

# Spot Safety Project Evaluation

Project Log # 200811081

Spot Safety Project # 05-02-204

**Spot Safety Project Evaluation of the Traffic Signal Installation  
At the Intersection of SR 1163 (Kelly Rd) and SR 1160 (Olive Chapel Rd)  
Wake County, Town of Apex**

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

2-3-2009

Date

Traffic Safety Project Engineer

# ***Spot Safety Project Evaluation Documentation***

## **Subject Location**

Evaluation of Spot Safety Project Number 05-02-204 located at the Intersection of SR 1163 (Kelly Road) and SR 1160 (Olive Chapel Road) 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 a multi-phase, actuated traffic signal (Sig ID 05-2214). In the before period, SR 1163 and SR 1160 were both two-lane facilities at the subject intersection with only a northbound left turn lane and speed limits of 45 mph on all approaches. The subject location is a crossroads type intersection, which was controlled by a stop sign on SR 1163 (Kelly Rd). Along with the signal installation, left turn lanes were added to the SR 1160 (Olive Chapel Rd) approaches.

The original statement of problem was that traffic volumes had increased to where motorists could no longer maneuver the intersection safely. The desired affect of the signal was to correct both congestion-delay issues and the developing accident problem. The intersection met signal warrants 2 and 3B.

The initial crash analysis was completed from December 1, 1998 to November 30, 2001 with seventeen (17) reported crashes, fourteen (14) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on November 1, 2003 with a total cost of \$150,000.00 funded by the NCDOT.

## **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 September through November 2003. The before period consisted of reported crashes from October 1, 1998 through August 31, 2003 (4 years and 11 months); and the after period consisted of reported crashes from December 1, 2003 through October 31, 2008 (4 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 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>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	31	12	- 61.3 %
Total Severity Index	7.26	4.08	- 43.8 %
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Target Crashes	21	6	- 71.4 %
Target Crash Severity Index	9.19	5.93	- 35.5 %
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Volume	6,400	12,500	95.3 %
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<u>Injury Crash Summary</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	4	3	- 25.0 %
Class C Injury Crashes	12	2	- 83.3 %
Total Injury Crashes	17	5	- 70.6 %

The naive before and after analysis at the treatment location resulted in a 61 percent decrease in Total Crashes, a 71 percent decrease in Target Crashes, and a 44 percent decrease in the Total Severity Index. The before period ADT year was 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 61 percent decrease in Total Crashes and a 71 percent decrease in Target Crashes. 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*, a large portion of crashes at the intersection in the before period (21 of 31) were the result of a vehicle unsuccessfully accessing Olive Chapel Rd from the stop condition on Kelly Rd. After the signal installation, this pattern was significantly reduced to just one (1), which was the result of a westbound vehicle on SR 1160 running the red light. This was the only crash in the after period resulting from a running of a red light. The remaining after period target crashes resulted from left turning motorists on Olive Chapel Rd and the permissive signal phase.

The calculated benefit to cost ratio for this project is **5.62 considering total crashes**. The benefit to cost ratio **considering only target crashes is 5.28**. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

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.



**SS# 05-02-204 Aerial Map  
Wake County**



Creekside Hills  
Apartments

SR 1163  
Kelly Road

Olive Chapel  
Elementary  
School

SR 1160 / 1164  
Olive Chapel Rd

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



Traveling East on SR 1160 (Olive Chapel Rd)



Traveling East on SR 1160 (Olive Chapel Rd)



Traveling North on SR 1163 (Kelly Road)



Traveling North on SR 1163 (Kelly Road)



Traveling South on SR 1163 (Kelly Rd)



Traveling South on SR 1163 (Kelly Rd)



Traveling West on SR 1160 (Olive Chapel Rd)



Traveling West on SR 1160 (Olive Chapel Rd)

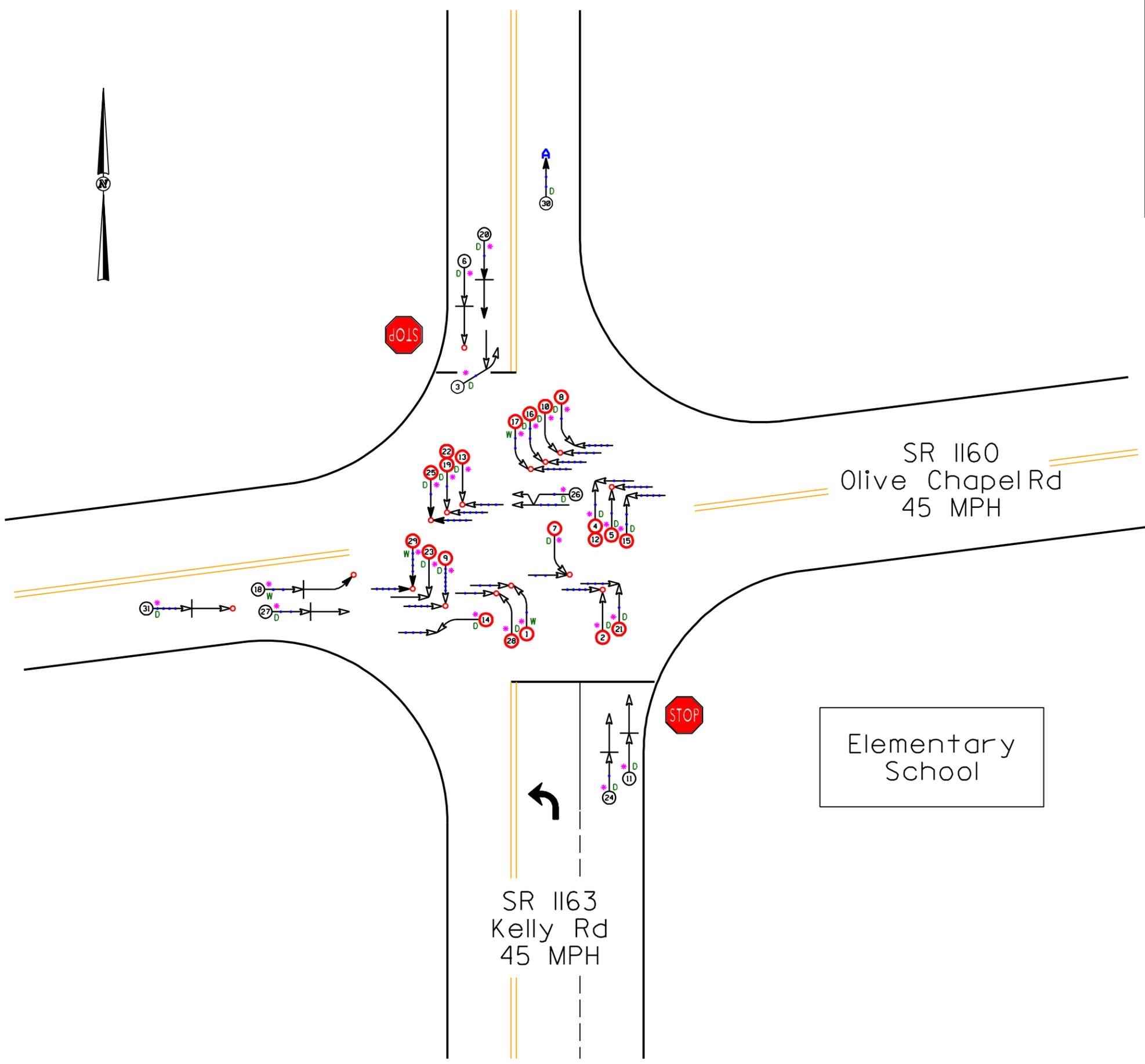




LEGEND

	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		60 MPH TO 69		OILY
	RAN OFF ROAD		70 AND UP		SPEED UNKNOWN		

SS# 05-02-204  
 Wake County  
 City of Apex  
 BEFORE Period  
 10/1/98 - 8/31/03



Intersection Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 5	AREA: 1
STUDY PERIOD: 10/1/1998 - 8/31/2003		
DISTANCE: Y-LINE = 150 FT		
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 1-8-2009		
LOG NUMBER: 05-02-204 BEFORE		

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

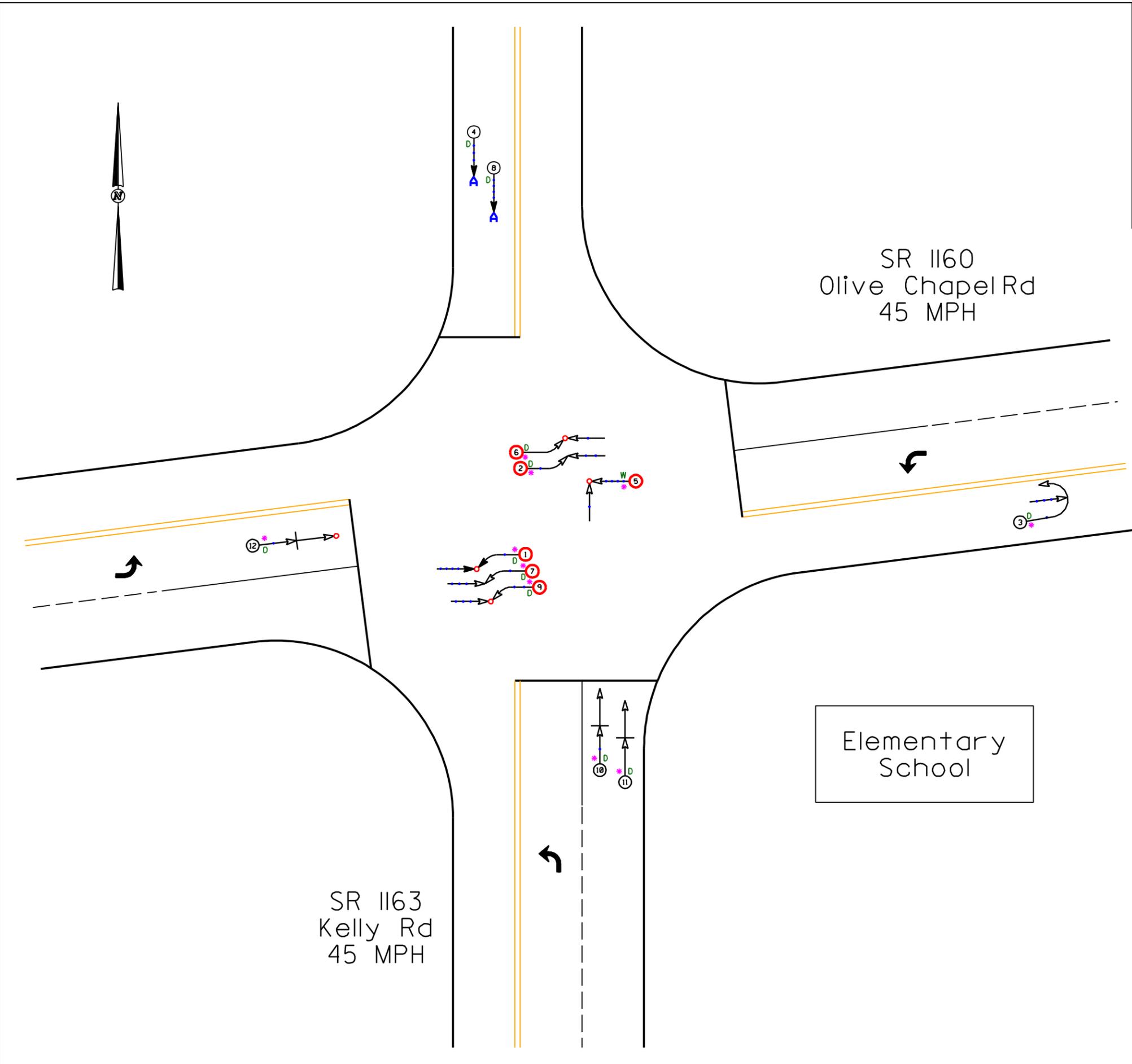
LEGEND

	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
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	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		OILY

SS# 05-02-204  
 Wake County  
 City of Apex  
 AFTER Period  
 12/1/03 - 10/31/08



New Signalized Intersection



SR 1160  
 Olive Chapel Rd  
 45 MPH

Elementary School

SR 1163  
 Kelly Rd  
 45 MPH

⊕ Intersection Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

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	STUDY PERIOD: 12/1/2003 - 10/31/2008	
	DISTANCE: Y-LINE = 150 FT	
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ANALYSIS CHECKED BY: N/A		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 1-8-2009		
LOG NUMBER: 05-02-204 AFTER		

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