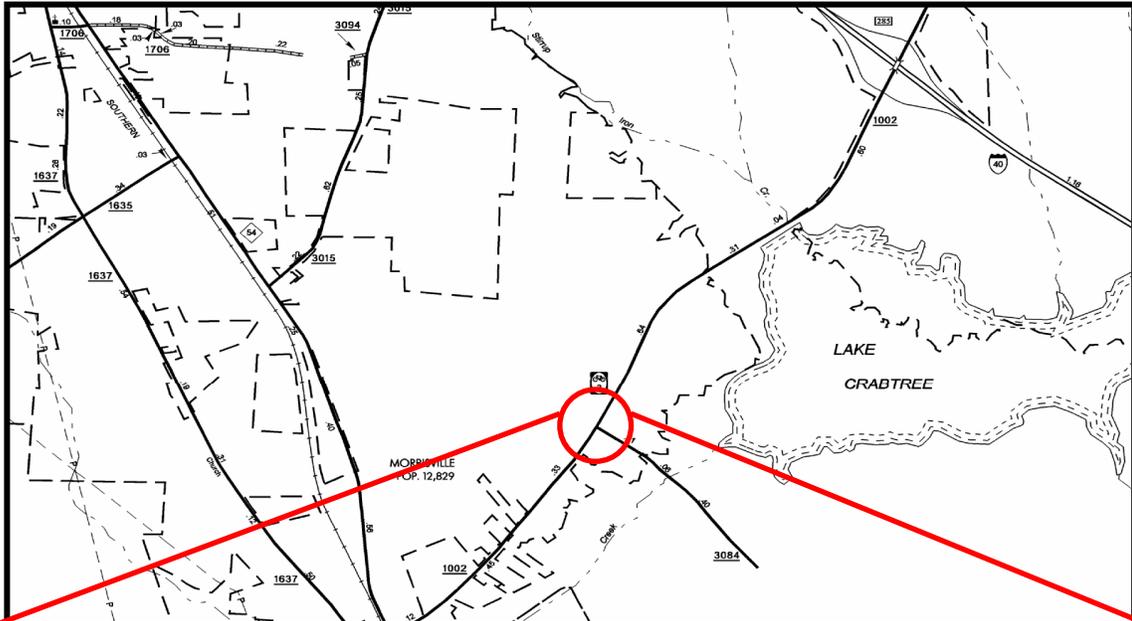
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 05-99-208 located at the Intersection of SR 1002 (Aviation Parkway) and SR 3084 (Evans Road) in Wake County, City of Morrisville.

The Sig ID is 05-1533 for this newly installed traffic signal.



## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection traffic signal. SR 1002 (Aviation Parkway) is a two lane roadway with a southbound left turn lane at this location. SR 3084 (Evans Road) is a four-lane median divided facility at the intersection that tees into SR 1002 and operated under stop control in the before period. All approaches have a speed limit of 45 mph. In July 2000, the geometrics of the intersection changed including the addition of a SR 1002 northbound right turn lane and a free-flow right turn movement from Evans Road onto Aviation Parkway with new pavement markings.

The original statement of problem was that vehicles on SR 3084 could not safely enter the intersection due to insufficient gaps in traffic. This was mainly a congestion issue due to commercial and industrial growth in the vicinity of this location. The intersection did meet signal warrants 8, 9, 10, and 11.

The initial crash analysis was completed from August 1, 1996 to July 31, 1999 with twenty-three (23) reported crashes. The final completion date for the improvement at the subject intersection was on February 4, 2003 with a total cost of \$70,000.

### 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 periods were the months of July 2000 and January through February 2003.

Before 1 (Stop Control): July 1, 1997 through June 30, 2000 (3 years);

Before 2 (New Alignment): August 1, 2000 through December 31, 2002 (2 years and 5 months);

After (Spot Safety Signal): March 1, 2003 through April 30, 2009 (6 years and 2 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 within 150 feet of the subject intersection. *Please see attached location map, aerial 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.

<u>Treatment Information</u>	<b>Before 1 3.0 Yrs</b>	<b>Before 2 2.42 Yrs</b>	<b>After 6.17 Yrs</b>
Total Crashes	22	16	28
<b>Total Crashes per Year</b>	<b>7.33</b>	<b>6.61</b>	<b>4.54</b>
Total Severity Index	2.01	3.31	2.59

<u>Treatment Information</u>	<b>Before 1 3.0 Yrs</b>	<b>Before 2 2.42 Yrs</b>	<b>After 6.17 Yrs</b>
Target Crashes – Frontal Impact	3	3	9
<b>Target Crashes per Year</b>	<b>1.00</b>	<b>1.24</b>	<b>1.46</b>
Target Crash Severity Index	5.93	5.93	5.11
Volume	19,600	26,300	32,800

<u>Injury Crash Summary</u>	<b>Before 1 3.0 Yrs</b>	<b>Before 2 2.42 Yrs</b>	<b>After 6.17 Yrs</b>
Fatal injury Crashes	0	0	0
Class A injury Crashes	0	0	0
Class B injury Crashes	0	1	2
Class C injury Crashes	3	7	4
Total Injury Crashes	3	8	6

The naive before and after analysis at the treatment location resulted in a 38 percent decrease in Total Crashes per Year through the analysis but a 46 percent increase in Target Crashes per Year through the analysis. The before period ADT years were 1998 and 2001; and the after period ADT year was 2006.

## 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 38 percent decrease in Total Crashes per year from the Before 1 period to the After period but a 46 percent increase in Target Crashes per year during that same time frame. The summary results above demonstrate that the Target Crash frequency has increased slightly while the Total Crash frequency has decreased through the analysis.

Referencing all the *Collision Diagrams*, the Before 1 Period indicated only three (3) frontal impact crashes in three years from SR 3084 vehicles improperly accessing SR 1002. However, a significant rear-end crash pattern of westbound right turning motorists exists with fourteen (14) collisions. Once the geometric changes were implemented, the Before 2 Period shows improvement in the rear-end pattern with only six (6) collisions over 2.42 years. Frontal impact crash frequency increased slightly from 1.0 to 1.24 crashes per year in the Before 2 Period.

In the After Period, the westbound Evans Road rear-end crash pattern frequency reduced from 2.5 to 1.0 crashes per year. However, a left-turn same roadway crash pattern has developed from the permissive green phasing. There were also two (2) red light run frontal impact collisions and a head-on crash from a vehicle that turned down the wrong side of Evans Road.

A comprehensive benefit-cost ratio was unable to be calculated at this location due to the intersection going through multiple changes during the evaluation time period.

Please see the attached *Treatment Site Photos*. Photos are provided for all three 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.

**TREATMENT SITE PHOTOS TAKEN 1/27/2009**



Traveling North on SR 1002 (Aviation Parkway)



Traveling South on SR 1002 (Aviation Parkway)



Traveling West on SR 3084 (Evans Road)

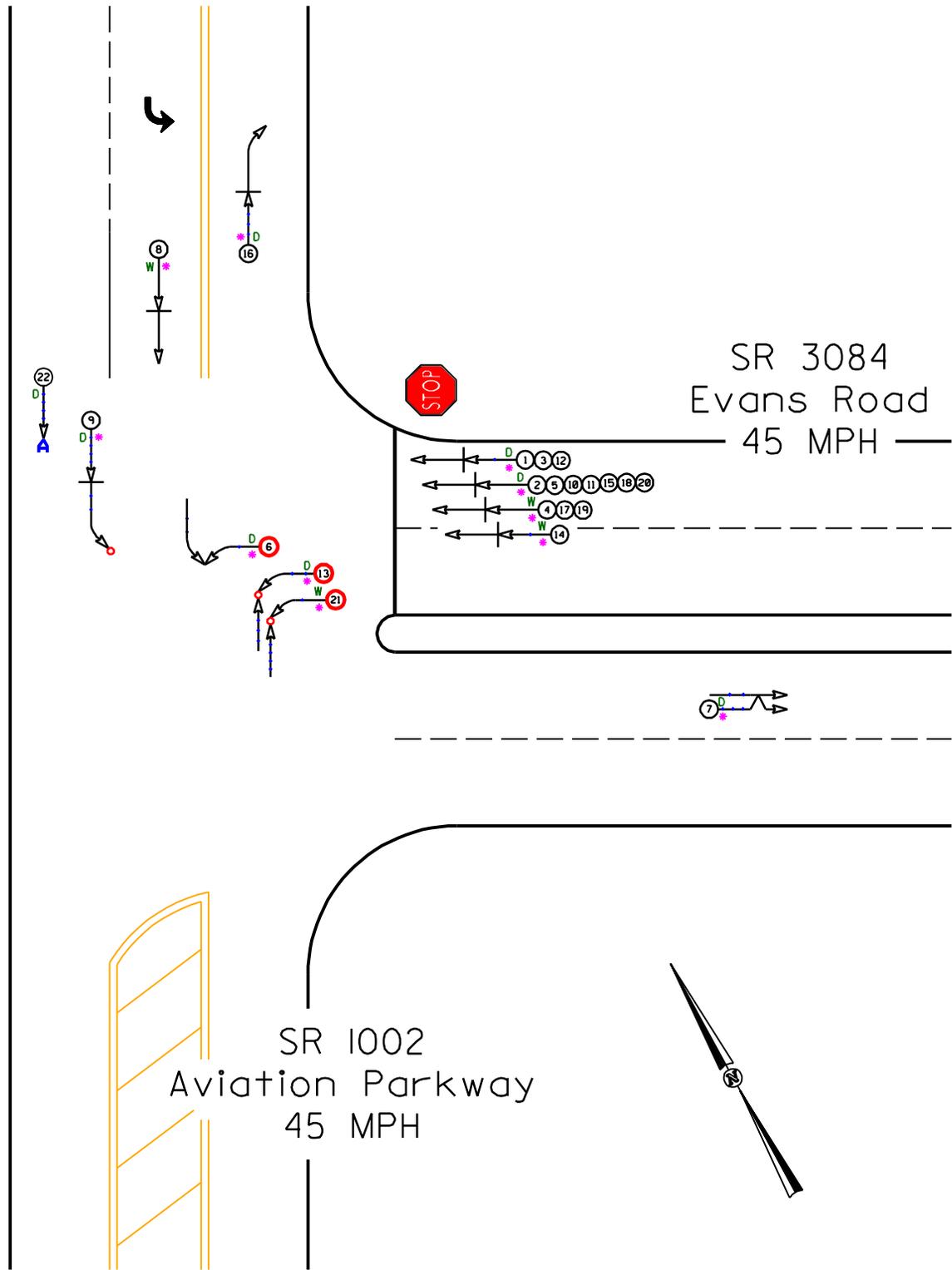


Traveling West on SR 3084 (Evans Road)

**LEGEND**

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		D RY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W ET
	HEAD ON		REAR END		50 MPH TO 59		I CY OR SNOW
	REAR END		INJURY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		FATALITY		70 AND UP		O NLY

SS# 05-99-208  
 Wake County  
 City of Morrisville  
 BEFORE I Period  
 7/1/97 - 6/30/00  
 3 Years



Frontal Impact  
Target Crashes

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	<b>COLLISION DIAGRAM</b>	
	DIVISION 5	AREA:
STUDY PERIOD: 7/1/1997 - 6/30/2000		
DISTANCE: Y-LINE + 150 FT		
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-6-2009		
LOG NUMBER: SS* 05-99-208 BEFORE I		
<b>N.C. DEPARTMENT of TRANSPORTATION</b> <b>DIVISION of HIGHWAYS</b> <b>TRANSPORTATION MOBILITY and</b> <b>SAFETY DIVISION</b>		

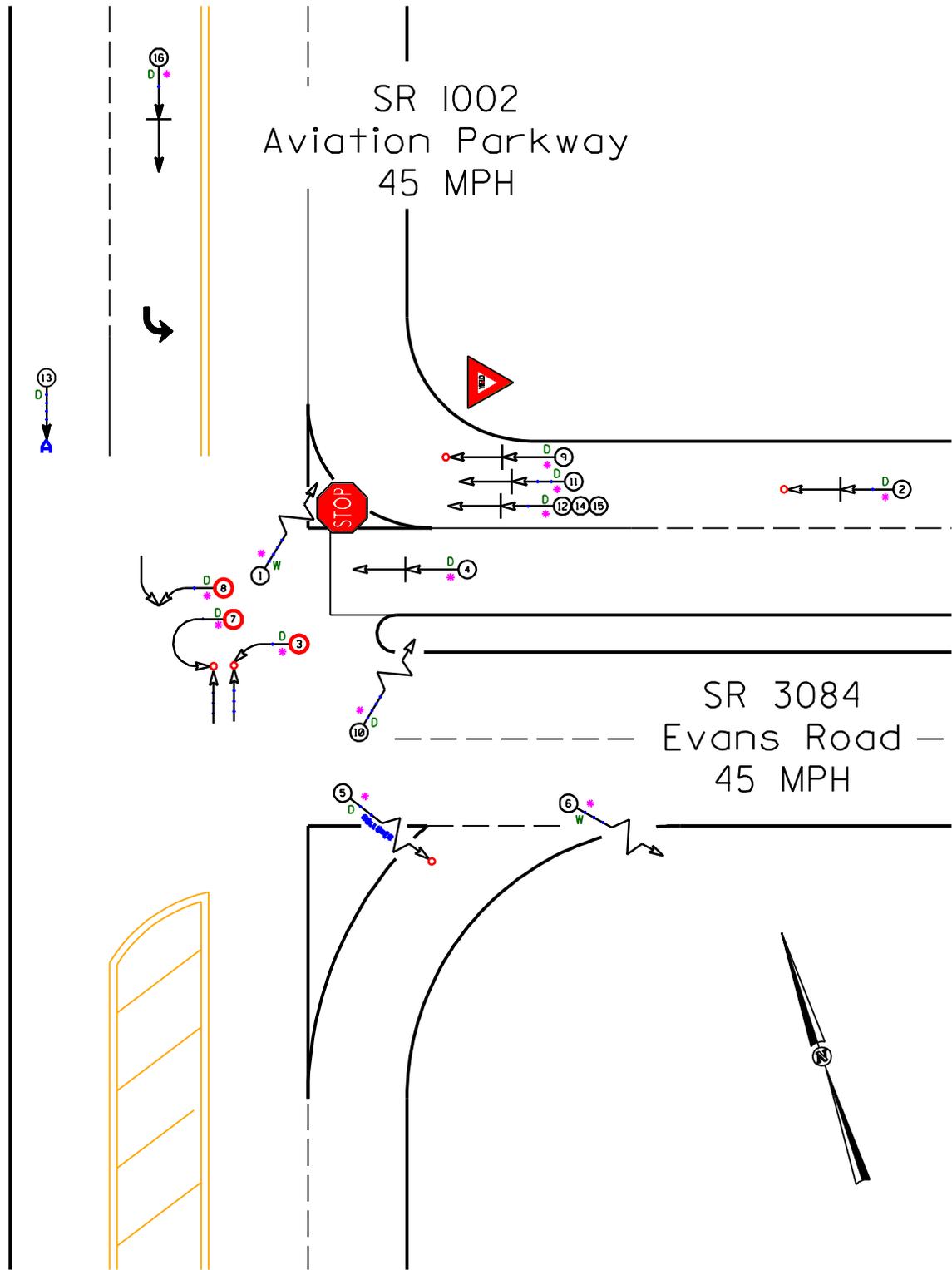
SR 1002  
Aviation Parkway  
45 MPH

SR 3084  
Evans Road —  
45 MPH

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		TO AND LP		50 MPH TO 59		ICY OR SNOW
	REAR END		HURRY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		FATALITY		70 MPH TO 79		ONLY

SS# 05-99-208  
Wake County  
City of Morrisville  
BEFORE 2 Period  
8/1/00 - 12/31/02  
2.42 Years



Frontal Impact  
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION 5	AREA:
	STUDY PERIOD: 8/1/2000 - 12/31/2002	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: BR	
	DIAGRAM PREPARED BY: JBS	
	DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE		
DATE: 6-6-2009		
LOG NUMBER: SS* 05-99-208 BEFORE 2		

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

SR 1002  
Aviation Parkway  
45 MPH

**LEGEND**

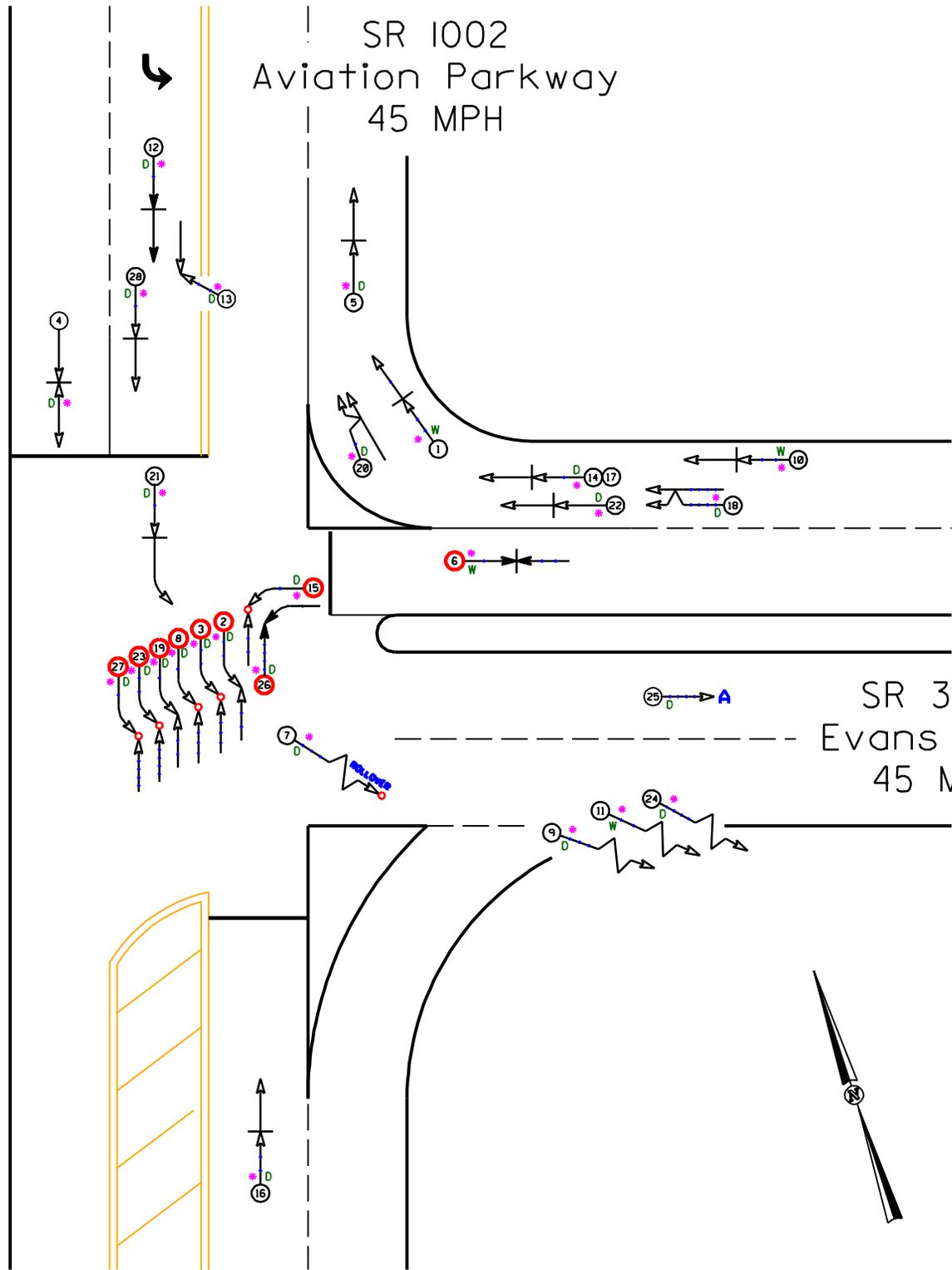
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		TO AND UP		50 MPH TO 59		ICY OR SNOW
	REAR END		INJURY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		9 MPH OR LESS		DRY

SS# 05-99-208  
Wake County  
City of Morrisville  
AFTER Period  
3/1/03 - 4/30/09  
6.17 Years



New Signalized  
Intersection  
Sig ID 05-1533

SR 3084  
Evans Road  
45 MPH



Frontal Impact  
Target Crashes

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	<b>COLLISION DIAGRAM</b>	
	DIVISION 5	AREA:
	STUDY PERIOD: 3/1/2003 - 4/30/2009	
	DISTANCE: Y-LINE + 150 FT	
	ANALYSIS PREPARED BY: JBS	
	ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-6-2009		
LOG NUMBER: SS* 05-99-208 AFTER		

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