

Spot Safety Project Evaluation

Order # 41000009943

Spot Safety Project # 10-04-215

**Spot Safety Project Evaluation of the Actuated Flasher Installation
NC 24/27 at SR 1125 (Bethel Church Road)
Cabarrus 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

12-3-2010

Date

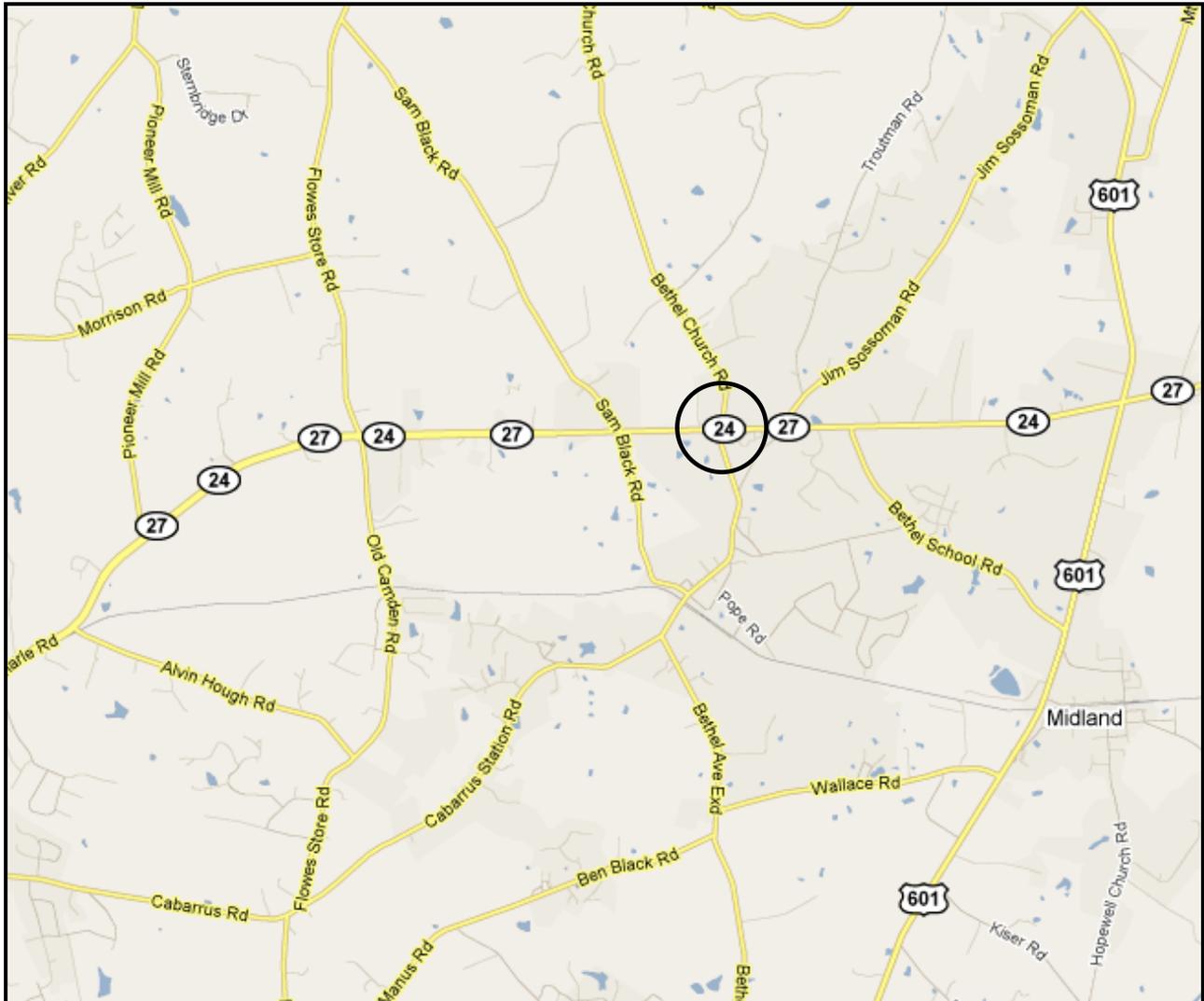
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-04-215 located at the Intersection of NC 24/27 (Albemarle Road) and SR 1125 (Bethel Church Road) in Cabarrus County, near the Town of Midland and south of the City of Concord.

The Sig ID is 10-0974 for this newly installed actuated flasher.





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 actuated intersection flasher. The flasher is designed to activate by SR 1125 vehicles approaching the intersection with the message of “Watch for Approaching Vehicles” displayed overhead on NC 24/27.

SR 1125 (Bethel Church Road) is two-lane facility with a speed limit of 45 mph on both approaches. NC 24/27 (Albemarle Road) is a five-lane cross-section roadway with dedicated left turn lanes at the intersection and a speed limit of 55 mph. The subject location is a four-leg crossroads intersection, which is controlled by a stop condition on the SR 1125 approaches. There is also a school located approximately 250 feet east of the intersection on NC 24/27.

The original statement of problem was the concern for collisions due to high peak hour volumes of school traffic attempting to cross five lanes of this major through route with insufficient gaps. There had also been a fatality angle collision at this location in September 2004. The intended purpose of the flasher installation was to alleviate collisions.

The initial crash analysis was completed from December 1, 2001 to November 30, 2004 with four (4) reported crashes, three (3) of which were deemed correctable including one fatality crash. The final completion date for the improvement at the subject intersection was on March 1, 2006 with a total cost of \$20,000.

During our research phase of the evaluation, the Safety Evaluation Group was informed that there is an upcoming funded Spot Safety Project to install a fully actuated 2-phase traffic signal at this intersection. The proposed signal is listed under Spot Safety # 10-10-010 and the installation date is unknown at this time.

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 March 2006. The before period consisted of reported crashes from July 1, 2001 through January 31, 2006 (4 years and 7 months); and the after period consisted of reported crashes from April 1, 2006 through October 31, 2010 (4 years and 7 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 Opposite Roadway Crashes were the target crashes for the applied countermeasure. The Opposite Roadway Crash types considered are as follows: Left turn, different roadways; Right turn, different roadways; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	7	21	200.0 %
Total Severity Index	16.06	8.84	- 45.0 %
Target Crashes – Opposite Road	5	17	240.0 %
Target Crash Severity Index	20.60	9.38	- 54.5 %
Volume (2003, 2008)	19,200	19,300	0.5 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	0	1	100.0 %
Class B injury Crashes	0	2	200.0 %
Class C Injury Crashes	4	10	150.0 %
Total Injury Crashes	5	13	160.0 %

The naive before and after analysis at the treatment location resulted in a 200 percent increase in Total Crashes, a 240 percent increase in Target Crashes, but a 45 percent decrease in the Total Severity Index. The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a small pattern of three (3) angle crashes and two (2) left turn different roadway collisions at the intersection including the fatality crash. With the installation of the actuated flasher and the ADTs appearing consistent, crashes tripled at this location. Angle collisions increased to eleven (11) and left turn different roadway crashes tripled to six (6) collisions. It was not explicitly stated in the crash reports that any of these collisions resulted from a SR 1125 motorist running the red flasher / stop sign.

The calculated benefit to cost ratio for this project is **(-10.57) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-8.29)**. 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



Traveling East on NC 24/27 (Albemarle Road)



Looking West on NC 24/27 – Flasher activated from SB vehicle



Traveling South on SR 1125 (Bethel Church Road) – “Stop” written at bar



Traveling North on SR 1125 approaching intersection

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 24/27 at SR 1125		BY: JBS						
COUNTY: Cabarrus		DATE: 12/1/2010						
FILE NO.: SS 10-04-215								
DETAILED COST:	TYPE IMPROVEMENT -	Actuated Flasher Installation						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$20,000	10	0.149	\$2,981			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$20,000	10	0.149	\$2,981			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$500			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$350			
	TOTAL ANNUAL COST=				\$3,831			
	TOTAL COST OF PROJECT=				\$20,000			
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	4.59	1	0.22	4	0.87	2	0.44	\$156,558
AFTER	4.59	1	0.22	12	2.61	8	1.74	\$197,037
								Annual Benefits from Crash Cost Savings (\$40,479)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST							= (\$44,310)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST							= -10.57
	TOTAL COST OF PROJECT	-	\$20,000		COMPREHENSIVE B/C RATIO	-		-10.57

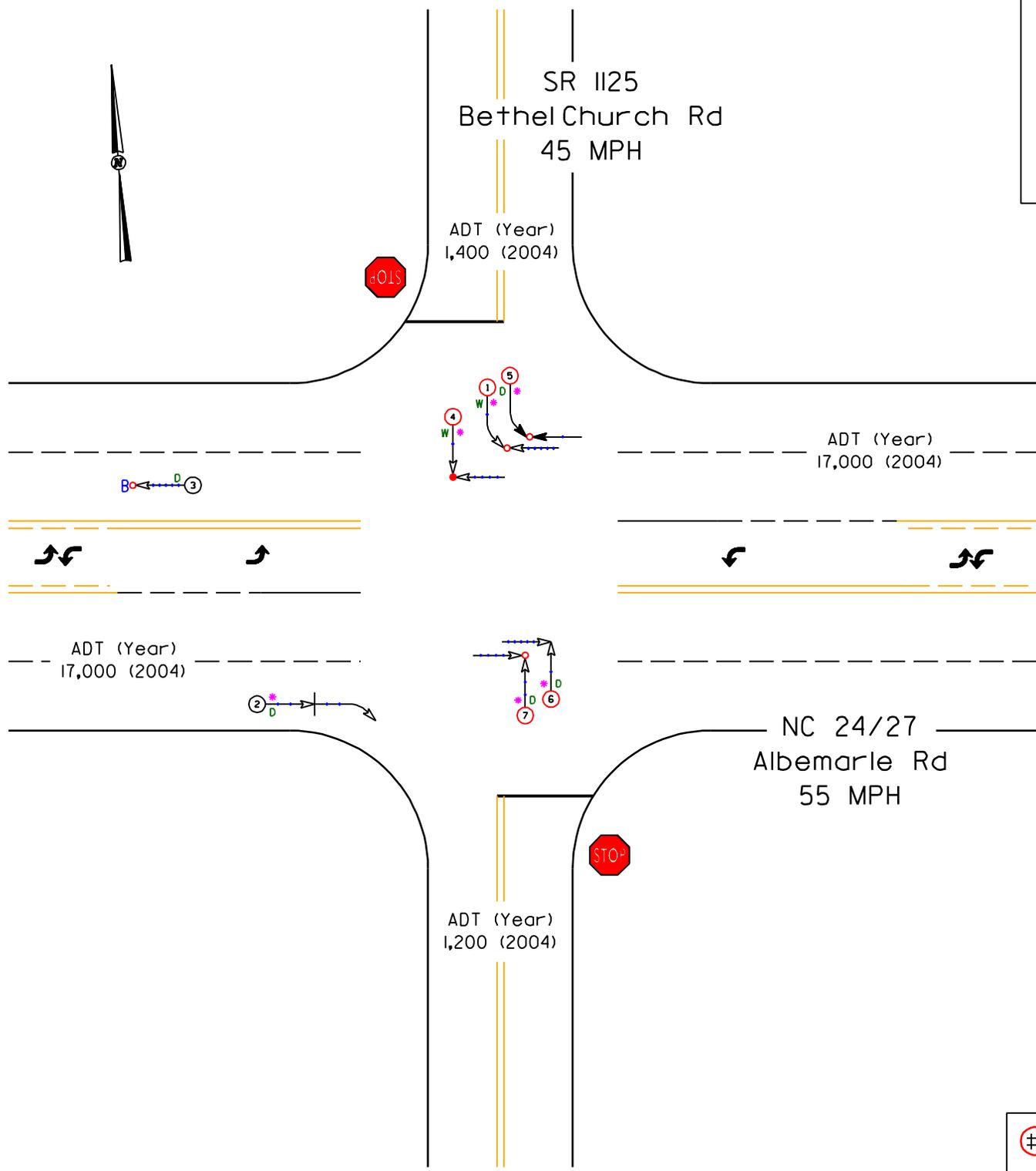
BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 24/27 at SR 1125		BY: JBS						
COUNTY: Cabarrus		DATE: 12/1/2010						
FILE NO.: SS 10-04-215 - Target Crashes (Opposite Roadway Collisions)								
DETAILED COST:	TYPE IMPROVEMENT -	Actuated Flasher Installation						
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$20,000	10	0.149	\$2,981			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$20,000	10	0.149	\$2,981			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$500			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$350			
	TOTAL ANNUAL COST=				\$3,831			
	TOTAL COST OF PROJECT=				\$20,000			
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	4.59	1	0.22	3	0.65	1	0.22	\$151,264
AFTER	4.59	1	0.22	9	1.96	7	1.53	\$183,028
								Annual Benefits from Crash Cost Savings (\$31,765)
	NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST							= (\$35,595)
	BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST							= -8.29
	TOTAL COST OF PROJECT	-	\$20,000		COMPREHENSIVE B/C RATIO	-		-8.29

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	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		HIT AND RUN		50 MPH TO 59		ICY OR SNOWY
	REAR END		INJURY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		ONLY

SS# 10-04-215
 Order# 41000009943
 Cabarrus County
 BEFORE Period
 7/1/01 - 1/31/06



Opposite Road
Target Crashes

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

TRAFFIC SAFETY UNIT

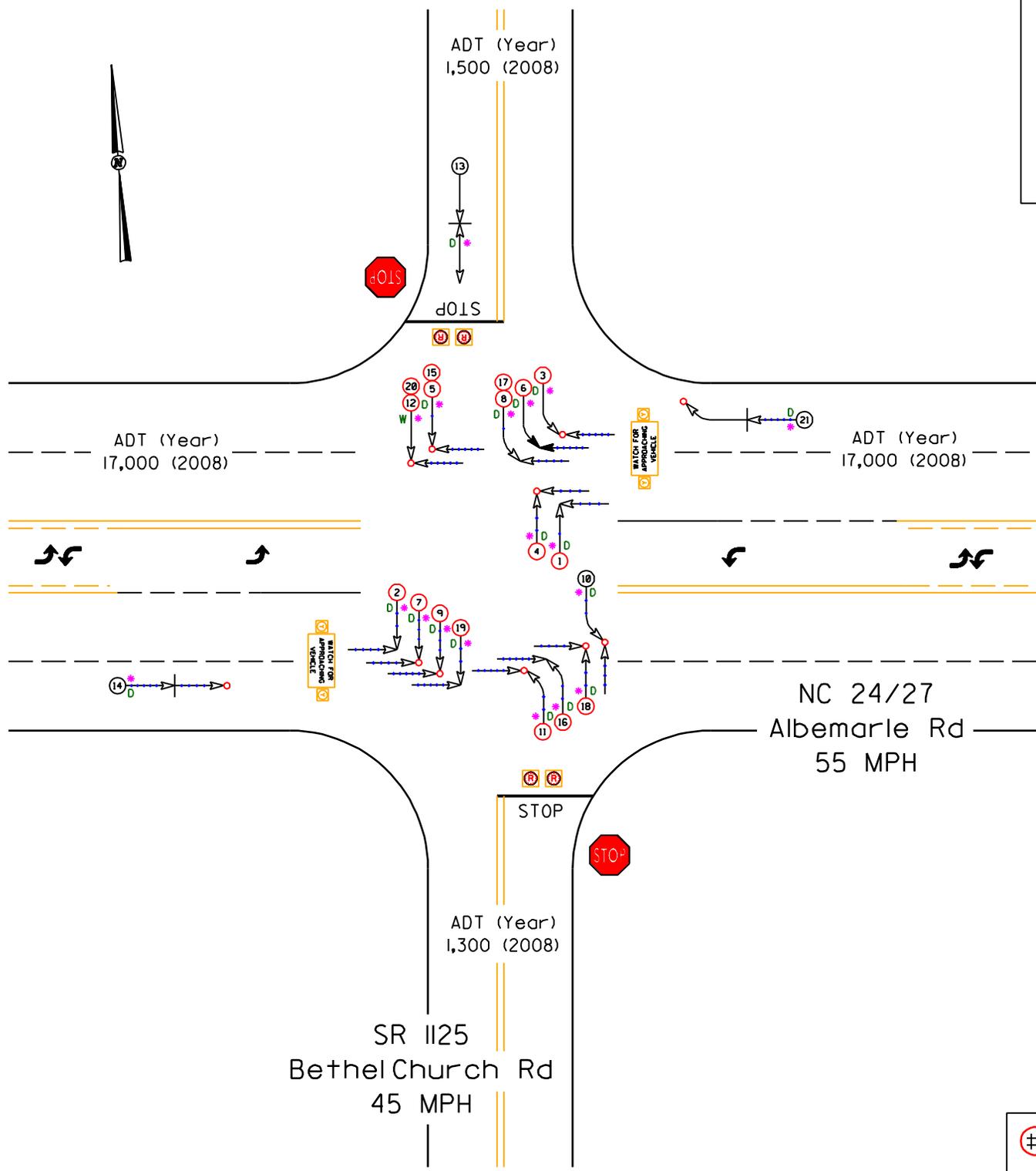
Date: 11-30-2010

Prepared By: J. Schrone

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	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		HURT		50 MPH TO 59		WET
	REAR END		FATALITY		60 MPH TO 69		ICY OR SNOWY
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP		ONLY

SS# 10-04-215
 Order# 41000009943
 Cabarrus County
 AFTER Period
 4/1/06 - 10/31/10



SR 1125 Approaches

WATCH FOR APPROACHING VEHICLE
 NC 24/27 Approaches

Opposite Road
 Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 12-1-2010 Prepared By: J. Schronce