Spot Safety Project Evaluation

Project Log # 200712079

Spot Safety Project # 06-01-213

Spot Safety Project Evaluation of the "Vehicles Entering When Flashing" Signs with Actuated Flashers at the Intersections of NC 87 Bypass and SR 1150, SR 1145 and SR 1700 City of Elizabethtown, Bladen County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator

_____ 9-22-2008
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-01-213 located in Bladen County along NC 87 Bypass at the following consecutive intersections:

Site 1: SR 1700 – Mercer Mill Road / Brown Marsh Road	(NC 87 MP: 24.58)
Site 2: US 701 / NC 242 – S. Poplar Street	(NC 87 MP: 25.25)
Site 3: SR 1145 – Martin Luther King Boulevard	(NC 87 MP: 25.83)
Site 4: SR 1150 – Peanut Plant Road	(NC 87 MP: 27.00)

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of poll mounted "Vehicle Entering When Flashing" signs with actuated flashers on the NC 87 approaches to sites 1, 3, and 4. NC 87 Bypass is a four lane divided facility with a 55 mph posted speed limit. SR 1700, SR 1145, and SR 1150 are all two lane roadways that form crossroads intersections with NC 87. Left and right dedicated turn lanes are installed on both approaches to each intersection. All the intersections are currently under stop sign control with rural speed limits of 55 mph. However, in June of 2006, SR 1150 (Peanut Plant Road) was reconstructed to a super-street design where only right hand turns are allowed from the side street.

Site 2, US 701 / NC 242, is a signalized intersection and was included in this evaluation because it lays in-between SR 1700 and SR 1145 in consecutive sequence. Under Spot Safety Project 06-06-213, poll mounted "Be Prepared to Stop" signs with flashers were installed on the NC 87 approaches to the intersection to alleviate a pattern of red light running crashes. This project was completed on February 18, 2008. The crash analysis and diagram attached to this evaluation show a five year period of crashes yielding to the before period of SS# 06-06-213.

The original statement of problem was an excessive pattern of angle collisions occurring at these intersections along the NC 87 Bypass. The main issue is that side street vehicles are unsuccessfully crossing the opposing two lanes of traffic after the median break of the four lane divided highway.

The initial crash analysis was completed from July 31, 1998 to July 31, 2001 with a total of sixty-two (62) reported crashes at the three intersections; with fifty-one (51) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on August 1, 2002 with a total cost of $110,000.00.

Naive Before and After Analysis

The following data tables depict the Naive Before and After Analysis for the treatment locations. Please note that Frontal Impact – Opposite Roadway Crashes were the target crashes for the applied countermeasure. The Frontal Impact – Opposite Roadway Crash types considered are as follows: Left turn, different roadways; Right turn, different roadways; and Angle.

The treatment data consisted of all crashes within 150 feet of the subject intersections. *Please see attached location maps and photos for further details.*

Site 1: NC 87 at SR 1700 (Mercer Mill Road / Brown Marsh Road)

Before Period: November 1, 1997 – June 30, 2002 (4 Years, 8 Months)
Construction Period: July and August, 2002
After Period: September 1, 2002 – April 30, 2007 (4 Years, 8 Months)
Extra Year: May 1, 2007 – April 30, 2008 (1 Year)

The ending date for the after period of this analysis was determined by the limiting factor of when NC 87 Bypass was open to traffic in October of 1997. The extra year of crash analysis brings the study up to current available crash data.

Treatment Information: Site 1 – SR 1700 (Mercer Mill Rd)				
	Before 4.67 Yrs	**After 4.67 Yrs**	**Percent Change (+ / -)**	**Extra 1 Yr**
Total Crashes	40	37	- 7.50 %	11
Total Severity Index	6.55	10.70	63.36 %	7.13
Total Crashes Per Year	8.56	7.93	- 7.36 %	11.00
Target Crashes	38	34	- 10.52 %	11
Target Crash Severity Index	6.65	11.34	70.53 %	7.13
Target Crashes Per Year	8.14	7.28	- 10.57 %	11.00
Volume	8,700	9,000	3.45 %	N/A
Injury Crash Summary – Total				
Fatal injury Crashes	0	1	100.00 %	0
Class A injury Crashes	0	1	100.00 %	0
Class B injury Crashes	9	13	44.44 %	5
Class C Injury Crashes	21	15	- 28.57 %	5
Total Injury Crashes	30	30	0.00 %	10

The naive before and after analysis at the treatment location resulted in a 7.5 percent decrease in Total Crashes, an 10.5 percent decrease in Target Crashes, although a 63 percent increase in the Total Severity Index which included 1 fatal collision. The before period ADT year was 2000 and the after period ADT year was 2004.

Site 2: NC 87 at US 701 / NC 242 (S. Poplar Street)

Study Dates: January 1, 2003 – December 31, 2007 (5 Years)
Target Crashes: Red-Light Run / Disregard Signal
Results: 26 Total Crashes (9.04 Severity), 18 Target (10.56 Severity)

Site 3: NC 87 at SR 1145 (Martin Luther King Boulevard)

Before Period: November 1, 1997 – June 30, 2002 (4 Years, 8 Months)
Construction Period: July and August, 2002
After Period: September 1, 2002 – April 30, 2007 (4 Years, 8 Months)
Extra Year: May 1, 2007 – April 30, 2008 (1 Year)

The ending date for the after period of this analysis was determined by the limiting factor of when NC 87 Bypass was open to traffic in October of 1997. The extra year of crash analysis brings the study up to current available crash data.

Treatment Information: Site 3 – SR 1145 (MLK Blvd)				
	Before 4.67 Yrs	**After 4.67 Yrs**	**Percent Change (+ / -)**	**Extra 1 Yr**
Total Crashes	18	27	50.00 %	7
Total Severity Index	18.57	10.45	- 43.73 %	8.40
Total Crashes Per Year	3.85	5.78	50.13 %	7.00
Target Crashes	17	25	47.06 %	7
Target Crash Severity Index	19.16	11.21	- 41.49 %	8.40
Target Crashes Per Year	3.64	5.35	46.98 %	7.00
Volume	6,700	7,300	8.96 %	N/A
Injury Crash Summary – Total				
Fatal injury Crashes	1	0	- 100.00 %	0
Class A injury Crashes	2	2	0.00 %	0
Class B injury Crashes	4	7	75.00 %	4
Class C Injury Crashes	8	7	- 12.50 %	3
Total Injury Crashes	15	16	6.67 %	7

The naive before and after analysis at the treatment location resulted in a 50 percent increase in Total Crashes, an 47 percent increase in Target Crashes, but a 44 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2004.

Site 4: NC 87 at SR 1150 (Peanut Plant Road)

Before Period: November 1, 1997 – June 30, 2002 (4 Years, 8 Months)
Construction Period: July and August, 2002
After Period: September 1, 2002 – May 31, 2006 (3 Years, 9 Months)

The ending date for the after period of this analysis was determined by the limiting factor of when SR 1150 was reconstructed in June of 2006.

Treatment Information: **Site 4 – SR 1150 (Peanut Plant Rd)**			
	Before 4.67 Yrs	**After 3.75 Yrs**	**Percent Change (+ / -)**
Total crashes	32	27	
Total crashes per year	6.85	7.20	5.11 %
Total Severity Index	13.19	14.63	10.92 %
Target Crashes	31	26	
Target Crashes per year	6.64	6.93	4.37 %
Target Crash Severity Index	13.59	14.87	9.42 %
Volume	8,600	10,200	18.60 %
Injury Crash Summary – Total			
Fatal injury Crashes	3	2	
Fatal Crashes per year	0.64	0.53	- 17.19 %
Class A injury Crashes	0	1	
A Injury Crashes per year	0.00	0.27	27.00 %
Class B injury Crashes	7	9	
B Injury Crashes per year	1.50	2.40	60.00 %
Class C Injury Crashes	15	10	
C Injury Crashes per year	3.21	2.67	- 16.82 %

The naive before and after analysis at the treatment location resulted in a 5 percent increase in Total Crashes Per Year, a 4 percent increase in Target Crashes Per Year, and a 11 percent increase in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2004.

Results and Discussion

Site 1

From the photos of site 1, it appears as if the vertical curvature approaching the intersection creates a sight distance issue for eastbound NC 87 motorists and those attempting to cross the eastbound lanes. This is evident by the pattern of angle collisions occurring on the diagrams in this direction. Eastbound angle collisions remained nearly constant, 32 in the before period and 30 in the after period, once the actuated flasher was installed. One fatal angle crash did occur in the after period involving a westbound NC 87 motorists and a northbound driver after they had successfully accessed the median. The fatal investigation report did not include any immediate alternations to the intersection due to the site being evaluated for the installation of a directional crossover. The extra year of crash analysis also shows an increase in crashes per year to 11.00 from 7.93 in the after period.

Site 3

Referencing the benefit–cost table below, site 3 is the only one that shows a positive response from the before the after period. However, from the analysis table above, the severity did decline by nearly half; although in the same time frame, the crashes doubled. The dominate crash pattern still remains eastbound NC 87 angle collisions with southbound motorists that accessed the median safely. In our study period, the before period fatal was eliminated however constant to increasing numbers are seen for the other injury classification crashes. From the photos, this location does not appear to have a vertical curvature sight distance issue; although the crossover with eastbound lanes does occur in the middle of a horizontal curve.

Site 4

This location had the most immediate issue with three fatal collisions in the before period and one in the after period. The after period saw a 5 percent increase in crashes per year and an 11 percent increase total severity. As stated in the background information, this location was reconstructed in June of 2006 to a super-street design. This involved extending the southern portion of SR 1150 to the right in order to place two crossovers on NC 87 for left turning motorists. This restricted access to right turn only from the side street at this intersection.

Overall

Benefit to Cost ratio analysis:

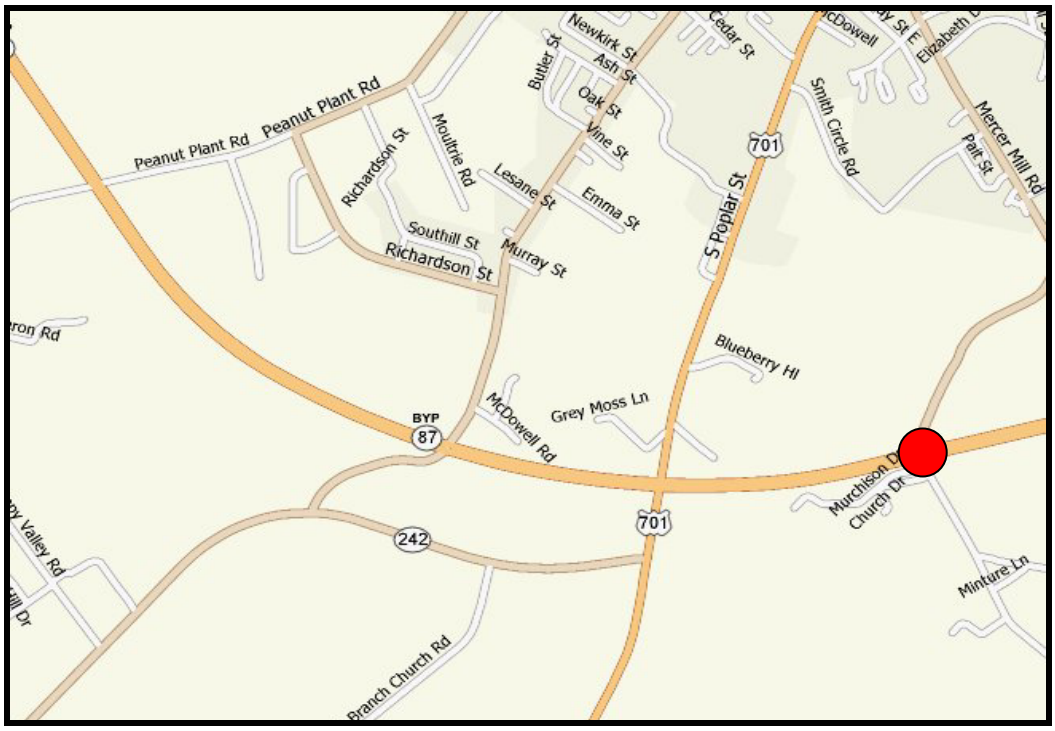
	Total B-C	**Target B-C**
Site 1: SR 1700 (Mercer Mill)	- 32.29	- 32.16
Site 3: SR 1145 (MLK Blvd)	14.68	14.33
Site 4: SR 1150 (Peanut Plant)	- 13.39	- 12.76

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 (total cost divided by three intersections) as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for NC 87 approaches to the treatment intersections, although the configuration of the SR 1150 (Peanut Plant Road) intersection shown is different from the configuration that was analyzed for this study, as explained in the *Project Background* section.

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.

SS# 06-01-213 Site 1
Bladen County – City of Elizabethtown
NC 87 Bypass at SR 1700



TREATMENT SITE PHOTOS TAKEN 4-8-2008

EB NC-87 at SR 1700

WB NC-87 at SR 1700

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 87 Bypass at SR 1700 | BY: JBS
COUNTY: Bladen | DATE: 7/22/2008
FILE NO.: SS 06-01-213 (Site 1) | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - "VEHICLE ENTERING" Flashers on NC 87 Approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$36,667	10	0.149	$5,464
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$36,667	10	0.149	$5,464

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $500
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,314
TOTAL COST OF PROJECT= $36,667

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	4.67	0	0.00	30	6.42	10	2.14	$123,983
AFTER	4.67	2	0.43	28	6.00	7	1.50	$327,901

Annual Benefits from Crash Cost Savings ($203,919)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($210,233)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -32.29

TOTAL COST OF PROJECT - $36,667 COMPREHENSIVE B/C RATIO - -32.29

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 87 Bypass at SR 1700 BY: JBS
COUNTY: Bladen DATE: 7/22/2008
FILE NO.: SS 06-01-213 - Site 1 NOTES: Target Crashes - Intersection Angle

DETAILED COST: TYPE IMPROVEMENT - "VEHICLE ENTERING" Flashers on NC-87 Approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$36,667	10	0.149	$5,464
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$36,667	10	0.149	$5,464

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $500
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,314
TOTAL COST OF PROJECT= $36,667

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

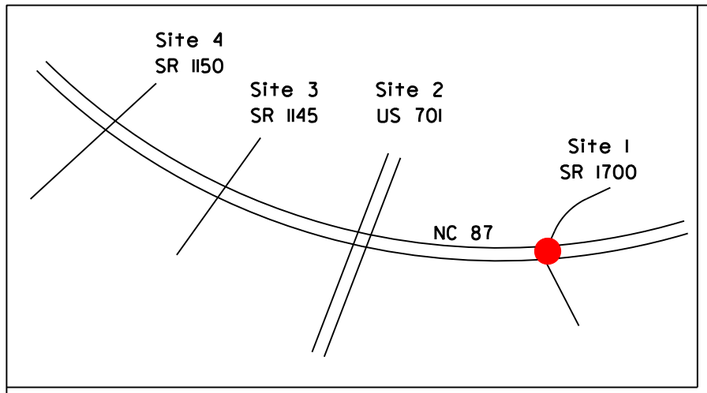
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	0	0.00	29	6.21	9	1.93	$119,293
AFTER	4.67	2	0.43	27	5.78	5	1.07	$322,377

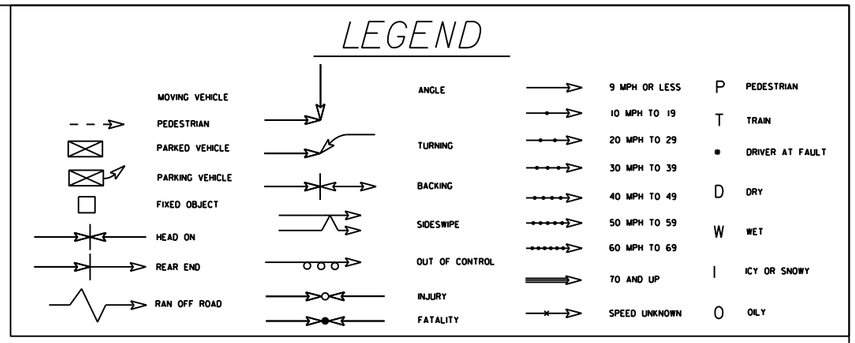
Annual Benefits from Crash Cost Savings ($203,084)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($209,398)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -32.16

TOTAL COST OF PROJECT - $36,667 COMPREHENSIVE B/C RATIO - -32.16





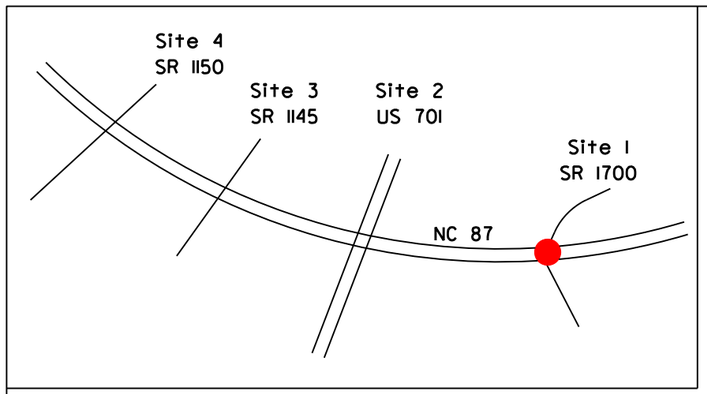
SS# 06-01-213
Bladen County
Elizabethtown
Site 1: BEFORE
NC 87 at SR 1700
11/1/97 - 6/30/02

Target Crashes
Frontal - Opposite Rds

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 11/1/1997 - 6/30/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-16-2008	
LOG NUMBER: SS# 06-01-213 Site 1	

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



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

SS# 06-01-213
Bladen County
Elizabethtown
Site 1: AFTER
NC 87 at SR 1700
9/1/02 - 4/30/07

VECHILE ENTERING

New Countermeasure Installed

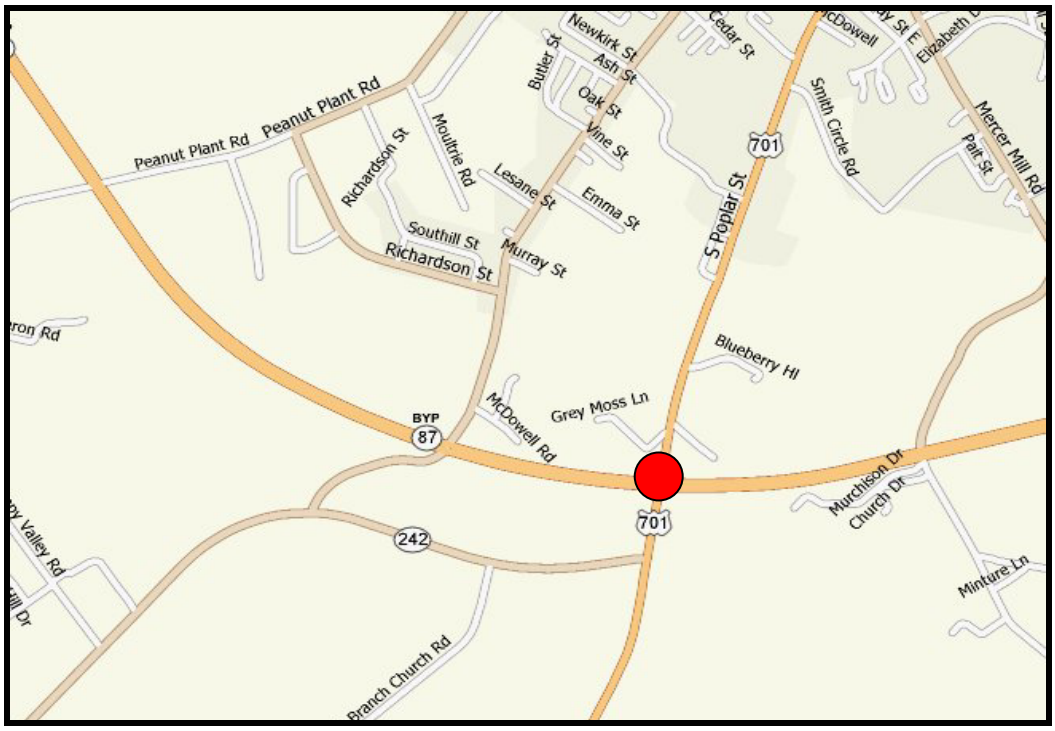
Target Crashes
Frontal - Opposite Rds

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 9/1/2002 - 4/30/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-16-2008	
LOG NUMBER: SS# 06-01-213 Site 1	

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

SS# 06-01-213 Site 2
Bladen County – City of Elizabethtown
NC 87 Bypass at US 701 / NC 242



TREATMENT SITE PHOTOS TAKEN 4/8/2008

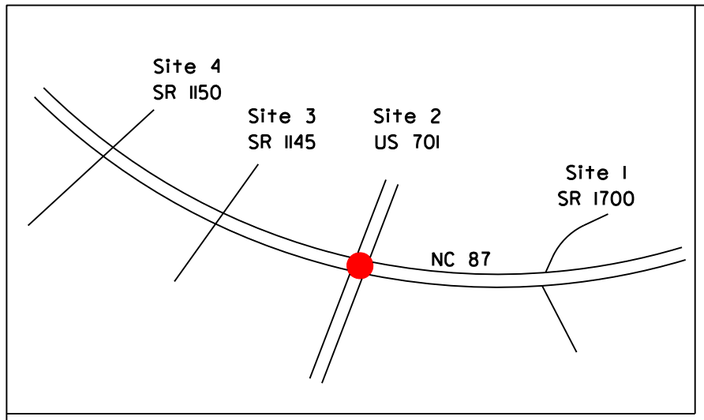
Traveling East on NC 87 Bypass

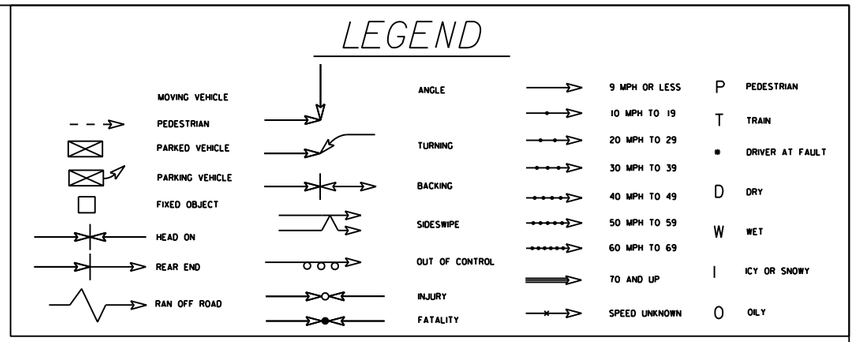
Traveling East on NC 87 – New Countermeasure (SS# 06-06-213)

Traveling West on NC 87 Bypass

Traveling West on NC 87 – New Countermeasure

Traveling West on NC 87 at US 701





NC-87 Byp at US-701
Bladen County
City of Elizabethtown
1/1/03 - 12/31/07
5 Years

Signalized Intersection

Target Crashes
Red Light Run

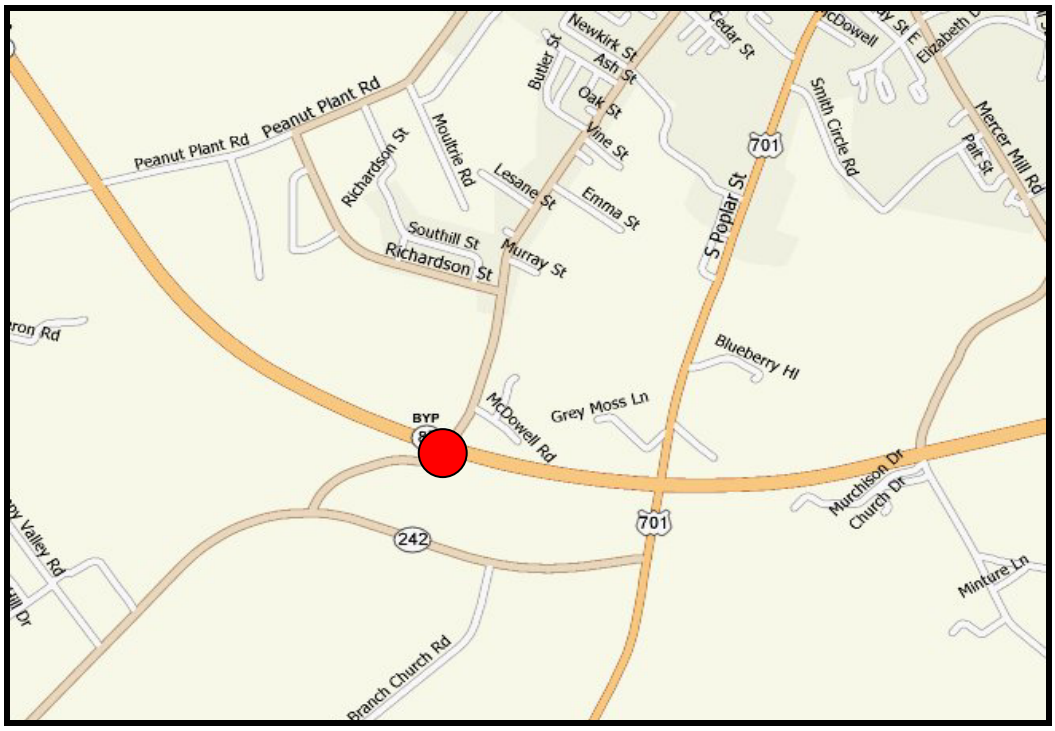
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 1/1/2003 - 12/31/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: 6-30-2008	
LOG NUMBER: N/A	

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

nc 87 & us 701 collision diagram.dgn 10/1/2008 5:07:57 PM

SS# 06-01-213 Site 3
Bladen County – City of Elizabethtown
NC 87 Bypass at SR 1145 (MLK Blvd)



TREATMENT SITE PHOTOS TAKEN 4-8-2008

EB NC-87 at SR 1145

WB NC-87 at SR 1145

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 87 Bypass at SR 1145 (MLK Blvd) BY: JBS
COUNTY: Bladen DATE: 7/22/2008
FILE NO.: SS 06-01-213 (Site 3) NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - "VEHICLE ENTERING" Flashers on NC 87 Approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$36,667	10	0.149	$5,464
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$36,667	10	0.149	$5,464

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $500
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,314
TOTAL COST OF PROJECT= $36,667

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	4.67	3	0.64	12	2.57	3	0.64	$369,957
AFTER	4.67	2	0.43	14	3.00	11	2.36	$277,281

Annual Benefits from Crash Cost Savings $92,677

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $86,362

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 14.68

TOTAL COST OF PROJECT - $36,667 COMPREHENSIVE B/C RATIO - 14.68

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 87 Bypass at SR 1145 (MLK Blvd) BY: JBS
COUNTY: Bladen DATE: 7/22/2008
FILE NO.: SS 06-01-213 - Site 3 NOTES: Target Crashes - Intersection Angle

DETAILED COST: TYPE IMPROVEMENT - "VEHICLE ENTERING" Flashers on NC-87 Approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$36,667	10	0.149	$5,464
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$36,667	10	0.149	$5,464

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $500
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,314
TOTAL COST OF PROJECT= $36,667

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

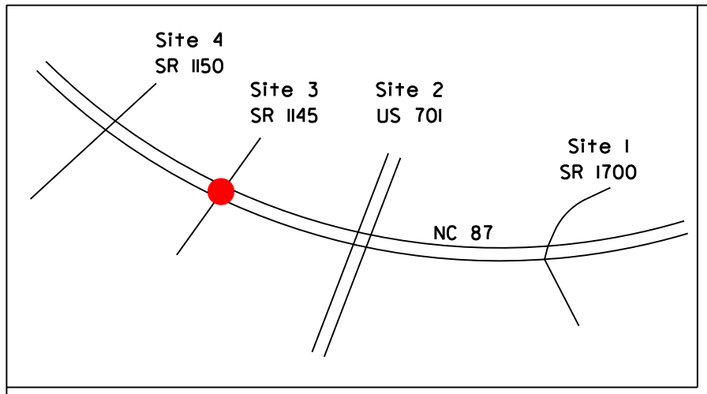
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	3	0.64	11	2.36	3	0.64	$366,103
AFTER	4.67	2	0.43	14	3.00	9	1.93	$275,610

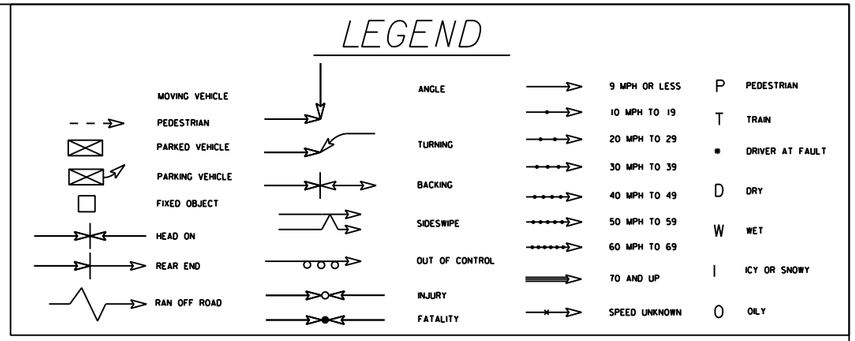
Annual Benefits from Crash Cost Savings $90,493

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $84,178

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 14.33

TOTAL COST OF PROJECT - $36,667 COMPREHENSIVE B/C RATIO - 14.33

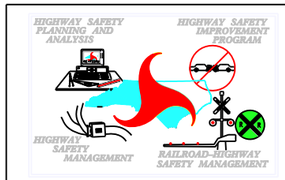




SS# 06-01-213
Bladen County
Elizabethtown
Site 3: BEFORE
NC 87 at SR 1145
11/1/97 - 6/30/02

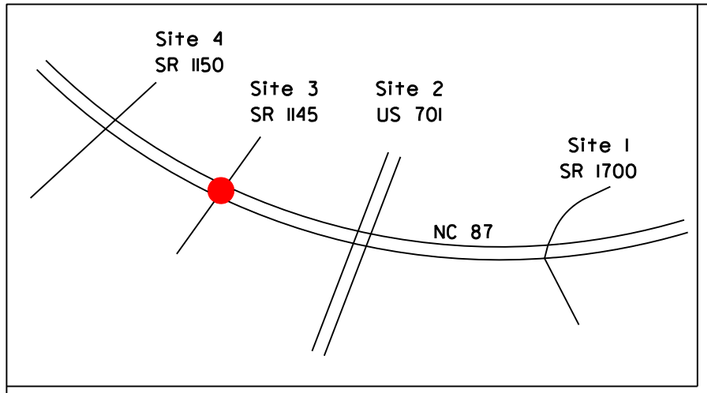
Target Crashes
Frontal Impact
Opposite Roadway

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 11/1/1997 - 6/30/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-17-2008	
LOG NUMBER: SS# 06-01-213 Site 3	

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



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
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50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

SS# 06-01-213
Bladen County
Elizabethtown
Site 3: AFTER
NC 87 at SR 1145
9/1/02 - 4/30/07

VECHILE ENTERING

New Countermeasure Installed

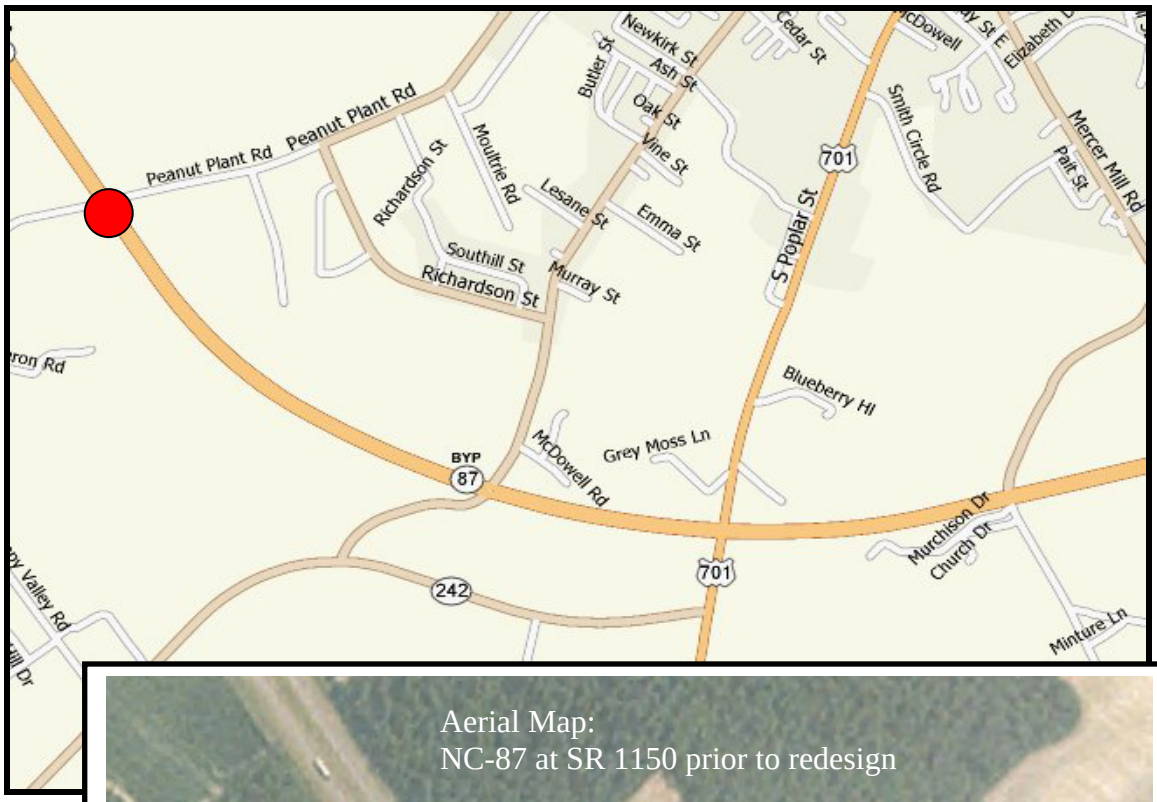
Target Crashes
Frontal Impact
Opposite Roadway

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 1/1/1997 - 6/30/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-17-2008	
LOG NUMBER: SS# 06-01-213 Site 3	

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

SS# 06-01-213 Site 4
Bladen County – City of Elizabethtown
NC 87 Bypass at SR 1150 (Peanut Plant Rd)



TREATMENT SITE PHOTOS TAKEN 4/8/2008
Site 4: SR 1150 After Intersection Reconstruction

Traveling East on NC 87 Bypass at SR 1150 (New Extension)

Traveling East on NC 87 at SR 1150 (Original Intersection)

Traveling West on NC 87 Bypass at SR 1150 (Original Intersection)

Traveling West on NC 87

Traveling North on SR 1150 (Peanut Plant Road extension)

Traveling South on SR 1150 (Peanut Plant Road)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 87 Bypass at SR 1150 (Peanut Plant) BY: JBS
COUNTY: Bladen DATE: 7/22/2008
FILE NO.: SS 06-01-213 (Site 4) NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - "VEHICLE ENTERING" Flashers on NC 87 Approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$36,667	10	0.149	$5,464
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$36,667	10	0.149	$5,464

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $500
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,314
TOTAL COST OF PROJECT= $36,667

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	4.67	3	0.64	22	4.71	7	1.50	$411,842
AFTER	3.75	3	0.80	19	5.07	5	1.33	$496,400

Annual Benefits from Crash Cost Savings ($84,558)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($90,873)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -13.39

TOTAL COST OF PROJECT - $36,667 COMPREHENSIVE B/C RATIO - -13.39

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 87 Bypass at SR 1150 (Peanut Plant) BY: JBS
COUNTY: Bladen DATE: 7/22/2008
FILE NO.: SS 06-01-213 - Site 4 NOTES: Target Crashes - Intersection Angle

DETAILED COST: TYPE IMPROVEMENT - "VEHICLE ENTERING" Flashers on NC-87 Approaches

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$36,667	10	0.149	$5,464
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$36,667	10	0.149	$5,464

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $500
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $350

TOTAL ANNUAL COST= $6,314
TOTAL COST OF PROJECT= $36,667

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

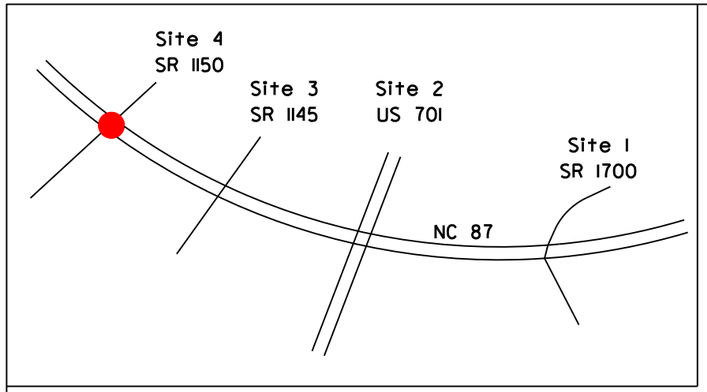
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	3	0.64	22	4.71	6	1.28	$411,006
AFTER	3.75	3	0.80	18	4.80	5	1.33	$491,600

Annual Benefits from Crash Cost Savings ($80,594)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($86,908)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -12.76

TOTAL COST OF PROJECT - $36,667 COMPREHENSIVE B/C RATIO - -12.76



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O OILY

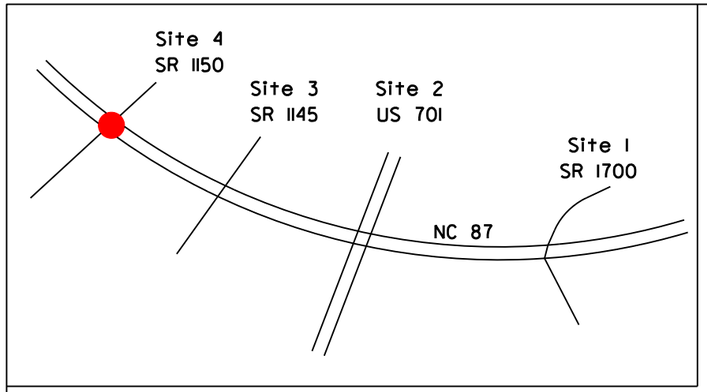
SS# 06-01-213
Bladen County
Elizabethtown
Site 4: BEFORE
NC 87 at SR 1150
11/1/97 - 6/30/02

Target Crashes
Frontal Impact
Opposite Roadway

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 11/1/1997 - 6/30/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-17-2008	
LOG NUMBER: SS# 06-01-213 Site 4	

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



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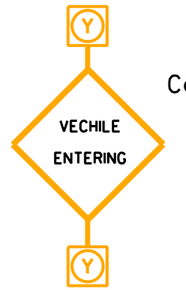
O OILY

SS# 06-01-213
Bladen County
Elizabethtown
Site 4: AFTER
NC 87 at SR 1150
9/1/02 - 5/31/06

After Period limited
by intersection redesign



New
Countermeasure
Installed

Target Crashes
Frontal Impact
Opposite Roadway

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 9/1/2002 - 5/31/2006	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 7-17-2008	
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DIVISION of HIGHWAYS
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