Spot Safety Project Evaluation

Project Log # 200702004

Spot Safety Project # 10-01-214

Spot Safety Project Evaluation of the Traffic Signal and Concrete Island Installation at US 29 (Concord Pkwy) and SR 1310 (Roberta Church Rd) in Cabarrus County

Documents Prepared By:

Safety Evaluation Group
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Principal Investigator

_____ 7/16/2007

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Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-01-214 – Traffic Signal and Concrete Island Installation at US 29 (Concord Pkwy) and SR 1310 (Roberta Church Rd) in Cabarrus County.

Project Information and Background from the Project File Folder

US 29 is a four lane divided roadway with a left turn lane at both approaches at SR 1310. SR 1310 is a two lane roadway with a right turn lane. The speed limit is 55 mph on US 29 and 45 mph on SR 1310. There is a nursery driveway that forms a fourth leg of the intersection opposite that of SR 1310. The driveway has a left-thru lane and a right turn lane.

The original problem statement shows there were insufficient gaps in US 29 traffic to allow safe movement from or to Roberta Church Road. The original crash analysis yielded 12 total crashes from 4/1/1998 through 4/1/2001. There were 3 left turn and 3 rear end-turn, crashes that totaled to 6 correctable crashes. The improvement chosen for the subject location was to install a traffic signal and a raised concrete median on the south approach of US 29. The final completion date for the improvement at the subject location was on October 7, 2002 at a cost of $45,000.

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 September 2002 through November 2002. The before period consisted of reported crashes from October 1, 1998 through August 31, 2002 (3 years, 11 months) and the after period consisted of reported crashes from December 1, 2002 through October 31, 2006 (3 years, 11 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 were the target crashes for the applied countermeasures. 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.

Treatment Information

	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	26	24	-7.7
Total Severity Index	6.8	5.3	-21.4
Frontal Impact Crashes	10	13	30.0
Frontal Severity Index	13.0	6.7	-48.6
Volume	33600	36900	9.8

Treatment Injury Crashes

	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	N/A
Class A	1	0	-100.0
Class B	1	4	300.0
Class C	9	10	11.1
Property Damage Only	15	10	-33.3

Frontal Injury Crashes

	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	N/A
Class A	1	0	-100.0
Class B	1	3	200.0
Class C	5	6	20.0
Property Damage Only	3	4	33.3

Table 1.

The naive before and after analysis at the treatment location resulted in an 8 percent decrease in Total Crashes, a 30 percent increase in Frontal Impact Crashes, and a 10 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 an 8 percent decrease in Total Crashes and a 30 percent increase in Frontal Impact Crashes. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total Crashes and an increase in the number of Frontal Impact Crashes from the before to the after period.

The data from table 1 shows a small change from the before to the after period in all categories. However, the collision diagrams show a change in crash patterns from the before to the after period. There was a pattern of westbound (left turning) and northbound (through) vehicles in the before period. The after period shows a pattern of southbound (left turning) and northbound (through) vehicles.

The after period shows a total of 9 left turn crashes of the southbound (left turning) and northbound (through) combination. There were 4 crashes that occurred from 12 PM – 1 PM, 3 from 8 PM - 9 PM, and the last 2 approximately 7 AM and 4 PM. During the field investigation it was noted that US 29 has protected permitted phasing on both approaches. Converting the southbound signal to a protected only phase may have positive effects on the after period crash pattern.

There was a conflict noticed between traffic leaving the nursery turning left or going straight across US 29 to SR 1310. Referencing page 3 from the treatment site photos, it can be seen that drivers traveling west toward the intersection may have trouble seeing across to the nursery where a vehicle may be turning left or going straight due to the lane offset. The problem noted was that when a vehicle leaves the nursery and turns left, another vehicle behind it may continue straight across. Drivers from SR 1310 may not see the vehicle coming straight across until the last moment. Though no crashes have been reported with this situation, changing the lane configuration from a left-thru and right turn only to a right-thru and left-turn only may improve the line of sight between SR 1310 and the nursery driveway.

The calculated benefit to cost ratio for this project is 11.88 considering total crashes. The benefit to cost ratio considering only target crashes is 11.74. 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.

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: US 29 at SR 1310 BY: SDC
COUNTY: Cabarrus DATE: 2/22/2007
FILE NO.: SS 10-01-214

DETAILED COST: TYPE IMPROVEMENT - Signal and Left Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$45,000	10	0.149	$6,706
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$45,000	10	0.149	$6,706

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $9,606
TOTAL COST OF PROJECT= $45,000

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	3.92	1	0.26	10	2.55	15	3.83	$188,393
AFTER	3.92	0	0.00	14	3.57	10	2.55	$74,235

Annual Benefits from Crash Cost Savings $114,158

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $104,552

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 11.88

TOTAL COST OF PROJECT - $45,000 COMPREHENSIVE B/C RATIO - 11.88

TARGET BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 29 at SR 1310 BY: SDC
COUNTY: Cabarrus DATE: 2/22/2007
FILE NO.: SS 10-01-214

DETAILED COST: TYPE IMPROVEMENT - Signal and Left Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$45,000	10	0.149	$6,706
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$45,000	10	0.149	$6,706

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $9,606
TOTAL COST OF PROJECT= $45,000

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	3.92	1	0.26	6	1.53	3	0.77	$158,087
AFTER	3.92	0	0.00	9	2.30	4	1.02	$45,306

Annual Benefits from Crash Cost Savings $112,781

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $103,174

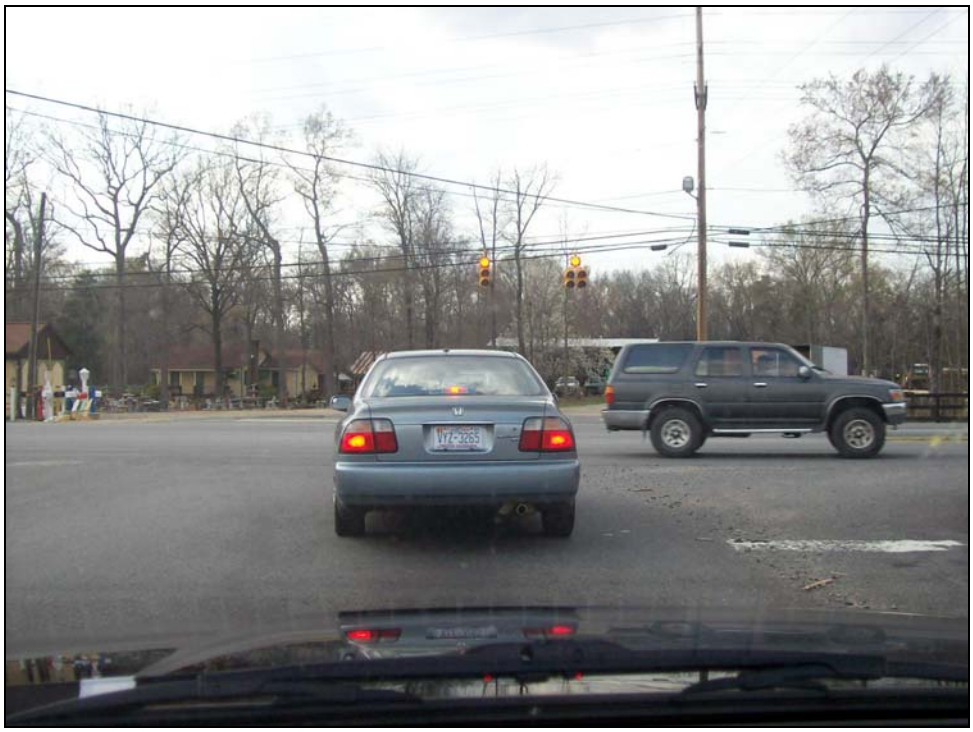
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 11.74

TOTAL COST OF PROJECT - $45,000 COMPREHENSIVE B/C RATIO - 11.74

Location Map: US 29 (Concord Pkwy) and SR 1310 (Roberta Church Rd).

Treatment Site Photos taken on March 22, 2007

Driving west on SR 1310

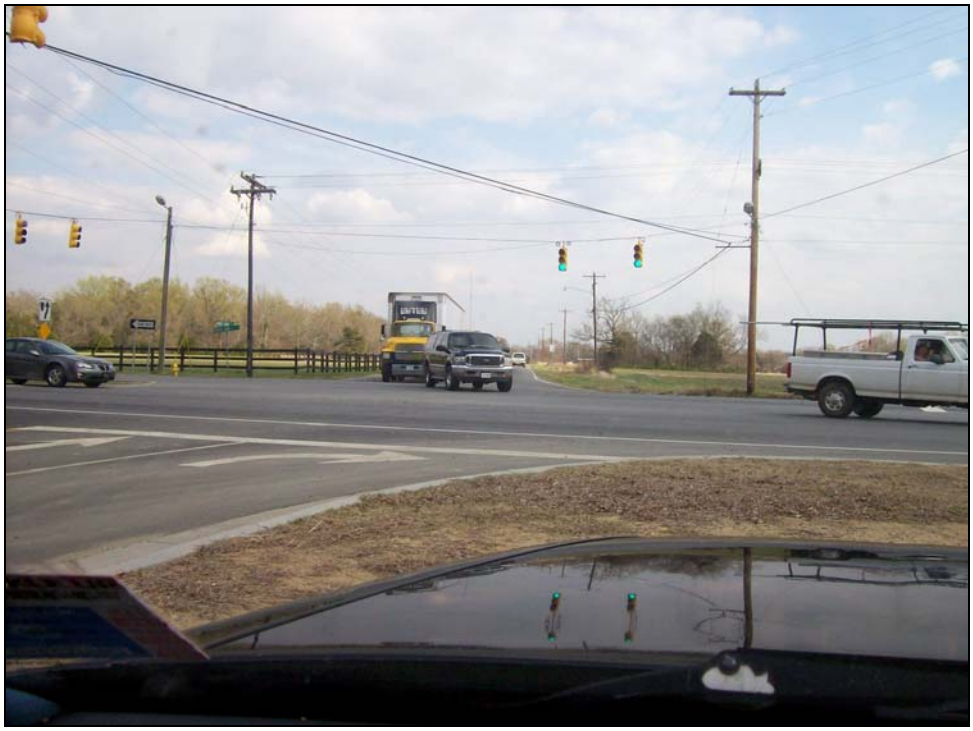


Driving west on SR 1310

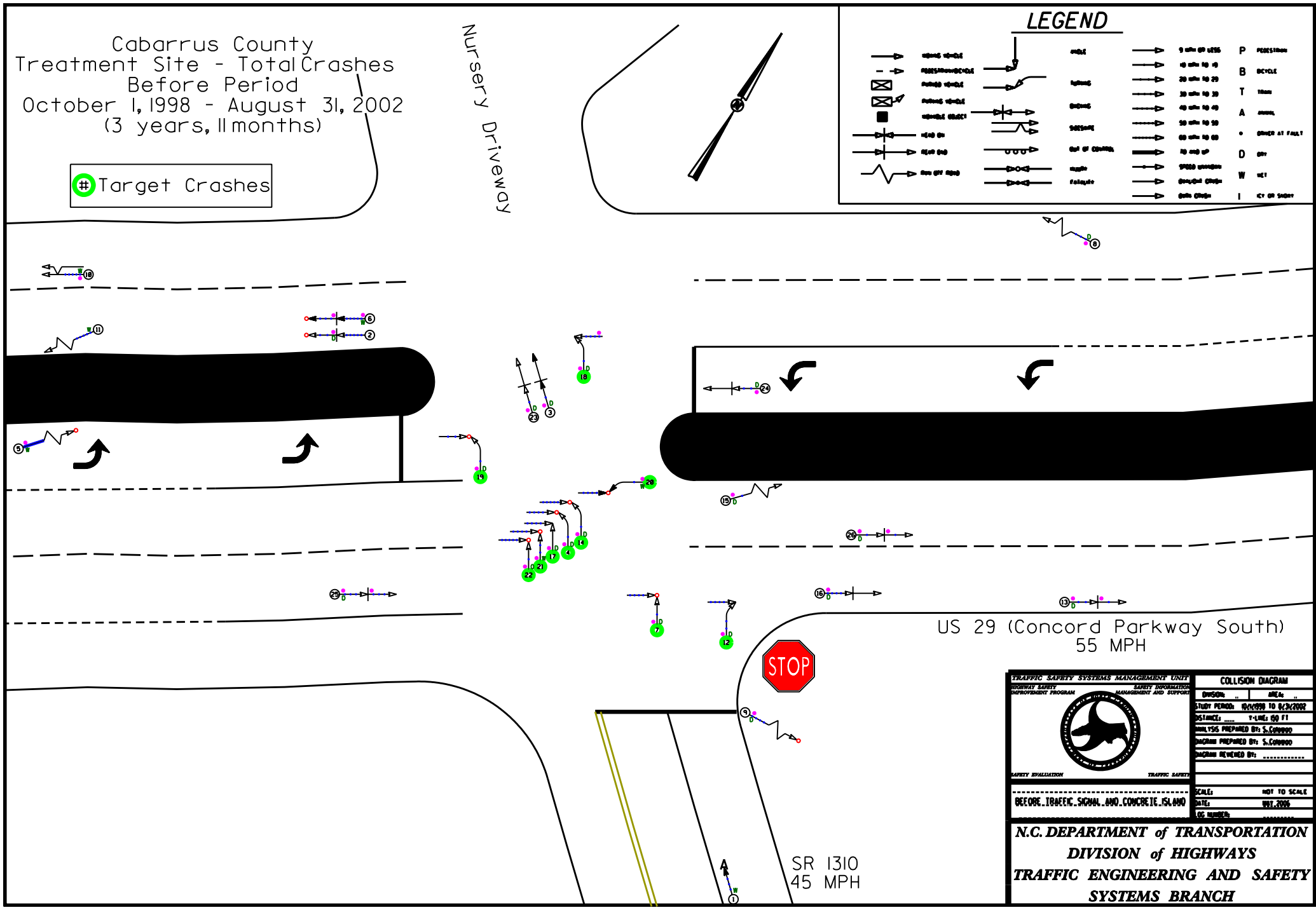
Driving north on US 29

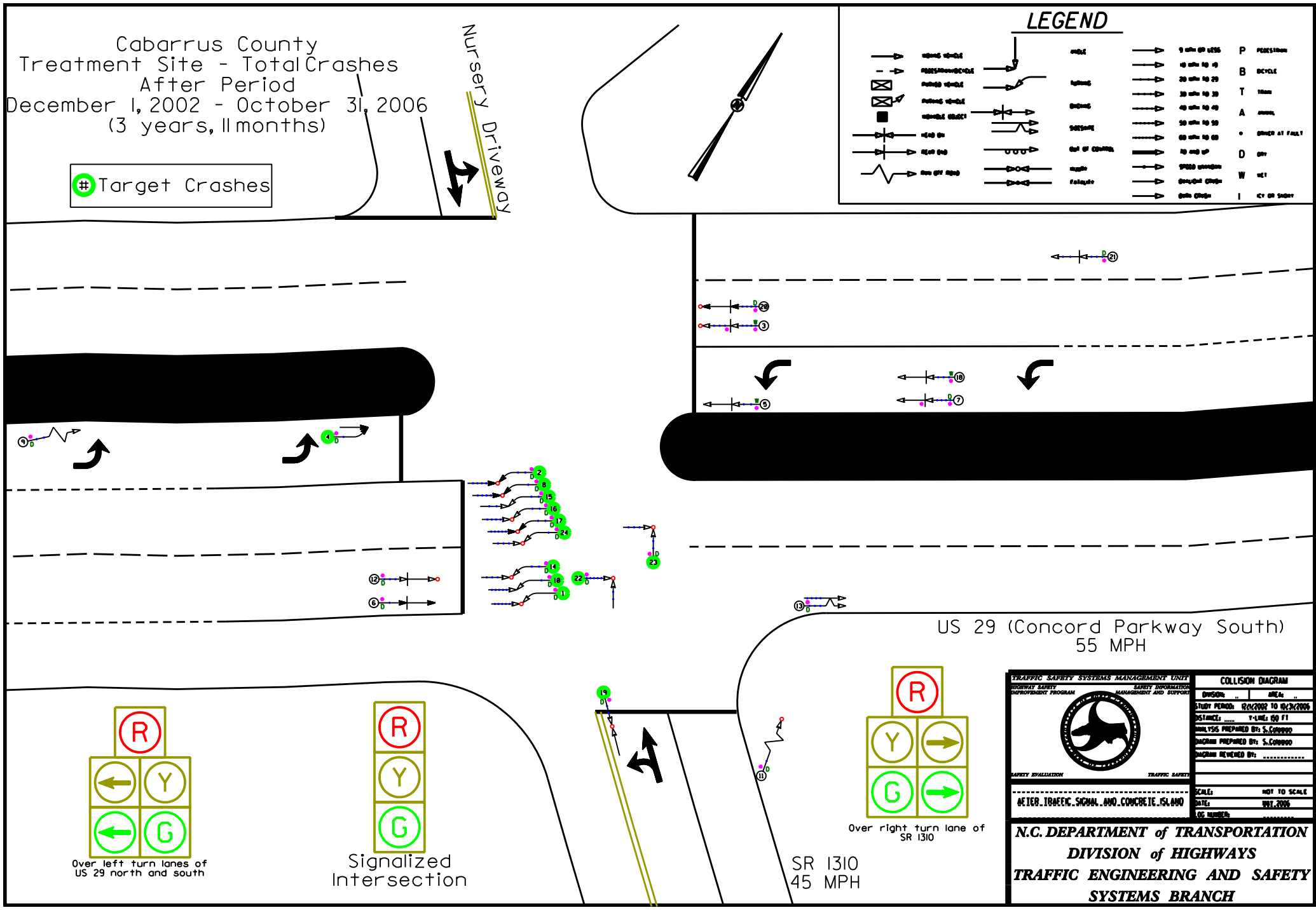
Driving south on US 29

Facing east from nursery driveway



Facing east from nursery driveway


Cabarrus County
Treatment Site - Total Crashes
Before Period
October 1, 1998 - August 31, 2002
(3 years, 11 months)
Target Crashes
Nursery Driveway
LEGEND
US 29 (Concord Parkway South)
55 MPH
STOP
SR 1310
45 MPH
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY
COLLISION DIAGRAM
BEFORE TRAFFIC SIGNAL AND CONCRETE ISLAND
SCALE: NOT TO SCALE
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH


Cabarrus County
Treatment Site - Total Crashes
After Period
December 1, 2002 - October 31, 2006
(3 years, 11 months)
Target Crashes
Nursery Driveway
LEGEND
US 29 (Concord Parkway South)
55 MPH
SR 1310
45 MPH
Over left turn lanes of
US 29 north and south
Signalized
Intersection
Over right turn lane of
SR 1310
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
COLLISION DIAGRAM
METER, IRREGULAR SIGNAL AND CONCRETE ISLAND
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH