Spot Safety Project Evaluation

Project Log # 200703088

Spot Safety Project # 03-01-207

Spot Safety Project Evaluation of the Installation of a Traffic Signal at the Intersection of SR 2048 (Gordon Rd) and SR 2117 (Harris Rd)
New Hanover 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

_____ 6/16/2008
Brad Robinson, EI Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-01-207 – The Intersection of SR 2048 (Gordon Rd) and SR 2117 (Harris Rd) in New Hanover County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install a traffic signal. The subject location is a three-leg intersection which was controlled by a stop sign on SR 2117 (Harris Rd) in the before period. SR 2048 (Gordon Rd) is a two lane roadway with a left turn lane on the southbound approach to the subject intersection. SR 2117 has an exclusive left and an exclusive right turn lane at the intersection. The speed limits are 45 mph for SR 2048 and 35 mph for SR 2117.

The original statement of problem was that there was a pattern of Left Turn Crashes resulting from motorists attempting to turn east onto SR 2048 (Gordon Rd) from SR 2117 (Harris Rd). The intersection was originally investigated due to a citizen request and met signal warrants 1, 2, 8, 9, and 11.

The initial crash analysis was conducted from November 30, 1997 to November 30, 2000 with a total of 26 crashes, 22 of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on January 8, 2002 with a total cost of $65,000.00.

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 was from November 1, 2001 to February 28, 2002. The before period consisted of reported crashes from February 1, 1998 through October 31, 2001 (3 years and 9 months) and the after period consisted of reported crashes from March 1, 2002 through November 30, 2005 (3 years and 9 months). The beginning date for this analysis was limited by the construction of the left turn lane on SR 2048 (Gordon Rd), which was completed on December 12, 1997.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	34	24	-29.4
Total Severity Index	4.92	4.08	-17.1
Target Crashes	30	14	-53.3
Target Crash Severity Index	4.7	3.64	-22.6
Volume	17,500	28,100	60.6
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	2	3	50.0
Class C Crashes	16	7	-56.3
PDO Crashes	16	14	-12.5

The naive before and after analysis at the treatment location resulted in a 29 percent decrease in Total Crashes, a 53 percent decrease in Target Crashes, and a 61 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2004.

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 29 percent decrease in Total Crashes and a 53 percent decrease in Target Crashes. The Total Severity Index decreased by 17 percent and the Target Crash Severity Index decreased by 23 percent. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is 3.34 considering total crashes. The benefit to cost ratio considering only target crashes is 4.48. 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.

Referencing the *Collision Diagrams*, it is apparent that the signal installation helped to significantly reduce the existing Target Crash pattern. In the before period there were 28 Left Turn-Different Roadway Crashes involving vehicles turning left from SR 2117. In the after period there were six crashes of this type, a reduction of 79 percent.

Although the signal installation reduced the Target Crashes that were prevalent in the before period, a new Target Crash pattern emerged in the after period. There were eight Right Turn-Different Roadway Crashes in the after period, which were non-existent in the before period. In all eight of these crashes the right turning vehicle was at fault. As shown in the *Treatment Site Photos*, site

distance is limited when looking east on SR 2048 from SR 2117 due to vegetation. This vegetation might not have existed in the before period, contributing to the pattern. The large increase in volume (61%) probably also contributed to the emergence of this pattern.

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.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 2048 at SR 2117 BY: Brad Robinson
COUNTY: New Hanover DATE: 6/5/2008
FILE NO.: SS 03-01-207

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$65,000	10	0.149	$9,687
Right-of-Way	$0	0	0.000	$0
TOTALS	$65,000	10	0.149	$9,687

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $12,787
TOTAL COST OF PROJECT= $65,000

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	3.75	0	0.00	18	4.80	16	4.27	$108,693
AFTER	3.75	0	0.00	10	2.67	14	3.73	$65,973

Annual Benefits from Crash Cost Savings $42,720

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $29,933

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 3.34

TOTAL COST OF PROJECT - $65,000 COMPREHENSIVE B/C RATIO - 3.34

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 2048 at SR 2117 BY: Brad Robinson
COUNTY: New Hanover DATE: 6/5/2008
FILE NO.: SS 03-01-207 Target Crashes

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$65,000	10	0.149	$9,687
Right-of-Way	$0	0	0.000	$0
TOTALS	$65,000	10	0.149	$9,687

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $12,787
TOTAL COST OF PROJECT= $65,000

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	3.75	0	0.00	15	4.00	15	4.00	$92,400
AFTER	3.75	0	0.00	5	1.33	9	2.40	$35,173

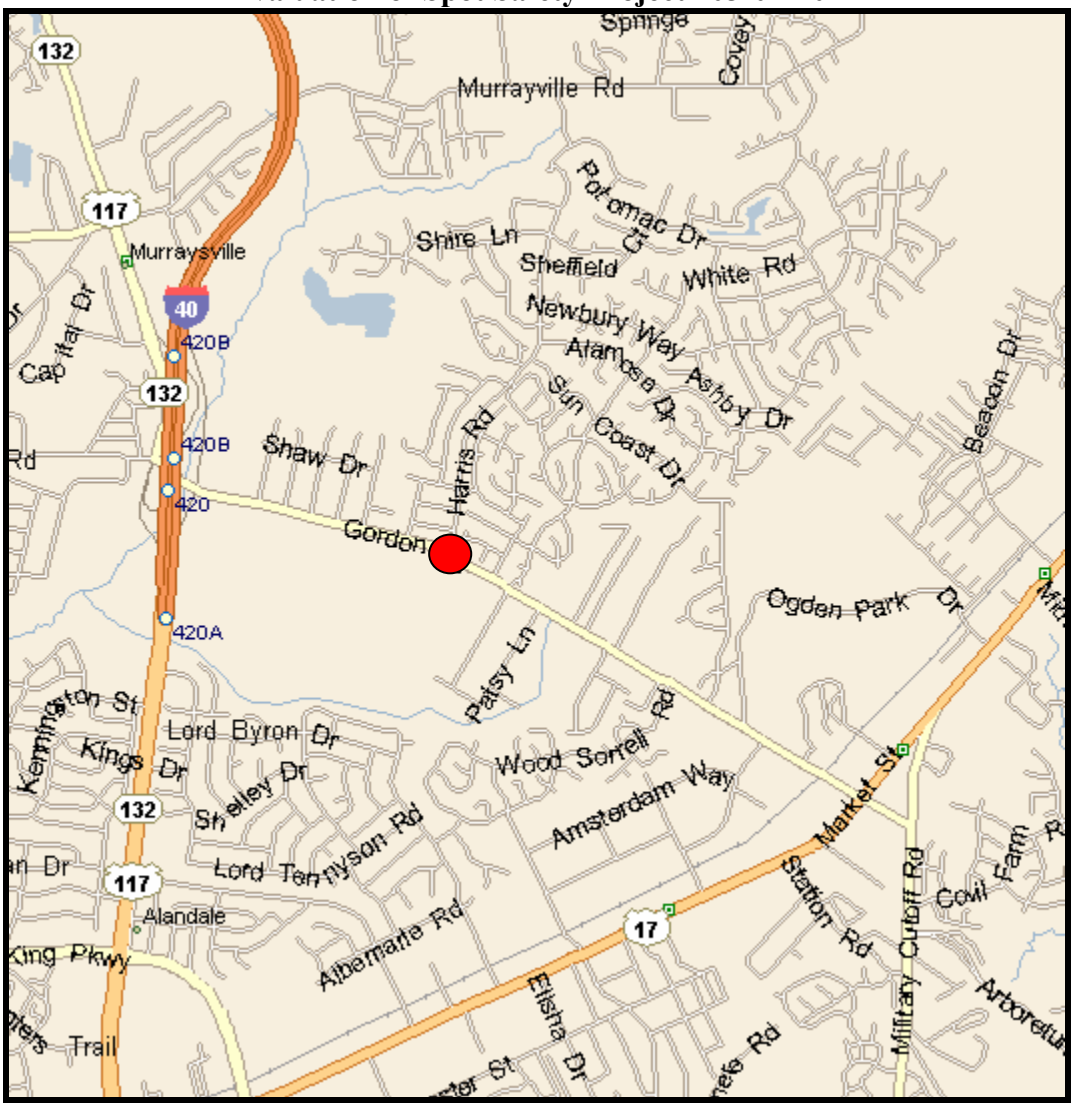
Annual Benefits from Crash Cost Savings $57,227

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $44,440

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 4.48

TOTAL COST OF PROJECT - $65,000 COMPREHENSIVE B/C RATIO - 4.48

Location Map
New Hanover County
Evaluation of Spot Safety Project #03-01-207



Treatment Location: SR 2048 (Gordon Rd) and SR 2117 (Harris Rd)

Treatment Site Photos Taken March 14, 2008

Traveling Eastbound on SR 2048 (Gordon Rd)

Traveling Eastbound on SR 2048 (Gordon Rd)

Traveling Westbound on SR 2048 (Gordon Rd)

Traveling Westbound on SR 2048 (Gordon Rd)

Traveling South on SR 2117 (Harris Rd)

Traveling South on SR 2117 (Harris Rd)

On SR 2117 (Harris Rd) looking left (east) at intersection.
Vegetation is limiting site distance.

New Hanover County
SR 2048 (Gordon Rd) and
SR 2117 (Harris Rd)
Before Period
From 2/1/1998-10/31/2001

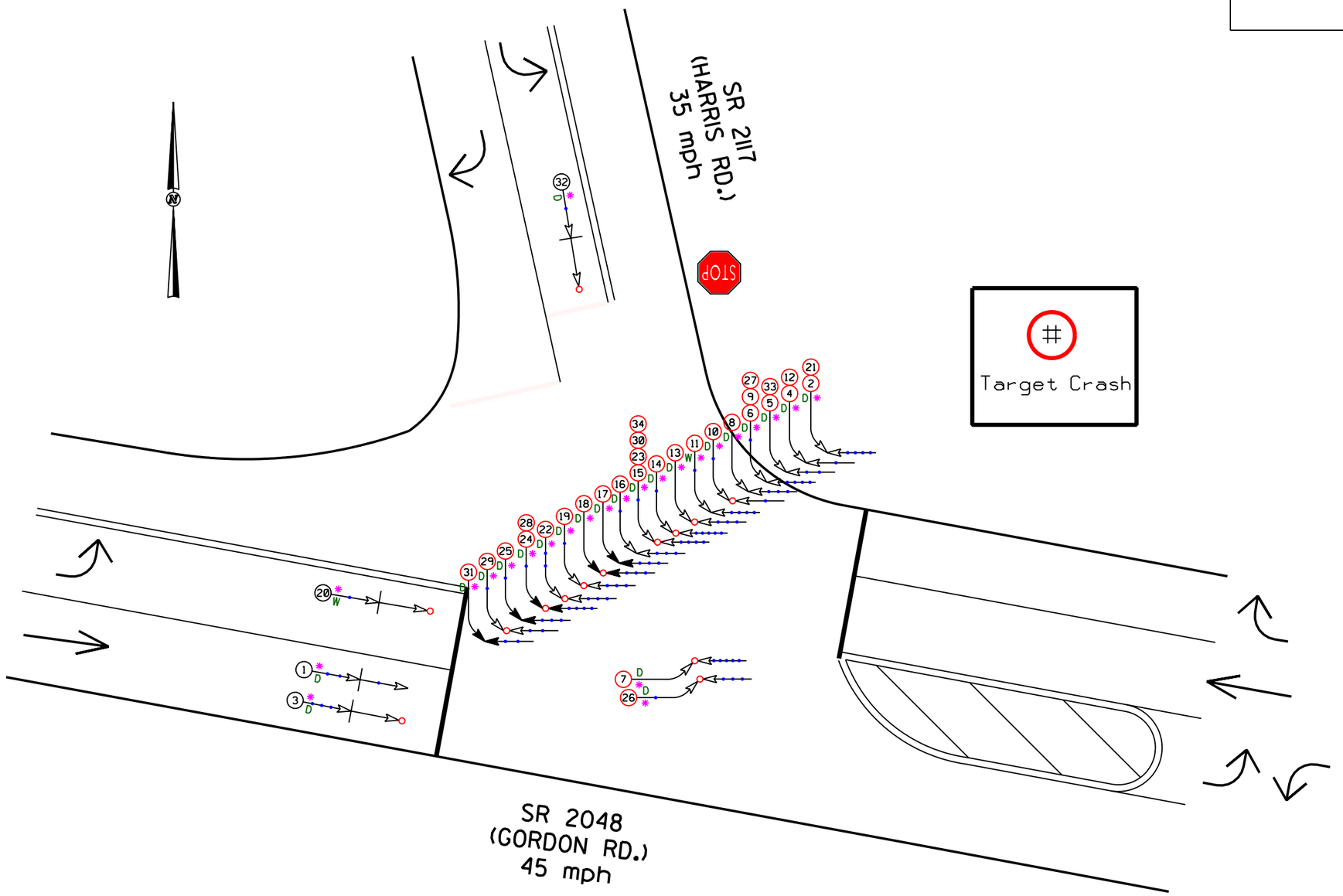
LEGEND

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
DAYLIGHT CRASH
DARK CRASH

P PEDESTRIAN
B BICYCLE
T TRAIN
A ANIMAL
• DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY

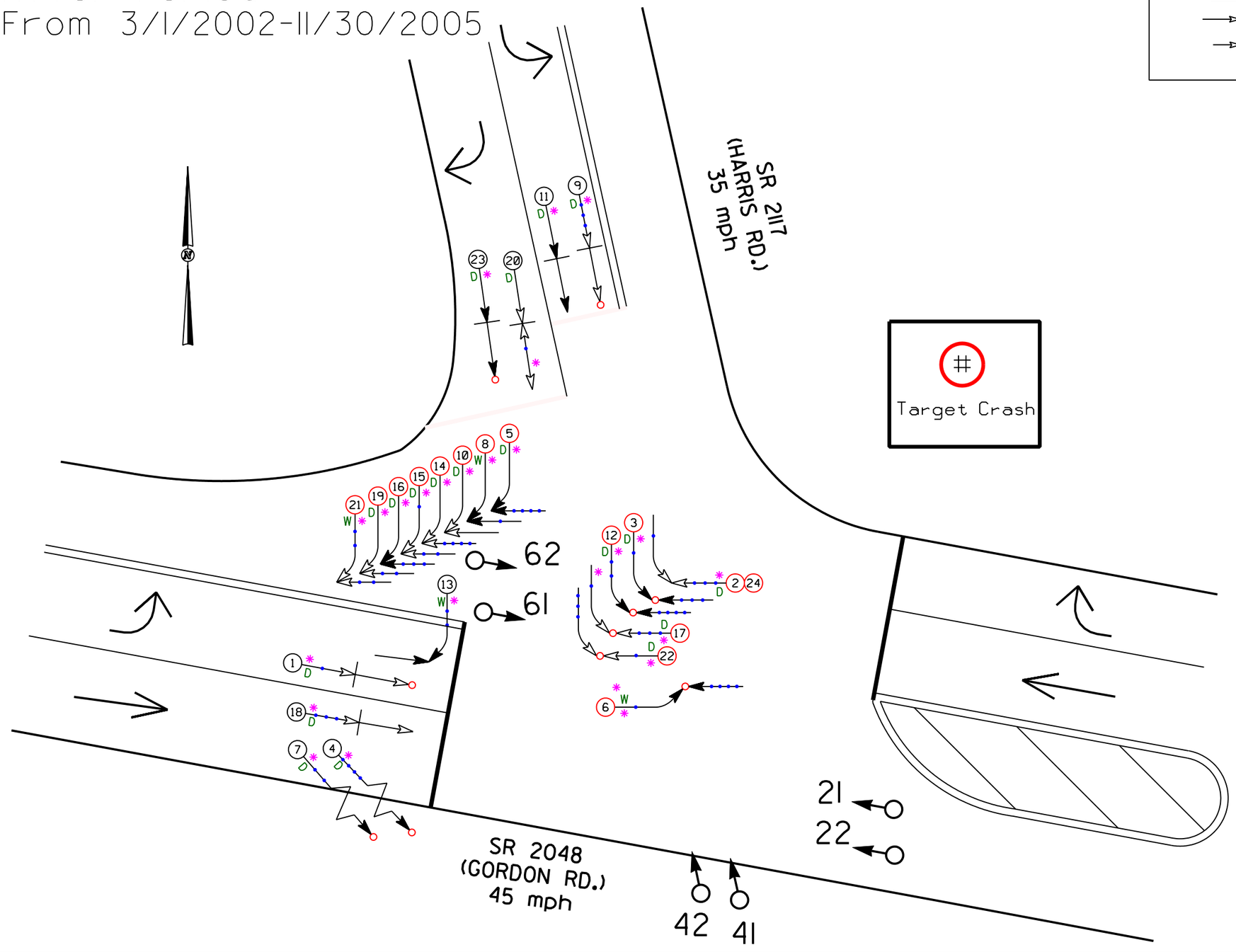
BEFORE

COLLISION DIAGRAM

DIVISION: 3	AREA: ..
STUDY PERIOD: 2/1/1998 TO 10/31/2001	
DISTANCE:	Y-LINE: 150 FT
ANALYSIS PREPARED BY: B. Robinson	
DIAGRAM PREPARED BY: B. Robinson	
DIAGRAM REVIEWED BY: _____	
SCALE:	NOT TO SCALE
DATE:	April 2008
LOG NUMBER:	200703088

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

New Hanover County
SR 2048 (Gordon Rd) and
SR 2117 (Harris Rd)
After Period
From 3/1/2002-11/30/2005



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

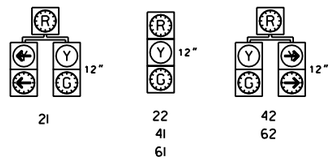
9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN
DAYLIGHT CRASH

P PEDESTRIAN
B BICYCLE
T TRAIN
A ANIMAL
• DRIVER AT FAULT
D DRY
W WET
I

Target Crash

SIGNAL FACE I.D.

Denotes L.E.D.



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	COLLISION DIAGRAM
HIGHWAY SAFETY IMPROVEMENT PROGRAM / SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION: 3 AREA: ..
	STUDY PERIOD: 3/1/2002 TO 11/30/2005
	DISTANCE: ..... Y-LINE: 150 FT
	ANALYSIS PREPARED BY: B. Robinson
	DIAGRAM PREPARED BY: B. Robinson
	DIAGRAM REVIEWED BY: _____
SAFETY EVALUATION / TRAFFIC SAFETY	
AFTER	SCALE: NOT TO SCALE
	DATE: April 2008
	LOG NUMBER: 200703088

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