

EVALUATION OF HIGH CRASH LOCATIONS (DARK CRITERIA) STUDY



LOCATION #3:
US 13 (Dupont Parkway)
MILEPOST 5.30 to 7.49
November 2012



Prepared for:
**Delaware Department of
Transportation**



By:
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EXECUTIVE SUMMARY

The purpose of this study was to evaluate locations with the highest ratios of crashes occurring during dark conditions throughout the state of Delaware. The study included reviewing crash history and existing conditions of the locations, identifying specific sites where crashes are occurring and providing recommendations to improve conditions.

The Hazard Elimination Program (HEP) site selection process was used to determine ten (10) locations statewide with a dark crashes Critical Ratio greater than one and ten (10) or more crashes occurring in the three year study period within a one-mile roadway segment. US 13 (Dupont Parkway), from Milepost 5.30 to 7.49, was determined to be one of the ten locations with the highest dark crashes Critical Ratios statewide.

Police crash reports were analyzed to identify high crash sites along US 13 from Milepost 5.30 to 7.49. Crash clusters were identified at the following four (4) locations:

- Site #1: Tybout's Split, SR 1 @ Ramp to SR 1 Northbound (M.P. 5.45)
- Site #2: US 13 (Dupont Parkway) @ SR 71 (Red Lion Road) Intersection (M.P. 6.05)
- Site #3: US 13 (Dupont Parkway) @ Bear Road/Hamburg Road Intersection (M.P. 6.31)
- Site #4: US 13 (Dupont Parkway) @ Federal School Lane Intersection (M.P. 7.13)

Existing roadway lighting is present at three (3) of these locations, Tybout's Split and the intersection of US 13 and SR 71 both have existing roadway lighting. The intersection of US 13 and Bear Road / Hamburg Road has partial intersection lighting. The intersection of US 13 and Federal School Lane has no existing lighting at the intersection, but there is existing lighting on the US 13 southbound approach to the intersection.

Because the intersection of US 13 and Bear Road / Hamburg Road features luminaires that appear to only cover part of the intersection, photometric calculations are recommended to evaluate the existing lighting. At a minimum, additional luminaires on the northeast and northwest corner of the intersection would improve lighting levels. Also, the lighting levels may benefit from increasing the wattage of the existing 250 Watt luminaires to 400 Watts.

An additional W3-3 sign is recommended to be installed on the southbound approach to the intersection of US 13 and Bear Road / Hamburg Road on the left side of the road at the location of the existing W3-3 on the right side of the road.

The intersection of US 13 and Federal School Lane does not have existing lighting, and was evaluated for potential nighttime safety improvements. No crash patterns that would benefit from lighting were identified. Therefore roadway lighting was not recommended for this intersection.

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1. INTRODUCTION

The purpose of this study was to evaluate locations with the highest ratios of crashes occurring during dark conditions throughout the state of Delaware. The study included reviewing crash history and existing conditions of the locations, identifying specific sites where crashes are occurring and providing recommendations to improve conditions.

The study included three parts:

Part 1: Location Selection – The Hazard Elimination Program (HEP) site selection process was used to determine ten (10) locations statewide with a dark crashes Critical Ratio greater than one and ten (10) or more crashes occurring in the three year study period within a one-mile roadway segment. Results from the location selection process were reviewed in coordination with DelDOT. Corridors that were already part of an ongoing HSIP or HEP project were not included in this study. The Critical Ratio methodology was used in the location selection process. The list of statewide 1.0 mile corridors ranked by Critical Ratio is included in Appendix D.

Part 2: Evaluation – After the list of the top ten locations was approved by DelDOT, initial review was performed for each selected location. The evaluation included field visits to the sites; collecting information on existing roadway and traffic conditions; crash analysis; preliminary lighting evaluation; and this report. The report includes existing lighting analysis; concept lighting improvement alternatives; other signing, striping and signal recommendations in accordance with the Delaware Strategic Highway Safety Plan (SHSP), particularly related to dark crashes; potential design/implementation issues, and identification of the need for more detailed studies (Phase II studies).

Part 3: Coordination – Coordination of implementation with ongoing DelDOT projects (HEP, Pavement & Rehabilitation, PD, etc.). When possible, DelDOT-approved recommendations are coordinated for inclusion into the construction of ongoing projects.

The location selection process resulted in a list of ten locations, including US 13 (Dupont Parkway)/SR 1 from milepost 5.30 to 7.49.

US 13 (Dupont Parkway)/SR 1

The evaluation and recommendations for US 13 (Dupont Parkway)/SR 1, from milepost 5.30 to 7.49, are included in this report.

The study location is in Bear, Delaware. US 13/SR 1 is a six-lane, divided freeway/expressway south of the ramp to northbound SR 1. North of the ramp, US 13 is a four-lane, divided principal arterial roadway.

In 2010, US 13/SR 1 experienced an ADT of 32,974 vehicles south of Red Lion Road, and 41,815 vehicles north of Bear Road/Hamburg Road.

Shoulders are present on both sides of the road in each direction throughout the project area. A study area map is provided in Figure 1.

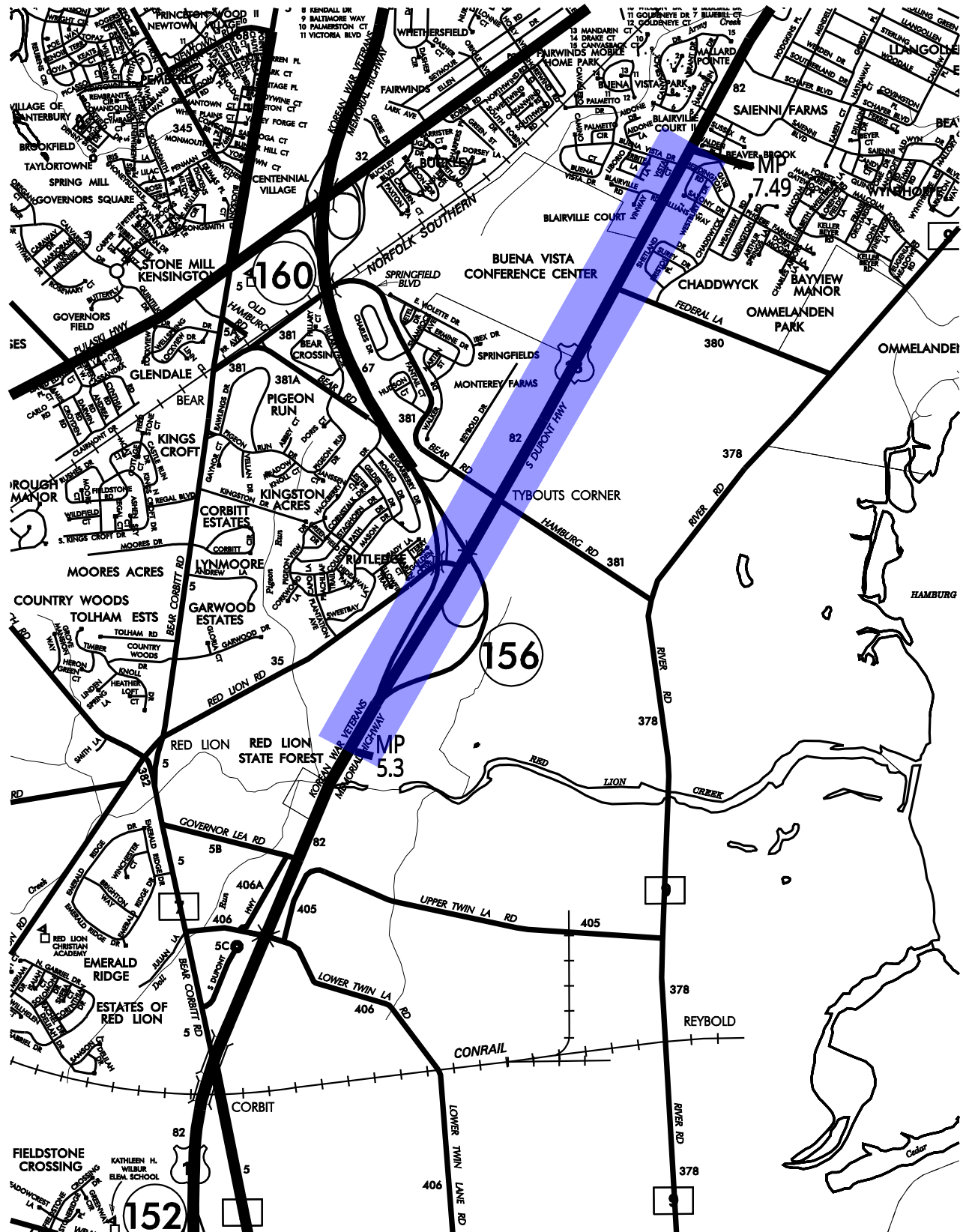


FIGURE 1 - STUDY AREA MAP
 US 13, MP 5.30-7.49
 New Castle, Delaware
 New Castle County



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2. CRASH DATA SUMMARY

This evaluation was based on crash data during the three year period from May 16, 2008 to May 16, 2011.

A total of 173 crashes occurred on US 13 (Dupont Parkway) from milepost 5.30 to 7.49 during the evaluation period.

Fifty (50) crashes resulted in personal injuries, not including fatality crashes. Two (2) crashes resulted in fatalities. Both of the fatal crashes occurred during daylight.

Rear end collisions were the most predominant type of impact, with 86 of the 173 crashes (50%).

Of the 173 crashes, 116 of the crashes occurred during daylight (67%). Forty-eight (48) of the crashes occurred during dark conditions (28%). Twenty-five (25) of the dark crashes occurred in dark-not lighted conditions (14%). Twenty-three (23) of the dark crashes occurred in dark-lighted conditions (13%). Nine (9) of the crashes occurred in dawn, dusk, and unknown conditions (5%).

The highest number of crashes (52) at an individual site occurred at the intersection of US 13 and Bear Road / Hamburg Road.

Crashes were grouped together into sites based on their location along US 13.

Site #1: Tybout's Split, SR 1 @ Ramp to SR 1 Northbound (M.P. 5.45)

There were 18 total crashes at the site during the evaluation period. Five (5) of the 18 crashes (28%) occurred during dark hours. This site has existing roadway lighting.

This site was not selected for evaluation based on the limited crash history during dark hours and presence of existing roadway lighting.

Site #2: US 13 (Dupont Parkway) @ SR 71 (Red Lion Road) Intersection (M.P. 6.05)

There were 48 total crashes at the site during the evaluation period. Eleven (11) of the 48 crashes (23%) occurred during dark hours. This site has existing roadway lighting.

This site was not selected for evaluation based on the limited crash history during dark hours and presence of existing roadway lighting shown in Photo 1.



Photo 1: US 13 @ SR 71 (Red Lion Road) Intersection, facing south

Site #3: US 13 (Dupont Parkway) @ Bear Road/Hamburg Road Intersection (M.P. 6.31)

There were 52 total crashes at the site during the evaluation period. Eleven (11) of the 52 crashes (21%) occurred during dark hours. This site has partial existing roadway lighting.

This site was selected for evaluation because of the crash history and because the intersection is only partially lit.

Site #4: US 13 (Dupont Parkway) @ Federal School Lane Intersection (M.P. 7.13)

There were 23 total crashes at the site during the evaluation period. Nine (9) of the 23 crashes (39%) occurred during dark hours. There is no roadway lighting at the intersection, only on the southbound approach.

This site was selected for evaluation based on the crash history and the combination of existing roadway lighting on the southbound approach to the intersection and a lack of lighting at the intersection.

3. ROADWAY AND SITE CHARACTERISTICS

Site #3: US 13 (Dupont Parkway) @ Bear Road/Hamburg Road Intersection (M.P. 6.31)

US 13 and Bear Road/Hamburg Road meet at a signalized intersection at milepost 6.31 of US 13.

US 13 northbound has two through lanes, a left turn lane and a right turn lane. Painted channelized islands are present for the northbound left and right turn lanes. US 13 southbound has two through lanes, a left turn lane and a right turn lane. Painted channelized islands are present for the southbound left and right turn lanes. Hamburg Road westbound has a left turn lane and a shared through/right turn lane. Bear Road eastbound has a left turn lane, through lane and right turn lane. The eastbound right turn lane features a painted channelizing island. An aerial showing the intersection layout is shown in Photo 2.



Photo 2: US 13 @ Bear Road / Hamburg Road Intersection

There are no pedestrian crosswalks present at the intersection. At the intersection, the posted speed limit for US 13 northbound and US 13 southbound is 55 miles per hour, and the posted speed limit for eastbound Bear Road is 45 miles per hour. There is no posted speed limit for westbound Hamburg Road approaching the intersection.

Existing Lighting

One (1) 250 Watt, HPS luminaire is present on both the southeast and southwest corners of the intersection. However, there are no luminaires on the northeast and northwest corners.



Photo 3: Facing north on US 13 just south of Bear Road / Hamburg Road

Site #4: US 13 (Dupont Parkway) @ Federal School Lane Intersection (M.P. 7.13)

US 13 and Federal School Lane meet at an unsignalized T-intersection at milepost 7.13 of US 13.



Photo 4: Facing north on US 13 just south of Federal School Lane

US 13 northbound has two through lanes, a left turn lane (for U-turns) and a right turn lane. US 13 southbound has two through lanes, and a left turn lane. Federal School Lane westbound is stop-controlled. Federal School Lane has one left turn lane and one right turn lane. There is a painted channelized right-turn island on the westbound approach. An opening in the US 13 median allows for vehicle turning movements to and from US 13. An aerial showing the intersection layout is shown in Photo 5.



Photo 5: US 13 @ Federal School Road Intersection

There are no pedestrian crosswalks or sidewalks present at the intersection. At the intersection, the posted speed limit for US 13 northbound and US 13 southbound is 55 miles per hour, and the posted speed limit for eastbound Federal School Road is 35 miles per hour.



Photo 6: Facing east towards the median opening, from the west side of US 13.

Existing Lighting

There are three (3) existing 250 Watt, HPS luminaires on utility poles on the west side of US 13, just north of the intersection, along the southbound approach to the intersection.



Photo 7: Facing north towards luminaires on southbound US 13.

4. LIGHTING WARRANT EVALUATION

The DelDOT Lighting Guidelines contain the conditions for determining if lighting is warranted at a given site. A warrant analysis is included below for each site that was selected for evaluation.

Site #3: US 13 (Dupont Parkway) @ Bear Road/Hamburg Road Intersection (M.P. 6.31)

Because the intersection has existing lighting for part of the intersection, the crash history is skewed compared to an unlit intersection. Therefore, the crash history cannot be relied upon in this circumstance for use in lighting warrant analysis. For informational purposes only, the crash patterns and percentage of nighttime accidents are evaluated below.

Crash Patterns

The Crash Data Summary and Evaluation showed that there were 52 total crashes near this intersection during the three year evaluation period. Eleven (11) of these crashes occurred during dark conditions.

The manner of impact of the eleven (11) dark crashes was as follows:

- 6 Rear end
- 2 Angle
- 1 Sideswipe
- 1 Run off the road
- 1 Police chase

An examination of the police crash reports showed a predominant number of rear end crashes. Of the six (6) rear end crashes, five (5) occurred on the southbound approach to the intersection.

Percentage of Nighttime Crashes

Twenty-one percent (11 out of 52) of the crashes at the site occurred during dark conditions.

Lighting Warrant Results

Because the intersection has existing lighting for part of the intersection, the crash history is skewed compared to an unlit intersection. Therefore, the crash history cannot be relied upon in this circumstance for use in lighting warrant analysis.

Site #4: US 13 (Dupont Parkway) @ Federal School Lane Intersection (M.P. 7.13)

Section 2.3, *Lighting Warrants*, of the DelDOT Lighting Guidelines states that lighting *may* be installed at “locations where crash patterns indicate that lighting may reduce crashes and where the percentage of nighttime accidents is 35 percent or greater.”

Crash Patterns

The Crash Data Summary and Evaluation showed that there were 23 total crashes near this intersection during the three year evaluation period. Nine (9) of these crashes occurred during dark conditions.

The manner of impact of the nine (9) dark crashes was as follows:

- 2 Rear end
- 2 Sideswipe
- 2 Deer
- 2 Run off the road
- 1 Angle

An examination of the police crash reports for the rear end crashes showed that one crash was the result of a driver falling asleep. The other rear end crash was the result of a driver who was travelling very fast and struck a tractor-trailer in the rear, then fled on foot into the woods.

One of the sideswipe crashes occurred on northbound US 13 north of the intersection, and the other sideswipe crash occurred on southbound US 13 south of the intersection.

The angle crash involved a driver with a learner's permit who was violating his permit conditional by driving without supervision.

No crash patterns that would benefit from lighting were identified.

Percentage of Nighttime Crashes

Thirty-nine percent (9 out of 23) of the crashes at the site occurred during dark conditions. The crash history at this intersection meets the conditions for a location where lighting "may be installed," as per Section 2.3 of the DelDOT Lighting Guidelines.

Lighting Warrant Results

This site has greater than 35% of crashes occurring during dark conditions, therefore meeting part of the lighting warrant for a site where roadway lighting *may* be installed. However, no crash patterns that would benefit from lighting were identified.

5. RECOMMENDATIONS

Recommendations are included below, and recommended improvements are summarized in the following table.

Site #3: US 13 (Dupont Parkway) @ Bear Road/Hamburg Road Intersection (M.P. 6.31)

Roadway Lighting

Because the intersection features luminaires that appear to only cover part of the intersection, photometric calculations would be beneficial to evaluate the existing lighting.

The intersection should be evaluated for simple or complex intersection lighting as per Section 4.3.2 of the DelDOT Lighting Design Guidelines. The speed of vehicles on US 13 (55 mile per hour speed limit) and the proximity to the access-controlled SR 1 (second intersection from the SR 1 / US 13 split), indicate that complex intersection lighting may be more appropriate. Complex intersection lighting typically includes two (2) lights on the approaches to the intersection, and one (1) luminaire after the intersection. Simple intersection lighting is limited to the area enclosed by the stop bars and crosswalks at the intersection, and does not typically include approach lighting.

At a minimum, additional luminaires on the northeast and northwest corner of the intersection would improve lighting levels. Also, the lighting levels may benefit from increasing the wattage of the existing 250 Watt luminaires to 400 Watts.

Other Improvements

The most predominant dark crashes at the intersection were rear end crashes, most of which occurred on the southbound approach. There are two existing Signal Ahead (W3-3) signs on the northbound approach to the intersection, one (1) on both the right and left side of the roadway. There is one (1) existing Signal Ahead (W3-3) sign on the right side of the southbound approach to the intersection. Section 2A.16 of the Delaware Manual on Uniform Traffic Control Devices (MUTCD) provides the following option: "Under some circumstances, such as on curves to the right, signs may be placed on median islands or on the left-hand side of the road. A supplementary sign located on the left-hand side of the roadway may be used on a multi-lane road where traffic in a lane to the right might obstruct the view to the right." It is recommended that an additional W3-3 sign be installed north of the intersection on the left side at the road at the location of the existing W3-3 on the right side of the road.

Site #4: US 13 (Dupont Parkway) @ Federal School Lane Intersection (M.P. 7.13)

Roadway Lighting

The crash history at US 13 @ Federal School Lane met DelDOT's conditions for an intersection where lighting may be warranted. However, no crash patterns that would benefit from lighting were identified. Therefore roadway lighting is not recommended.

Recommended Improvements

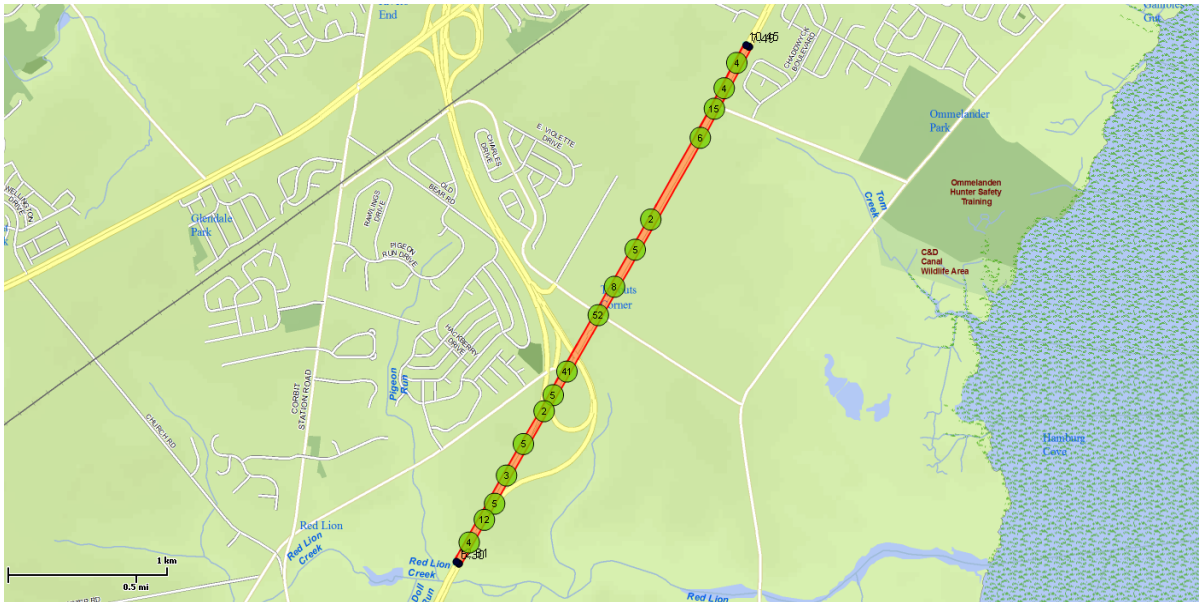
Site	Recommended Improvement
#3. US 13 @ Bear Rd / Hamburg Rd Intersection (MP 6.31)	Evaluate for simple or complex intersection lighting as per Section 4.3.2 of the DelDOT Lighting Design Guidelines. At a minimum, additional luminaires on the northeast and northwest corner of the intersection would improve lighting levels. Also, the lighting levels may benefit from increasing the wattage of the existing 250 Watt luminaires to 400 Watts.
	Install an additional W3-3 sign on the southbound approach of the intersection on the left side of the road at the location of the existing W3-3 on the right side of the road.

APPENDIX A: Crash Data Summary

Delaware Crash Analysis Reporting System (CARS)

Crash Study Time Period: Study Period from 05-16-2008 to 05-16-2011
Query Type: dualHwyBuffer
Description: N82 US 13 South Dupont Highway
MP 5.30-7.49

Study Requested By: LD
Study Generated By: tdtsswn
Number of Crashes: 173
Includes Non-Reportable Crashes: N
Study Code:



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State of Delaware Crash Study Summary

Study Period from 05-16-2008 to 05-16-2011

Summary		Classification			Manner Of Impact		
	# of Crashes		# of Crashes	% of Total Crashes		# of Crashes	% of Total Crashes
Total Crashes	173	Non-Reportable	0	0.00%	Front to rear	86	49.71%
Fatal Crashes	2				Front to front	4	2.31%
Total Alcohol-Related Crashes	8		121	69.94%	Angle	24	13.87%
Total Non Alcohol-Related Crashes	162		50	28.90%	Sideswipe, same direction	27	15.61%
Total Fatalities	2		2	1.16%	Sideswipe, opposite direction	1	0.58%
Total Pedestrian Fatalities	0	Total			173		
Total Pedestrian Injuries	0				Rear to side	0	0.00%
Total Pedestrian Crashes	0				Rear to rear	1	0.58%
Total Motorcycle Crashes	4				Other	10	5.78%
Total Pedalcyclist Crashes	0				Unknown	3	1.73%
					Not a collision between two vehicles	17	9.83%
					Total	173	

Alcohol Related Crashes by Classification					
	Non-reportable	Reportable	Personal Injury	Fatality	Total
Alcohol Related	0	5	2	1	8
Non-Alcohol Related	0	114	47	1	162
Total	0	119	49	2	170

Manner of Impact By Classification					
	Non-Reportable	Reportable	Personal Injury	Fatality	Total
Front to rear	0	57	29	0	86
Front to front	0	2	2	0	4
Angle	0	14	9	1	24
Sideswipe, same direction	0	26	1	0	27
Sideswipe, opposite direction	0	1	0	0	1
Rear to side	0	0	0	0	0
Rear to rear	0	1	0	0	1
Other	0	6	4	0	10
Unknown	0	3	0	0	3
Not a collision between two vehicles	0	11	5	1	17
Total	0	121	50	2	173

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Day Of Week		
	# of Crashes	% of Total Crashes
Sunday	19	10.98%
Monday	31	17.92%
Tuesday	22	12.72%
Wednesday	31	17.92%
Thursday	25	14.45%
Friday	21	12.14%
Saturday	24	13.87%
Total	173	

Time Of Day (AM)		
	# of Crashes	% of Total Crashes
00:00 - 00:59	1	0.58%
01:00 - 01:59	0	0.00%
02:00 - 02:59	3	1.73%
03:00 - 03:59	4	2.31%
04:00 - 04:59	3	1.73%
05:00 - 05:59	3	1.73%
06:00 - 06:59	12	6.94%
07:00 - 07:59	12	6.94%
08:00 - 08:59	6	3.47%
09:00 - 09:59	3	1.73%
10:00 - 10:59	5	2.89%
11:00 - 11:59	15	8.67%
Total	67	

Time Of Day (PM)		
	# of Crashes	% of Total Crashes
12:00 - 12:59	6	3.47%
13:00 - 13:59	11	6.36%
14:00 - 14:59	10	5.78%
15:00 - 15:59	7	4.05%
16:00 - 16:59	18	10.40%
17:00 - 17:59	18	10.40%
18:00 - 18:59	12	6.94%
19:00 - 19:59	3	1.73%
20:00 - 20:59	4	2.31%
21:00 - 21:59	6	3.47%
22:00 - 22:59	3	1.73%
23:00 - 23:59	8	4.62%
Total	106	
Unknown Time	0	

Surface Conditions		
	# of Crashes	% of Total Crashes
Dry	144	83.24%
Wet	22	12.72%
Snow	4	2.31%
Ice/Frost	0	0.00%
Sand	0	0.00%
Water (standing,mo'	0	0.00%
Slush	0	0.00%
Oil	0	0.00%
Mud, Dirt, Gravel	1	0.58%
Other	0	0.00%
Unknown	2	1.16%
Total	173	

Lighting Conditions		
	# of Crashes	% of Total Crashes
Daylight	116	67.05%
Dawn	4	2.31%
Dusk	3	1.73%
Dark-Lighted	23	13.29%
Dark-Not Lighted	25	14.45%
Dark-Unknown Lighting	0	0.00%
Other	0	0.00%
Unknown	2	1.16%
Total	173	

Weather Conditions		
	# of Crashes	% of Total Crashes
Clear	130	75.14%
Cloudy	20	11.56%
Fog, Smog, Smoke	0	0.00%
Rain	18	10.40%
Sleet, Hail (freezing rain or drizzle)	0	0.00%
Snow	1	0.58%
Blowing Snow	2	1.16%
Severe Crosswinds	0	0.00%
Blowing Sand, Soil, Dirt	0	0.00%
Other	0	0.00%
Unknown	2	1.16%
Total	173	

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First Harmful Event		
	# of Crashes	% of Total Crashes
Overturn/Rollover, Non-Collision	2	1.16%
Fire/Explosion, Non-Collision	1	0.58%
Immersion, Non-Collision	0	0.00%
Jackknife, Non-Collision	0	0.00%
Cargo/Equipment Loss or Shift, Non-Collision	0	0.00%
Fell/Jumped From Motor Vehicle, Non-Collision	0	0.00%
Thrown or Falling Object, Non-Collision	0	0.00%
Other Non-Collision, Non-Collision	0	0.00%
Pedestrian, Collision With Person, Motor Vehicle, or Non-Fixed Object	0	0.00%
Pedalcycle, Collision With Person, Motor Vehicle, or Non-Fixed Object	1	0.58%
Railway Vehicle (train, engine), Collision With Person, Motor Vehicle, or Non-Fixed Object	0	0.00%
Animal, Collision With Person, Motor Vehicle, or Non-Fixed Object	6	3.47%
Motor Vehicle in Transport, Collision With Person, Motor Vehicle, or Non-Fixed Object	136	78.61%
Legally Parked Motor Vehicle, Collision With Person, Motor Vehicle, or Non-Fixed Object	1	0.58%
Struck by Falling, Shifting Cargo or Anything Set in Motion by Motor Vehicle, Collision With Person, Motor Vehicle, or Non-Fixed Object	0	0.00%
Work Zone / Maintenance Equipment, Collision With Person, Motor Vehicle, or Non-Fixed Object	1	0.58%
Other Non-Fixed Object, Collision With Person, Motor Vehicle, or Non-Fixed Object	0	0.00%
Impact Attenuator/Crash Cushion, Collision With Fixed Object	0	0.00%
Bridge Overhead Structure, Collision With Fixed Object	0	0.00%
Bridge Pier or Support, Collision With Fixed Object	0	0.00%
Bridge Rail, Collision With Fixed Object	0	0.00%
Cable Barrier, Collision With Fixed Object	0	0.00%
Culvert, Collision With Fixed Object	0	0.00%
Curb, Collision With Fixed Object	0	0.00%
Ditch, Collision With Fixed Object	1	0.58%
Embankment, Collision With Fixed Object	6	3.47%

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Guardrail Face, Collision With Fixed Object	3	1.73%
Guardrail End, Collision With Fixed Object	0	0.00%
Concrete Traffic Barrier, Collision With Fixed Object	2	1.16%
Other Traffic Barrier, Collision With Fixed Object	0	0.00%
Tree (standing), Collision With Fixed Object	1	0.58%
Utility Pole, Collision With Fixed Object	2	1.16%
Light Support, Collision With Fixed Object	1	0.58%
Traffic Sign Support, Collision With Fixed Object	1	0.58%
Overhead Sign Support, Collision With Fixed Object	0	0.00%
Traffic Signal Support, Collision With Fixed Object	0	0.00%
Fence, Collision With Fixed Object	1	0.58%
Mailbox, Collision With Fixed Object	0	0.00%
Other Post, Pole or Support, Collision With Fixed Object	2	1.16%
Other Fixed Object (wall, building, tunnel, etc.), Collision With Fixed Object	2	1.16%
Illegally Parked Motor Vehicle, Collision with person, vehicle, or object not fixed	0	0.00%
Stopped Motor Vehicle, Collision with person, vehicle, or object not fixed	0	0.00%
Unknown, Collision With Fixed Object	3	1.73%
Total	173	

Primary Contributing Circumstance		
	# of Crashes	% of Total Crashes
Speeding	2	1.16%
Failed to yield right of way	3	1.73%
Passed Stop Sign	0	0.00%
Disregard Traffic Signal	3	1.73%
Wrong side or wrong way	0	0.00%
Improper passing	0	0.00%
Improper lane change	4	2.31%
Following too close	10	5.78%
Made improper turn	3	1.73%
Driving under the influence	3	1.73%
Driver inattention, distraction, or fatigue	18	10.40%
Driving in a careless or reckless manner	9	5.20%
Driving in an aggressive manner	0	0.00%
Improper backing	0	0.00%
Other improper driving	3	1.73%
Mechanical defects	1	0.58%
Animal in Roadway - Deer	2	1.16%
Animal in Roadway - Other Animal	0	0.00%
Other environmental circumstances - weather, glare	2	1.16%
Roadway circumstances - debris, holes, work zone	0	0.00%
Other	7	4.05%
Unknown	2	1.16%
Total	72	

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Driver Contributing Circumstance		
	# of Drivers	% of Total Drivers
No Contributing Action		2.78%
Failed to yield right of way		4.17%
Ran Red Light		0.00%
Ran Stop Sign		4.17%
Disregard other traffic sign		0.00%
Disregard other road markings		0.00%
Exceeded authorized speed limit		5.56%
Driving too fast for conditions		13.89%
Made an improper turn		4.17%
Improper backing		4.17%
Wrong side or wrong way		25.00%
Followed too closely		12.50%
Failure to keep in proper lane		0.00%
Ran off roadway		0.00%
Operating vehicle in erratic, reckless, careless, negligent or aggressive manner		4.17%
Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway, etc.		1.39%
Over-correcting/over-steering		2.78%
Improper Passing		0.00%
Other Contributing Action		2.78%
Unknown		2.78%
Total		

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CTY	RD	MP	C-MP	DIR	COMP/HQ#	Date	Time	Day	Fat	Inj	AL	LC	WC	SC	FHE	PC	Class	MOI
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2008

N	82	2.88	11.85	2	0908069492	7/28/08	0340	2	0	0	N	04	01	01	13		02	01
N	82	6.02	6.02	1	0908064116	7/14/08	0515	2	0	0	N	04	04	02	13		02	01
N	82	6.31	6.31	1	0908051811	6/9/08	1219	2	0	0	N	01	01	01	13		02	01
N	82	6.06	6.06	1	0908057440	6/25/08	1801	4	0	0	N	01	01	01	13		02	01
N	82	2.23	11.2	2	0908070658	7/31/08	1336	5	0	0	N	01	01	01	13		02	03
N	82	5.96	5.96	1	0908073130	8/7/08	1821	5	0	0	N	01	02	01	13		03	01
N	82	6.02	6.02	1	0908059146	6/30/08	1115	2	0	0	N	01	01	01	13		03	04
N	82	1.75	10.72	2	0908048189	5/30/08	0446	6	0	0	N	05	01	01	13		02	01
N	82	2.61	11.58	2	0908072115	8/4/08	1754	2	0	0	N	01	01	01	10		03	03
N	82	7.18	7.18	1	0208077120	8/19/08	2351	3	0	0	N	05	01	01	13		02	01
N	82	6.3	6.3	1	0908082265	9/3/08	0626	4	0	0	N	01	01	01	13		02	01
N	82	3.19	12.16	2	0908057985	6/27/08	0837	6	0	0	N	01	01	01	13		03	01
N	82	5.52	5.52	1	0908070660	7/31/08	1342	5	0	0	N	01	02	01	13		02	01
N	82	7.06	7.06	1	0908055153	6/19/08	2210	5	0	0	N	05	01	01	16		02	00
N	381	0.65	0.65	5	0908046194	5/24/08	1415	7	0	0	N	01	01	01	13		03	01
N	82	2.48	11.45	2	0908068020	7/24/08	0039	5	0	0		05	04	02	13		03	01
N	67	0.05	0.05	1	0908057281	6/25/08	0610	4	0	0	N	01	01	01	13		02	03
N	82	6.23	6.23	1	0908114910	12/12/08	1854	6	0	0	N	04	01	01	13		02	01
N	82	6	6	1	0908101546	10/31/08	1250	6	0	0	N	01	01	01	13		03	01
N	82	6.28	6.28	1	0908072682	8/6/08	1301	4	0	0	N	01	01	01	13		03	01
N	82	6.32	6.32	1	0208088554	9/21/08	1327	1	0	0	N	01	01	01	13		02	01
N	380	0.01	0.01	5	0908112421	12/5/08	0709	6	0	0	N	01	01	01	13		02	03
N	82	6.44	6.44	1	0908117588	12/20/08	2341	7	0	0	Y	05	02	01	13		02	03
N	82	2.89	11.86	2	0908076816	8/18/08	0743	2	1	0	Y	01	01	01	13	04	04	03
N	381	0.65	0.65	5	0908087337	9/18/08	0702	5	0	0	N	01	01	01	13		02	03
N	82	2.54	11.51	2	0908079058	8/24/08	1315	1	0	0	N	01	01	01	13		02	01
N	82	2.87	11.84	2	0908119441	12/26/08	1654	6	0	0	N	05	01	01	13		02	01
N	82	2.38	11.35	2	0908118554	12/23/08	1830	3	0	0	N	05	01	01	13		02	01
N	82	6.01	6.01	1	0908105012	11/11/08	1128	3	0	0	N	01	01	01	13		03	01
N	381	0.65	0.65	5	0908113560	12/8/08	1747	2	0	0	N	05	01	01	13		02	01
N	82	2.64	11.61	2	0908088903	9/22/08	1339	2	0	0	N	01	01	01	13	11	02	01
N	82	1.72	10.69	2	0208115854	12/15/08	1807	2	0	0	N	04	01	01	13		03	03
N	82	1.54	10.51	2	0208086047	9/14/08	1254	1	0	0	N	01	01	01	13		02	01
N	82	6.28	6.28	1	3208127256	10/13/08	1443	2	0	0	N	01	01	01	13		03	01
N	82	2.7	11.67	2	0908087149	9/17/08	1628	4	0	0	N	01	01	01	13		03	01
N	381	0.65	0.65	5	0908117557	12/20/08	2338	7	0	0	Y	04	02	01	13		02	03
N	82	2.65	11.62	2	0908100721	10/28/08	2148	3	0	0	N	04	01	01	13	88	02	04

2009

N	82	2.66	11.63	2	0909078499	9/2/09	1737	4	0	0	N	01	01	01	13		03	01
N	82	2.62	11.59	2	0909052144	6/15/09	1432	2	0	0	N	01	01	01	13		02	04
N	82	2.98	11.95	2	0909077515	8/30/09	1431	1	0	0	N	01	01	01	13		03	01

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CTY	RD	MP	C-MP	DIR	COMP/HQ#	Date	Time	Day	Fat	Inj	AL	LC	WC	SC	FHE	PC	Class	MOI
2009																		
N	381	0.65	0.65	5	0909080601	9/9/09	1716	4	0	0	N	01	02	02	13		03	03
N	82	6.3	6.3	1	0909074079	8/20/09	1052	5	0	0	N	01	01	01	13		03	03
N	381	0.65	0.65	5	0909063492	7/19/09	1353	1	0	0	N	01	01	01	13		02	01
N	82	2.73	11.7	2	0909073501	8/18/09	1640	3	0	0	N	01	01	01	13		02	01
N	67	0.04	0.04	1	0909074405	8/21/09	1111	6	0	0	N	01	01	01	13		02	04
N	381	0.65	0.65	5	0909057386	7/1/09	0353	4	0	0	N	04	02	01	13		03	03
N	82	1.75	10.72	2	0909060638	7/10/09	1641	6	0	0	N	01	01	01	13		02	04
N	82	6.42	6.42	1	0909055054	6/24/09	1420	4	0	0	N	01	01	01	13		02	01
N	82	2.62	11.59	2	0909039962	5/11/09	1631	2	0	0	N	01	01	01	13		02	01
N	82	7.12	7.12	1	0909029391	4/9/09	0744	5	0	0	N	01	01	01	13		02	01
N	82	6.23	6.23	1	0909029256	4/8/09	1629	4	0	0	N	01	01	01	13		02	01
N	381	0.65	0.65	5	0909020306	3/10/09	2003	3	0	0	N	04	01	01	13		02	04
N	82	2.63	11.6	2	0909008159	1/29/09	1552	5	0	0	N	01	01	01	13	11	02	01
N	82	1.88	10.85	2	0909051408	6/13/09	0656	7	0	0	N	01	01	01	32		03	00
N	82	6.05	6.05	1	0909025781	3/28/09	1755	7	0	0	N	01	02	02	13		02	01
N	82	6.48	6.48	1	0909019680	3/8/09	1800	1	0	0	N	01	01	09	14		02	05
N	82	5.89	5.89	1	0909061465	7/13/09	0643	2	0	0	N	01	01	01	13		02	01
N	380	0.01	0.01	5	0909011309	2/9/09	1744	2	0	0	N	03	01	01	13		02	03
N	67	0.07	0.07	1	0909063974	7/20/09	2342	2	0	0	N	05	02	01	40		02	00
N	82	2.56	11.53	2	0909015127	2/22/09	1126	1	0	1	Y	01	04	02	26		03	00
N	82	3.76	12.73	2	0909072516	8/15/09	1248	7	0	0	N	01	01	01	13		02	04
N	381	0.65	0.65	5	0909023638	3/21/09	1654	7	0	0	N	01	01	01	13		02	04
N	82	7.18	7.18	1	0909029385	4/9/09	0655	5	0	0	N	01	01	01	13		02	01
N	82	3.42	12.39	2	0909096543	10/30/09	2352	6	0	0	N	05	04	02	12		02	99
N	82	6.31	6.31	1	0209070220	8/8/09	1617	7	0	0	N	01	01	01	13		02	01
N	67	0.09	0.09	1	0909011946	2/11/09	1759	4	0	0	N	03	01	01	26		02	00
N	35	7.84	7.84	5	0909010054	2/5/09	1617	5	0	1	N	01	01	01	13		03	01
N	82	1.55	10.52	2	0209010752	2/7/09	2125	7	0	0	N	05	02	01	13		02	04
N	82	2.63	11.6	2	0909010225	2/6/09	0957	6	0	1	N	01	01	01	13	12	03	01
N	82	6.03	6.03	1	0909084348	9/21/09	1545	2	0	0	N	01	01	01	13		02	01
N	82	5.47	5.47	1	0909070378	8/9/09	0743	1	0	0		01	04	02	27		02	00
N	82	6.33	6.33	1	0909071460	8/12/09	1140	4	0	0		01	01	01	13		02	01
N	35	7.84	7.84	5	0909067671	8/1/09	0826	7	0	0	N	01	01	01	13		02	01
N	82	6.01	6.01	1	0909095353	10/27/09	0746	3	0	0	N	01	04	02	13		02	01
N	82	6.29	6.29	1	0909009666	2/4/09	0905	4	0	0	N	01	01	02	26		02	00
N	82	6.01	6.01	1	0909091091	10/13/09	1450	3	0	0	N	01	01	01	13		03	01
N	82	2.6	11.57	2	0909095057	10/26/09	1029	2	0	0	N	01	01	01	13		02	04
N	381	0.65	0.65	5	0909093437	10/21/09	1405	4	0	0	N	01	01	01	13		03	01
N	82	1.56	10.53	2	0909097913	11/4/09	1739	4	0	0	N	05	01	01	12		02	00
N	82	2.67	11.64	2	0909095484	10/27/09	1644	3	0	0	N	01	04	02	13		02	01

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2009

N	82	6.04	6.04	1	0909095019	10/26/09	0727	2	0	0	N	01	01	01	13		02	01
N	67	0.07	0.07	1	0909095649	10/28/09	0548	4	0	0	N	04	04	02	13		02	01
N	67	5.88	12.36	2	0909112730	12/20/09	1336	1	0	0	N	01	01	03	27		02	00
N	82	2.23	11.2	2	0909042495	5/18/09	1727	2	0	0	N	01	01	01	13		02	04
N	82	6.05	6.05	1	0909032195	4/18/09	1105	7	0	0	N	01	01	01	13		02	01
N	82	1.67	10.64	2	0209112810	12/20/09	1709	1	0	0	N	04	06	03	40		02	00
N	82	1.68	10.65	2	0909030352	4/12/09	0345	1	0	0	N	05	01	01	12		02	00
N	82	6.62	6.62	1	0909022293	3/17/09	1623	3	0	0	N	01	01	01	13		02	01
N	82	3.26	12.23	2	0909032546	4/19/09	1103	1	0	1	N	01	01	01	27		03	00
N	82	6.12	6.12	1	0909018502	3/5/09	0716	5	0	0	N	01	01	01	13		02	01
N	82	6.03	6.03	1	0909046552	5/30/09	1500	7	0	0	N	01	01	01	13		03	01
N	82	7.23	7.23	1	0909029958	4/10/09	2032	6	0	0	N	05	02	01	13	02	02	03
N	381	0.65	0.65	5	0909028840	4/7/09	0719	3	0	0	N	01	01	01	13		02	01
N	67	0.05	0.05	1	0909048531	6/5/09	0631	6	0	0	N	02	04	02	13		02	04
N	380	0.01	0.01	5	0909024629	3/25/09	0912	4	0	0	N	01	01	01	13		02	01
N	82	6.05	6.05	1	0909039683	5/10/09	1726	1	0	0	N	01	01	01	13		03	01
N	82	2.88	11.85	2	0909044077	5/23/09	0436	7	0	0	N	04	01	01	13		03	01
N	381	0.65	0.65	5	0909072059	8/14/09	0450	6	0	0	Y	04	01	01	13		02	03
N	82	2.54	11.51	2	0909032763	4/20/09	0226	2	0	0	N	05	01	01	32		02	00
N	381	0.66	0.66	5	0909089940	10/9/09	1725	6	0	1	N	01	01	01	13	08	03	01
N	35	7.84	7.84	5	0909100209	11/11/09	2307	4	0	0	N	04	04	02	13		02	01
N	82	2.38	11.35	2	0909087456	10/1/09	2133	5	0	0	N	04	01	01	26		02	00
N	82	2.63	11.6	2	0209084976	9/23/09	1650	4	0	0	N	01	01	01	13		02	04
N	82	5.4	5.4	1	0909103056	11/20/09	2250	6	0	0	N	05	01	01	12		03	00
N	82	7.06	7.06	1	0909106009	11/30/09	1803	2	0	0	N	05	04	02	13		03	01
N	82	3	11.97	2	0909105702	11/29/09	1530	1	0	0	N	01	01	01	13		02	04
N	67	0.03	0.03	1	0909080875	9/10/09	1515	5	0	0	N	01	01	01	26		03	00
N	82	6.33	6.33	1	0909096835	10/31/09	2045	7	0	0	N	04	04	02	13		02	04
N	82	7.35	7.35	1	0209081851	9/13/09	1220	1	1	2	N	01	01	01	31	04	04	00
N	82	2.6	11.57	2	0909096446	10/30/09	1710	6	0	0	N	01	01	01	13	88	02	03
N	00082	5.96			0909114100	12/24/09	0646	5	0	0	N	01	02 -	01	13	08	02	07

2010

N	00082	10.7			0210003434	1/13/10	1315	4	0	1	N	01	01 - 01	01	25	88	03	88
N	00082	2.89	11.86	2	0210054123	6/19/10	1912	7	0	0	N	01	01 - 01	01	13	07	02	04
N	00082	2.64	11.61	2	0210109533	12/1/10	1724	4	0	0	N	05	01 -	01	13	11	02	01
N	00082	6.06			0910025670	3/28/10	1145	1	0	1	N	01	02 -	01	13	11	03	01
N	00082	6.13			0910029198	4/7/10	2326	4	0	0	N	04	01 -	01	13	15	02	01
N		-9.95			0910031159	4/13/10	2013	3	0	0	N	05	04 -	02	26	15	02	88
N	00082	6.06			0910000485	1/2/10	2107	7	0	0	N	04	01 -	01	13	08	02	01
N	00082	3.06			0910031894	4/16/10	0749	6	0	0	N	01	01 -	01	29	10	02	04

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2010

N	00082	1.67			0910032057	4/16/10	1446	6	0	0	N	01	01 -	01	34	88	02	88
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CTY	RD	MP	C-MP	DIR	COMP/HQ#	Date	Time	Day	Fat	Inj	AL	LC	WC	SC	FHE	PC	Class	MOI
2010																		
N	00082	1.73	10.70	2	0910045917	5/27/10	1845	5	0	0	N	01	01 -	01	12	17	02	03
N	00082	5.44			0910032487	4/17/10	1733	7	0	0	N	01	01 -	01	02	16	02	88
N	00082	2.64	11.61	2	0910061953	7/13/10	0737	3	0	0	N	01	04 -	02	13	08	02	01
N	00035	7.83	7.83	1	0910077077	8/26/10	1441	5	0	3	N	01	01 -	01	13	01	03	03
N		-9.95			0910062424	7/14/10	1249	4	0	0	N	01	04 -	02	39	12	02	02
N	00082	6.32			0910002499	1/9/10	1842	7	0	2	Y	04	02 -	01	13	10	03	01
N	00082	5.94	5.94	1	0910090999	10/7/10	0632	5	0	1	N	02	01 -	01	13	88	03	01
N	00082	2.59	11.56	2	0910078664	8/31/10	1141	3	0	0	N	01	01 -	01	13	09	02	04
N		-9.95			0910064775	7/21/10	0213	4	0	0	N	04	02 -	01	33	11	02	02
N	00082	1.55	10.52	2	0910113386	12/13/10	1725	2	0	0	N	05	01 -	01	13	15	02	04
N	00082	1.8	10.77	2	0910113712	12/14/10	1755	3	0	0	N	05	01 -	01	13	12	02	04
N	00082	6.06			0910004980	1/19/10	0855	3	0	0	N	01	01 -	01	13	11	02	01
N	00082	6.45			0910036156	4/29/10	1513	5	0	1	N	01	01 -	01	13	08	03	02
N	00082	6.12	6.12	1	0910066578	7/26/10	0826	2	0	3	N	01	01 -	01	13	08	03	01
N	00082	6.06	6.06	1	0910081166	9/8/10	0739	4	0	0	N	01	01 -	01	13	11	02	01
N	00082	6.08	6.08	1	0910081177	9/8/10	0812	4	0	0	N	01	01 -	01	13	11	02	04
N	00035	7.83	7.83	1	0910053092	6/17/10	0245	5	0	1	N	04	01 -	01	13	01	03	03
N	00082	6.05			0910036887	5/1/10	1402	7	0	2	N	01	01 -	01	13	11	03	01
N	00082	2.64	11.61	2	0910115990	12/20/10	1340	2	0	0	N	01	01 -	01	13	88	02	03
N	00082	6.31	6.31	1	0910081712	9/9/10	1842	5	0	0	Y	01	01 -	01	13	11	02	01
N	00082	6.07			0910038017	5/4/10	1538	3	0	1	N	01	01 -	01	13	08	03	01
N	00380	0.01	0.01	1	0910055419	6/19/10	1900	7	0	0	N	99	99 -	99	99	99	02	99
N	00082	2.6	11.57	2	0910055684	6/24/10	0821	5	0	2	N	01	01 -	01	39	09	03	88
N	00082	2.35			0910007909	1/29/10	1616	6	0	0	N	01	02 -	01	13	08	02	01
N	00082	5.44	5.44	1	0910056511	6/26/10	1344	7	0	0	N	01	01 -	01	13	07	02	04
N	00082	6.61			0910023721	3/21/10	1804	1	0	1	N	01	02 -	01	13	12	03	88
N	00082	7.12	7.12	1	0910118145	12/27/10	0641	2	0	0	N	05	07 -	03	13	12	02	01
N	00082	6.29	6.29	1	0910097465	10/26/10	1026	3	0	0	N	01	02 -	01	13	11	02	01
N	00082	5.74	5.74	1	0910041605	5/14/10	2104	6	0	3	N	04	04 -	02	13	12	03	01
N	00082	5.49	5.49	1	0910085125	9/20/10	1106	2	0	1	N	01	01 -	01	01	11	03	88
N	00082	7.23	7.23	1	0910074437	8/18/10	1157	4	0	0	N	01	04 -	02	13	02	02	03
N	00082	6.05	6.05	1	0910056579	6/26/10	1658	7	0	0	N	01	01 -	01	13	11	02	01
N	00082	6.05	6.05	1	0910097558	10/26/10	1611	3	0	0	N	01	02 -	01	13	11	02	01
N	00082	3.36	12.33	2	0910118933	12/29/10	1610	4	0	1	N	01	01 -	01	99	99	03	03
N	00082	5.68	5.68	1	0910085893	9/22/10	1618	4	0	2	N	01	01 -	01	13	12	03	01
N	00035	7.83	7.83	1	0910056692	6/26/10	2307	7	0	0	N	04	01 -	01	13	12	02	01
N	00082	2.62	11.59	2	0910057943	6/30/10	1820	4	0	0	N	01	01 -	01	13	07	02	04
N	00082	6.06	6.06	1	3210106433	9/20/10	0625	2	0	0	N	02	01 -	01	13	11	02	01

2011

N	006317	0.37	0.37	1	0211020011	3/7/11	0305	2	0	0	Y	99	99 -	99	99	10	02	99
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"Disclaimer for CARS: Crash data and associated police reports are intended for DelDOT use only and shall not be transmitted, copied, distributed or provided to any entity other than DelDOT unless written approval is received from the DelDOT Legal Section. Police reports are the property of the Delaware State Police."

CTY	RD	MP	C-MP	DIR	COMP/HQ#	Date	Time	Day	Fat	Inj	AL	LC	WC	SC	FHE	PC	Class	MOI
2011																		
N	00082	5.38	5.38	1	0911003225	1/11/11	2205	3	0	0	N	05	07 -	03	13	19	02	04

CTY	RD	MP	C-MP	DIR	COMP/HQ#	Date	Time	Day	Fat	Inj	AL	LC	WC	SC	FHE	PC	Class	MOI
-----	----	----	------	-----	----------	------	------	-----	-----	-----	----	----	----	----	-----	----	-------	-----

2011

N	00067	0.1	0.10	1	0911005678	1/20/11	0646	5	0	0	N	02	01 -	01	13	02	02	04
N	00082	7.13	7.13	1	0911016734	2/24/11	0547	5	0	1	N	05	01 -	01	12	17	03	02
N	00082	3.7	12.67	2	0911030308	4/10/11	1927	1	0	0	N	03	01 -	01	37	11	02	88
N	00082	6.07	6.07	1	0911006936	1/24/11	1012	2	0	0	N	01	01 -	01	13	08	02	01
N	00082	5.49	5.49	1	0911032943	4/19/11	1131	3	0	0	N	01	02 -	02	13	88	02	88
N	00067	0.82	0.82	1	0911019962	3/6/11	1730	1	0	0	N	05	04 -	02	29	19	02	04
N	00067	0.04	0.04	1	0911009294	1/31/11	1114	2	0	0	N	01	01 -	01	13	11	02	01
N	00082	2.64	11.61	2	0911022608	3/15/11	2124	3	0	1	N	04	01 -	01	13	11	03	01
N	00067	0.07	0.07	1	0911010320	2/3/11	1648	5	0	0	N	01	01 -	01	13	07	02	04
N	00082	2.64	11.61	2	0911035366	4/27/11	1102	4	0	0	N	01	02 -	01	13	08	02	01
N	00381	0.66	0.66	2	0911035980	4/29/11	1004	6	0	2	N	01	01 -	01	13	04	03	03
N	00082	6.1	6.10	1	0911011407	2/7/11	0644	2	0	0	N	01	01 -	01	01	12	02	88
N	00381	0.65	0.65	1	0911025740	3/26/11	1156	7	0	0	N	01	01 -	01	13	09	02	03

Report generated by tdtsswn at 2011-05-23 12:10:27.817

Report Legend

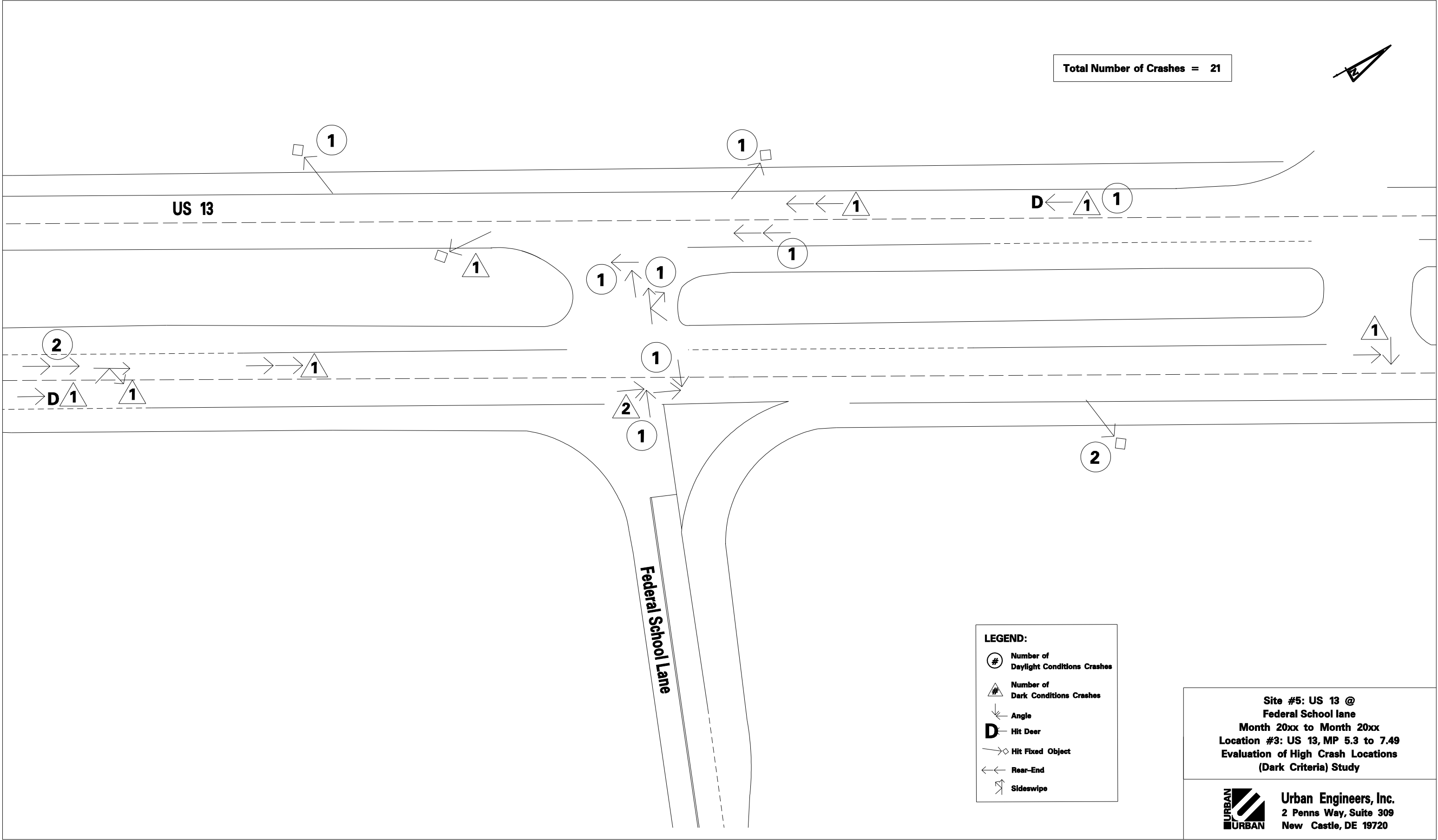
Cty - County
 Rd - Maintenance Road
 MP - Milepoint
 C-MP - Continuous Milepoint
 Dir - Direction of Highway
 COMP/HQ# - Complaint Number/Headquarters Number
 DAY - Day Of Week Code
 Fat - Fatality
 Inj - Injury
 AL - Alcohol Involved
 LC - Lighting Condition
 WC - Weather Condition
 SC - Surface Condition
 MHE - Most Harmful Event
 PC - Primary Contributing Circumstance
 Class - Report Classification
 MOI - Manner of Impact

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APPENDIX B: Crash Diagrams

Site #3: US 13 (Dupont Parkway) @ Bear Road/Hamburg Road Intersection

Site #4: US 13 (Dupont Parkway) @ Federal School Lane Intersection



APPENDIX C: Previous Study

2002 HSIP – Site Q Report



INTRODUCTION

Site Q is a 1.69 mile corridor along US 13/Dupont Parkway from 0.39 miles south of the ramp to northbound SR 1 to 0.45 miles north of Bear Road/Hamburg Road. US 13 is four-lane, divided, open-section roadway with shoulders. The posted speed limit is 55 miles per hour and the ADT is approximately 28,800. Within the limits of the site, there is one signalized intersection at Bear Road/Hamburg Road, and one unsignalized intersection at SR 71/Red Lion Road. The ramp to SR 1 northbound is located approximately 0.5 miles south of SR 71/Red Lion Road intersection. Approximately 0.2 miles south of SR 71/Red Lion Road, southbound SR 1 merges with US 13 southbound.

Bear Road/Hamburg Road in the vicinity of US 13 was identified as part of the 2000 Highway Safety Improvement Program – Site O.

ACCIDENT DATA SUMMARIES

A total of 114 accidents were reported during the three-year study period between January 1998 and December 2000 including three fatalities and 28 (41%) accidents resulting in injuries. The following is a summary of the accident data by location and type:

- US 13/Bear Road/Hamburg Road – 66 total accidents including one fatality
 - 19 southbound rear end accidents
 - 15 northbound rear end accidents
- US 13/Red Lion Road – 24 total accidents
 - 11 southbound through/eastbound left-turn accidents (two fatalities including one involving a driver under the influence of alcohol)
 - 2 northbound through/eastbound left-turn accidents

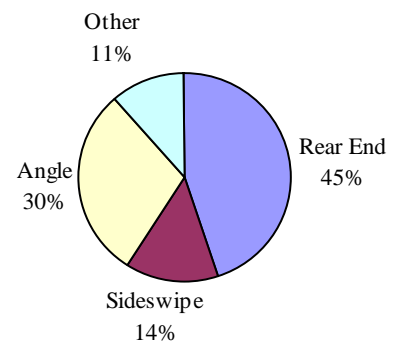
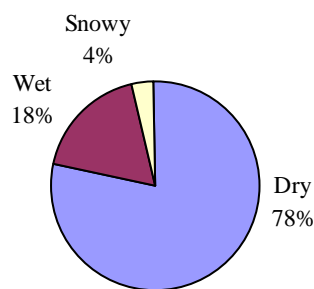
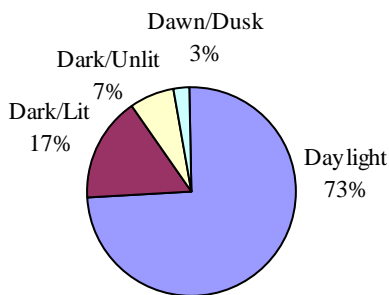
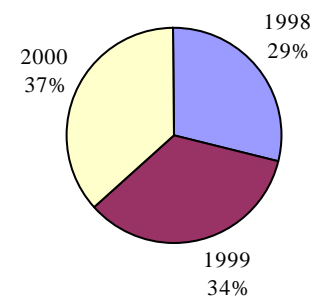
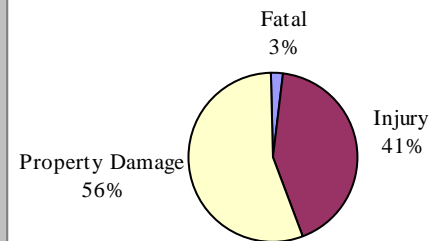
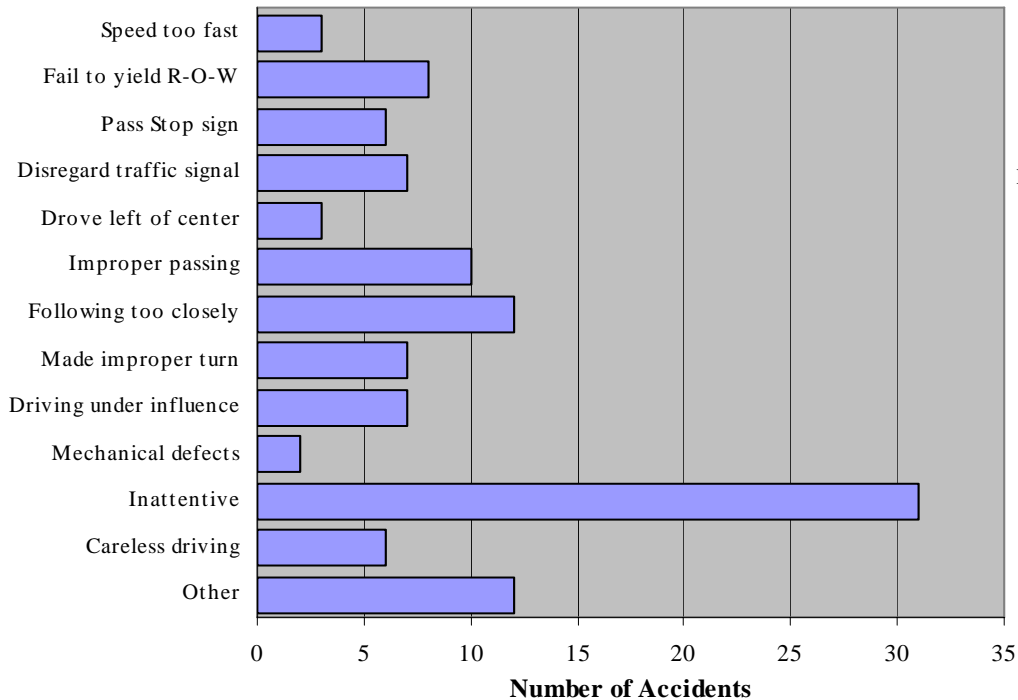
A categorical summary of the accidents by type, severity, surface condition, lighting condition, year, and primary cause is shown in Table 1.

FIELD OBSERVATIONS

US 13/Bear Road/Hamburg Road

- The traffic signal at Bear Road/Hamburg Road is the first signalized intersection along US 13 northbound for approximately three miles. For vehicles traveling from northbound SR 1 to US 13, there are no signals for approximately seven miles. The signal operates with exclusive left-turn phasing on the northbound/southbound approaches. The eastbound/westbound approaches operate with split phasing.
- Two ground mounted warning signs are located on northbound US 13 approaching the intersection. One is located approximately one miles to the south that reads: “EXPRESSWAY ENDS – ½ MILE.” Another is located approximately 1000 feet south of the intersection that reads “EXPRESSWAY ENDS – WATCH FOR CROSSING TRAFFIC.”
- W3-3 (Signal Ahead) signs are posted on both the northbound and southbound approach to the intersection. The Bear Road/Hamburg Road intersection is located approximately 1300 feet north of SR 71.

TABLE 1
Accident Data Summary



US 13/SR 71/Red Lion Road

- SR 71/Red Lion Road forms a T-intersection with US 13. The eastbound SR 71 approach operates under STOP control. Eastbound left-turns must travel across two lanes of southbound US 13 traffic to access the northbound US 13 acceleration lane. This acceleration lane becomes a left-turn lane for westbound Bear Road. Several vehicles were observed turning left from eastbound SR 71 and weaving across northbound US 13 to access the right-turn lane to head east on Hamburg Road.

REMEDIAL IMPROVEMENTS

- Replace the STOP line on the eastbound Bear Road approach to US 13.
- Install an R4-7 (Keep Right) sign in the median (facing westbound traffic) on the west leg of the US 13 and Bear Road/Hamburg Road intersection.

TOTAL COST OF IMPROVEMENTS – \$500 (Remedial Improvements Only)

TASK 1A STUDIES

Perform turning movement counts at the US 13/SR 71/Red Lion Road intersection and signal warrant analyses to determine the need for traffic signalization or other warning devices including a partial traffic signal that would control the southbound US 13 and eastbound SR 71 approaches.

INTRODUCTION

Site Q is a 1.69 mile corridor along US 13/Dupont Parkway from 0.39 miles south of the ramp to northbound SR 1 to 0.45 miles north of Bear Road/Hamburg Road. US 13 is four-lane, divided, open-section roadway with shoulders. The posted speed limit is 55 miles per hour and the ADT is approximately 28,800. Within the limits of the site, there is one signalized intersection at Bear Road/Hamburg Road, and one unsignalized intersection at SR 71/Red Lion Road.

At the Task I meeting, the HSIP recommended additional studies at the US 13 @ SR 71/Red Lion Road intersection to determine the need for traffic signalization or other warning devices including a partial traffic signal that would control the southbound US 13 and eastbound SR 71 approaches.

US 13 @ SR 71/RED LION ROAD INTERSECTION STUDY

Site Description: US 13 @ SR 71/Red Lion Road is a three-legged, unsignalized intersection. The northbound US 13 approach has a left-turn lane and two through lanes. Northbound left-turns are channelized by a concrete island. The southbound US 13 approach includes two through lanes and a right-turn lane. The eastbound SR 71 approach has separate left and right-turn lanes.

Accident Summary: A total of 28 total accidents were reported at the US 13 @ SR 71 intersection during the study period between January 1998 and May 2002 including 15 accidents resulting in injuries and three resulting in fatalities. Of these, seventeen were angle accidents involving southbound US 13 and eastbound SR 71 left-turning vehicles including three resulting in fatalities. Two of the three fatal accidents involved a motorist under the influence of alcohol. Two angle accidents occurred involving northbound US 13 and eastbound left-turning vehicles.

Field Observations: The following observations were noted during field visits.

US 13 @ SR 71

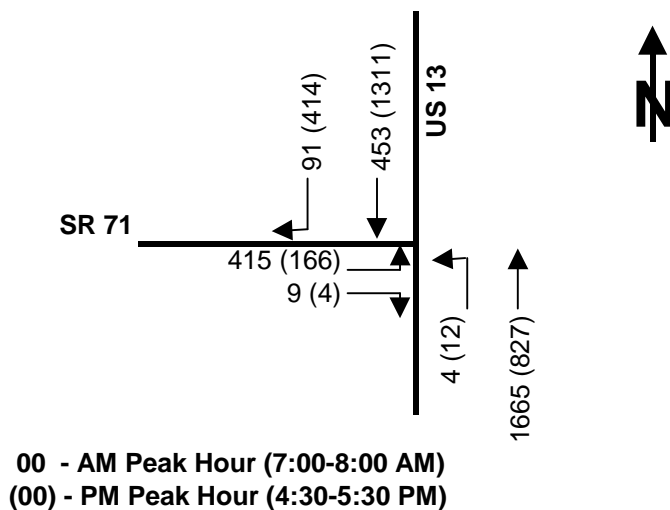
- Eastbound left-turns must travel across two lanes of southbound US 13 traffic to access the northbound US 13 acceleration lane. This acceleration lane becomes a left-turn lane for westbound Bear Road. Several vehicles were observed turning left from eastbound SR 71 and weaving across northbound US 13 to access the right-turn lane to head east on Hamburg Road.
- The ramp to SR 1 northbound is located approximately 0.5 miles south of SR 71/Red Lion Road intersection. Approximately 0.2 miles south of SR 71/Red Lion Road, southbound SR 1 merges with US 13 southbound.
- During the morning peak hour, northbound US 13 queues from the traffic signal at Bear Road/Hamburg Road often extend to the SR 71 intersection, making it difficult for eastbound SR 71 left-turning vehicles to merge with northbound US 13 traffic.
- Several eastbound left-turning vehicles were observed stopping within the acceleration lane on northbound US 13 because they were unable to find gaps in traffic. On one occasion, an eastbound left-turning vehicle blocked the southbound US 13 lanes because of vehicles stopped within the acceleration lane on northbound US 13.
- The traffic signal at Bear Road/Hamburg Road to the north provides gaps in southbound US 13 traffic, when the majority of eastbound SR 71 motorists make their turning movements.

US 13 @ Bear Road/Hamburg Road

- The traffic signal at Bear Road/Hamburg Road is the first signalized intersection on northbound US 13 for approximately three miles. For vehicles traveling from northbound SR 1 to US 13, there are no signals for approximately seven miles. The signal operates with exclusive left-turn phasing on the northbound and southbound approaches. The eastbound and westbound approaches operate with split phasing.
- Two ground mounted warning signs are located on northbound US 13 approaching the intersection. One is located approximately one mile to the south that reads: “EXPRESSWAY ENDS – ½ MILE.” Another is located approximately 1000 feet south of the intersection that reads “EXPRESSWAY ENDS – WATCH FOR CROSSING TRAFFIC.”
- W3-3 (Signal Ahead) signs are posted on both the northbound and southbound approach to the intersection. The Bear Road/Hamburg Road intersection is located approximately 1200 feet north of SR 71.

Traffic Volumes: Turning movement counts were conducted at US 13 @ SR 71 intersection on Wednesday, June 26, 2002 from 6:00 AM to 7:00 PM. The Appendix contains the count data summaries and peak hour volumes are shown in Figure 1. As shown, the predominant movement during the morning peak period is northbound toward Wilmington. The reverse occurs during the evening peak period.

FIGURE 1
Peak Hour Traffic Volumes



Origin-Destination Study: An origin destination study was performed on Wednesday, December 4, 2002 during the morning peak hour to determine how many eastbound left-turns from SR 71 weave across northbound US 13 and make a right-turn onto eastbound Hamburg Road. Of the 415 eastbound left-turning vehicles observed during the peak hour, 70 (17%) of these vehicles make a right-turn onto Hamburg Road.

Peak Hour Delay/Queues: On Friday, December 13, 2002, vehicle delay and queues were measured on the eastbound SR 71 approach to US 13 during the morning peak hour. The longest queue recorded during the peak hour was 16 vehicles. As indicated, vehicles from the side streets are generally delayed less than 30 seconds during peak hours. Peak hour delay data is included in the Appendix and is summarized in Table 1.

TABLE 1
Peak Hour Delay Summary

Approach – Movement	Total Delay (Veh.-Hrs.)	Average Delay (Seconds)	Longest Queue (Vehicles)
Eastbound SR 71 Left-Turn	3.25 Veh. Hrs.	22.1	16

Sight Distances: Table 2 is a summary of sight distance criteria and available sight distances on intersection approaches for 70 mile per hour. As indicated, all sight distances exceed criteria. Additional measurements were performed to determine if traffic signal indications on US 13 would meet MUTCD visibility requirements. Sight distance on the southbound US 13 is partially restricted by the SR 1 bridge, located approximately 375 feet south of SR 71. Measurements were taken at a point 18 feet above the travel lane, the minimum clearance to the bottom of the signal housing (15 feet), plus the distance to the red signal indication (63 feet). As shown, signal visibility requirements would be met.

TABLE 2
Sight Distances

Type	Approach-Movement	Criteria	Available Sight Distance	Criteria Met
Corner Sight Distance	Eastbound SR 71			
	Left Turn	775'	>800' (Left) >800' (Right – in median)	Yes
	Right Turn	670'	>800' (Left)	Yes
Stopping Sight Distance	US 13			
	Northbound	730'	>800'	Yes
	Southbound	730'	>800'	Yes
Signal Indication Visibility	US 13			
	Northbound	715' (60 mph)	>1000'	Yes
	Southbound	715' (60 mph)	900'	Yes

Traffic Signal Warrant Analyses: Signal warrant analyses were conducted in accordance with the 2000 edition of the Manual on Uniform Traffic Control Devices (MUTCD). A summary of the warrant analyses is presented in Table 3. The posted speed limit on US 13 is 50 miles per hour; therefore, the MUTCD's reduced volume criteria were applied. The Appendix contains tabulations of Warrants 1, 2, and 3. As shown below, Warrant 1 – Eight-Hour Vehicular Volume, Warrant 2 – Four-Hour Vehicular Volume, Warrant 3 – Peak Hour Volume and Warrant 7 – Crash Experience are met.

TABLE 3
Traffic Signal Warrant Analyses Summary

MUTCD ¹ Warrant	Criteria			No. of Hours Meets Criteria (Warrants 1,2,4) Actual Conditions (Warrant 3)	Warrant Criteria Met?	
	Major Street Volume (VPH) ²	Minor Street Volume (VPH) ²	No. of Hours Required			
1 – Eight-Hour Vehicular Volume (Any of the three conditions must be met)						
Cond. A - Min. Vehicular Volume	420	105	8	13	Yes	Yes
Cond. B – Interruption of Cont. Traffic	630	53	8	13	Yes	
Cond. C - Combination of Conditions <ul style="list-style-type: none">80% of Condition A80% of Condition B	336 504	84 42	8 8	13	Yes	
2 – Four-Hour Vehicular Volume	(See Figure 4C-1 or 4C-2)		4	13		Yes
3 – Peak Hour (Either of the two conditions must be met)						
Condition A	Delay ≥4 Veh.-Hrs. Approach Volume ≥ 100 vph Entering Volume ≥ 650 vph		1	3.25 Veh-Hr 191 vph 2501 vph	Yes	Yes
Condition B	(See Figure 4C-3 or 4C-4)		1	13	Yes	
4 – Pedestrian Volume (Both of the two conditions must be met)						
Condition A	100 Pedestrians/Hour or 190 Pedestrians/Hour		4 1	0 0	No	No
Condition B	# Adequate Gaps During Same Hour < 60		1	0	No	
5 – School Crossing	# Adequate Gaps During x-Minute Time Period < x Minutes			-		NA
6 – Coordinated Signal System	(Refer to MUTCD Section 4C.07 for Criteria)			-		No
7 – Crash Experience	(Refer to MUTCD Section 4C.08 for Criteria)			-		Yes
8 – Roadway Network	(Refer to MUTCD Section 4C.09 for Criteria)			-		NA

¹ Source: U.S.D.O.T., F.H.W.A.: *Manual on Uniform Traffic Control Devices (MUTCD)*; Washington, D.C., 2000 Edition

² VPH = Vehicles Per Hour

³ NA = Not Applicable

Capacity Analyses: Capacity analyses were conducted using Highway Capacity Manual (SYNCHRO Software) methodologies to determine the impact of installing a half-signal or a full traffic signal at the US 13 @ SR 71 intersection. As shown in Table 4, under existing conditions, overall intersection delay is minimal. Installing either a half signal, that stops southbound US 13 traffic only or a full traffic signal will result in overall intersection level of service 'A' or 'B' during peak hours.

TABLE 4
Capacity Analyses Summary

Alternative	Movement	AM Peak Hour		PM Peak Hour	
		Delay ¹	LOS ²	Delay ¹	LOS ²
Existing Conditions - Unsignalized	Intersection	13.8	-	12.5	-
	EB Left-Turn	33.5 (calculated)	D	116.8 (calculated)	F
		22.2 (observed)	C		
Alternative 1 - Half Signal	Intersection	9.4	A	4.0	A
	EB Left-Turn	36.3	D	44.5	D
Alternative 2 - Full Signal	Intersection	17.7	B	6.0	A
	EB Left-Turn	36.5	D	44.6	D

¹ Delay - Average Delay (seconds) per intersection approach vehicle

² LOS - Intersection Level of Service

TASK 1A RECOMMENDATION

MUTCD traffic signal Warrants 1, 2, 3 and 7 are met at the US 13 @ SR 71 intersection. Additionally, of the twenty-eight accidents at the intersection, 15 resulted in injuries and two resulted in fatalities. Installing a half signal would address the largest cluster of accidents at the intersection, southbound/eastbound angle accidents; however, stopping only southbound traffic does not address concerns regarding the weave on northbound US 13 between SR 71 and Hamburg Road. Based on field observations, eastbound left-turning motorists often have difficulty finding gaps in northbound US 13 traffic. Therefore, we recommend the installation of a full traffic signal at the US 13 @ SR 71 intersection. Although the sight distance on the southbound US 13 approach meets MUTCD sight distance requirements for signal indications, the SR 1 bridge located 375 feet north of the intersection will partially obstruct motorists view of the signal indications. To address this concern, we recommend the installation of a “RED SIGNAL AHEAD WHEN FLASHING” advance warning device on the southbound US 13 approach to SR 71.

The assumed accident reduction is 65 percent¹ of the 19 angle accidents or 44 percent of the twenty-eight total accidents at the US 13 @ SR 71 intersection.

BENEFIT/COST ANALYSIS

Equivalent Uniform Annual Benefit	\$360,185.20
Equivalent Uniform Annual Cost	\$17,797.19
Total Cost of Improvements	\$125,000
Benefit/Cost Ratio	20.24

¹ Agent, Kenneth. “Development of Accident Reduction Factors.” Kentucky Transportation Center. KTC-96-13. June 1996.

HSIP 2002
Site Q

In-House Working Document (Not for external distribution)



Northbound US 13 approach to SR 1 split



Northbound US 13 south of SR 71



Northbound US 13 approach to SR 71



Northbound US 13 approach to SR 71



Northbound US 13 approach to SR 71



Northbound US 13 at SR 71



Northbound US 13 approach to Hamburg Road



Westbound Hamburg Road approach to US 13



Westbound Hamburg Road approach to
US 13



Westbound Hamburg Road approach to
US 13



Eastbound Hamburg Road approach to
US 13



Eastbound Hamburg Road approach to
US 13



Eastbound Hamburg Road approach to
US 13



Southbound US 13 approach to SR 71



Southbound US 13 approach to SR 71



Southbound US 13 approach to SR 71



Southbound US 13 approach to SR 71



Southbound US 13 approach to SR 71



Southbound US 13 approach to SR 71



Southbound US 13 approach to SR 71



Eastbound SR 71 approach to US 13



Eastbound SR 71 approach to US 13



Eastbound SR 71 approach to US 13



Eastbound SR 71 approach to US 13



Eastbound SR 71 at US 13 looking north



Eastbound SR 71 at US 13 looking south



Looking south at northbound US 13 from the median at SR 71



Northbound US 13 acceleration lane for eastbound SR 71 left turns



Northbound US 13 acceleration lane for eastbound SR 71 left turns approaching Bear/Hamburg Road



Northbound US 13 acceleration lane for eastbound SR 71 left turns approaching Bear/Hamburg Road



Northbound US 13 left-turn lane approaching Bear/Hamburg Road



Southbound US 13 approach to SR 1 On-Ramp

APPENDIX D: Statewide 1.0 Mile Corridors Ranked by Critical Ratio

Delaware - Statewide
Accident Date Range
01/01/2007 - 12/31/2009

Interval Length
1.0 mile

Parameters
AMBIENT_LIGHT_PARAMETER-05

Rank	Crit. Ratio	County	Road	Road Name	Beg MP	End MP	# Accs	Notes
1	10.12	1	355D	Harmony Road	0	0.05	1	<10 accidents - Did not meet criteria
2	5.93	1	34H	US 13	0	0.1	1	<10 accidents - Did not meet criteria
3	4.48	1	367	Welsh Tract Road	0	0.99	19	Location #1
4	4.48	1	367	Welsh Tract Road	0.1	1.09	19	Location #1
5	4.01	1	367	Welsh Tract Road	0.2	1.19	17	Location #1
6	4.01	1	367	Welsh Tract Road	0.3	1.29	17	Location #1
7	3.78	1	367	Welsh Tract Road	0.4	1.39	16	Location #1
8	3.76	1	367	Welsh Tract Road	0.5	1.49	16	Location #1
9	3.7	3	199	Fowlers Beach Road	1.2	2.15	4	<10 accidents - Did not meet criteria
10	3.6	1	11A	Delaware Park Road	0	0.15	4	<10 accidents - Did not meet criteria
11	3.56	3	246	Albury Avenue	0.9	1.89	7	<10 accidents - Did not meet criteria
12	3.55	3	199	Fowlers Beach Road	1.1	2.09	4	<10 accidents - Did not meet criteria
13	3.51	3	396		1.8	2.79	6	<10 accidents - Did not meet criteria
14	3.51	3	396		1.9	2.89	6	<10 accidents - Did not meet criteria
15	3.46	2	14	SR 42	3	3.91	5	<10 accidents - Did not meet criteria
16	3.43	1	31A	Old Limestone Road	0	0.31	1	<10 accidents - Did not meet criteria
17	3.43	3	14C		0	0.29	1	<10 accidents - Did not meet criteria
18	3.27	3	60	SR 54	3.1	4.09	7	<10 accidents - Did not meet criteria
19	3.27	3	60	SR 54	3.2	4.19	7	<10 accidents - Did not meet criteria
20	3.27	3	60	SR 54	3.3	4.29	7	<10 accidents - Did not meet criteria
21	3.25	1	38	St. Andrews School Road	0	0.99	7	<10 accidents - Did not meet criteria
22	3.23	2	429	Mechanic Street	3.1	4.09	6	<10 accidents - Did not meet criteria
23	3.23	2	429	Mechanic Street	3.2	4.19	6	<10 accidents - Did not meet criteria
24	3.23	2	429	Mechanic Street	3.3	4.29	6	<10 accidents - Did not meet criteria
25	3.18	1	429	Mechanic Street	3.8	4.79	7	<10 accidents - Did not meet criteria
26	3.14	2	14	SR 42	2.9	3.89	5	<10 accidents - Did not meet criteria
27	3.09	2	14	SR 42	2.8	3.79	5	<10 accidents - Did not meet criteria
28	3.05	2	14	SR 42	2.7	3.69	5	<10 accidents - Did not meet criteria
29	3.05	3	246	Albury Avenue	1	1.99	6	<10 accidents - Did not meet criteria
30	3.04	2	14	SR 42	2.6	3.59	5	<10 accidents - Did not meet criteria
31	3.02	1	367	Welsh Tract Road	0.6	1.59	13	Location #1
32	3.02	3	396		2.2	3.16	5	<10 accidents - Did not meet criteria
33	3	3	542A		0	0.18	1	<10 accidents - Did not meet criteria
34	2.93	3	396		2	2.99	5	<10 accidents - Did not meet criteria
35	2.93	3	396		2.1	3.09	5	<10 accidents - Did not meet criteria
36	2.83	1	355B		0	0.26	1	<10 accidents - Did not meet criteria
37	2.83	3	361	West Avenue	2.3	3.29	8	<10 accidents - Did not meet criteria
38	2.81	1	12A	Farrand Drive Ext.	0	0.1	2	<10 accidents - Did not meet criteria
39	2.8	3	60	SR 54	4.8	5.79	6	<10 accidents - Did not meet criteria
40	2.8	3	60	SR 54	4.9	5.89	6	<10 accidents - Did not meet criteria
41	2.8	3	60	SR 54	5	5.99	6	<10 accidents - Did not meet criteria
42	2.79	3	361	West Avenue	2.2	3.19	8	<10 accidents - Did not meet criteria
43	2.78	3	361	West Avenue	2.1	3.09	8	<10 accidents - Did not meet criteria
44	2.75	3	261		1.1	2.09	8	<10 accidents - Did not meet criteria
45	2.71	1	429	Mechanic Street	3.7	4.69	6	<10 accidents - Did not meet criteria
46	2.71	3	544		0.2	1.19	6	<10 accidents - Did not meet criteria
47	2.69	1	224	Upper Snuffmill Road	0	0.95	6	<10 accidents - Did not meet criteria
48	2.69	1	429	Mechanic Street	3.6	4.59	6	<10 accidents - Did not meet criteria
49	2.69	2	429	Mechanic Street	2.8	3.79	5	<10 accidents - Did not meet criteria
50	2.69	2	429	Mechanic Street	2.9	3.89	5	<10 accidents - Did not meet criteria
51	2.69	2	429	Mechanic Street	3	3.99	5	<10 accidents - Did not meet criteria
52	2.66	3	199	Fowlers Beach Road	0.8	1.79	3	<10 accidents - Did not meet criteria
53	2.66	3	199	Fowlers Beach Road	0.9	1.89	3	<10 accidents - Did not meet criteria
54	2.66	3	199	Fowlers Beach Road	1	1.99	3	<10 accidents - Did not meet criteria
55	2.65	1	315A		0	0.08	1	<10 accidents - Did not meet criteria
56	2.65	3	261		1.2	2.19	7	<10 accidents - Did not meet criteria
57	2.58	1	318A	St. James Church Road	0	0.24	1	<10 accidents - Did not meet criteria
58	2.58	3	246		0.5	1.49	5	<10 accidents - Did not meet criteria
59	2.58	3	544		0.1	1.09	6	<10 accidents - Did not meet criteria
60	2.56	3	246	Albury Avenue	0.6	1.59	5	<10 accidents - Did not meet criteria
61	2.55	2	127		0	0.41	1	<10 accidents - Did not meet criteria
62	2.55	3	246	Albury Avenue	0.7	1.69	5	<10 accidents - Did not meet criteria
63	2.55	3	246	Albury Avenue	0.8	1.79	5	<10 accidents - Did not meet criteria
64	2.55	3	246	Albury Avenue	1.1	2.09	5	<10 accidents - Did not meet criteria

Delaware - Statewide

Accident Date Range

01/01/2007 - 12/31/2009

Interval Length

1.0 mile

Parameters

AMBIENT_LIGHT_PARAMETER-05

Rank	Crit. Ratio	County	Road	Road Name	Beg MP	End MP	# Accs	Notes
65	2.55	3	261		1	1.99	8	<10 accidents - Did not meet criteria
66	2.51	3	28	US 9	6	6.99	14	Location #2
67	2.5	2	295		0	0.99	3	<10 accidents - Did not meet criteria
68	2.5	2	295		0.1	1.09	3	<10 accidents - Did not meet criteria
69	2.46	3	361	West Avenue	1.9	2.89	8	<10 accidents - Did not meet criteria
70	2.44	2	88		0.2	1.19	4	<10 accidents - Did not meet criteria
71	2.43	2	14	SR 42	2.4	3.39	4	<10 accidents - Did not meet criteria
72	2.43	2	14	SR 42	2.5	3.49	4	<10 accidents - Did not meet criteria
73	2.42	2	88		0.3	1.29	4	<10 accidents - Did not meet criteria
74	2.4	2	88		0.4	1.39	4	<10 accidents - Did not meet criteria
75	2.4	3	544		0.3	1.29	5	<10 accidents - Did not meet criteria
76	2.38	2	14	SR 42	2.3	3.29	4	<10 accidents - Did not meet criteria
77	2.37	1	454	Sawmill Branch Road	0.5	1.46	3	<10 accidents - Did not meet criteria
78	2.37	3	28	US 9	5.9	6.89	13	Location #2
79	2.35	1	275	Golden Ring Road	1.4	2.39	8	<10 accidents - Did not meet criteria
80	2.35	1	275	Golden Ring Road	1.5	2.49	8	<10 accidents - Did not meet criteria
81	2.35	3	261		0.9	1.89	8	<10 accidents - Did not meet criteria
82	2.34	2	88		0.5	1.49	4	<10 accidents - Did not meet criteria
83	2.34	3	396		1.7	2.69	4	<10 accidents - Did not meet criteria
84	2.34	3	60	SR 54	3	3.99	5	<10 accidents - Did not meet criteria
85	2.34	3	60	SR 54	3.4	4.39	5	<10 accidents - Did not meet criteria
86	2.34	3	60	SR 54	3.5	4.49	5	<10 accidents - Did not meet criteria
87	2.34	3	60	SR 54	3.6	4.59	5	<10 accidents - Did not meet criteria
88	2.34	3	60	SR 54	3.7	4.69	5	<10 accidents - Did not meet criteria
89	2.34	3	60	SR 54	3.8	4.79	5	<10 accidents - Did not meet criteria
90	2.34	3	60	SR 54	5.1	6.09	5	<10 accidents - Did not meet criteria
91	2.32	3	361		2	2.99	7	<10 accidents - Did not meet criteria
92	2.31	2	271		3.1	4.01	2	<10 accidents - Did not meet criteria
93	2.28	1	260	Brecks Lane Road	0	0.57	2	<10 accidents - Did not meet criteria
94	2.28	2	384		3	3.99	7	<10 accidents - Did not meet criteria
95	2.27	2	88		0.1	1.09	4	<10 accidents - Did not meet criteria
96	2.22	1	429	Mechanic Street	3.5	4.49	5	<10 accidents - Did not meet criteria
97	2.22	2	207		2.9	3.89	4	<10 accidents - Did not meet criteria
98	2.22	2	207		3	3.99	4	<10 accidents - Did not meet criteria
99	2.21	1	429	Mechanic Street	3.3	4.29	5	<10 accidents - Did not meet criteria
100	2.21	1	82	SR 1	5.5	6.49	12	Location #3
101	2.19	3	261		0.8	1.79	8	<10 accidents - Did not meet criteria
102	2.17	1	275	Golden Ring Road	1.6	2.59	7	<10 accidents - Did not meet criteria
103	2.17	1	469	Black Diamond Road	0.4	1.39	3	<10 accidents - Did not meet criteria
104	2.17	1	469	Black Diamond Road	0.5	1.49	3	<10 accidents - Did not meet criteria
105	2.17	1	469	Black Diamond Road	0.6	1.59	3	<10 accidents - Did not meet criteria
106	2.17	1	469	Black Diamond Road	0.7	1.69	3	<10 accidents - Did not meet criteria
107	2.16	3	28	US 9	9.1	10.09	13	Location #4
108	2.15	2	30	Main Street	1.5	2.49	9	<10 accidents - Did not meet criteria
109	2.15	2	429		2.7	3.69	4	<10 accidents - Did not meet criteria
110	2.15	2	429		3.4	4.39	4	<10 accidents - Did not meet criteria
111	2.15	2	429		3.6	4.59	4	<10 accidents - Did not meet criteria
112	2.15	3	353		2.3	3.29	3	<10 accidents - Did not meet criteria
113	2.15	3	525		1.8	2.79	7	<10 accidents - Did not meet criteria
114	2.15	3	525		1.9	2.89	7	<10 accidents - Did not meet criteria
115	2.15	3	525		2	2.99	7	<10 accidents - Did not meet criteria
116	2.15	3	525		2.1	3.09	7	<10 accidents - Did not meet criteria
117	2.15	3	525		2.2	3.19	7	<10 accidents - Did not meet criteria
118	2.14	3	28	US 9	6.1	7.09	12	Location #2
119	2.14	3	361		2.4	3.39	6	<10 accidents - Did not meet criteria
120	2.13	1	452	Fieldsboro Road	0	0.99	3	<10 accidents - Did not meet criteria
121	2.13	1	452	Fieldsboro Road	0.1	1.09	3	<10 accidents - Did not meet criteria
122	2.13	1	452	Fieldsboro Road	0.2	1.19	3	<10 accidents - Did not meet criteria
123	2.13	1	452	Fieldsboro Road	0.3	1.29	3	<10 accidents - Did not meet criteria
124	2.13	1	452	Fieldsboro Road	0.4	1.39	3	<10 accidents - Did not meet criteria
125	2.13	1	452	Fieldsboro Road	0.5	1.49	3	<10 accidents - Did not meet criteria
126	2.13	1	452	Fieldsboro Road	0.6	1.59	3	<10 accidents - Did not meet criteria
127	2.13	2	30	Main Street	1.6	2.59	9	<10 accidents - Did not meet criteria
128	2.13	3	353		2.4	3.39	3	<10 accidents - Did not meet criteria

Delaware - Statewide

Accident Date Range

01/01/2007 - 12/31/2009

Interval Length

1.0 mile

Parameters

AMBIENT_LIGHT_PARAMETER-05

Rank	Crit. Ratio	County	Road	Road Name	Beg MP	End MP	# Accs	Notes
129	2.12	2	8	US 113	9.6	10.59	13	Location #5
130	2.12	3	24	SR 24	18.2	19.19	7	<10 accidents - Did not meet criteria
131	2.12	3	24	SR 24	18.4	19.39	7	<10 accidents - Did not meet criteria
132	2.12	3	24	SR 24	18.5	19.49	7	<10 accidents - Did not meet criteria
133	2.11	3	246	Albury Avenue	0.3	1.29	4	<10 accidents - Did not meet criteria
134	2.11	3	261		1.3	2.29	5	<10 accidents - Did not meet criteria
135	2.11	3	353		2.1	3.09	3	<10 accidents - Did not meet criteria
136	2.11	3	477		0	0.99	3	<10 accidents - Did not meet criteria
137	2.1	1	26	Old Baltimore Pike	2.5	3.49	21	Location #6
138	2.1	3	48		7.2	8.19	7	<10 accidents - Did not meet criteria
139	2.1	3	48		7.3	8.29	7	<10 accidents - Did not meet criteria
140	2.1	3	48		7.4	8.39	7	<10 accidents - Did not meet criteria
141	2.1	3	48		7.5	8.49	7	<10 accidents - Did not meet criteria
142	2.1	3	48		7.6	8.59	7	<10 accidents - Did not meet criteria
143	2.1	3	48		7.7	8.69	7	<10 accidents - Did not meet criteria
144	2.1	3	48		7.8	8.79	7	<10 accidents - Did not meet criteria
145	2.1	3	48		7.9	8.89	7	<10 accidents - Did not meet criteria
146	2.1	3	48		8	8.99	7	<10 accidents - Did not meet criteria
147	2.09	2	30	Main Street	0.7	1.69	7	<10 accidents - Did not meet criteria
148	2.09	3	246	Albury Avenue	0.4	1.39	4	<10 accidents - Did not meet criteria
149	2.09	3	28	US 9	8.9	9.89	12	Location #4
150	2.07	3	246	Albury Avenue	1.8	2.7	3	<10 accidents - Did not meet criteria
151	2.07	3	326	State Street	0.8	1.79	8	<10 accidents - Did not meet criteria
152	2.06	2	188		0	0.32	1	<10 accidents - Did not meet criteria
153	2.06	3	353		2	2.99	3	<10 accidents - Did not meet criteria
154	2.06	3	353		2.5	3.49	3	<10 accidents - Did not meet criteria
155	2.05	1	26	Old Baltimore Pike	2.8	3.79	21	Location #6
156	2.05	3	594		0	0.99	6	<10 accidents - Did not meet criteria
157	2.04	2	30	Main Street	0.4	1.39	7	<10 accidents - Did not meet criteria
158	2.04	3	246		1.2	2.19	4	<10 accidents - Did not meet criteria
159	2.04	3	28	US 9	9	9.99	12	Location #4
160	2.04	3	544		0.4	1.39	4	<10 accidents - Did not meet criteria
161	2.03	2	303		1.2	2.19	2	<10 accidents - Did not meet criteria
162	2.02	1	301	Thompson's Station Road	0.3	1.29	9	<10 accidents - Did not meet criteria
163	2.02	1	301	Thompson's Station Road	0.4	1.39	9	<10 accidents - Did not meet criteria
164	2.02	2	54	Main Street	0.1	1.09	6	<10 accidents - Did not meet criteria
165	2.02	2	54	Main Street	0.2	1.19	6	<10 accidents - Did not meet criteria
166	2.02	2	54	Main Street	0.3	1.29	6	<10 accidents - Did not meet criteria
167	2.02	2	54	Main Street	0.4	1.39	6	<10 accidents - Did not meet criteria
168	2.02	2	54	Main Street	0.5	1.49	6	<10 accidents - Did not meet criteria
169	2.01	3	28	US 9	5.8	6.79	11	Location #4
170	2.01	3	488		2.8	3.79	4	<10 accidents - Did not meet criteria
171	2.01	3	488		2.9	3.89	4	<10 accidents - Did not meet criteria
172	2	1	82	SR 1	5.6	6.59	12	Location #3
173	2	1	9	SR 52	3.2	4.19	16	Location #7
174	2	2	8	US 113	9.7	10.69	12	Location #5
175	1.99	3	361		1.8	2.79	7	<10 accidents - Did not meet criteria
176	1.99	3	479A		0	0.6	2	<10 accidents - Did not meet criteria
177	1.98	1	26	Old Baltimore Pike	2.6	3.59	20	Location #6
178	1.98	1	26	Old Baltimore Pike	2.9	3.89	20	Location #6
179	1.98	1	9	SR 52	3.1	4.09	16	Location #7
180	1.98	2	325	Big Oak Road	1.4	2.39	4	<10 accidents - Did not meet criteria
181	1.98	2	73	North Street	4.3	5.29	7	<10 accidents - Did not meet criteria
182	1.98	3	207		1.3	2.29	7	<10 accidents - Did not meet criteria
183	1.98	3	353		1.9	2.89	3	<10 accidents - Did not meet criteria
184	1.98	3	544		1	1.99	2	<10 accidents - Did not meet criteria
185	1.97	1	26	Old Baltimore Pike	2.7	3.69	20	Location #6
186	1.97	2	30	Main Street	1.4	2.39	8	<10 accidents - Did not meet criteria
187	1.97	3	2	US 13	3.6	4.59	18	Location #8
188	1.96	1	383	Church Road	0.4	1.37	8	<10 accidents - Did not meet criteria
189	1.96	2	30	Main Street	0.3	1.29	7	<10 accidents - Did not meet criteria
190	1.96	2	384		3.1	4.09	6	<10 accidents - Did not meet criteria
191	1.96	3	16	SR 16	25.8	26.79	5	<10 accidents - Did not meet criteria
192	1.96	3	16	SR 16	25.9	26.89	5	<10 accidents - Did not meet criteria

Delaware - Statewide**Accident Date Range**

01/01/2007 - 12/31/2009

Interval Length

1.0 mile

Parameters

AMBIENT_LIGHT_PARAMETER-05

Rank	Crit. Ratio	County	Road	Road Name	Beg MP	End MP	# Accs	Notes
193	1.96	3	16	SR 16	26	26.99	5	<10 accidents - Did not meet criteria
194	1.96	3	16	SR 16	26.1	27.09	5	<10 accidents - Did not meet criteria
195	1.96	3	353		2.6	3.59	3	<10 accidents - Did not meet criteria
196	1.95	2	73	North Street	4.2	5.19	7	<10 accidents - Did not meet criteria
197	1.95	3	326	State Street	0.7	1.69	8	<10 accidents - Did not meet criteria
198	1.94	1	32	US 40	4.2	5.19	25	Location #9
199	1.94	2	73	North Street	4.4	5.39	7	<10 accidents - Did not meet criteria
200	1.94	3	213	Walnut Street	8.1	9.09	5	<10 accidents - Did not meet criteria
201	1.94	3	484		2.7	3.69	4	<10 accidents - Did not meet criteria
202	1.92	1	17	SR 92	0	0.99	17	Location #10