Spot Safety Project Evaluation

Order # 41000013062

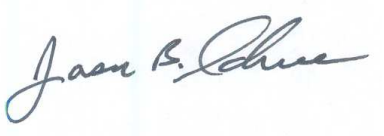
Spot Safety Project # 07-01-221

Spot Safety Project Evaluation of the Intersection Realignment
NC 86 at SR 1001 (Walnut Grove Church Road)
Orange 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

Traffic Safety Project Engineer

8-2-2011
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 07-01-221 located at the Intersection of NC 86 and SR 1001 (Walnut Grove Church Road) in Orange County, north of the City of Hillsborough.

Aerial Photograph from Google Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the intersection realignment with addition of three (3) concrete channelization medians. NC 86 and SR 1001 (Walnut Grove Church Road) are both two-lane facilities at the subject intersection with speed limits of 55 mph on all approaches. The subject location is a three-leg intersection, which is controlled by a stop condition on SR 1001. The after period channelization medians create the intersection to 90-degrees and prevent some movements from the store parking lot.

The original statement of problem was the concern for collisions due to an increase in traffic volumes at this location. The intended purpose of the new intersection alignment and channelization is to alleviate the potential accident problem and help correct the sight distance issues for the skewed intersection.

The initial crash analysis was completed from June 1, 1998 to May 31, 2001 with five (5) reported crashes, three (3) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on April 2, 2007 with a total cost of $80,000.

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 February through April 2007. The before period consisted of reported crashes from February 1, 2003 through January 31, 2007 (4 years); and the after period consisted of reported crashes from May 1, 2007 through April 30, 2011 (4 years). 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.

Treatment Information	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	6	5	- 16.7 %
Total Severity Index	3.47	5.44	56.8 %
Target Crashes – Frontal Impact	1	2	100.0 %
Target Crash Severity Index	1.00	4.70	100.0 %
Volume (2005, 2009)	8,000	7,700	- 3.8 %

Injury Crash Summary	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	0	- 100.0 %
Class C Injury Crashes	1	3	200.0 %
Total Injury Crashes	2	3	50.0 %

The naive before and after analysis at the treatment location resulted in a 17 percent decrease in Total Crashes, a 100 percent increase in Target Crashes, and a 57 percent increase 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 presented one (1) frontal impact crash where a motorists failed to yield to a turning vehicle as they pulled into the intersection from the store parking lot. South of the intersection, there were three (3) other crashes related with vehicles entering the PVA. After the realignment and channelization, the intersection frontal impact pattern

increased to two (2) crashes from SR 1001 left turning vehicles failed to yield to southbound NC 86 motorists. However, the PVA crashes to the south of the intersection were completely eliminated.

The calculated benefit to cost ratio for this project is **(-0.21) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-0.37)**. 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 our field visit on July 21st, 2011 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

Travelling North on NC 86 at SR 1001 – new concrete medians

Travelling South on NC 86 at SR 1001

Travelling West on SR 1001 (Walnut Grove Church Rd) at NC 86

Sight Distance looking North on NC 86

Sight Distance looking South on NC 86

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 86 at SR 1001 BY: JBS
COUNTY: Orange DATE: 7/25/2011
FILE NO.: SS 07-01-221

DETAILED COST: TYPE IMPROVEMENT - Channelization & Realignment

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$80,000	10	0.149	$11,922
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$80,000	10	0.149	$11,922

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $1,600
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $13,522
TOTAL COST OF PROJECT= $80,000

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	4.00	0	0.00	2	0.50	4	1.00	$14,300
AFTER	4.00	0	0.00	3	0.75	2	0.50	$17,150

Annual Benefits from Crash Cost Savings ($2,850)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($16,372)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.21

TOTAL COST OF PROJECT - $80,000 COMPREHENSIVE B/C RATIO - -0.21

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 86 at SR 1001 BY: JBS
COUNTY: Orange DATE: 7/25/2011
FILE NO.: SS 07-01-221 Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - Channelization & Realignment

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$80,000	10	0.149	$11,922
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$80,000	10	0.149	$11,922

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $1,600
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $13,522
TOTAL COST OF PROJECT= $80,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

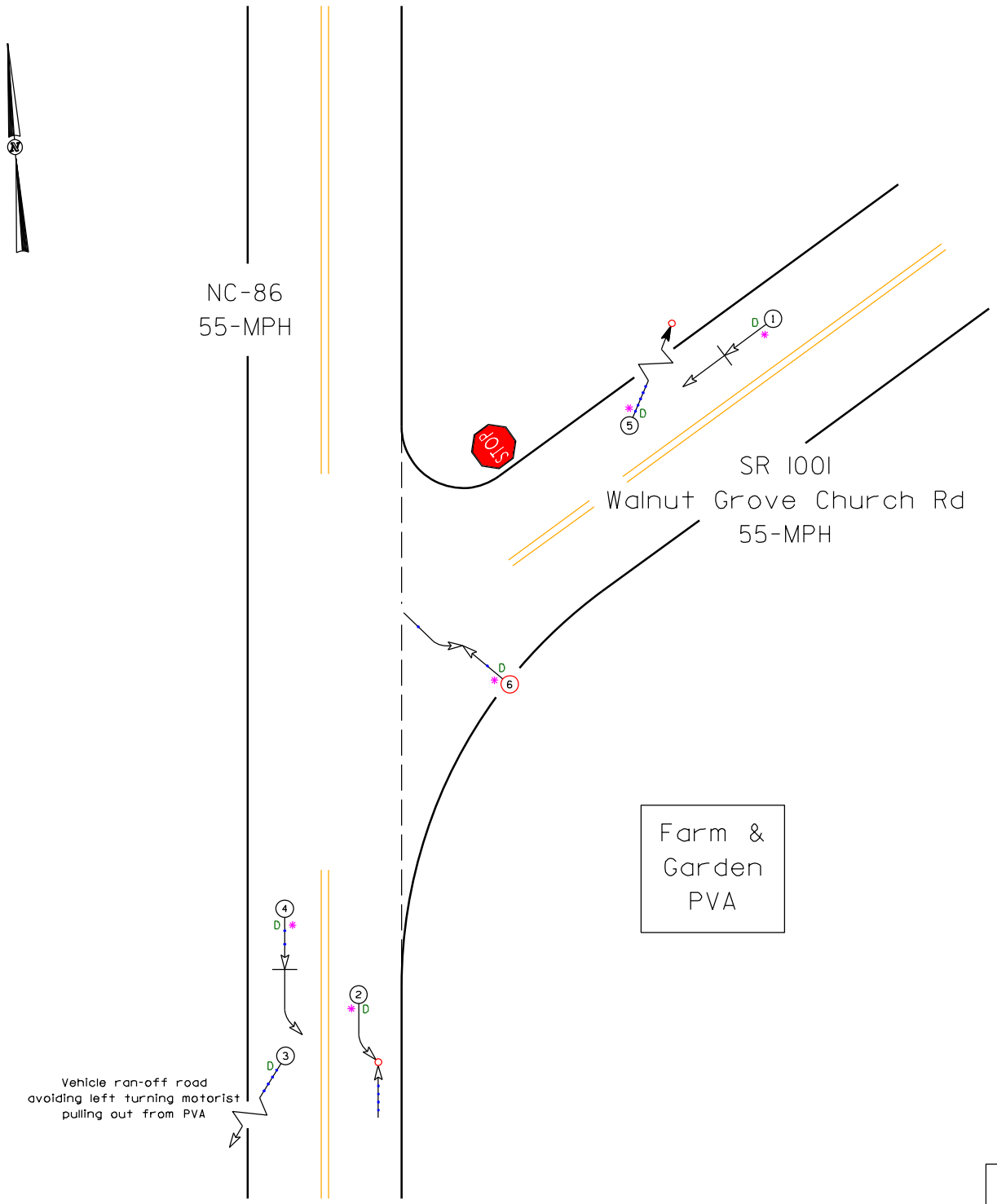
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.00	0	0.00	0	0.00	1	0.25	$1,075
AFTER	4.00	0	0.00	1	0.25	1	0.25	$6,075

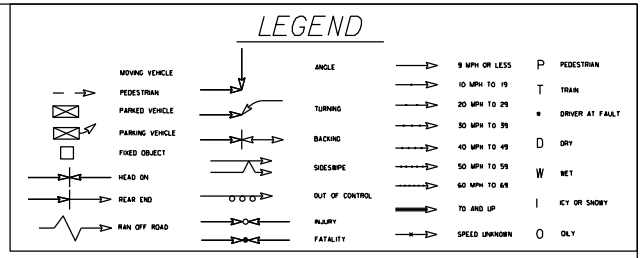
Annual Benefits from Crash Cost Savings ($5,000)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($18,522)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -0.37

TOTAL COST OF PROJECT - $80,000 COMPREHENSIVE B/C RATIO - -0.37





SS# 07-01-221
Order# 41000013062
Orange County
BEFORE Period
2/1/03 - 1/31/07

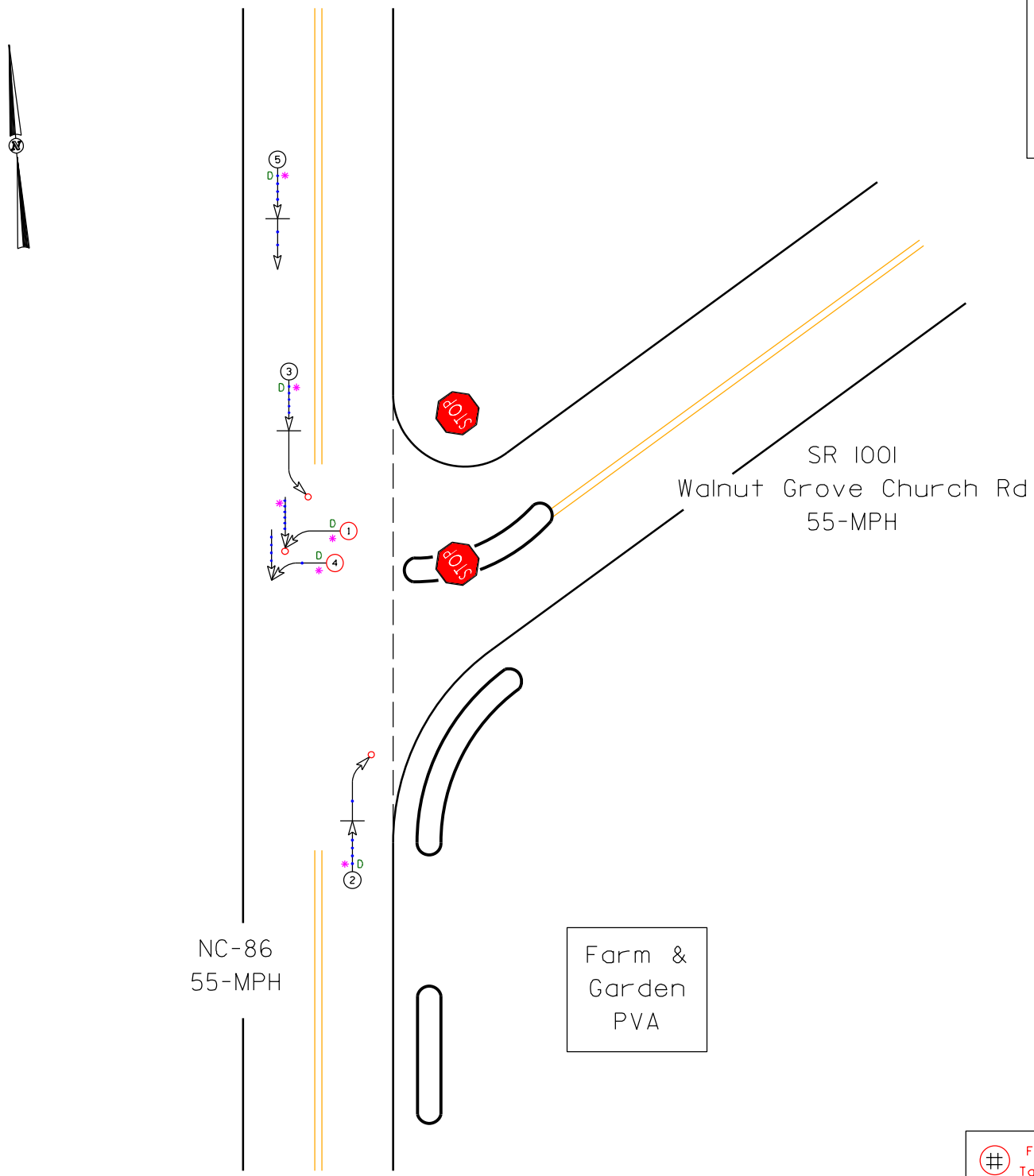
Frontal Impact
Target Crashes

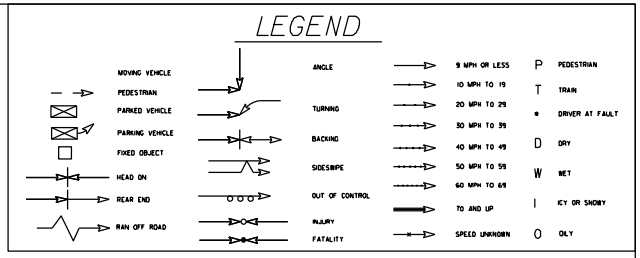
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 7-6-2011

Prepared By: J. Schronce





SS# 07-01-2211
Order# 41000013062
Orange County
AFTER Period
5/1/07 - 4/30/11

Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 7-15-2011

Prepared By: J. Schronce