

Spot Safety Project Evaluation

Project Log # 200702006

Spot Safety Project # 10-95-430

Spot Safety Project Evaluation of the Channelization (Prohibit Left Turn) from Bellhaven Boulevard at NC 16 (Brookshire Boulevard) in Mecklenburg County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Samuel D. Coleman, EI

7/16/2007
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-95-430 – Channelization (Prohibit Left Turn) from Bellhaven Boulevard at NC 16 (Brookshire Boulevard) in Mecklenburg County.

Project Information and Background from the Project File Folder

NC 16 is a 55 mph, 4 lane divided highway with a left turn lane on the westbound approach toward the treatment intersection. Bellhaven Boulevard is a two lane undivided roadway with a dedicated left and right turn lane at the intersection with NC 16. The intersection is controlled by a stop condition on Bellhaven Boulevard.

There were 61 crashes reported during the initial study period from 1/1/1995 through 12/31/1997. There were 19 angle, 27 rear end and 15 random crashes at the treatment intersection. The 19 angle crashes involved vehicles turning left from Bellhaven Boulevard. The improvement chosen for the location was to eliminate the left turn movement from Bellhaven Boulevard. The final completion date for the improvement at the subject location was on May 30, 2002 at a cost of \$15,000.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes along the subject road, the crash data omitted from this analysis to consider for an adequate construction period was from April 2002 through June 2002. The before period consisted of reported crashes from December 1, 1997 through March 31, 2002 (4 years, 4 months) and the after period consisted of reported crashes from July 1, 2002 through October 31, 2006 (4 years, 4 months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The treatment data consisted of all crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the above information. Please note that Frontal Impact crash types involving left turning vehicles leaving Bellhaven Boulevard were the target crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, different roadway, Head On and Angle.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	49	29	-40.8
Total Severity Index	4.0	3.8	-5.3
Target Crashes	1	0	-100.0
Target Crash Severity Index	1.0	0.0	-100.0
Volume	54200	56600	4.4
<u>Treatment Injury Crashes</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	N/A
Class A	0	0	N/A
Class B	2	4	100.0
Class C	18	7	-61.1
Property Damage Only	29	18	-37.9

Table 1.

The naive before and after analysis at the treatment location resulted in a 41 percent decrease in Total Crashes a 100 percent decrease in Frontal Impact Crashes and a 4 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2000 and the after period ADT year was 2004.

Results and Discussion

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 41 percent decrease in Total Crashes and a 100 percent decrease in Target Crashes. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total Crashes and a decrease in the number of Target Crashes from the before to the after period.

Referencing Table 1 there is a significant decrease in total crashes. However there isn't much change with the target crashes due to the fact there was one target crash in the before period. After reviewing the crash reports, some illustrations contained in the reports showed some type of barricade for the left turn lane on Bellhaven in the before period. Crashes occurring on 11/30/1998 and 6/25/1999 both show a barricade that is related to roadway construction. Crashes occurring on 10/29/2000, 1/29/2001, and 5/23/2001 shows a barricade oriented like the one included in the treatment site photos. According to the crash reports there seems to have been road construction occurring at different time intervals during the before period. That may be a reason there is only one angle crash involving a vehicle leaving Bellhaven Boulevard.

The calculated benefit to cost ratio for this project is 15.59 considering total crashes. The benefit to cost ratio considering only target crashes is 0.30. 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 costs.

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 road.

TREATMENT BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 16 at Bellhaven Blvd
 COUNTY: Mecklenburg
 FILE NO.: SS 10-95-430

BY: SDC
 DATE: 6/19/2007

DETAILED COST: TYPE IMPROVEMENT - Channelization (raised)

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$15,000	10	0.149	\$2,235
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$15,000	10	0.149	\$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$800
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$3,035
 TOTAL COST OF PROJECT= \$15,000

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	4.33	0	0.00	20	4.62	29	6.70	\$109,261
AFTER	4.33	0	0.00	11	2.54	18	4.16	\$61,940

Annual Benefits from Crash Cost Savings \$47,321

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$44,286
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 15.59

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - 15.59

TARGET BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 16 at Bellhaven Blvd
 COUNTY: Mecklenburg
 FILE NO.: SS 10-95-430

BY: SDC
 DATE: 6/19/2007

DETAILED COST: TYPE IMPROVEMENT - Channelization (raised)

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$15,000	10	0.149	\$2,235
Right-of-Way	\$0	0	0.000	\$0
	\$0	0	0.000	\$0

TOTALS \$15,000 10 0.149 \$2,235

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$800
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$3,035
 TOTAL COST OF PROJECT= \$15,000

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	4.33	0	0.00	0	0.00	1	0.23	\$901
AFTER	4.33	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$901

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$2,135)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.30

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - 0.30

Treatment Site Photos taken March 23, 2007



Driving east on NC 16



Facing north on Bellhaven Blvd



Facing north on Bellhaven Blvd



Looking west from Bellhaven Blvd



Facing west on NC 16



Facing south on Bellhaven Blvd



Driving north on Bellhaven Blvd



Driving north on Bellhaven Blvd



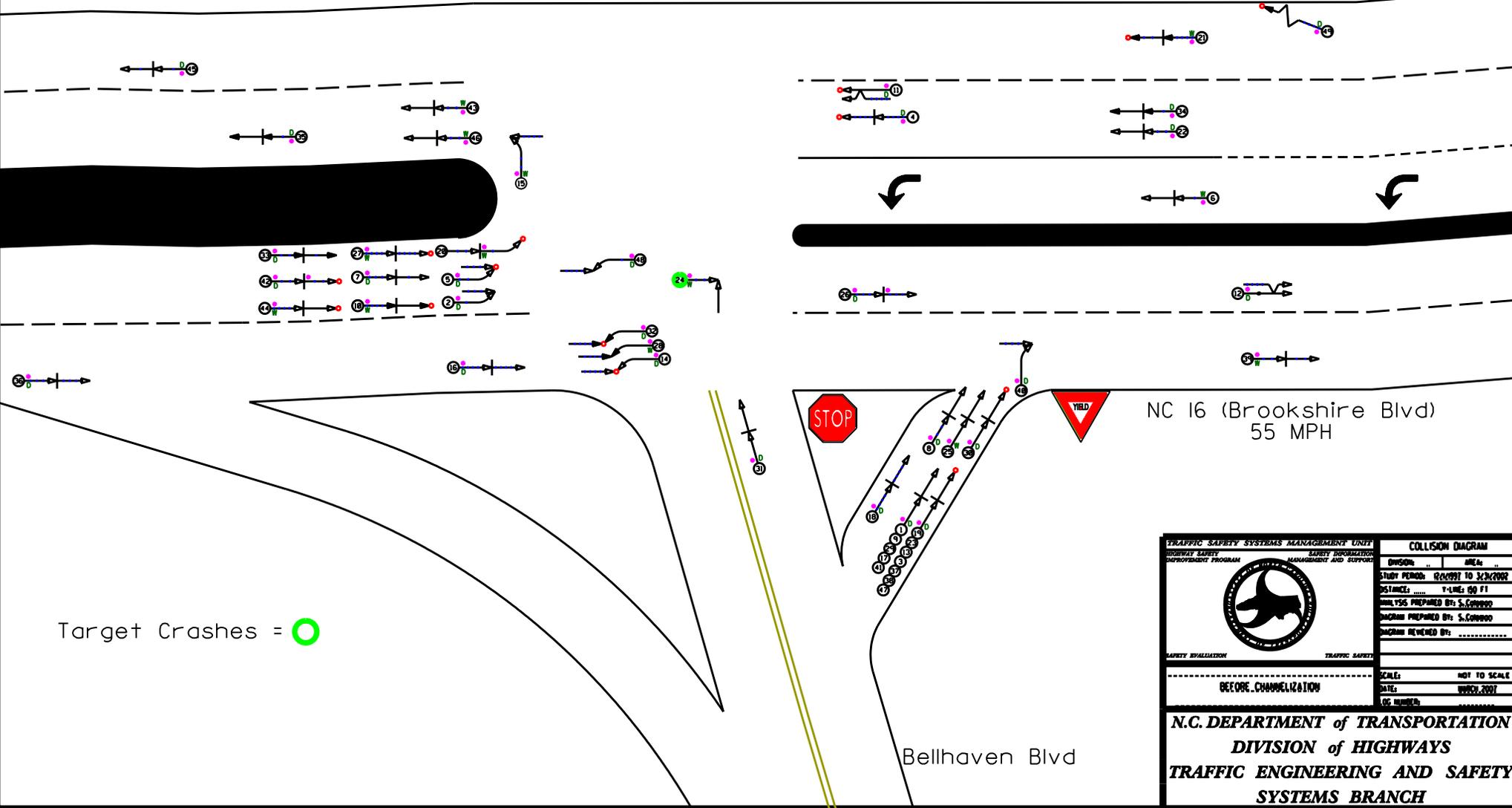
Driving north on Bellhaven Blvd

Mecklenburg County
Treatment Site - TotalCrashes
Before Period
December 1, 1997 - March 31, 2002
(4 years, 4 months)



LEGEND

	vehicle stopped		vehicle		0 mph to 15		P pedestrian
	vehicle stopped		vehicle		15 mph to 20		B bicycle
	vehicle stopped		vehicle		20 mph to 25		T truck
	vehicle stopped		vehicle		25 mph to 30		A auto
	vehicle stopped		vehicle		30 mph to 35		OTHER AT FAULT
	vehicle stopped		vehicle		35 mph to 40		D driver
	vehicle stopped		vehicle		40 mph to 45		W west
	vehicle stopped		vehicle		45 mph to 50		L left of side
	vehicle stopped		vehicle		50 mph to 55		
	vehicle stopped		vehicle		55 mph to 60		
	vehicle stopped		vehicle		60 mph to 65		
	vehicle stopped		vehicle		65 mph to 70		
	vehicle stopped		vehicle		70 mph to 75		
	vehicle stopped		vehicle		75 mph to 80		
	vehicle stopped		vehicle		80 mph to 85		
	vehicle stopped		vehicle		85 mph to 90		
	vehicle stopped		vehicle		90 mph to 95		
	vehicle stopped		vehicle		95 mph to 100		
	vehicle stopped		vehicle		100 mph to 105		
	vehicle stopped		vehicle		105 mph to 110		
	vehicle stopped		vehicle		110 mph to 115		
	vehicle stopped		vehicle		115 mph to 120		
	vehicle stopped		vehicle		120 mph to 125		
	vehicle stopped		vehicle		125 mph to 130		
	vehicle stopped		vehicle		130 mph to 135		
	vehicle stopped		vehicle		135 mph to 140		
	vehicle stopped		vehicle		140 mph to 145		
	vehicle stopped		vehicle		145 mph to 150		
	vehicle stopped		vehicle		150 mph to 155		
	vehicle stopped		vehicle		155 mph to 160		
	vehicle stopped		vehicle		160 mph to 165		
	vehicle stopped		vehicle		165 mph to 170		
	vehicle stopped		vehicle		170 mph to 175		
	vehicle stopped		vehicle		175 mph to 180		
	vehicle stopped		vehicle		180 mph to 185		
	vehicle stopped		vehicle		185 mph to 190		
	vehicle stopped		vehicle		190 mph to 195		
	vehicle stopped		vehicle		195 mph to 200		
	vehicle stopped		vehicle		200 mph to 205		
	vehicle stopped		vehicle		205 mph to 210		
	vehicle stopped		vehicle		210 mph to 215		
	vehicle stopped		vehicle		215 mph to 220		
	vehicle stopped		vehicle		220 mph to 225		
	vehicle stopped		vehicle		225 mph to 230		
	vehicle stopped		vehicle		230 mph to 235		
	vehicle stopped		vehicle		235 mph to 240		
	vehicle stopped		vehicle		240 mph to 245		
	vehicle stopped		vehicle		245 mph to 250		
	vehicle stopped		vehicle		250 mph to 255		
	vehicle stopped		vehicle		255 mph to 260		
	vehicle stopped		vehicle		260 mph to 265		
	vehicle stopped		vehicle		265 mph to 270		
	vehicle stopped		vehicle		270 mph to 275		
	vehicle stopped		vehicle		275 mph to 280		
	vehicle stopped		vehicle		280 mph to 285		
	vehicle stopped		vehicle		285 mph to 290		
	vehicle stopped		vehicle		290 mph to 295		
	vehicle stopped		vehicle		295 mph to 300		
	vehicle stopped		vehicle		300 mph to 305		
	vehicle stopped		vehicle		305 mph to 310		
	vehicle stopped		vehicle		310 mph to 315		
	vehicle stopped		vehicle		315 mph to 320		
	vehicle stopped		vehicle		320 mph to 325		
	vehicle stopped		vehicle		325 mph to 330		
	vehicle stopped		vehicle		330 mph to 335		
	vehicle stopped		vehicle		335 mph to 340		
	vehicle stopped		vehicle		340 mph to 345		
	vehicle stopped		vehicle		345 mph to 350		
	vehicle stopped		vehicle		350 mph to 355		
	vehicle stopped		vehicle		355 mph to 360		
	vehicle stopped		vehicle		360 mph to 365		
	vehicle stopped		vehicle		365 mph to 370		
	vehicle stopped		vehicle		370 mph to 375		
	vehicle stopped		vehicle		375 mph to 380		
	vehicle stopped		vehicle		380 mph to 385		
	vehicle stopped		vehicle		385 mph to 390		
	vehicle stopped		vehicle		390 mph to 395		
	vehicle stopped		vehicle		395 mph to 400		
	vehicle stopped		vehicle		400 mph to 405		
	vehicle stopped		vehicle		405 mph to 410		
	vehicle stopped		vehicle		410 mph to 415		
	vehicle stopped		vehicle		415 mph to 420		
	vehicle stopped		vehicle		420 mph to 425		
	vehicle stopped		vehicle		425 mph to 430		
	vehicle stopped		vehicle		430 mph to 435		
	vehicle stopped		vehicle		435 mph to 440		
	vehicle stopped		vehicle		440 mph to 445		
	vehicle stopped		vehicle		445 mph to 450		
	vehicle stopped		vehicle		450 mph to 455		
	vehicle stopped		vehicle		455 mph to 460		
	vehicle stopped		vehicle		460 mph to 465		
	vehicle stopped		vehicle		465 mph to 470		
	vehicle stopped		vehicle		470 mph to 475		
	vehicle stopped		vehicle		475 mph to 480		
	vehicle stopped		vehicle		480 mph to 485		
	vehicle stopped		vehicle		485 mph to 490		
	vehicle stopped		vehicle		490 mph to 495		
	vehicle stopped		vehicle		495 mph to 500		



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	
ROADWAY SAFETY IMPROVEMENT PROGRAM	SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION	
BEFORE CHANNELIZATION	
TRAFFIC SAFETY	
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH	

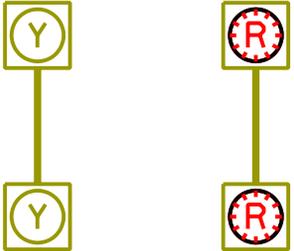
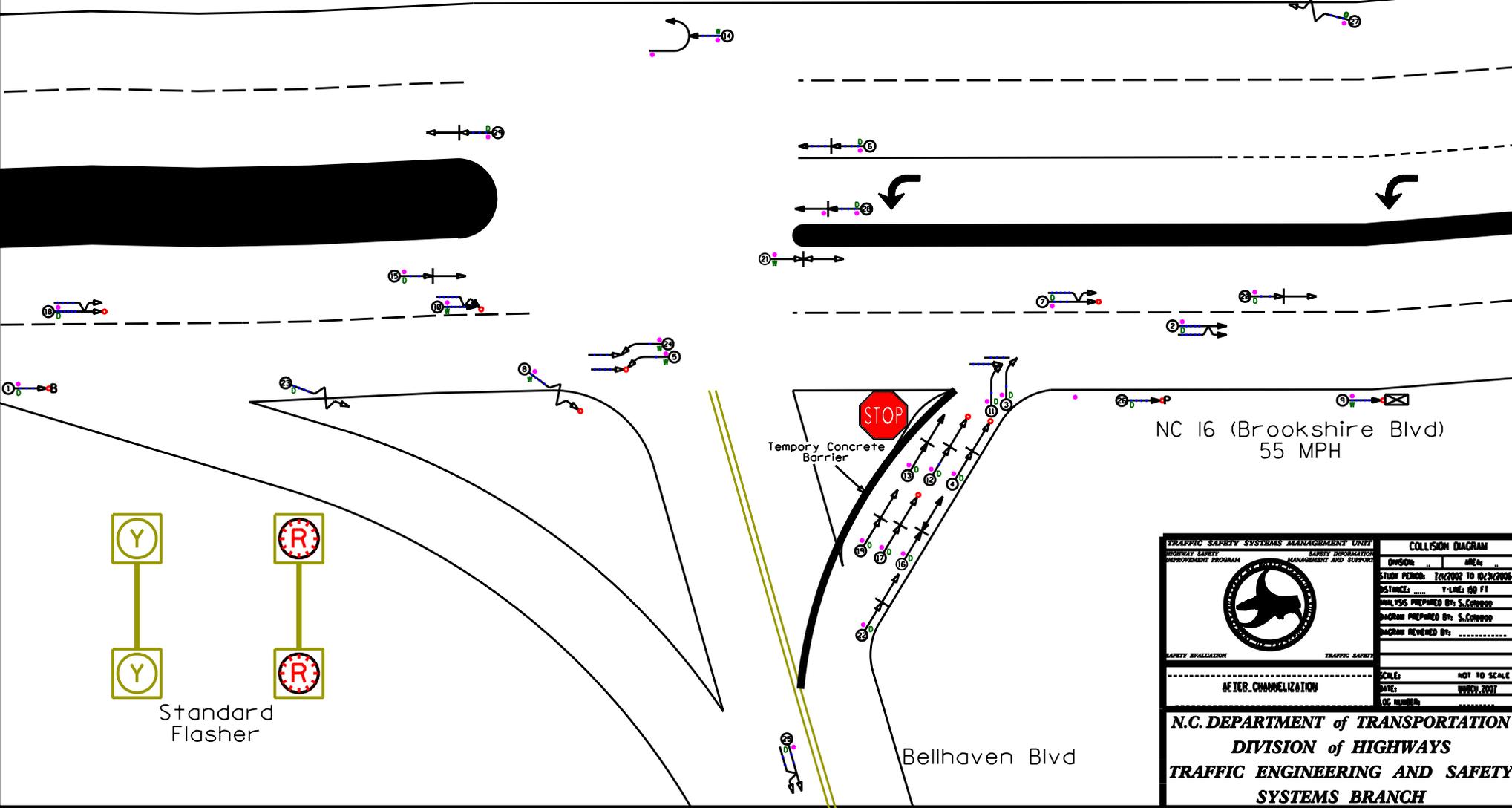
COLLISION DIAGRAM	
DIVISION:	AREA:
STUDY PERIOD: 12/01/97 TO 3/31/02	
DISTANCE: T-LINE: 150 FT	
ANALYSIS PREPARED BY: S. COLEMAN	
DIAGRAM PREPARED BY: S. COLEMAN	
DIAGRAM REVIEWED BY:	
SCALE:	NOT TO SCALE
DATE:	MARCH 2002
LOG NUMBER:	

Mecklenburg County
Treatment Site - Total Crashes
After Period
July 1, 2002 - October 31, 2006
(4 years, 4 months)



LEGEND

	vehicle involved		pedestrian
	bicycle involved		truck
	motorcycle involved		other at fault
	vehicle involved		driver
	vehicle involved		witness
	vehicle involved		other driver
	vehicle involved		pedestrian
	vehicle involved		bicycle
	vehicle involved		truck
	vehicle involved		other at fault
	vehicle involved		driver
	vehicle involved		witness
	vehicle involved		other driver



Standard Flasher

STOP
Temporary Concrete Barrier
Bellhaven Blvd

NC 16 (Brookshire Blvd)
55 MPH

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
ROADWAY SAFETY IMPROVEMENT PROGRAM	SAFETY ORGANIZATION	DIVISION:	AREA:
		STUDY PERIOD:	7/1/2002 TO 10/31/2006
		DISTANCE:	1-MILE: 150 FT
SAFETY EVALUATION		ANALYSIS PREPARED BY:	S. COLEMAN
TRAFFIC SAFETY		DIAGRAM PREPARED BY:	S. COLEMAN
METER CHANNELIZATION		DIAGRAM REVIEWED BY:	
SCALE:		DATE:	NOT TO SCALE MARCH 2007
N.C. DEPARTMENT of TRANSPORTATION		LOG NUMBER:	
DIVISION of HIGHWAYS		TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH	