



**SR 48 AT HEDGEROW PLACE/HARLECH DRIVE AND SR 48 AT COURTNEY ROAD
TRAFFIC SIGNAL WARRANT EVALUATION
JANUARY 30, 2019**

Senate Resolution No. 10 (SR 10), sponsored by Senators Delcollo and Lavelle, was passed by the 149th General Assembly of the Delaware State Senate. SR 10 created a Special Committee to study and make recommendations regarding truck traffic along SR 41, SR 48, and SR 7 in New Castle County. Per SR 10, the Special Committee was directed to study and make recommendations regarding how to reduce the number of trucks traveling along these roadways and improvements in engineering, infrastructure, education, and enforcement that can improve the quality of life for those who live along these roadways. In a report published January 12, 2018, The Committee made recommendations to DelDOT and the General Assembly, which included recommendation #13: Conduct signal warrant studies for the following locations:

- SR 48 and Old Wilmington Road
- SR 48 and Courtney Road
- SR 48 and Hedgerow Place/Harlech Drive
- SR 48 and Old Hobson Farm

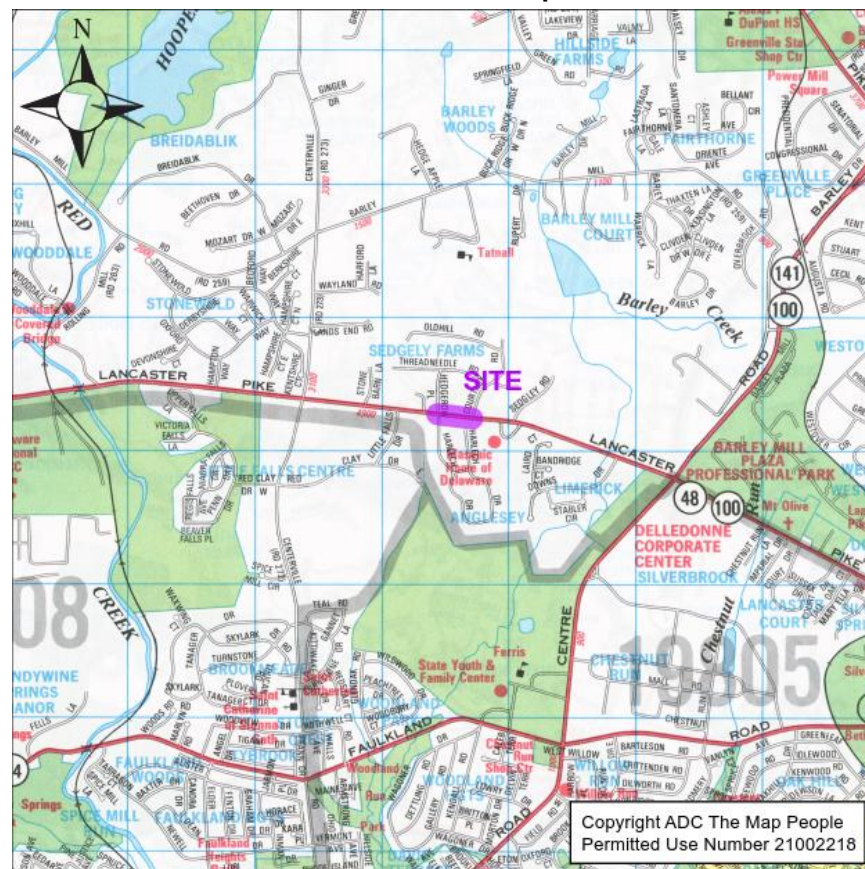
The following study presents the signal warrant analysis at SR 48 and Hedgerow Place/Harlech Drive and at SR 48 and Courtney Road.

SITE DESCRIPTION

The intersections of SR 48 and Hedgerow Place/Harlech Drive and SR 48 and Courtney Road are located approximately 1.6 miles west of the City of Wilmington (see Figure 1). The intersections are located between the signalized SR 48 intersections with SR 141 (Centre Road) to the east and Centerville Road to the west. At Hedgerow Place/Harlech Drive, eastbound SR 48 contains two through lanes, a left-turn lane, and a right-turn lane; westbound SR 48 contains two through lanes, a left-turn lane, and a right-turn lane. At Courtney Road, eastbound SR 48 contains two through lanes; westbound SR 48 contains two through lanes and a right-turn lane. Only right-turn movements are permitted from all side streets. The posted speed limit is 45 mph on SR 48. Southbound Hedgerow Place, northbound Harlech Drive, and southbound Courtney Road are stop-controlled and channelized at SR 48, with marked pedestrian crossings of each side street.

For purposes of this signal warrant analysis, the adjacent intersections of SR 48 at Hedgerow Place/Harlech Drive and SR 48 at Courtney Road will be analyzed together, for a single potential signal at Hedgerow Place/Harlech Drive. Because Courtney Road connects internally to Hedgerow Place, some volume is expected to shift should signalization occur. Signalization would allow for all movements at the intersection of SR 48 and Hedgerow Place/Harlech Drive; the intersection of SR 48 at Courtney Road would remain a right-in, right-out intersection.

FIGURE 1
Site Location Map



CRASH SUMMARY

A total of six crashes were reported during the 5.3-year period between January 2013 and April 2018 at the intersection of SR 48 and Hedgerow Place/Harlech Drive, including one (17 percent) crash resulting in personal injury. The following is a summary of the crashes by type:

- 2 westbound rear end crashes, one due to a vehicle changing lanes and the other due to slowing for traffic ahead
- 1 eastbound sideswipe crash (resulting in personal injury)
- 1 eastbound rear end crash due to stopping for a school bus
- 1 eastbound crash with animal in roadway
- 1 southbound left-turn/westbound angle crash (illegal median crossing)

A total of two crashes were reported during the 5.3-year period between January 2013 and April 2018 at the intersection of SR 48 and Courtney Road, including one (50 percent) crash resulting in personal injury. The following is a summary of the crashes by type:

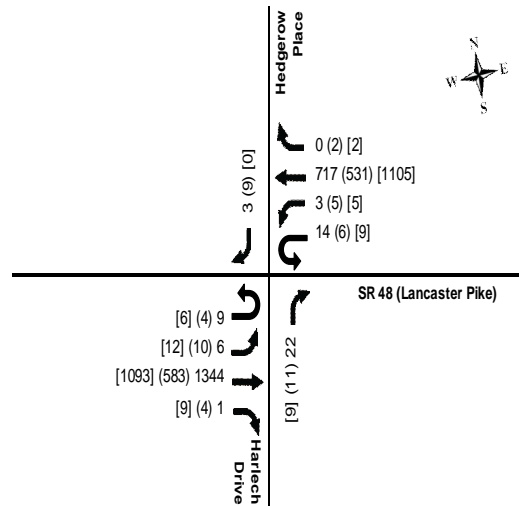
- 1 eastbound rear end crash due to slowing for traffic ahead
- 1 eastbound motorcycle crash with animal in roadway (resulting in personal injury)



TRAFFIC VOLUMES

Turning movement counts were conducted on Thursday, April 19, 2018 from 6:00 AM to 7:00 PM at the intersection of SR 48 and Hedgerow Place/Harlech Drive and are summarized in Figure 2.

FIGURE 2
Peak Hour Volumes

**April 19, 2018 Traffic Volumes**

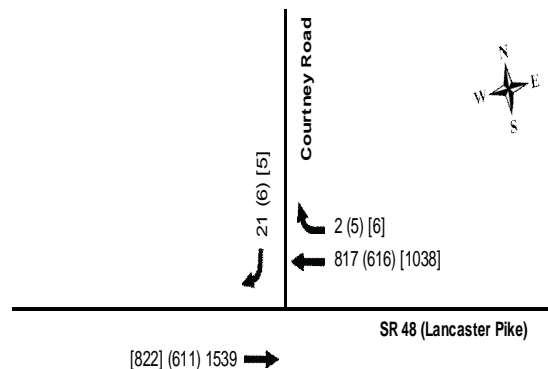
00: AM Peak Hour (6:45 - 7:45 AM)

(00): Midday Peak Hour (11:15 AM - 12:15 PM)

[00]: PM Peak Hour (4:15 - 5:15 PM)

Turning movement counts were conducted on Wednesday, April 25, 2018 from 6:00 AM to 7:00 PM at the intersection of SR 48 and Courtney Road and are summarized in Figure 3.

FIGURE 3
Peak Hour Volumes

**April 25, 2018 Traffic Volumes**

00: AM Peak Hour (7:15 - 8:15 AM)

(00): Midday Peak Hour (1:00 - 2:00 PM)

[00]: PM Peak Hour (4:30 - 5:30 PM)

SIGHT DISTANCE

SR 48 has a 45-mph posted speed limit. The slope of westbound SR 48 approaching the intersection of Hedgerow Place is -1.4 percent, and the slope approaching Harlech Drive on eastbound SR 48 is +1.5 percent. The slope of westbound SR 48 approaching the intersection of Courtney Road is -3.7 percent, and the slope approaching Courtney Road on eastbound SR 48 is +3.0 percent. These speed and grade measurements were used to determine the stopping and intersection sight distance guidelines from equations in the *AASHTO Policy on Geometric Design of Highways and Streets*.

As shown in Table 1, the southbound Hedgerow Place corner sight distances looking left and right at SR 48 do not meet AASHTO criteria when vehicles are positioned at the stop line (view is obstructed by trees to the left and to the right; see Photos 1-2). Southbound Hedgerow Place corner sight distances looking left and right meet AASHTO criteria when vehicles move beyond the stop line (see Photos 3-4). During field observations, it was noted that many vehicles pull forward and wait beyond the stop line before turning onto SR 48.



Photo 1: Southbound Hedgerow Place corner sight distance looking left onto SR 48 (from stop line)



Photo 2: Southbound Hedgerow Place corner sight distance looking right onto SR 48 (from stop line)



Photo 3: Southbound Hedgerow Place corner sight distance looking left onto SR 48 (beyond stop line)



Photo 4: Southbound Hedgerow Place corner sight distance looking right onto SR 48 (beyond stop line)

TABLE 1
Sight Distance Measurements – Hedgerow Place

Corner Sight Distance								
Approach	Looking Left (563 ft required)				Looking Right (563 ft required if median restriction is eliminated)			
	From stop line	Criteria Met?	Beyond stop line	Criteria Met?	From stop line	Criteria Met?	Beyond stop line	Criteria Met?
Southbound Hedgerow Place	80 ft	No	>750 ft	Yes	225 ft	No	>750 ft	Yes
Stopping Sight Distances								
Approach		Measured		Criteria		Criteria Met?		
Westbound SR 48		>750 ft		368 ft		Yes		
Eastbound SR 48		>750 ft		352 ft		Yes		

As shown in Table 2, the northbound Harlech Drive corner sight distances looking left and right at SR 48 do not meet AASHTO criteria when vehicles are positioned at the stop line (view is obstructed by slope and landscaping to the left and to the right; see Photos 5-6). Northbound Harlech Drive corner sight distances looking left and right meet AASHTO criteria when vehicles move beyond the stop line (see Photos 7-8). During field observations, it was noted that many vehicles pull forward and wait beyond the stop line before turning onto SR 48.





Photo 5: Northbound Harlech Drive corner sight distance looking left onto SR 48 (from stop line)



Photo 6: Northbound Harlech Drive corner sight distance looking right onto SR 48 (from stop line)



Photo 7: Northbound Harlech Drive corner sight distance looking left onto SR 48 (beyond stop line)



Photo 8: Northbound Harlech Drive corner sight distance looking right onto SR 48 (beyond stop line)

**TABLE 2
Sight Distance Measurements – Harlech Drive**

Corner Sight Distance								
Approach	Looking Left (563 ft required)				Looking Right (563 ft required if median restriction is eliminated)			
	From stop line	Criteria Met?	Beyond stop line	Criteria Met?	From stop line	Criteria Met?	Beyond stop line	Criteria Met?
Northbound Harlech Drive	70 ft	No	>750 ft	Yes	40 ft	No	>750 ft	Yes
Stopping Sight Distances								
Approach		Measured		Criteria		Criteria Met?		
Westbound SR 48		>750 ft		368 ft		Yes		
Eastbound SR 48		>750 ft		352 ft		Yes		

As shown in Table 3, the southbound Courtney Road corner sight distances looking left and right at SR 48 do not meet AASHTO criteria when vehicles are positioned at the stop line (view is obstructed by trees to the left and to the right; see Photos 9-10). Southbound Courtney Road corner sight distance looking left does not meet AASHTO criteria when vehicles move beyond the stop line due to the crest vertical curve on westbound SR 48 (see Photo 11). The measured intersection sight distance is 275 feet, 45 feet less than the calculated minimum AASHTO intersection sight distance guideline of 320 feet. Southbound Courtney Road corner sight distance looking right meets AASHTO criteria when vehicles move beyond the stop line (see Photo 12). During field observations, it was noted that many vehicles pull forward and wait beyond the stop line before turning onto SR 48.



Photo 9: Southbound Courtney Road corner sight distance looking left onto SR 48 (from stop line)



Photo 10: Southbound Courtney Road corner sight distance looking right onto SR 48 (from stop line)



Photo 11: Southbound Courtney Road corner sight distance looking left onto SR 48 (beyond stop line)



Photo 12: Southbound Courtney Road corner sight distance looking right onto SR 48 (beyond stop line)

TABLE 3
Sight Distance Measurements – Courtney Road

Corner Sight Distance								
Approach	Looking Left (619 ft required)				Looking Right (563 ft required if median restriction is eliminated)			
	From stop line	Criteria Met?	Beyond stop line	Criteria Met?	From stop line	Criteria Met?	Beyond stop line	Criteria Met?
Southbound Courtney Road	160 ft	No	320 ft	No	190 ft	No	>750 ft	Yes
Stopping Sight Distances								
Approach		Measured		Criteria		Criteria Met?		
Westbound SR 48		440 ft		383 ft		Yes		
Eastbound SR 48		>750 ft		344 ft		Yes		

SPEED STUDY

Free-flow vehicle speeds were measured along SR 48 between 1:15 PM and 2:15 PM on Thursday, January 11, 2018. The results are summarized in Table 4. As shown, the 85th-percentile speeds along SR 48 are 15 and 14 miles per hour above the 45-mph speed limit on eastbound and westbound SR 48, respectively.

TABLE 4
Speed Data Summary

Criteria	SR 48	
	Eastbound	Westbound
Posted Speed Limit	45 mph	45 mph
85 th -Percentile Speed	60 mph	59 mph
% More Than 5 mph Over Speed Limit	74%	80%
Mean Speed	54 mph	54 mph
High/Low Speed	66/42 mph	72/43 mph
USLIMITS2 Recommendation	55 mph	55 mph

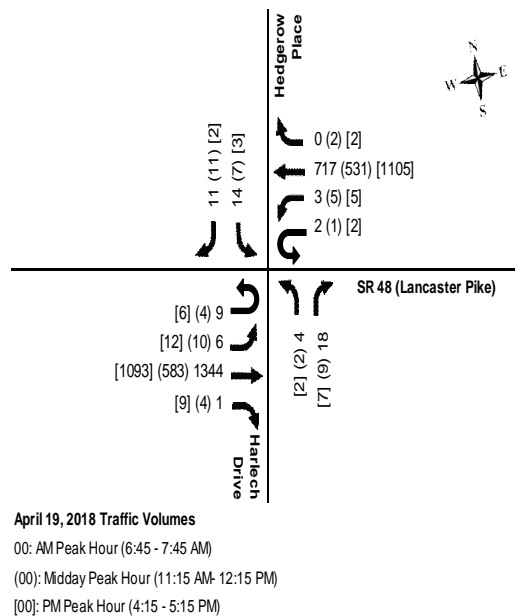
ORIGIN-DESTINATION STUDY

On Thursday, January 25, 2018 from 7:30 AM to 9:00 AM, a study was performed at the adjacent intersections to better understand the u-turn volumes originating from each minor roadway. The following are the proportions of vehicles that made a right turn and then an immediate u-turn:

- Hedgerow Place: 3 of 8 (38 percent); 1 of 3 crossed the median illegally
- Harlech Drive: 5 of 27 (19 percent); 1 of 5 crossed the median illegally
- Courtney Road: 14 of 22 (64 percent)

The information gathered in this study was used to assign the existing right-turn volumes to projected right- and left-turn volumes under the signalized condition. It was assumed that additional volume from Courtney Road would be added to the southbound Hedgerow Place left-turn movement, due to signalization. The extrapolated volumes are summarized in Figure 4.

FIGURE 4
Extrapolated Peak Hour Volumes



TRAFFIC SIGNAL WARRANT ANALYSIS

A signal warrant analysis was conducted in accordance with the *2011 Delaware Manual on Uniform Traffic Control Devices (DE MUTCD)* for the intersection of SR 48 at Hedgerow Place/Harlech Drive (extrapolated volumes). A summary of the warrant analysis is presented in Table 5. The 85th-percentile speeds on SR 48 exceed 40 miles per hour; therefore, the *2011 DE MUTCD*'s reduced volume criteria were applied. Two lanes are provided for the major road (SR 48) approach, and one lane is provided on the minor approaches. All right turns were included in the analysis to represent a "worst-case" scenario. As shown in Table 5, none of the traffic signal warrants are met. The side-street volume does not meet the warrant; it would effectively need to increase by five times to meet the minimum. After SR 141/SR 48 construction was completed, a spot count was conducted to confirm that the previously counted traffic volumes were not impacted by the construction closures and detours. The spot count showed that the side-street volumes were consistent with the previous count (i.e., still requiring a very significant increase in demand to satisfy warrants).

TABLE 5
Traffic Signal Warrant Analysis Summary

DE MUTCD Warrant	Criteria			No. of Hours Meets Criteria (Warrants 1, 2, 4) Actual Conditions (Warrant 3)		Warrant Criteria Met?
	Major Street Volume (VPH)	Minor Street Volume (VPH)	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	0	No	No
Cond. B – Interruption of Cont. Traffic	630	53	8	0	No	
Cond. C – Combination of Conditions <ul style="list-style-type: none">80% of Condition A80% of Condition B	336 504	84 42	8 8	0 0	No	
2 – Four-Hour Vehicular Volume	(See Figure 4C-1 or 4C-2)		4	0		No
3 – Peak Hour	(Either of the two conditions must be met)					
Condition A	Delay ≥ 4 Veh.-Hrs. Approach Volume ≥ 100 vph Entering Volume ≥ 800 vph		1	0	No	No
Condition B	(See Figure 4C-3 or 4C-4)		1	0	No	
4 – Pedestrian Volume	(Both of the two conditions must be met)					
Condition A	(See Figure 4C-5 or 4C-6)		4	0	No	No
Condition B	(See Figure 4C-7 or 4C-8)		1	0	No	
5 – School Crossing	(Refer to DE MUTCD Section 4C.06 for Criteria)			-		N/A
6 – Coordinated Signal System	(Refer to DE MUTCD Section 4C.07 for Criteria)			-		N/A
7 – Crash Experience	(Refer to DE MUTCD Section 4C.08 for Criteria)			-		No
8 – Roadway Network	(Refer to DE MUTCD Section 4C.09 for Criteria)			-		N/A
9 – Intersection Near a Grade Crossing	(Refer to DE MUTCD Section 4C.10 for Criteria)			-		N/A



RECOMMENDATIONS

At this time, no changes to the intersection operations or geometrics at SR 48 at Hedgerow Place/Harlech Drive and at SR 48 at Courtney Road are recommended. With eight reported crashes in the more than five-year study period at the two intersections, only one of which was a type potentially correctable by signalization, there are no significant safety concerns at these locations. The current channelized design of the intersection and the restricted side-street left-turns reduces the potential conflict points thus creating a safer intersection with less chances of a crash occurring. Additionally, no signal warrants are met; therefore, no signalization is recommended at this time. However, it is recommended to trim the trees within the right-of-way on the corners of SR 48 at the intersections of Hedgerow Place and Courtney Road.

