

# Spot Safety Project Evaluation

Order # 41000016877

Spot Safety Project # 11-07-203

## Spot Safety Project Evaluation of the Crossover Installation US 221 at SR 1149 (Mt Jefferson Road) Ashe County

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

1-23-2012

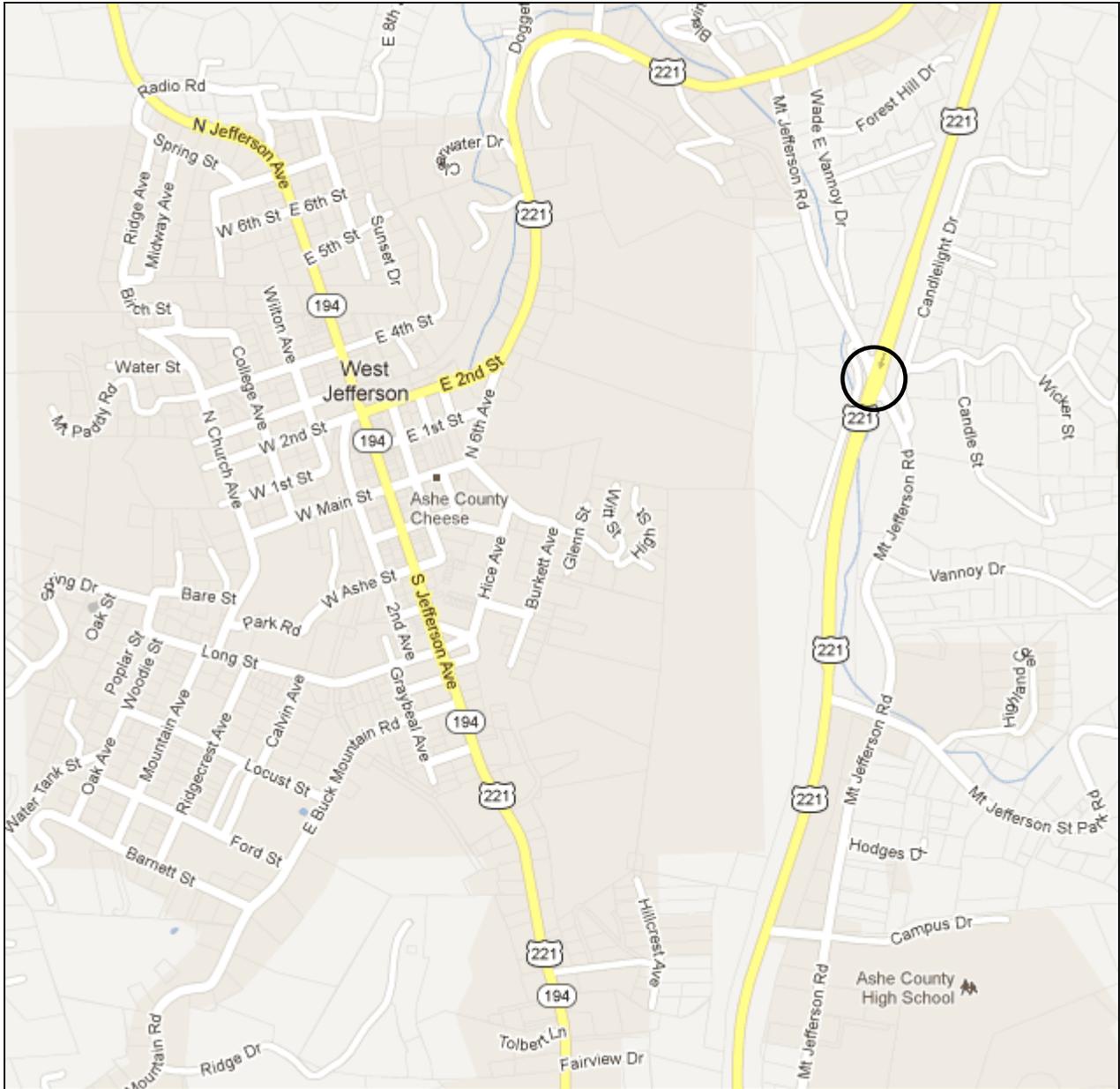
Date

Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 11-07-203 located at the Intersection of US 221 Bypass and SR 1149 (Mount Jefferson Road) in Ashe County, near the City of West Jefferson.





Aerial Photo provided from BING Map

### **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 limited movement crossover with concrete dividers. US 221 is a two-lane roadway with developed left and right turn lanes on each approach and a 55-mph speed limit. SR 1149 is four lanes on the westbound approach and two lanes on the eastbound approach with a 35-mph speed limit. The subject location is a four-leg crossroads intersection on a heavy skew angle, which is controlled by a stop condition on SR 1149 (Mt Jefferson Rd).

The original statement of problem stated that vehicles on SR 1149 were experiencing frontal impact crashes while attempting to cross the intersection. The intended purpose of the crossover improvement was to help alleviate the occurrence and severity of collisions.

The initial crash analysis was completed from January 1, 2002 to December 31, 2006 with fifteen (15) reported angle crashes and two (2) left turn different roadway collisions. The final completion date for the improvement at the subject intersection was on December 12, 2007 with a total cost of \$365,000.

## 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 period were the months of October 2007 through January 2008. The before period consisted of reported crashes from January 1, 2004 through September 30, 2007 (3 years and 9 months); and the after period consisted of reported crashes from February 1, 2008 through October 31, 2011 (3 years and 9 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 Crossover Crashes were the target crashes for the applied countermeasure. The Crossover Crash types considered are as follows: Left turn, different roadways; and Angle.

<u>Treatment Information</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	45	21	- 53.3 %
Total Severity Index	4.33	3.47	- 19.9 %
Target Crashes	15	0	- 100.0 %
Target Crash Severity Index	7.53	0.00	- 100.0 %
Volume (2005,2009)	14,500	15,100	4.1 %

<u>Injury Crash Summary</u>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	3	3	0.0 %
Class C Injury Crashes	7	4	- 42.9 %
Total Injury Crashes	11	7	- 36.4 %

The naive before and after analysis at the treatment location resulted in a 53 percent decrease in Total Crashes, a 100 percent removal of Target Crashes, and a 20 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 indicated fifteen (15) angle / left turn different roadway crashes in all four quadrants including a fatality crash in April 2007. After the crossover installation all of these crashes were eliminated by the removal of the through movement option at the intersection for SR 1149 motorists.

The before period also indicated strong patterns of rear-end crashes in the right turn lanes on both approaches of SR 1149 (Mount Jefferson Road). The before period diagrams showed eleven (11) collisions eastbound and eighteen (18) collisions on the westbound approach. With the crossover installation, these patterns also improved to five (5) crashes eastbound and eight (8) collisions westbound.

Typically, crossover installations occur on median divided roadways and the Safety Evaluation Group evaluates the closest u-turn locations for crash migration. However, with this installation, motorists have the ability to u-turn at the end of the concrete medians. A general search analyzing for u-turn related crashes was completed for the after period and two (2) crashes were observed. Crash 1 (ID-103171191) occurred 0.4 mile north of the intersection where a gravel pullover exists on the shoulder of US-221. Crash 2 (ID-103266213) occurred 200 feet south of the intersection on US-221. In both cases, the u-turning vehicle was rear-ended while slowing down to complete their turn safely.

The calculated benefit to cost ratio for this project is **3.75 considering total crashes**. The benefit to cost ratio **considering only target crashes is 3.56**. 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 from Google Street View for all four 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 (Google Street View)**



**Looking South on US-221**



**Looking North on US-221**



**Looking East onto SR 1149 (Mt Jefferson Road)**



**Looking West onto SR 1149 (Mt Jefferson Road)**

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: US 221 at SR 1149		BY: JBS						
COUNTY: Ashe		DATE: 1/20/2012						
FILE NO.: SS 11-07-203		Crossover Target Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	Crossover Installation						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$365,000	10	0.149	\$54,396			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$365,000	10	0.149	\$54,396			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$800			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$55,196			
	TOTAL COST OF PROJECT=				\$365,000			
COMPREHENSIVE COST REDUCTION:								
	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES							
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	3.75	1	0.27	10	2.67	34	9.07	\$260,320
AFTER	3.75	0	0.00	7	1.87	14	3.73	\$53,387
						Annual Benefits from Crash Cost Savings		\$206,933
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$151,738	
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	3.75	
	TOTAL COST OF PROJECT	-	\$365,000	COMPREHENSIVE B/C RATIO	-			3.75

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: US 221 at SR 1149		BY: JBS						
COUNTY: Ashe		DATE: 1/20/2012						
FILE NO.: SS 11-07-203		Crossover Target Crashes						
DETAILED COST:	TYPE IMPROVEMENT -	Crossover Installation						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$365,000	10	0.149	\$54,396			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$365,000	10	0.149	\$54,396			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$800			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$55,196			
	TOTAL COST OF PROJECT=				\$365,000			
COMPREHENSIVE COST REDUCTION:								
	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES							
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	3.75	1	0.27	3	0.80	11	2.93	\$196,613
AFTER	3.75	0	0.00	0	0.00	0	0.00	\$0
						Annual Benefits from Crash Cost Savings		\$196,613
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$141,418	
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	3.56	
	TOTAL COST OF PROJECT	-	\$365,000	COMPREHENSIVE B/C RATIO	-			3.56

ADT (Year)  
10,000 (2005)

US-221  
(Bypass)  
55-mph

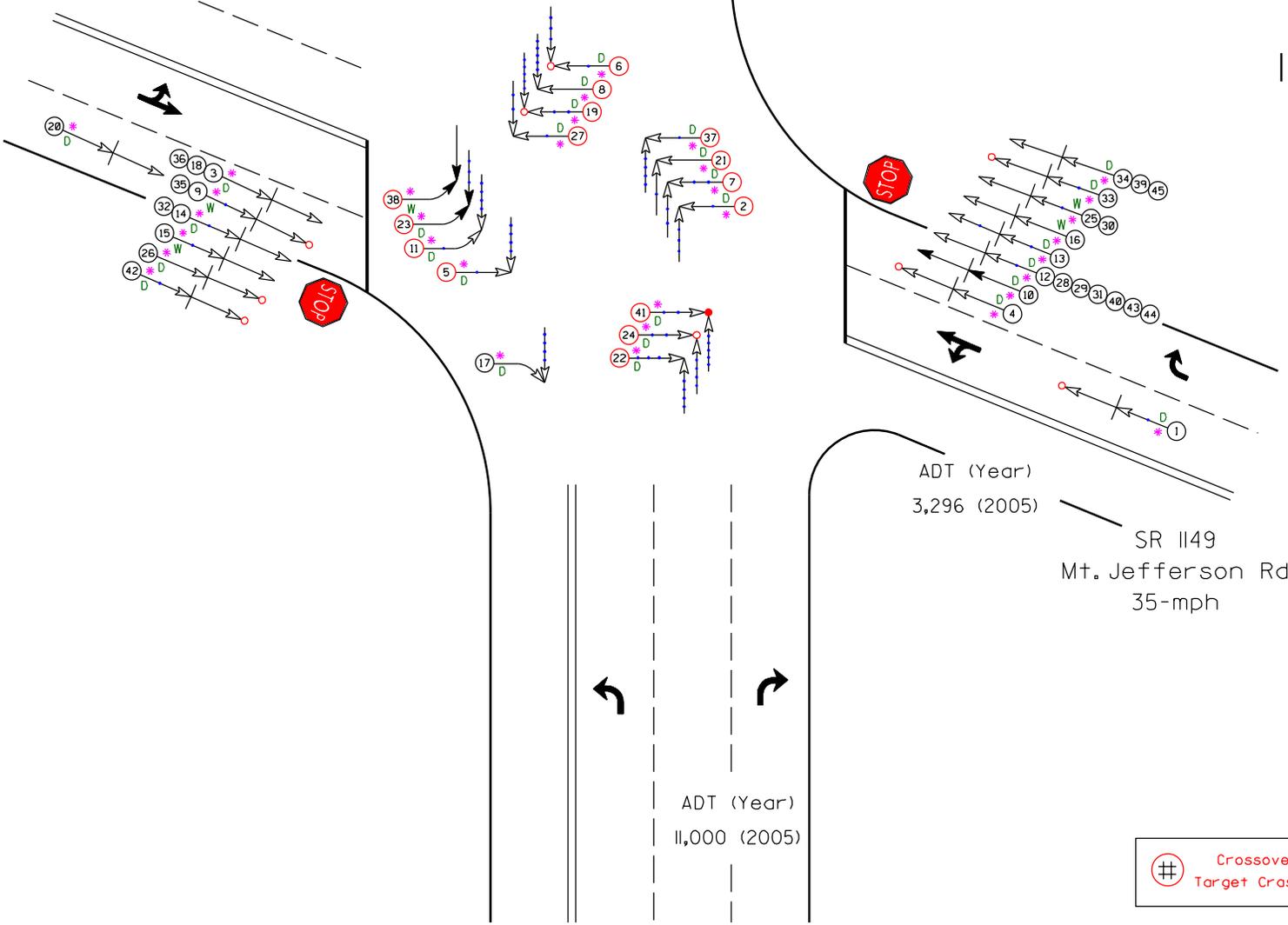
SR 1149  
Mt. Jefferson Rd  
35-mph  
ADT (Year)  
4,800 (2005)

**LEGEND**

	MOVING VEHICLE		ANGLE		10 MPH TO 19		PEDESTRIAN
	PEDESTRIAN		TURNING		20 MPH TO 29		TRAIN
	PAKING VEHICLE		BACKING		30 MPH TO 39		DRIVER AT FAULT
	FIXED OBJECT		SIDESWIPE		40 MPH TO 49		WET
	HEAD ON		OUT OF CONTROL		50 MPH TO 59		ICY OR SNOWY
	REAR END		RUNAWAY		60 MPH TO 69		ONLY
	RAN OFF ROAD		FATALITY		SPEED UNKNOWN		



SS# 11-07-203  
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Ashe County  
BEFORE Period  
1/1/04 - 9/30/07

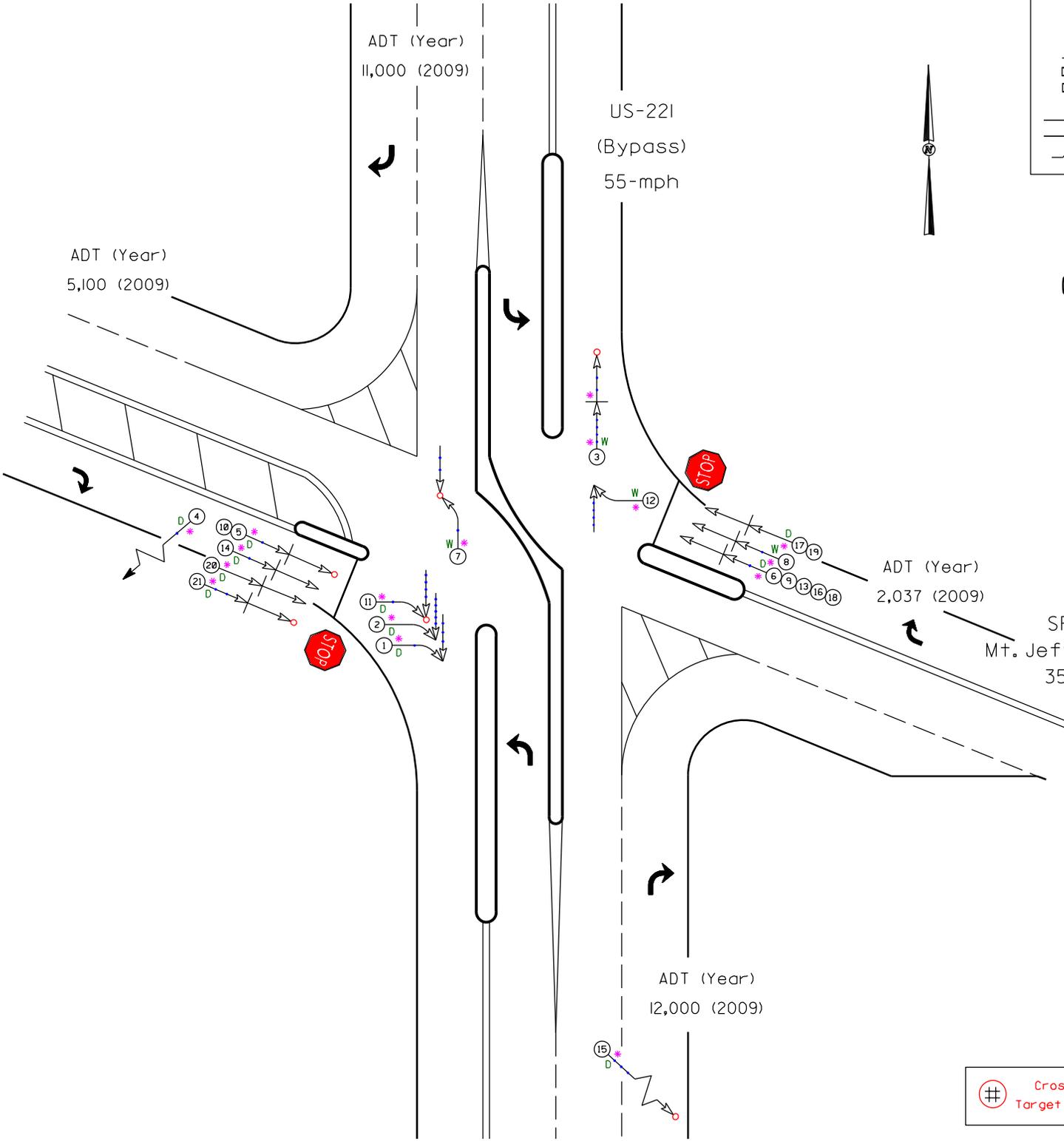


**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY and SAFETY DIVISION**

**TRAFFIC SAFETY UNIT**

Date: 1-19-2012

Prepared By: J. Schronce



**LEGEND**

	MOVING VEHICLE		ANGLE		5 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	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		RUNAWAY		50 MPH TO 59		ICY OR SNOWY
	REAR END		RUNAWAY		60 MPH TO 69		UNKNOWN
	RAN OFF ROAD		RUNAWAY		TO AND UP		UNKNOWN
			FATALITY		SPEED UNKNOWN		UNKNOWN



SS# 11-07-203  
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 Ashe County  
 AFTER Period  
 2/1/08 - 10/31/11

Crossover  
Target Crashes

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