

# **Hazard Elimination Project Evaluation**

Project Log # 41000019209

Hazard Elimination Project W-4703

**Evaluation of the  
Traffic Signals / New Crossovers / Intersection Realignment  
US-70 (Business) at Moore Street, S. Smith Street,  
John Street, Durham Street & Boling Street  
City of Clayton, Johnston County**

Documents Prepared By:

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

**Principal Investigator**



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Jason B. Schronce

1/24/2013

Date

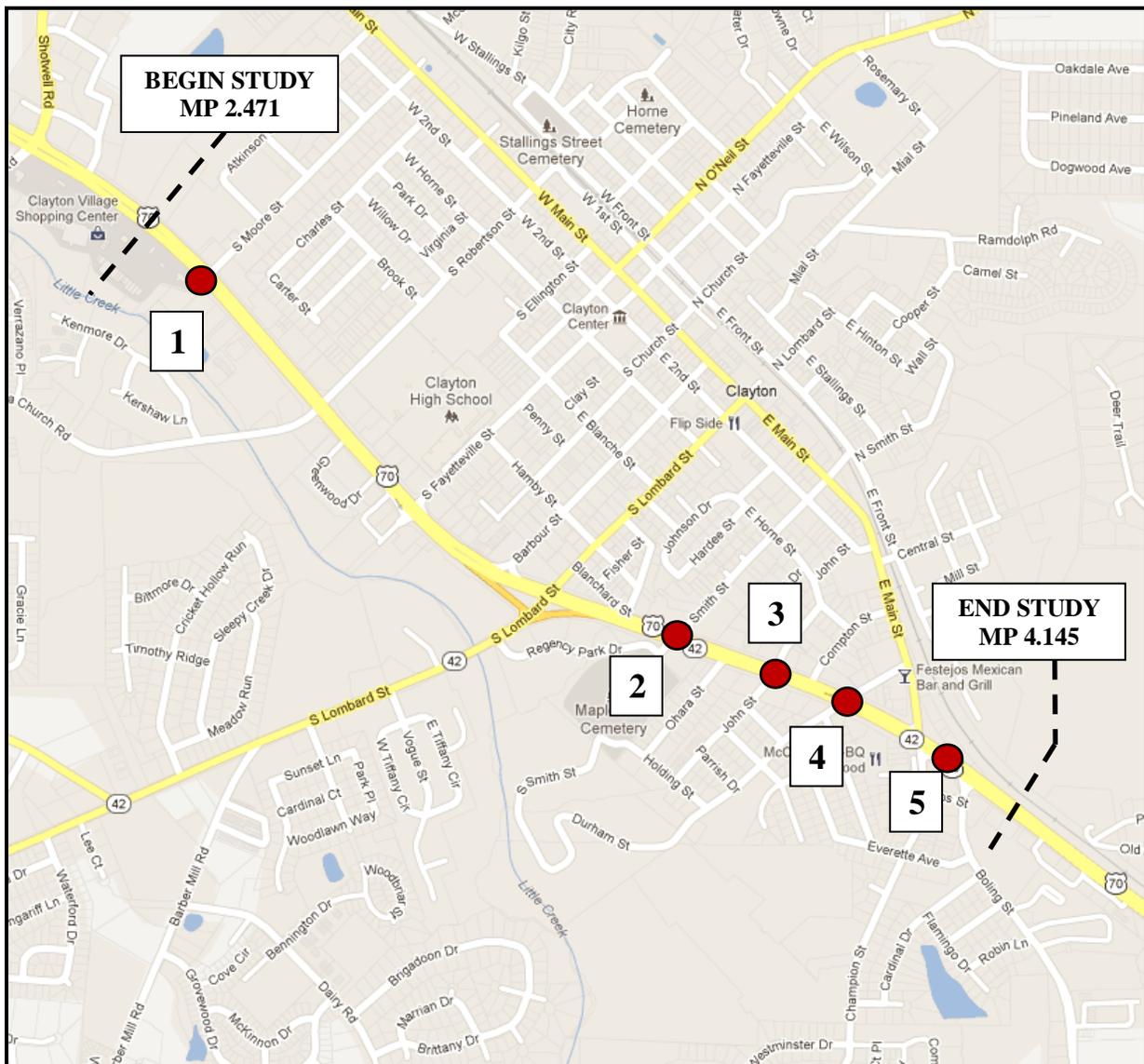
Traffic Safety Project Engineer

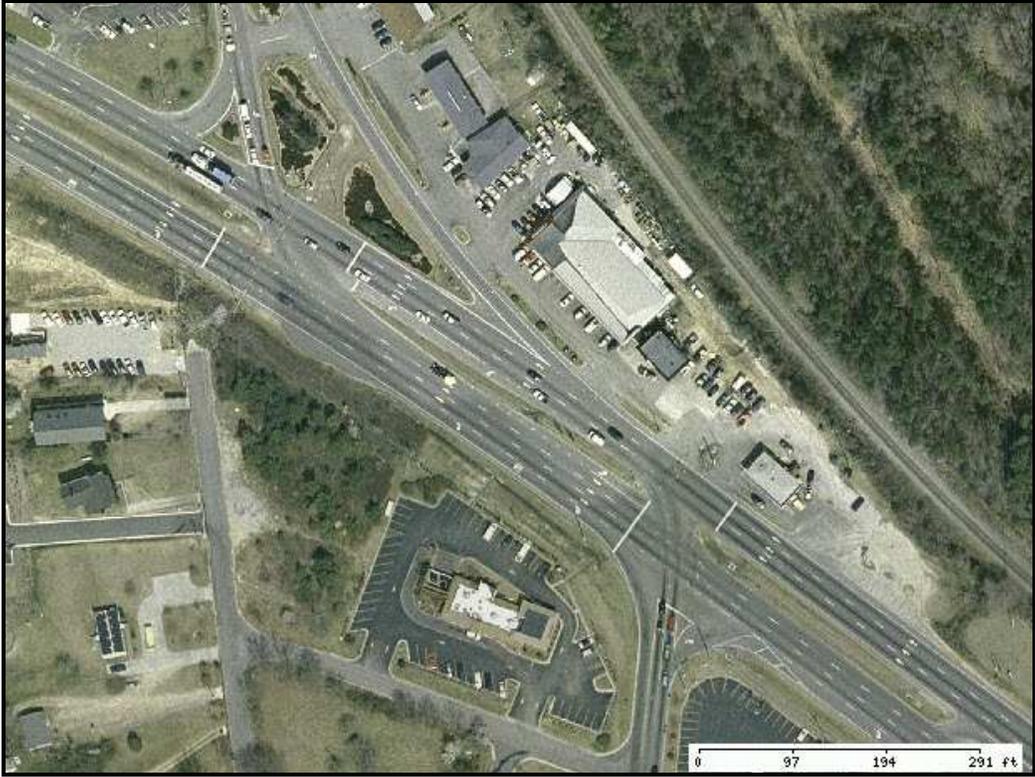
# Hazard Elimination Project Evaluation Documentation

## Subject Location

Evaluation of Hazard Elimination Project Number W-4703 located along US-70 (US-70 Business in the After Period) from 150 feet west of Moore Street to 150 feet east Boling Street in Johnston County, in the City of Clayton. The Milepost Range of US-70 Business is 2.471 to 4.145 for a total segment length of 1.674 miles. The Countermeasures included:

1. Moore Street (MP 2.499) - New Traffic Signal
2. South Smith Street (MP 3.541) - New Directional Crossover
3. John Street (MP 3.696) - New Traffic Signal
4. Durham Street (MP 3.861) - New Directional Crossover
5. Boling Street (MP 4.117) - Remove Signal & Realign with Main Street





**Johnston County GIS - Before Period (Former Alignment)  
Main Street & Boiling Street Combo**



**Google Maps – After Period New Alignment**

## **Project Information and Background from the Project File Folder**

The safety countermeasures chosen for the subject segment included two (2) new traffic signals at Moore Street and John Street, two (2) directional crossovers at Smith Street and Durham Street, and the removal of the traffic signal at Boling Street with realign to the East Main Street intersection on US-70 Business through Clayton. US-70 (Business) is a major east-west divided highway that varies between six (6) and four (4) lanes. This section of highway is primarily commercial with numerous driveways including Clayton High School. The speed limit on this segment is 45-mph.

The original statement of problem confirmed that this section of US-70 (Business) contained numerous accidents due to traffic congestion and multiple turning conflicts. The countermeasure's purpose centered on creating a more uniform traffic flow and eliminating select turning movements to enhance safety and mobility.

The initial crash analysis was completed from May 1, 1999 to April 30, 2002 with 113 reported crashes, 69 of which were frontal impact in nature. The final completion date for the improvement along the subject section was on September 30, 2008 with a total cost of \$1,637,500. The projected benefit cost ratio was 18.55:1.

## **Naive Before and After Analysis**

After reviewing the hazard elimination 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 were the months of May 2007 through October 2008. The before period consisted of reported crashes from May 1, 2003 through April 30, 2007 (4.0 years); and the after period consisted of reported crashes from November 1, 2008 through October 31, 2012 (4.0 years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

This project was one in a series of discovered projects that occurred along this section of US-70 (Business) during the study time limits. The following lists are projects we identified, although the Safety Evaluation Group cannot eliminate the possibility that other funds and projects might have occurred:

### Before Period

1. Spot Safety 04-00-225 (Completed 6/25/2003) – US-70 at NC 42 East – Left Turn Lane Storage *\*This project was just East of the subject section but within influence range\**
2. W-4409 (Completed 7/29/2005) – US-70 from NC-42 to SR 1553 – Widen Roadway to Three Lanes

### Construction Period

1. Durham Street Crossover – From crash reports this crossover appeared to have been installed in May 2007
2. US-70 Bypass around Clayton – Opened 6/9/2008 – Section changed to US-70 Business
3. W-4703 (Completed 9/30/2008) – Project being evaluated.

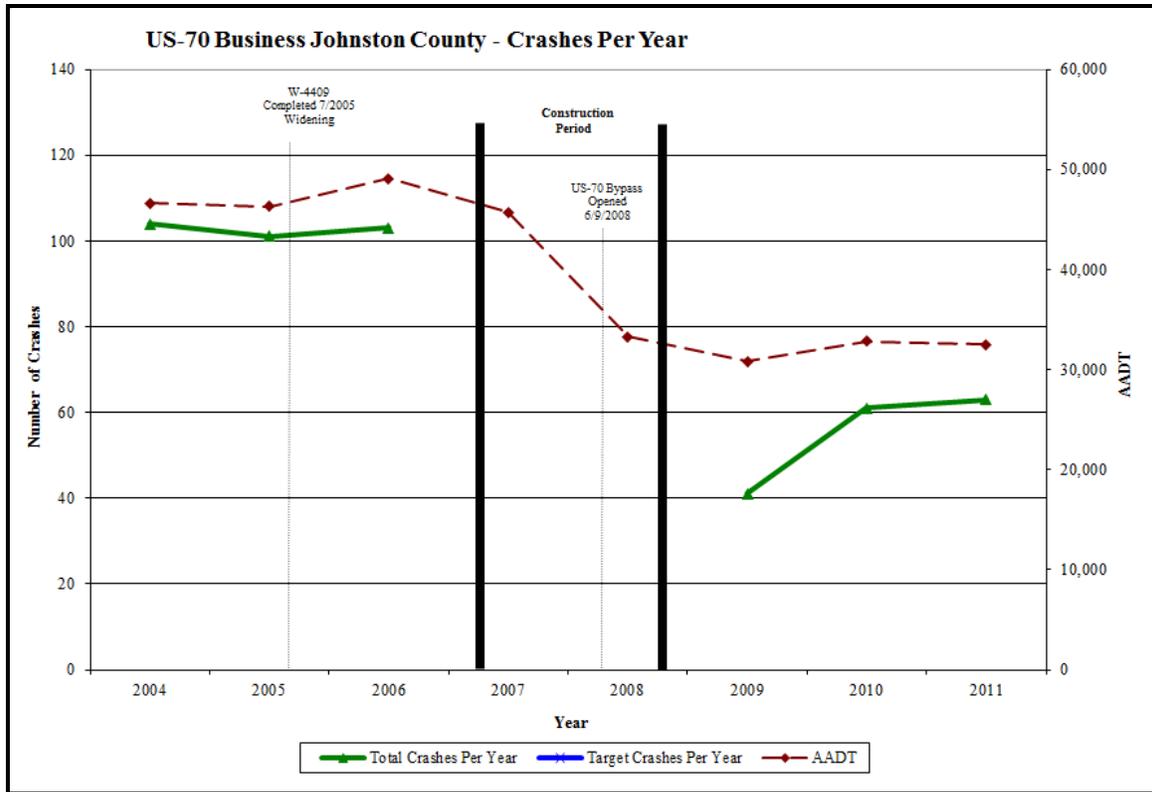
The treatment data consisted of all crashes within 150 feet y-line of the US-70 segment from Milepost 2.471 (150 west of Moore Street) to Milepost 4.145 (150 west of Boling Street). The following tables depict the Naïve Before and After Analysis for the Total Crashes along the treatment section. Please note that a target crash type was not selected for this study due to multiple countermeasures installed under a single project.

<b><u>Treatment Information</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-)/ Percent Increase (+)</b>
Total Crashes – Both Directions	391	220	- 43.7 %
Total Severity Index	3.50	3.67	4.9 %
Volume (2005, 2010)	46,300	32,800	- 29.2 %
Total Crash Rate (100 Million Vehicle Miles)	345.29	274.25	- 20.6 %

The naive before and after analysis at the treatment location resulted in a 44 percent reduction in Total Crashes. The before period ADT year was 2005 and the after period ADT year was 2010.

<b><u>US-70 Business (MP 2.471 – 4.145)</u></b>	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-)/ Percent Increase (+)</b>
<b>Injury Crashes</b>			
Fatal Injury Crashes	0	0	N/A
Class-A Injury Crashes	1	2	100.0 %
Class-B Injury Crashes	39	18	- 53.8 %
Class-C Injury Crashes	83	41	- 50.6 %
Property Damage Only Crashes	268	159	- 40.7 %
<b>Contributing Factors</b>			
Night Crashes	59	51	- 13.6 %
Animal Crashes	5	5	0.0 %
Wet Road Crashes	77	34	- 55.8 %
Alcohol Related	8	9	12.5 %
<b>Crashes Per Intersection (150' Y-Line)</b>			
A – Moore Street (New Signal)	38	28	- 26.3 %
Segment A-B	33	27	- 18.2 %
B – Amelia Church / Robertson (Existing Sig)	60	37	- 38.3 %
Segment B-C	15	12	- 20.0 %
C – Fayetteville Street (Existing Signal)	37	10	- 73.0 %
Segment C-D	21	17	- 19.0 %
D – South Smith Street (New Crossover)	23	10	- 56.5 %
Segment D-E	13	8	- 38.5 %
E – John Street (New Signal)	22	15	- 31.8 %
Segment E-F	4	1	- 75.0 %
F – Durham Street (New Crossover)	39	8	- 79.5 %
Segment F-G	9	2	- 77.8 %
G – Main / Champion / Boiling (Realign)	77	45	- 41.6 %

To further examine the data, the Safety Evaluation Group plotted the Total Crashes per year vs. the Segment ADT to show the correlation of volume to the opening of US-70 Bypass around Clayton. At that time, the subject section was renamed US-70 Business.



## Results and Discussion

From the tables above, we observe a significant reduction (44 percent) in crashes from the before to the after period along this route. However, the largest impact factor of this reduction would presumably be the opening of US-70 Bypass around Clayton which resulted in a 29 percent reduction in the ADT of this section. Even with the drop in traffic volumes, the Total Crash Rate did reduce by 21 percent.

Examining the crashes per intersection location indicates that the segment experienced crash decreases along the entire segment, ranging from 18 percent to 80 percent. The spot that saw the most improvement included the crossover at Durham Street with a 79.5 percent reduction in crashes. Although not directly evaluated, wet roadway crashes also reduced by 56 percent throughout the study period.

The calculated benefit to cost ratio for this project is **0.95 considering total crashes**. 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.

Additionally, the Safety Evaluation Group examined the after period crashes per location (see chart above) and determined to display collision diagrams for the locations with greater than 20 crashes in the 4.0 years of after data. The collision diagrams are attached for the following intersections:

Site A: US-70 Business at Moore Street (New Traffic Signal)

Site B: US-70 Business at Amelia Church Road / Robertson Street (Existing Traffic Signal)

Site G: US-70B/NC-42 at Main Street / Champion Street & Boling Street (Realignment)

Please see that attached collision diagrams.

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: US-70 Business in Clayton  
 COUNTY: Johnston  
 FILE NO.: W-4703

BY: JBS  
 DATE: 11/28/2012

DETAILED COST: TYPE IMPROVEMENT - Traffic Signal, X-Overs, Realignment

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$1,637,350	10	0.149	\$244,013
Right-of-Way	\$0	0	0.000	\$0
TOTALS	\$1,637,350	10	0.149	\$244,013

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,400  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$247,313  
 TOTAL COST OF PROJECT= \$1,637,350

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	4.00	1	0.25	114	28.50	268	67.00	\$1,015,600
AFTER	4.00	2	0.50	59	14.75	159	39.75	\$780,925

Annual Benefits from Crash Cost Savings \$234,675

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$12,638)

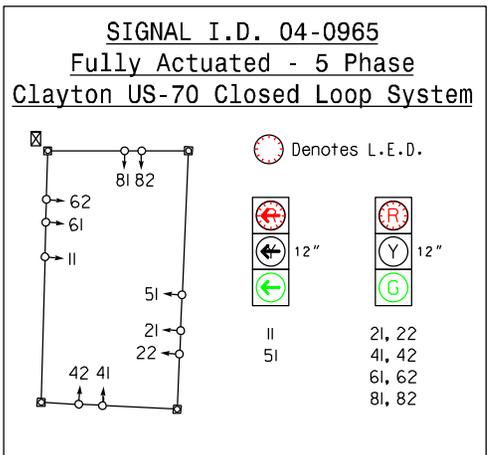
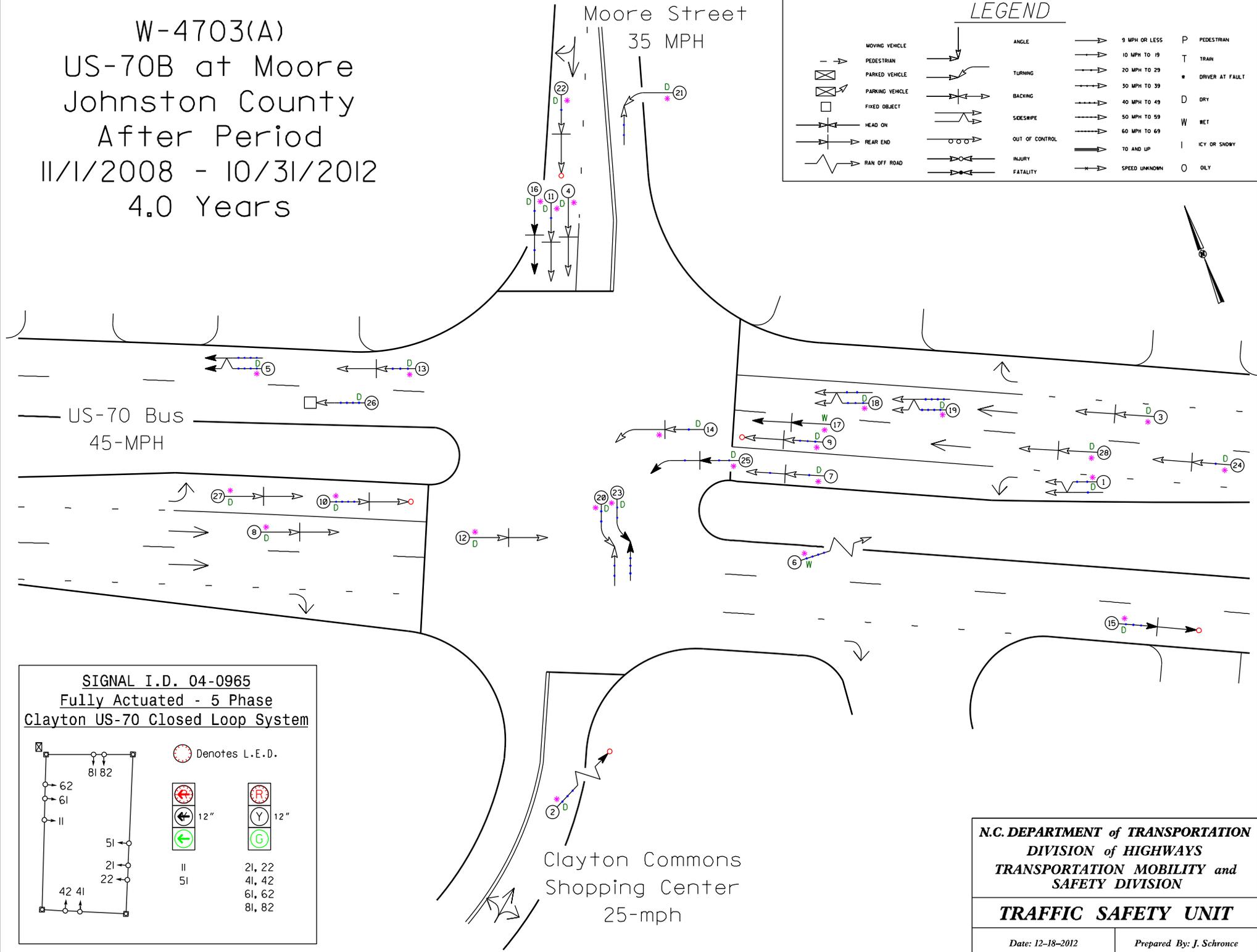
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.95

TOTAL COST OF PROJECT - \$1,637,350 COMPREHENSIVE B/C RATIO - 0.95

W-4703(A)  
 US-70B at Moore  
 Johnston County  
 After Period  
 11/1/2008 - 10/31/2012  
 4.0 Years

**LEGEND**

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		TO AND LIP		50 MPH TO 59		ICY OR SNOWY
	REAR END		INJURY		60 MPH TO 69		FATALITY
	RAN OFF ROAD		SPEED UNKNOWN		9 MPH OR LESS		ONLY



**N.C. DEPARTMENT of TRANSPORTATION**  
 DIVISION of HIGHWAYS  
 TRANSPORTATION MOBILITY and  
 SAFETY DIVISION

**TRAFFIC SAFETY UNIT**

Date: 12-18-2012      Prepared By: J. Schronce

W-4703(B)  
 US-70B at SR 1552  
 Johnston County  
 AFTER Period  
 11/1/2008 - 10/31/2012  
 4.0 Years

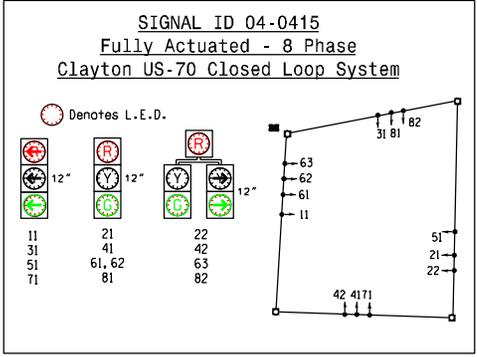
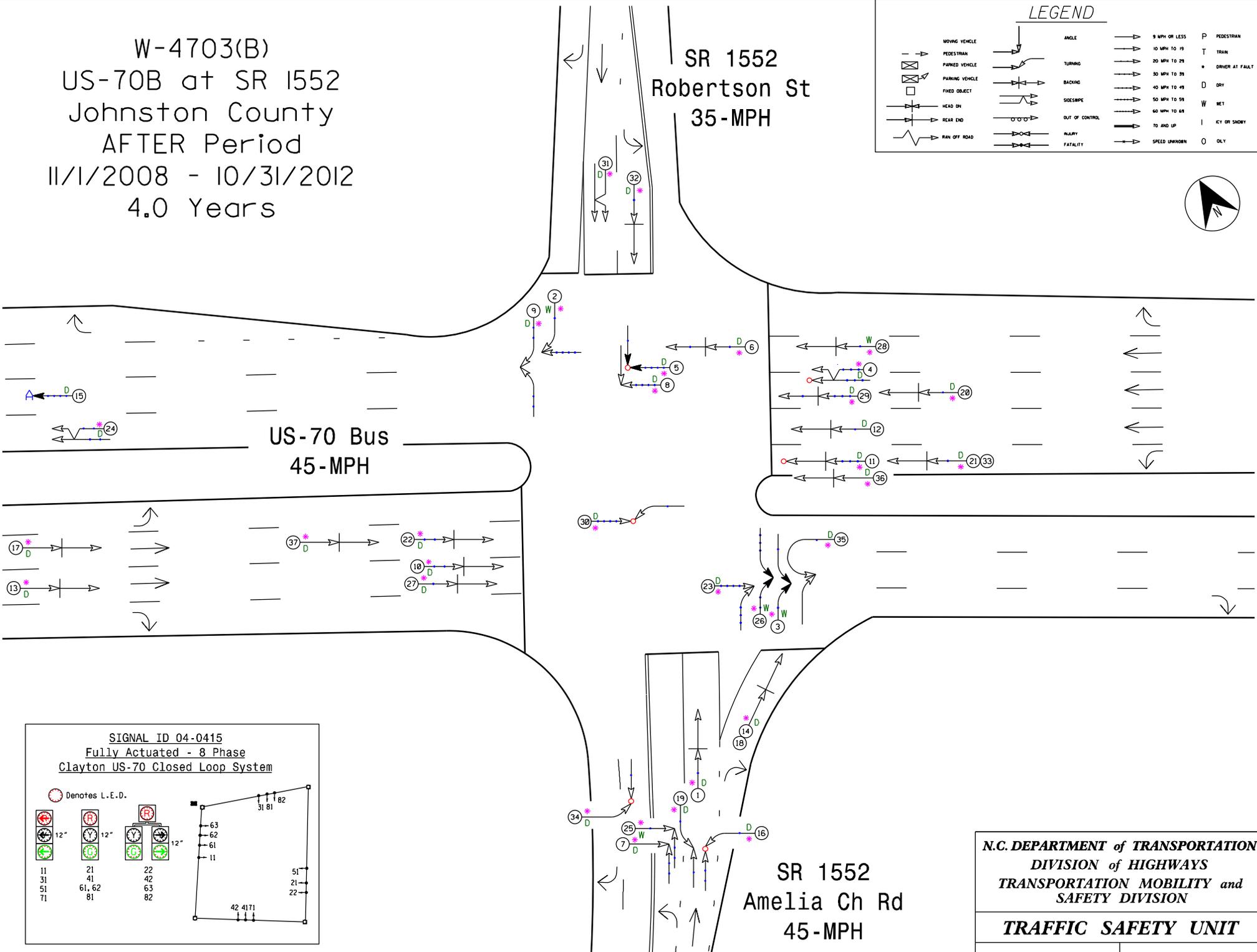
SR 1552  
 Robertson St  
 35-MPH

US-70 Bus  
 45-MPH

SR 1552  
 Amelia Ch Rd  
 45-MPH

**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
	PAKED VEHICLE		SIDESWIPE		40 MPH TO 49		DRY
	FIXED OBJECT		OUT OF CONTROL		50 MPH TO 59		WET
	HEAD ON		RAN OFF ROAD		60 MPH TO 69		KEY OR SMOKY
	REAR END		RAN OFF ROAD		70 AND UP		FATALITY
	RAN OFF ROAD		RAN OFF ROAD		SPEED UNKNOWN		ONLY



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 DIVISION of HIGHWAYS  
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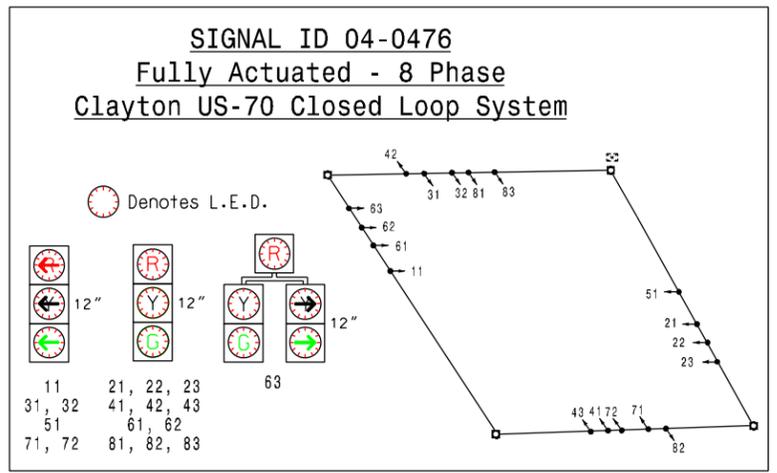
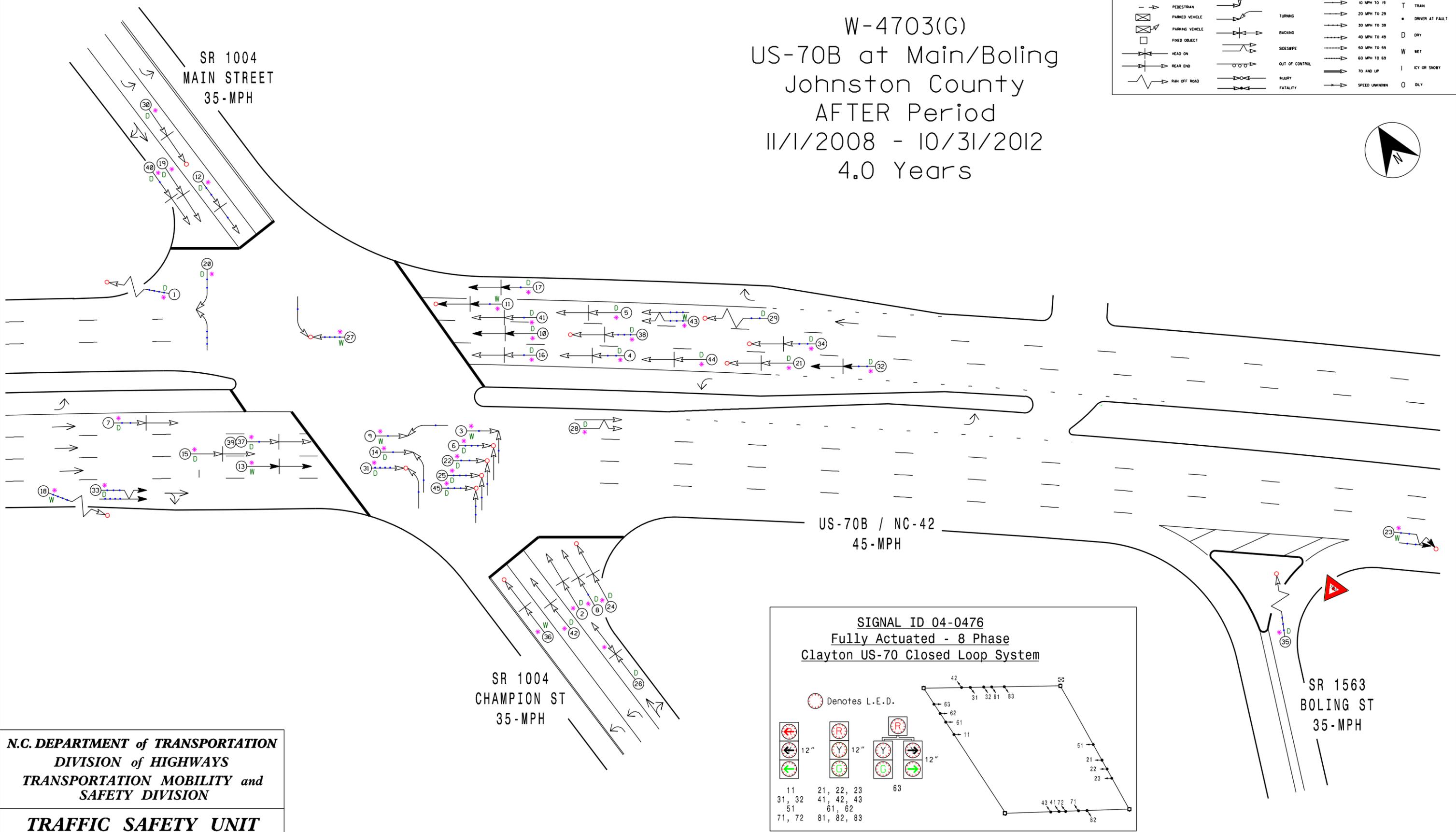
**TRAFFIC SAFETY UNIT**

Date: 12-18-2012      Prepared By: J. Schronce

W-4703(G)  
 US-70B at Main/Boling  
 Johnston County  
 AFTER Period  
 11/1/2008 - 10/31/2012  
 4.0 Years

**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
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		HURRY		50 MPH TO 59		I ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		T TO AND UP
	RAN OFF ROAD		SPEED UNKNOWN		70 MPH TO 79		O ONLY



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**TRAFFIC SAFETY UNIT**

Date: 12-19-2012

Prepared By: J. Schronce