Spot Safety Project Evaluation

Project Log # 200512210

Spot Safety Project # 11-97-202

Evaluation of the Installation of "Headlights Recommended" signs on US 421 From West of US 601 in Yadkin County to east of SR 2433 (Windy Gap Rd) in Wilkes County

Documents Prepared By:

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_____ 9/13/2006
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Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 11-97-202 – US 421 from west of US 601 in Yadkin County to east of SR 2433 (Windy Gap Rd) in Wilkes County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of "Headlights Recommended, Next XX* Miles" signs along US 421 from west of US 601 in Yadkin County to east of SR 2433 (Windy Gap Rd) in Wilkes County. US 421 was a 2-lane facility at the subject location, an approximately 20 mile segment. On both ends of this segment, US 421 was a 4-lane divided facility. The signs were placed at both ends of the segment and also near I-77. The signs were attached to Two-way Traffic warning signs to help convey the reason headlights were recommended. **XX=8, 11, or 20 miles*

US 421 is a major arterial route which carries a substantial number of tourist, recreational, commercial, and commuting traffic to western North Carolina. US 421 has long, gentle vertical curves which often causes the available passing sight distances to be deceiving to motorists. Long lines of traffic would develop on the 2-lane section and motorists would often make unsafe passing maneuvers. The "Headlights On" countermeasure was assumed to improve the visibility of oncoming vehicles and to enable passing motorists to detect oncoming vehicles sooner and provide more time to react.

This 2-lane segment of US 421 was eventually converted to a 4-lane segment starting in 2001 and the signs were taken down.

The initial crash analysis for this strip was completed from January 1, 1987 to September 1, 1996. According to the initial analysis, there were 961 Total Crashes, including 17 fatal crashes. There were 18 Head-On Crashes, which involved 6 of the fatal crashes.

Naive Before and After Analysis

After reviewing the 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 July 1, 1997 through September 30, 1997. The before period consisted of reported crashes from April 1, 1994 through June 30, 1997 (3 Years, 3 Months) and the after period consisted of reported crashes from October 1, 1997 through December 31, 2000 (3 Years, 3 Months). The ending date for this analysis was determined by the time period in which the widening of the segment to a four-lane divided facility began.

The treatment data consisted of all crashes on the 20.41-mile strip of US 421 from west of US 601 in Yadkin County to east of SR 2433 (Windy Gap Rd) in Wilkes County. A 0 feet Y-line was used in the analysis and only mainline crashes were included. Please see attached *Location Map* for further detail.

The following data Table 1 depicts the Naive Before and After Analysis for the Total Crashes, Potential Target Crashes, and Actual Target Crashes at the treatment location. Tables 2 and 3 provide an in-depth examination of the Naïve Before and After Analysis for the Potential Target Crashes and Actual Target Crashes.

Potential Target Crashes include all lane departure crash types that could have potentially involved a vehicle crossing the centerline. Please note that Potential Target Crashes include the following crash types: Ran Off Road - Right, Ran Off Road - Left, Ran Off Road - Straight, Overturn/Rollover, Fixed Object, Head On, Sideswipe - Same Direction, Sideswipe - Opposite Direction, and Parked Motor Vehicle.

Actual Target Crashes include all crashes where at least one vehicle actually crossed the centerline. The crash reports for all Potential Target Crashes were reviewed to determine those belonging to the Actual Target Crashes. All cross-centerline crashes (not only Head On and Sideswipe crashes) are included because of the potential for approaching vehicles to have affected or been affected by the movements of the vehicle involved in the crash. For example, an out of control vehicle might have crossed the centerline and ran off the road to the left. An opposing vehicle might have seen its headlights and slowed down, therefore not hitting the first vehicle. If the countermeasure was successful, Ran-Off-Road Crashes might have increased, but Sideswipe-Opposite Direction or Head-On Crashes might have decreased.

Table 1. Treatment Information	Before Period	After Period	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	378	425	12.4
Total Severity Index	9.83	11.13	13.2
Potential Total Target Crashes	133	150	12.8
Potential Target Severity Index	10.57	14.07	33.1
Actual Target Crashes	59	69	16.9
Actual Target Severity Index	14.04	20.70	47.4
Volume	11,300	13,400	18.6

Table 2. Potential Target Crash Information	Before Period	After Period	Percent Reduction (-)/ Percent Increase (+)
Target Crashes- Injuries			
Fatal Injury Crashes	1	7	600
Non-Fatal Injury Crashes	60	73	21.7
Total Injury Crashes	61	80	31.1
Target Crashes-Contributing Factors			
Night Crashes	48	46	-4.2
Wet Crashes	43	33	-23.3
Alcohol/ Drug Crashes	6	10	66.7
Target Crashes- Crash Types			
Ran Off Road	109	92	-15.6
Fixed Object	1	12	1100.0
Sideswipe, Same Direction	13	18	38.5
Sideswipe, Opposite Direction	1	14	1300.0
Head On	5	9	80.0
Overturn / Rollover	2	4	100.0
Parked Motor Vehicle	2	1	-50.0

Table 3. Actual Target Crash Information	Before Period	After Period	Percent Reduction (-)/ Percent Increase (+)
Target Crashes- Injuries			
Fatal Injury Crashes	1	6	500.0
Non-Fatal Injury Crashes	29	39	34.5
Total Injury Crashes	30	45	50
Target Crashes-Contributing Factors			
Night Crashes	25	19	-24
Wet Crashes	20	18	-10
Alcohol/ Drug Crashes	5	8	60
Target Crashes- Crash Types			
Ran Off Road	46	32	-30.4
Fixed Object	0	5	N/A
Sideswipe, Same Direction	7	8	14.3
Sideswipe, Opposite Direction	1	13	1200
Head On	5	9	80
Overturn / Rollover	0	2	N/A

The naive before and after analysis at the treatment location resulted in a 12 percent increase in Total Crashes, a 13 percent increase in Potential Target Crashes, and a 17 percent increase in Actual Target Crashes. There was also a 13 percent increase in the Total Severity Index, a 33 percent increase in the Potential Target Severity Index, and a 47 percent increase in the Actual Target Severity Index. The treatment location experienced a 19 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1995 and the after period ADT year was 1999.

Results and Discussion

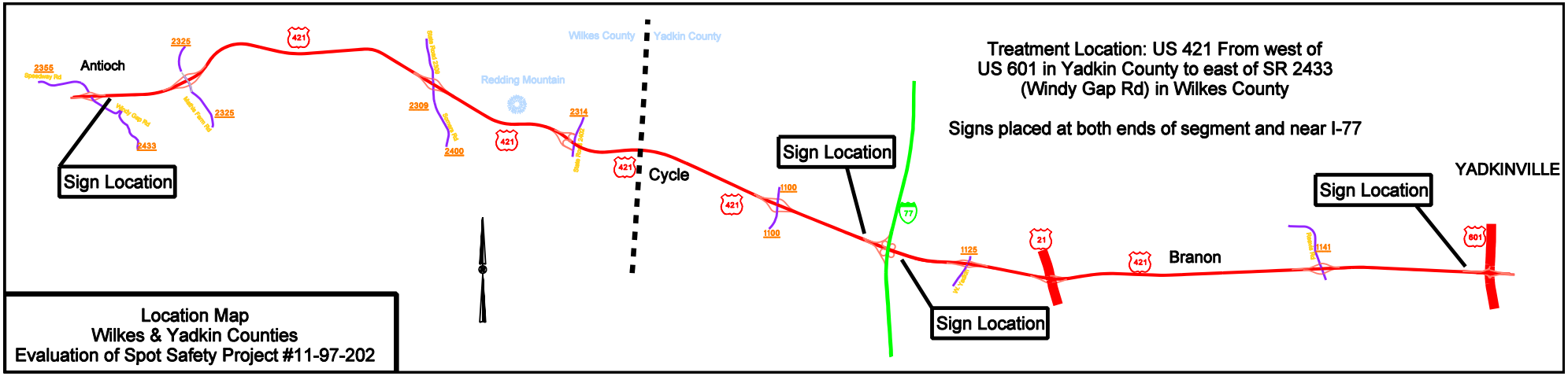
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 12 percent increase in Total Crashes, a 13 percent increase in Potential Target Crashes, and a 17 percent increase in Actual Target Crashes. The Total Severity Index increased by 13 percent, the Potential Target Severity Index increased by 33 percent, and the Actual Target Severity Index increased by 47 percent. The summary results above demonstrate that the treatment location appears to have had an increase in the number of Total Crashes and both Potential and Actual Target Crashes from the before to the after period. The Severity Index of Total, Potential Target, and Actual Target Crashes also appears to have increased from the before to the after period.

Analysis of the Actual Target Crashes reveals the following. Actual Target Crashes of all types except for Ran-Off-Road increased from the before to the after period. Sideswipe - Opposite Direction and Head-On Crashes, two of the key target crashes, increased significantly (1200% and 80%, respectively). It is also interesting that while the signs are meant to influence day light crashes, day time crashes actually increased (Night Actual Target Crashes decreased 24%, although Actual Target Crashes increased 17%). In addition, both Fatal and Non-Fatal Injury Crashes

increased from the before to the after period. Fatal Crashes increased from 1 to 6, while Non-Fatal Injury Crashes increased from 29 to 39.

From this data, it appears that the signs did not help reduce the crash problem along the treatment segment, although this data cannot determine why. There is no way to determine if the signs actually persuaded any significant number of drivers to actually use their headlights along this strip of roadway.

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.


Antioch
2355
2325
421
2325
2433
Sign Location
2309
2400
Redding Mountain
2314
421
Wilkes County
Yadkin County
421
Cycle
Sign Location
1100
1100
421
77
1126
21
Sign Location
421
Branon
1141
Sign Location
601
YADKINVILLE
Treatment Location: US 421 From west of
US 601 in Yadkin County to east of SR 2433
(Windy Gap Rd) in Wilkes County
Signs placed at both ends of segment and near I-77
Location Map
Wilkes & Yadkin Counties
Evaluation of Spot Safety Project #11-97-202