

Spot Safety Project Evaluation

Spot Safety Project # 12-06-203

Spot Safety Project Evaluation of the Signal Installation I-40 Westbound Ramp at SR 1007 (W. First Street / Old US 70) Catawba County

Documents Prepared By:
Stantec Consulting Ltd.
for
Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Kellie L. Reep
Transportation Designer

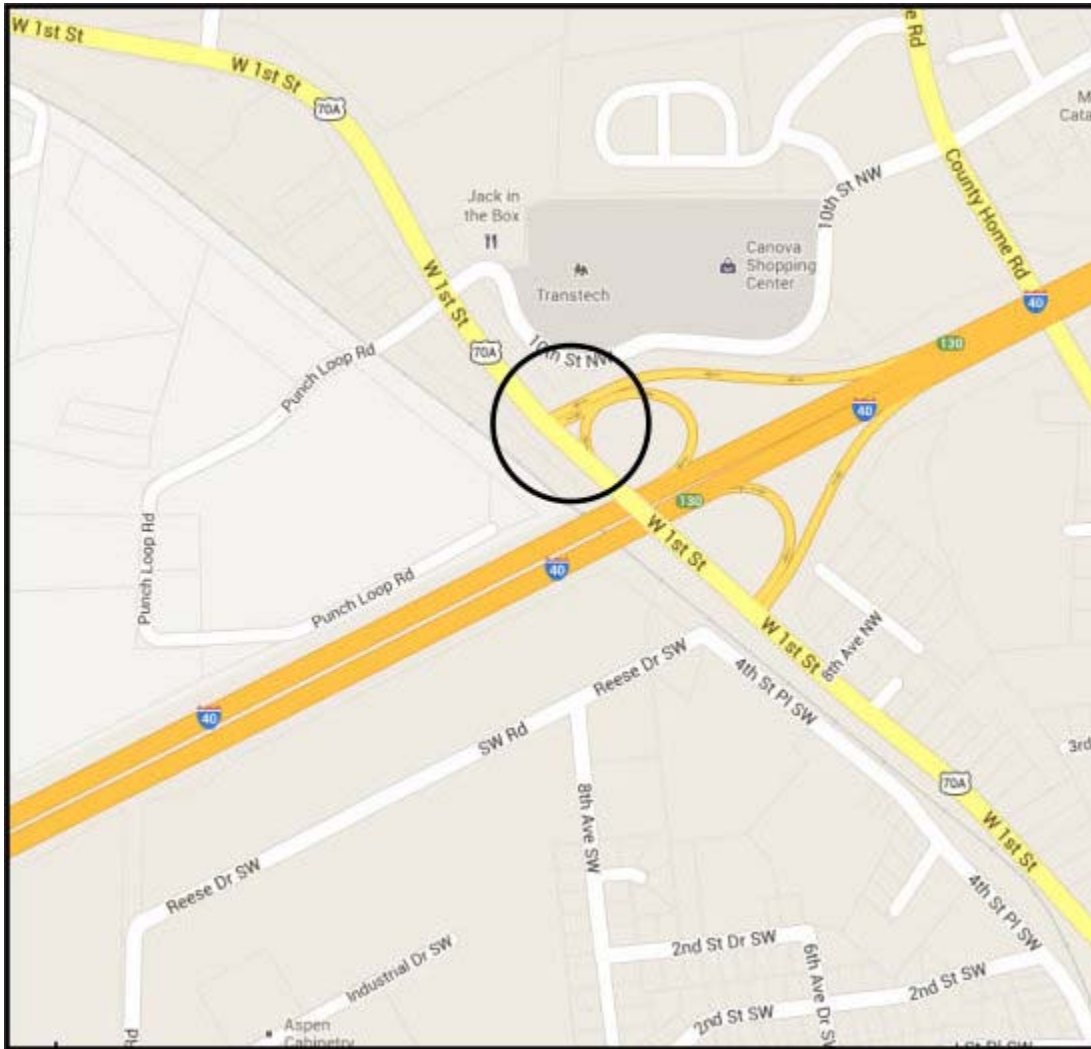
8-6-2013
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-06-203 located at the Intersection of I-40 Westbound Ramps at SR 1007 (W. First Street / Old US 70) in Catawba County.

The Sig ID is 12-1324 for this 3-Phase Fully Actuated Traffic Signal.





Aerial Provided from Google Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a signal.

I-40 is a 4-lane divided interstate. The westbound off-ramp has exclusive left- and right-turn lanes at the intersection. North of the interchange, SR 1007 (W. First Street / Old US 70) is a four-lane road with a center two-way left turn lane. South of the interchange, SR 1007 is a two-lane undivided roadway that leads into the downtown area of Conover. The road widens on the north side of the interchange to accommodate a southbound exclusive left-turn lane. The speed limit on SR 1007 is 45-mph. The speed limit on the I-40 off-ramp is not posted. The subject location is stop-controlled on the I-40 westbound off-ramp.

The original statement of problem was the presence of frontal impact collisions. The initial crash analysis was completed from February 1, 2000 to January 31, 2005 with thirty-four (34) reported crashes. The final completion date for the improvement at the subject intersection was on February 13, 2008 with a total cost of \$80,000.00.

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 were the months of January through March 2008. The before period consisted of reported crashes from November 1, 2002 through December 31, 2007 (5 years, 2 months); and the after period consisted of reported crashes from April 1, 2008 through May 31, 2013 (5 years, 2 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection for the I-40 WB ramps and SR 1007 approaches. *Please see attached location map and aerial map for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. Frontal Impact crashes include: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	65	14	- 78.5 %
Total Severity Index	3.28	2.59	- 21.0 %
Target Crashes	20	4	- 80.0 %
Target Crash Severity Index	5.07	4.70	- 7.3 %
Volume (2005, 2010)	20,700	19,000	- 8.2 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	3	2	- 33.3 %
Class C Injury Crashes	17	1	- 94.1 %
Property Damage Only	45	11	- 75.6 %

The naive before and after analysis at the treatment location resulted in a 78.5 percent decrease in Total Crashes, an 80 percent decrease in Target Frontal Impact Crashes, and a 7.3 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2010.

To further analyze the intersection crash patterns, the following chart shows different traffic movements and the change in crash totals through the study:

<u>Additional Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Left Turn, Different Roadway (Target)	11	1	- 90.9 %
Left Turn, Same Roadway (Target)	8	3	- 62.5 %
Angle (Target)	1	0	- 100.0 %
Northbound Approach Rear End Crashes	0	2	+ 200.0 %
Westbound Approach Rear End Crashes	37	7	- 81.1 %
Sideswipe	4	0	- 100.0 %

Results and Discussion

Referencing the *Collision Diagrams*, the target crashes experienced an 80 percent decrease in frontal impact collisions. The target crash severity index saw a decrease of 7.3 percent. Class B and C injury crashes decreased by 33.3 percent and 94.1 percent, respectively from the before to after period.

From the additional information chart above, the number of left turn, different roadway crashes decreased from eleven (11) to one (1). The left turn, same roadway crashes decreased from eight (8) to three (3) through the evaluation time frame.

Along the I-40 westbound off-ramp, the rear end crashes decreased from thirty-seven (37) to seven (7) throughout the evaluation period. In the before period, all but one (1) of the rear-end crashes occurred in the right-turn lane on the off-ramp. In the same location in the after period, there was only one (1) rear-end crash. The rear-end crashes on SR 1007 increased from one (1) to three (3). Two (2) of the three (3) rear-ends in the after period on SR 1007 were on the northbound approach leg; the other rear-end was in the left-turn lane on the southbound leg.

Please see the attached *Treatment Site Photos*. Photos are provided from Google Street View for all three approaches to the treatment intersection. 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.

Treatment Site Photos from Google Street View



Google Maps (October 2012) – Looking Southeast on SR 1007



Google Maps (October 2012) – Looking Northwest on SR 1007

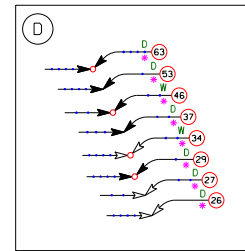
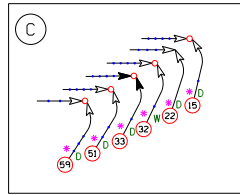
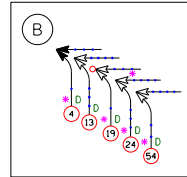


Google Maps (October 2012) – Looking West on I-40 Westbound Off-Ramp

SS# 12-06-203
 Catawba County
 BEFORE Period
 11/1/02 - 12/31/07



LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		ANIMAL
	PARKED VEHICLE		TURNING		10 MPH TO 19		PEDESTRIAN
	MOVABLE OBJECT		BACKING		20 MPH TO 29		BICYCLE
	HEAD ON		SIDESWIPE		30 MPH TO 39		TRAIN
	REAR END		INJURY		40 MPH TO 49		DRIVER AT FAULT
	RAN OFF ROAD		FATALITY		50 MPH TO 59		DRY
	DAYLIGHT CRASH		TO AND UP		60 MPH TO 69		WET
	NIGHT CRASH		SPEED UNKNOWN		ICY OR SNOWY		Other



ADT (Year)
 20,000 (2005)
 45 MPH

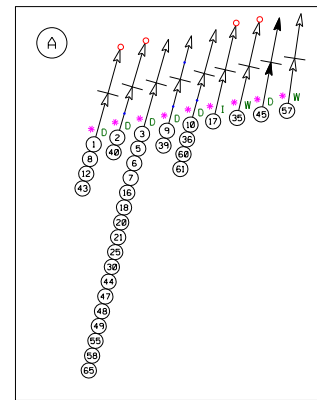
SR 1007 (W. First St. / Old US 70)

ADT (Year)
 16,000 (2005)
 45 MPH

I-40 WB On Ramp
 ADT (Year)
 2,600 (2005)
 Speed Limit Not Posted

I-40 WB Off Ramp
 ADT (Year)
 2,800 (2005)
 Speed Limit Not Posted

SR 1007 (W. First St. / Old US 70)



Frontal Impact
 Target Crashes

PREPARED FOR
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

Date: 8/7/2013

Prepared By: KLR



Stantec

Stantec Consulting Services Inc.
 801 Jones Franklin Road
 Suite 300
 Raleigh, NC 27606
 Tel. (919) 851-6866
 Fax. (919) 851-7024
 www.stantec.com
 License No. F-0572

SS# 12-06-203
 Catawba County
 AFTER Period
 4/1/08 - 5/31/13



LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		A ANIMAL
	PARKED VEHICLE		TURNING		10 MPH TO 19		P PEDESTRIAN
	MOVABLE OBJECT		BACKING		20 MPH TO 29		B BICYCLE
	HEAD ON		SIDESWIPE		30 MPH TO 39		T TRAIN
	REAR END		INJURY		40 MPH TO 49		D DRY
	RAN OFF ROAD		FATALITY		50 MPH TO 59		W WET
	DAYLIGHT CRASH		60 MPH TO 69		70 AND UP		I ICY OR SAIDY
	NIGHT CRASH		SPEED UNKNOWN		O Other		

ADT (Year)
 19,000 (2010)
 45 MPH

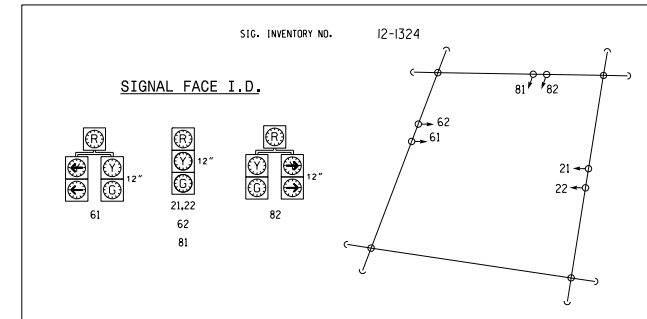
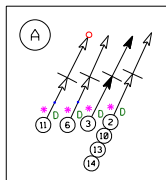
SR 1007 (W. First St. / Old US 70)

ADT (Year)
 14,000 (2010)
 45 MPH

I-40 WB On Ramp
 ADT (Year)
 2,400 (2010)
 Speed Limit Not Posted

I-40 WB Ramps
 ADT (Year)
 2,600 (2010)
 Speed Limit Not Posted

SR 1007 (W. First St. / Old US 70)



Frontal Impact
 Target Crashes

PREPARED FOR
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

Date: 8/7/2013

Prepared By: KLR



Stantec

Stantec Consulting Services Inc.
 801 Jones Franklin Road
 Suite 300
 Raleigh, NC 27606
 Tel. (919) 851-6866
 Fax. (919) 851-7024
 www.stantec.com
 License No. F-0572