

Spot Safety Project Evaluation

Project Log # 200501244

Spot Safety Project # 11-96-213

**Spot Safety Project Evaluation, of the Flashing Traffic Signal Installation,
At the Intersection of NC 113 and US 221, Alleghany County**

Documents Prepared By:

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Traffic Safety Systems Management Section
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Principal Investigator

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04/12/2005
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 11-96-213 – The Intersection of NC 113 and US 221, Alleghany County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis and an Odds Ratio comparison analysis of the treatment data has been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

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 overhead flashing traffic signal. Perry McCutcheon, Division Traffic Engineer, originally requested the improvements. Both US 221 and NC 113 are two-lane facilities at the treatment intersection with posted speed limits of 55 mph. The subject location is controlled by stop signs on US 221.

The initial crash analysis for this location was completed from January 1, 1987 through October 31, 1996 with a total of ten reported crashes. According to the initial crash analyses, there were ten Angle crashes resulting in one fatality, two class A injuries, eleven class B injuries, and ten class C injuries. All accidents involved elderly drivers at fault (65 years or older) and foreign to the area. Motorists were running the “unexpected” stop sign condition on US 221. The final completion date for the improvement at the subject intersection was on April 8, 1997.

Comparison 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 March 1, 1997 through May 31, 1997. The before period consisted of reported crashes from January 1, 1990 through February 28, 1997 (7 Years, 2 Months) and the after period consisted of reported crashes from June 1, 1997 through July 31, 2004 (7 Years, 2 Months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The analysis also consisted of two different sets of data, the treatment and the comparison data. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of a sum of all crashes within 150 feet of four intersections located near the treatment intersection. The four intersections that comprise the comparison data are as follows:

NC 113 at SR 1316-Piney Creek School Rd.,
 NC 113 at SR 1316-South Fork Church Rd.,
 NC 113 at SR 1300-Allen Rd., and
 NC 113 at NC 18-SR 1143-Elk Knob Rd.

Please see attached *Location Map* for further detail. The following data table depicts the Naive Before and After Analysis for the treatment and comparison intersections. 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	9	7	- 22.2
Total Severity Index	22.78	7.34	- 67.8
Frontal Impact Crashes	9	5	- 44.4
Frontal Severity Index	22.78	6.92	- 69.6
Volume	860	1100	27.9

Comparison Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	14	9	- 35.7
Total Severity Index	8.00	21.96	174.5
Frontal Impact Crashes	7	4	- 42.9
Frontal Severity Index	3.11	23.65	660.5
Volume	960	1200	25.0

Odds Ratio: Treatment versus Comparison

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Treatment Total Crashes	9	7	---
Comparison Total Crashes	14	9	21.0 %
Treatment Frontal Impact Crashes	9	5	---
Comparison Frontal Impact Crashes	7	4	- 2.8 %

The naive before and after analysis at the treatment location resulted in a 22.2 percent decrease in Total Crashes, a 67.8 percent decrease in the Total Severity Index, and a 27.9 percent increase in Average Daily Traffic (ADT). The comparison location experienced a 35.7 percent decrease in Total Crashes, a 174.5 percent increase in the Total Severity Index, and a 25.0 percent increase in ADT. The before period ADT year was 1993 and the after period ADT year was 2000.

The Odds Ratio is used as another means of calculating the treatment effect. The number of crashes in the before and after period from the Comparison are used to calculate the percent reduction in crashes for the Treatment Intersection. As shown in the previous table, using the Odds Ratio calculation, there is a 21.0 percent increase in Total Treatment Intersection crashes and a 2.8 percent decrease in Frontal Impact Treatment Intersection crashes.

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 22.2 percent decrease in Total Crashes and a 44.4 percent decrease in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 21.0 percent increase in Total Crashes and a 2.8 percent decrease in Frontal Impact Crashes at the Treatment Intersection. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total and Frontal Impact Crashes from the before to the after period using the Naïve Before and After analysis method. However, when using the Odds Ratio to measure the treatment effect there appears to be an increase in Total Crashes at the treatment location. Also note that the crash severity decreased dramatically (by 67.8 percent for Total Crashes) from the before to the after period.

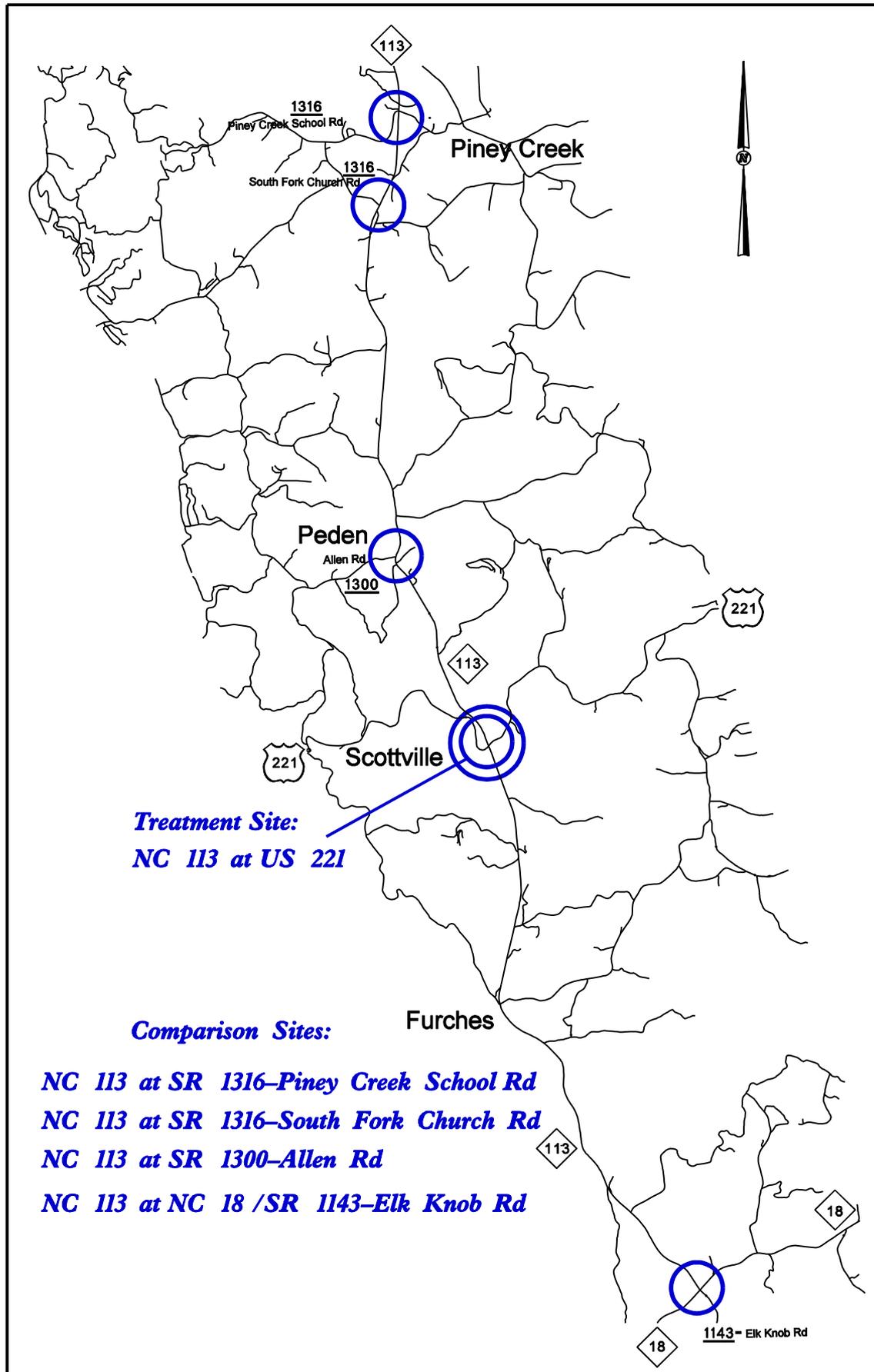
Please see the attached Treatment Site Photos. Photos are provided for each leg of the intersection. Photos are also included showing the STOP AHEAD pavement markings on US 221, which were added as part of the spot safety project improvement. In addition, photos are provided showing the limited sight distance for stopped vehicles on US 221.

The countermeasure crash reduction for Total Crashes at the subject intersection can be in the range of a 22.2 percent decrease to a 21.0 percent increase in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection can be in the range of a 2.8 percent

decrease to a 44.4 percent increase in crashes. 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.

Evaluation of Spot Safety Project Number 11-96-213

Location Map, Alleghany County



Treatment Site Photos (Taken on February 17, 2005)



Looking north on NC 113



Looking south on NC 113

Treatment Site Photos (Taken on February 17, 2005)



Looking west on US 221



Looking east on US 221

Treatment Site Photos (Taken on February 17, 2005)



Driving west (toward Treatment Intersection) on US 221



Driving east (toward Treatment Intersection) on US 221

Treatment Site Photos (Taken on February 17, 2005)



Looking north, from eastbound approach

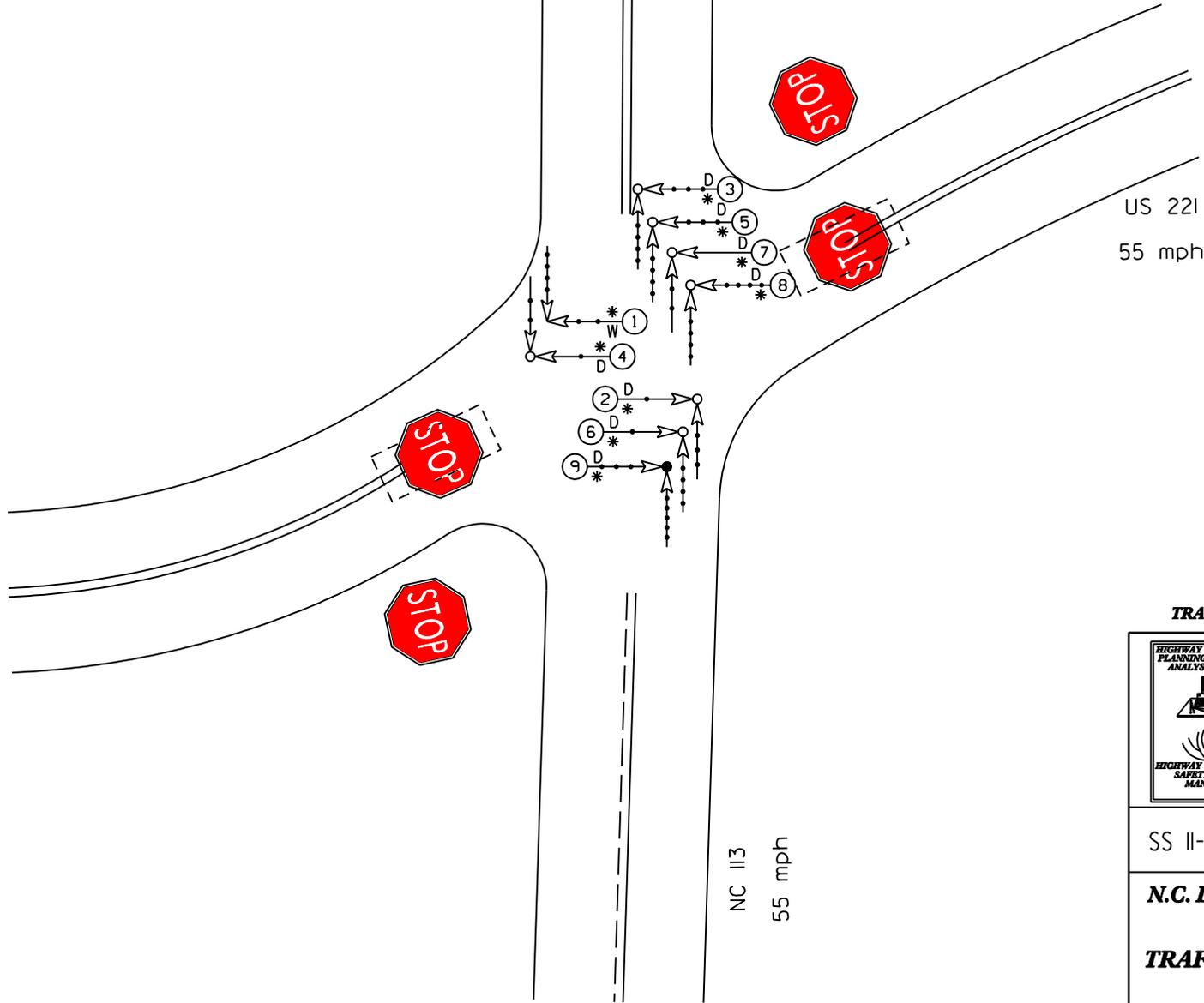
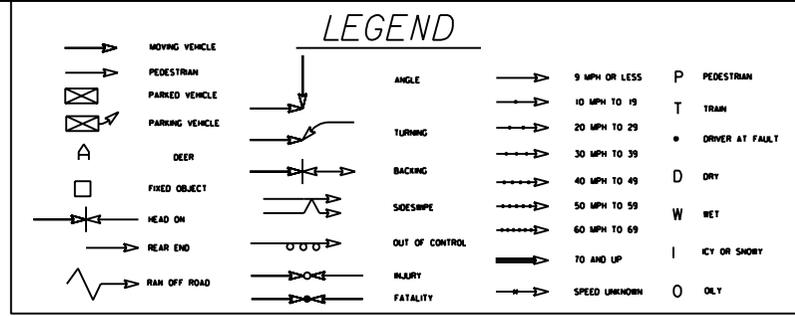


Looking south, from westbound approach



Looking north, from westbound approach

SS II-96-213
 Treatment Site - TotalCrashes
 Before Period
 1/1/1990 - 2/28/1997
 (7 years, 2 months)



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

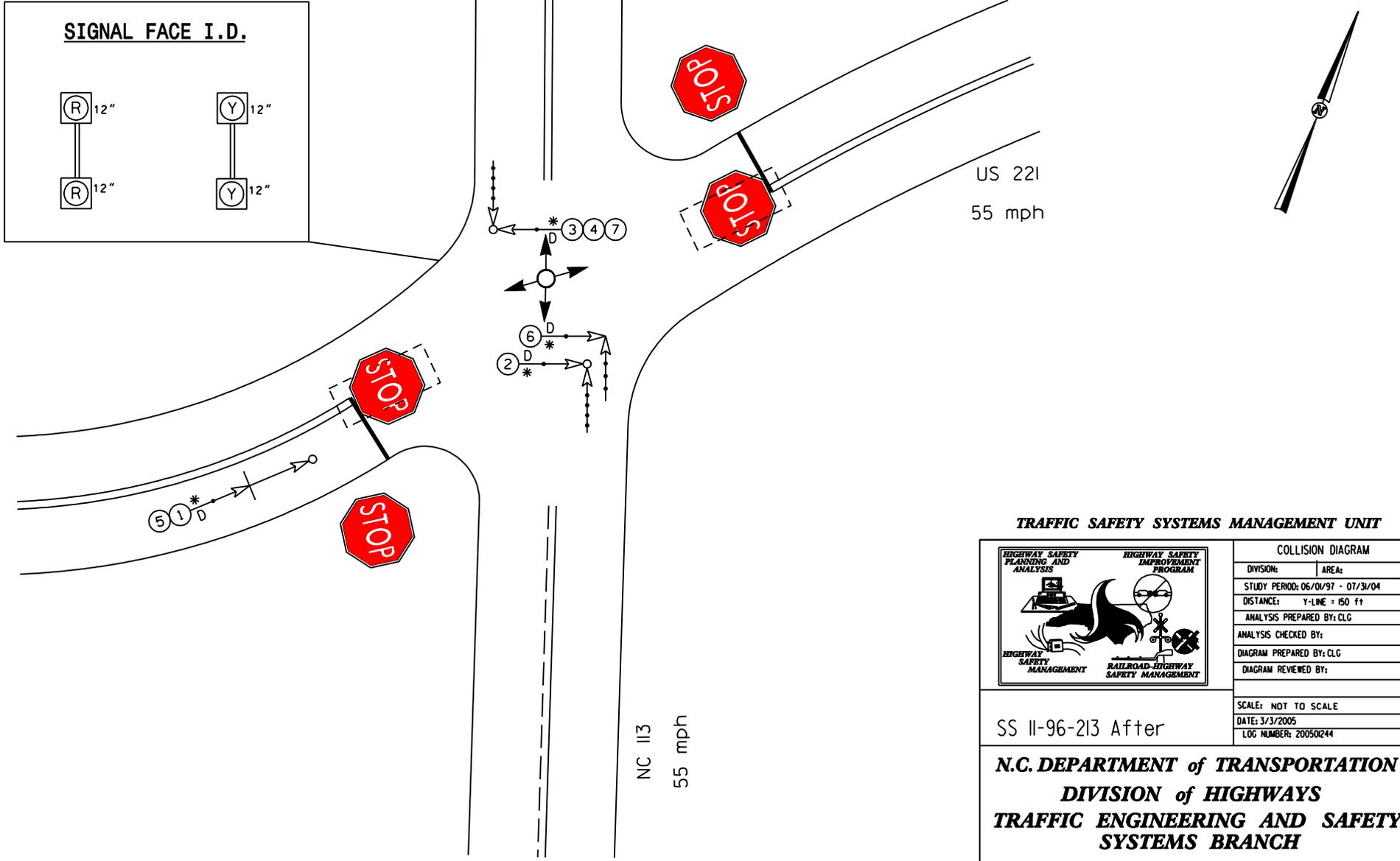
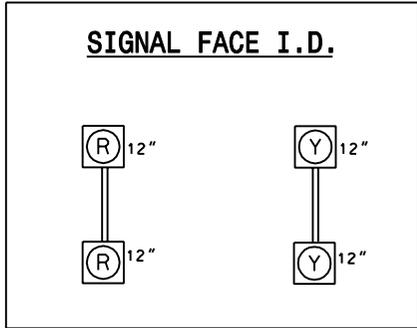
	COLLISION DIAGRAM	
	DIVISION:	AREA:
	STUDY PERIOD: 01/01/90 - 02/28/97	
	DISTANCE: Y-LINE = 150 ft	
	ANALYSIS PREPARED BY: CLG	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: CLG		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: 3/3/2005		
LOG NUMBER: 20050244		

SS II-96-213 Before

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH

SS II-96-213
 Treatment Site - TotalCrashes
 After Period
 6/1/1997 - 7/31/2004
 (7 years, 2 months)

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
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
	DEER		OUT OF CONTROL		40 MPH TO 49		W WET
	FIXED OBJECT		HAIARY		50 MPH TO 59		I ICY OR SNOWY
	HEAD ON		FATALITY		60 MPH TO 69		O ONLY
	REAR END				70 AND UP		
	RAN OFF ROAD				SPEED UNKNOWN		



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION:	AREA:
	STUDY PERIOD: 06/01/97 - 07/31/04	
	DISTANCE: Y-LINE = 150 ft	
	ANALYSIS PREPARED BY: CLG	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: CLG		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: 3/3/2005		
LOG NUMBER: 20050244		

SS II-96-213 After

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH