



DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

FEBRUARY 2014

CHARLESTOWN TOWNSHIP, CHESTER COUNTY

CONGESTION & CRASH

Analysis Program

site



The Delaware Valley Regional Planning Commission is dedicated to uniting the region's elected officials, planning professionals, and the public with a common vision of making a great region even greater. Shaping the way we live, work, and play, DVRPC builds consensus on improving

transportation, promoting smart growth, protecting the environment, and enhancing the economy. We serve a diverse region of nine counties: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey. DVRPC is the federally designated Metropolitan Planning Organization for the Greater Philadelphia Region — leading the way to a better future.



The symbol in our logo is adapted from the official DVRPC seal and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

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Executive Summary

The goals of the Congestion and Crash Site Analysis Program (CCSAP) are to: 1.) improve the accessibility and efficiency of the region's transportation system, 2.) improve safety and air quality, and 3.) reduce congestion through analyses of specific highway locations with demonstrated problems in both New Jersey and Pennsylvania.

Due to their many conflict points, more crashes occur at intersections than at midblock locations. In addition, the geometry of an intersection can present many issues for the road user. Assuring the efficient operation of intersections is an increasingly important issue as municipalities attempt to maximize roadway capacity to serve the growing demand for travel. The objective is to identify cost-effective improvements that will reduce crashes and congestion.

A range of candidate intersections was initially developed by the Delaware Valley Regional Planning Commission (DVRPC) from the Congestion Management Process (CMP) and crash screening process. Four intersections were generated from this method for the Chester County Planning Commission (CCPC) to consider. Of the four intersections, the CCPC selected the intersection of Charlestown Road at Hollow Road. In 2010, PennDOT requested that the township conduct a traffic study at an adjacent location: the intersection of Charlestown Road and Pikeland Road/Trevor Lane. Unable to fund the traffic study and given the proximity to the Charlestown Road and Hollow Road intersection, the CCPC requested that both locations be included in the CCSAP. Despite the low number of crashes, the CCPC saw this as an ideal opportunity to evaluate both of these unsignalized intersections for safety improvements.

With input from the advisory committee of local and county representatives and the analyses performed by DVRPC, improvement strategies were developed (see [Appendix A](#) for list of advisory committee participants). The range of strategies included the following: adding signage, realigning the Charlestown Road at Pikeland Road intersection, removing trees and hedges, and restriping. With guidance from the advisory committee, the range was refined into a set of recommendations. PennDOT agreed to implement several of the recommendations, which should help improve the traffic flow and safety of all roadway users traveling through both intersections.

Introduction

This technical report provides analysis and recommendations for two unsignalized intersections in Charlestown Township, Chester County: 1.) Charlestown Road (SR 1019) at Pikeland Road (SR 1026)/Trevor Lane and 2.) Charlestown Road at Hollow Road (SR 1024). The recommended strategies cover both safety and operational improvements. Many of the operational improvements were modeled and the results compared to existing conditions. It was not possible to model the safety improvements, but they were developed based on professional knowledge and discussions with members of the study advisory committee. The resulting recommendations are summarized in the final chapter of the report.

Study Process

The Delaware Valley Regional Planning Commission (DVRPC) study team conducted field visits to observe the issues at both study locations. Data was then compiled and analyzed, including crash records data, Annual Average Daily Traffic (AADT) data, and turning movement counts. On May 7, 2012, a field visit meeting was held with the study advisory committee, which included representatives from the following agencies: the Chester County Planning Commission (CCPC), Charlestown Township, PennDOT District 6, and DVRPC. The field visit helped to identify safety issues at both intersections.

DVRPC staff conducted follow-up field visits to better define the existing conditions and refine the identification of problems. Subsequently, a technical analysis was performed to better understand and quantify the identified transportation issues. This included level of service (LOS), travel speed, and crash history analyses. Based on this work, a set of potential improvements was developed that addressed the identified problems. Findings and preliminary recommendations were presented to the advisory committee at a follow-up meeting held at the Charlestown Township Municipal Building on June 27, 2012. The purpose of the meeting was to discuss the recommendations and to get the advisory committee's perspectives on prioritizing and implementing the recommendations.

Level of Service (LOS) Evaluation

LOS analysis is a common tool for assessment of transportation facilities. When applied as a measure of performance for an entire or a particular component of an intersection, LOS has a precise meaning: the average delay experienced by a driver traveling through the intersection or a specific component of it. The parameters of delay that determine the various LOS categories for an unsignalized intersection are displayed in [Table 1](#).

A review of the existing conditions and the various potential improvement scenarios for the study intersections was conducted using Synchro software. Necessary information for determining delay and LOS measures at an unsignalized intersection include turning movement counts and roadway geometry. For unsignalized intersections, Synchro only utilizes control delay, for which it relies exclusively upon Highway Capacity Manual (HCM) methods. The delay range for unsignalized intersections is different from those for signalized intersections primarily due to driver expectation. The expectation is that signalized intersections are designed to carry higher volumes of traffic and therefore higher levels of delay are acceptable. LOS isn't a complete answer and needs to be supplemented with other analyses and field views.

Table 1: LOS Designations and Associated Delays for Unsignalized Intersections

LOS	Total Delay per Vehicle (seconds/vehicle)	LOS Criteria
A - Desirable	≤ 10	Very low control delay; all drivers find freedom of operation; very rarely more than one car in the queue.
B - Desirable	> 10 and ≤ 15	Some drivers begin to consider the delay troublesome; seldom is there more than one vehicle in queue.
C - Desirable	> 15 and ≤ 25	Most drivers feel restricted; most often there is more than one vehicle in queue.
D - Acceptable	> 25 and ≤ 35	Drivers feel restricted; most often there is more than one vehicle in the queue.
E - Undesirable	> 35 and ≤ 55	Drivers find delays approaching intolerable levels; there is frequently more than one vehicle in the queue; this level denotes a state in which the demand is close or equal to the probable maximum number of vehicles that can be accommodated by the movement.
F - Unsatisfactory	> 55	Very constrained flow; represents an intersection failure situation that is caused by geometric and/or operational constraints external to the intersection.

Source: *Highway Capacity Manual*, 2000.

Speed Analysis

DVRPC conducted a speed analysis to measure the average travel speeds on Charlestown Road between the two study intersections. Eighty-fifth percentile speeds were calculated and compared with posted speed limits.

Crash History Review

This analysis includes crashes that occurred at the two study intersections from 2007 through 2011. The main goals of this review are to highlight crash trends and determine causal factors. The collision diagrams used in this analysis were derived from reportable crash records provided by PennDOT District 6. In Pennsylvania, a crash is considered reportable when a person is injured or killed, or if a vehicle must be towed from the scene. The Pennsylvania State Police respond to incidents in Charlestown Township. Non-reportable crashes were not made available from the Pennsylvania State Police for this analysis.

Study Location

The focus of the study as shown in **Figure 1** on page 7 is the two unsignalized intersections of Charlestown Road at Pikeland Road/Trevor Lane and Charlestown Road at Hollow Road. These intersections are approximately one-third of a mile apart. On a regional level, Charlestown Road provides access to Charlestown Elementary School, Valley Creek Park, Valley Forge Christian College, and Phoenixville Borough. It also connects with several key roads, including US 202, PA 29 (State Road/Morehall Road), and Swedesford Road. Pikeland Road, Hollow Road, and Trevor Lane connect to residential areas in Charlestown Township.

Charlestown Road follows a northwesterly direction. Pikeland Road runs in an easterly direction. Trevor Lane runs in a southerly direction. Hollow Road runs in a northeasterly and southwesterly direction. For the purpose of this document, the orientation along Charlestown Road will be referenced as north and south. The orientation of Pikeland Road/Trevor Lane and Hollow Road will be denoted as east and west.

Intersection 1: Charlestown Road at Pikeland Road/Trevor Lane

Charlestown Road has a functional classification of rural major collector. As shown in the photographs below, the southbound and northbound Charlestown Road approaches contain one combined through, left- and right-turn lane. Pikeland Road is classified as a local road and contains one shared through, left- and right-turn lane. Trevor Lane is a driveway servicing three homes in the new Ashford subdivision. The southbound Charlestown Road, Pikeland Road, and Trevor Lane approaches are stop-controlled. This intersection is skewed and is not signalized.



View facing Pikeland Road approach. Source: DVRPC, 2012.



View of Charlestown Road southbound approach. Source: DVRPC, 2012.



View from Trevor Lane approach. Source: DVRPC, 2012.



View of intersection from the northwest quadrant. Source: DVRPC, 2012.

Intersection 2: Charlestown Road at Hollow Road

Hollow Road is classified as a local roadway. The eastbound and westbound approaches contain one combined shared through, left- and right-turn lane and are stop-controlled. Both Charlestown Road approaches contain one combined through, left- and right-turn lane. The northbound and southbound approaches are on a downhill grade.



Eastbound view of Hollow Road approach. Source: DVRPC, 2012.



Westbound view of Hollow Road approach. Source: DVRPC, 2012.



Southbound view of Charlestown Road at Hollow Road. Source: DVRPC, 2012.



Northbound view of Charlestown Road at Hollow Road. Source: DVRPC, 2012.

Figure 1
Regional Setting

Analysis Area / Intersection

EAST PIKELAND

SCHUYLKILL

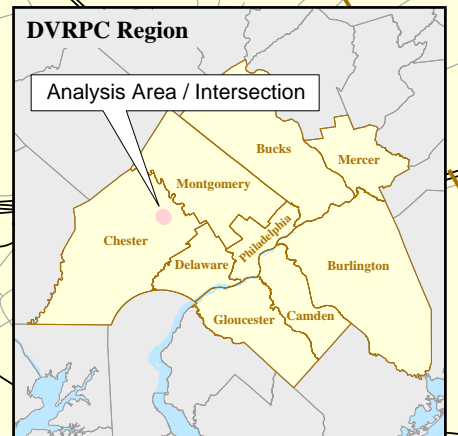
CHARLESTOWN

TREDYFFRIN

EAST WHITELAND

DVRPC Region

Analysis Area / Intersection



Existing Conditions

The following list summarizes some of the comments made by the study advisory committee at the kick-off meeting relating to existing traffic conditions at the study intersections.

Intersection 1: Charlestown Road at Pikeland Road/Trevor Lane

Advisory Committee Comments

1. Township officials said that traffic in the morning is impeded by the stop sign on the southbound Charlestown Road approach. Often, motorists ignore the stop sign by either yielding or rolling through the intersection. Recently, conditions have worsened on this approach due to the PA 29 widening construction project taking place three-quarter miles south of this intersection. More information on the PA 29 construction project is on page 27.
2. Sight distance is poor from Pikeland Road. Overgrown vegetation and trees impede drivers' view of southbound Charlestown Road. The intersection's skew could be a contributing factor in the sight distance issue.
3. Township officials said that drivers are speeding on Charlestown Road.

AADT Counts

DVRPC counts taken in 2010 on Charlestown Road north of the study intersection showed an AADT volume of 8,089 vehicles. Counts taken in 2009 on Pikeland Road showed an AADT volume of nearly 2,500 vehicles. AADT data was not available for Trevor Lane.

Peak Hour Turning Movement Counts

Manual turning movement counts at the intersection were taken on May 7, 2012, between the hours of 6:00 AM and 9:00 AM and between 3:00 PM and 6:00 PM. A peak hour turning movement diagram is shown in [Figure 2](#) on page 11. The morning peak hour is 7:30 AM to 8:30 AM, and the afternoon peak hour is 4:45 PM to 5:45 PM.

During the morning peak hour, 833 vehicles traveled through this intersection. The dominant movements in the morning were the southbound through movement (460 vehicles) and eastbound right-turn movement (239 vehicles). Commuters traveling south on Charlestown Road were likely heading to access US 202. These movements represented 84 percent of the

intersection’s volume. Turning movements onto Pikeland Road were minimal. Township officials reported that the southbound right-turn movement onto Pikeland Road is nonexistent due to the awkward skew. No turn movements were observed from Trevor Lane.

During the afternoon peak hour, 1,126 vehicles traveled through the intersection. This is a 26 percent increase in traffic compared to morning conditions. The dominant movements were the northbound through movement (733 vehicles) and northbound left-turn movement (205 vehicles) onto Pikeland Road. This reversed traffic pattern is likely attributed to motorists returning home in the evening. Traffic movement from Pikeland Road was light. No turn movements were observed from Trevor Lane.

Existing LOS

An LOS analysis was conducted for the study intersection to determine the operational quality in terms of vehicle delay. **Table 2** below summarizes the LOS of the intersection under existing conditions. The temporary traffic impacts (i.e. increased travel delay, particularly for the southbound approach) from the PA 29 project were not considered.

The intersection operates at conditions that are desirable by engineering standards. The overall LOS for this intersection during the morning and afternoon peak period was A, with delays of 10 and three seconds, respectively. The highest delays were in the morning on the southbound and eastbound approaches. This was attributed to higher vehicle volumes and the stop-and-go conditions associated with stop signs at both approaches. Compared to morning conditions, afternoon delay on the southbound and eastbound approaches was reduced by seven and five seconds, respectively. The northbound approach barely had any delays due to free-flow conditions. Since there were no turn movements recorded from Trevor Lane, no delay or LOS could be calculated.

Table 2: Existing LOS for Charlestown Road at Pikeland Road/Trevor Lane Intersection

Direction	Morning		Afternoon	
	Delay (s)	LOS	Delay (s)	LOS
NB Charlestown Road	0	A	2	A
SB Charlestown Road	15	B	8	A
EB Pikeland Road	7	A	2	A
WB Trevor Lane	n/a	n/a	n/a	n/a
Total Intersection	10	A	3	A

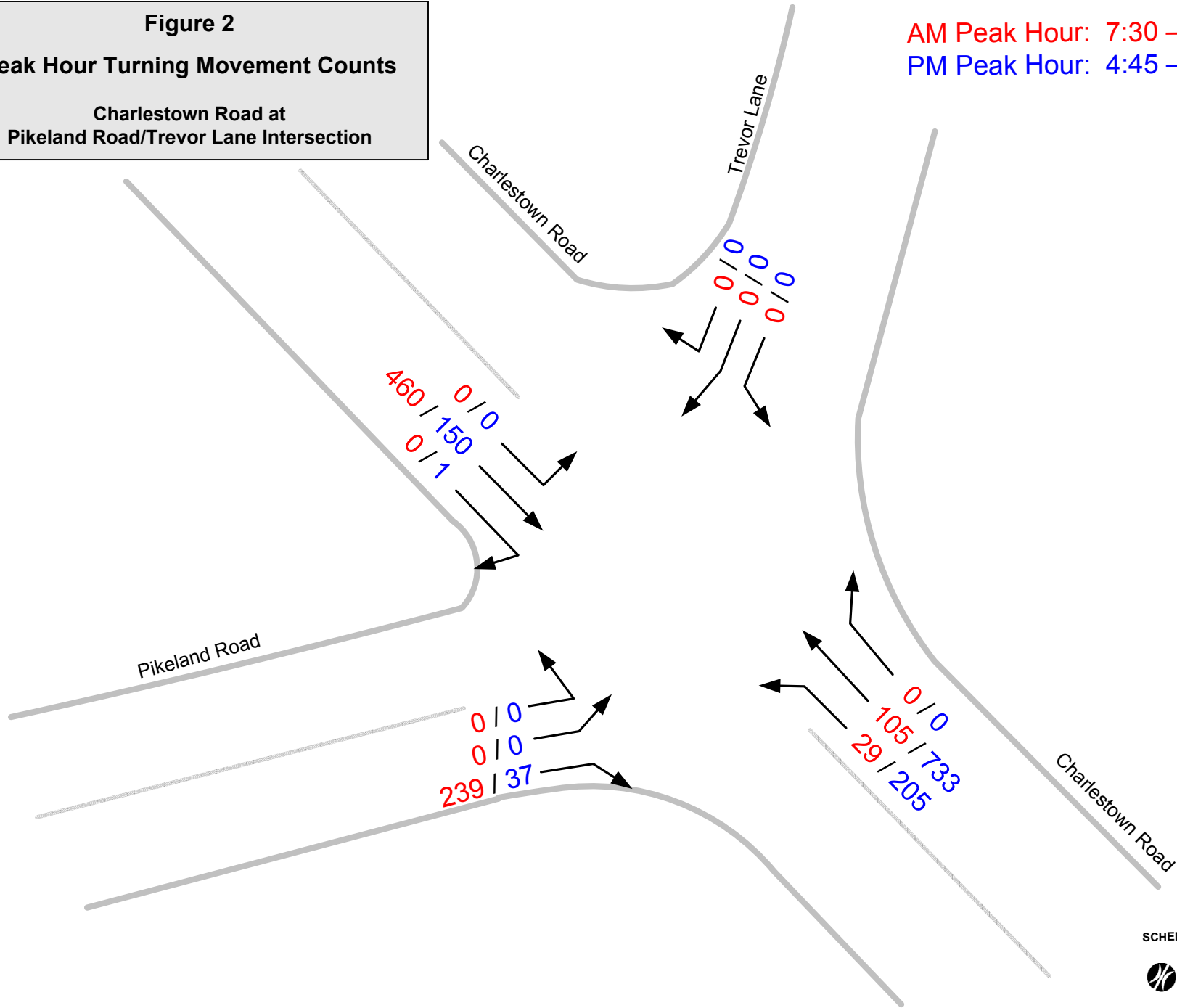
Source: DVRPC, 2012.

Figure 2

Peak Hour Turning Movement Counts

Charlestown Road at
Pikeland Road/Trevor Lane Intersection

AM Peak Hour: 7:30 – 8:30 AM
PM Peak Hour: 4:45 – 5:45 PM



Land Use

The land use surrounding the immediate intersection is wooded and low-density residential development. [Figure 3](#) on page 13 is an aerial view of the intersection. Homes located in the Ashford subdivision occupy the east side of the intersection. The west side of the intersection is wooded.

Pedestrians

Although the Ashford subdivision and Charlestown Elementary School are located in the vicinity of the intersection, pedestrian activity is reported to be nonexistent. There are no sidewalks or shoulders surrounding the immediate intersection.

Transit

No transit service is available along Charlestown Road.

Figure 3
Study Area
Charlestown Road at Pikeland Road/
Trevor Lane Intersection



N
0 25 50
Feet
Aerial Imagery: ESRI, 2011
dvrpc

Intersection 2: Charlestown Road at Hollow Road

Advisory Committee Comments

1. There are numerous angle crashes.
2. Vehicles traveling along Charlestown Road speed through the intersection. This may be attributed to the steep grades.
3. There are no intersection pavement markings to supplement signage conditions.
4. Sight distance is an issue for westbound left-turning vehicles. This is the result of the overgrown vegetation and tall hedge.
5. The drainage grate located in the southeast corner of the intersection is not level with the pavement. This can present a safety hazard for right-turning vehicles and bicyclists.
6. Sight distance is an issue for westbound left-turning Hollow Road vehicles due to a large overgrown hedge.

AADT Counts

Several DVRPC counts taken in 2010 revealed the following AADT volume: Charlestown Road south of the study intersection had 8,089 vehicles; Charlestown Road north of study intersection had 6,974 vehicles, and Hollow Road east of the intersection had 283 vehicles. In 2009, counts taken on the west side of Hollow Road showed an AADT volume of 616 vehicles. These AADT counts remain consistent with the previous year's counts.

Peak Hour Turning Movement Counts

Manual turning movement counts were taken at the intersection. These counts were taken on May 2, 2012, between the hours of 6:00 AM and 9:00 AM and between 3:00 PM and 6:00 PM. A peak hour turning movement diagram is shown in [Figure 4](#) on page 16. The morning peak hour is 6:45 AM to 7:45 AM, and the afternoon peak hour is 4:30 PM to 5:30 PM.

During the morning peak hour, 697 vehicles traveled through this intersection. The dominant movements in the morning were the southbound through (484 vehicles) and southbound right-turns (107 vehicles), which represent 85 percent of the intersection's volume. Township officials said the heavy southbound right-turn movement is likely due to commuters using Hollow Road and Pikeland Road to by-pass the stop sign on Charlestown Road at Pikeland Road/Trevor Lane intersection. This additional traffic adds to the heavy right-turn movement from Pikeland Road to southbound Charlestown Road. Traffic movements entering and leaving Hollow Road were minimal.

Counts taken during the afternoon peak period showed that 881 vehicles traveled through this intersection. The highest traffic volumes were the northbound and southbound through movements on Charlestown Road, with 695 and 124 vehicles, respectively. Similar to morning traffic patterns, few vehicles entered or left from Hollow Road.

Existing LOS

Table 3 shows that the Charlestown Road at Hollow Road intersection is operating at desirable conditions of LOS A in both peak periods. Delays along both Hollow Road approaches were LOS B and C for the morning and afternoon peak hours, respectively. These LOS equate to one or two vehicles waiting for gaps in traffic on Charlestown Road to proceed through the intersection. The northbound and southbound approaches barely had any delays.

Table 3: Existing LOS Analysis for Charlestown Road at Hollow Road Intersection

Direction	Morning		Afternoon	
	Delay (s)	LOS	Delay (s)	LOS
NB Charlestown Road	1	A	0	A
SB Charlestown Road	0	A	0	A
EB Hollow Road	15	B	21	C
WB Hollow Lane	15	B	18	C
Total Intersection	1	A	1	A

Source: DVRPC, 2012.

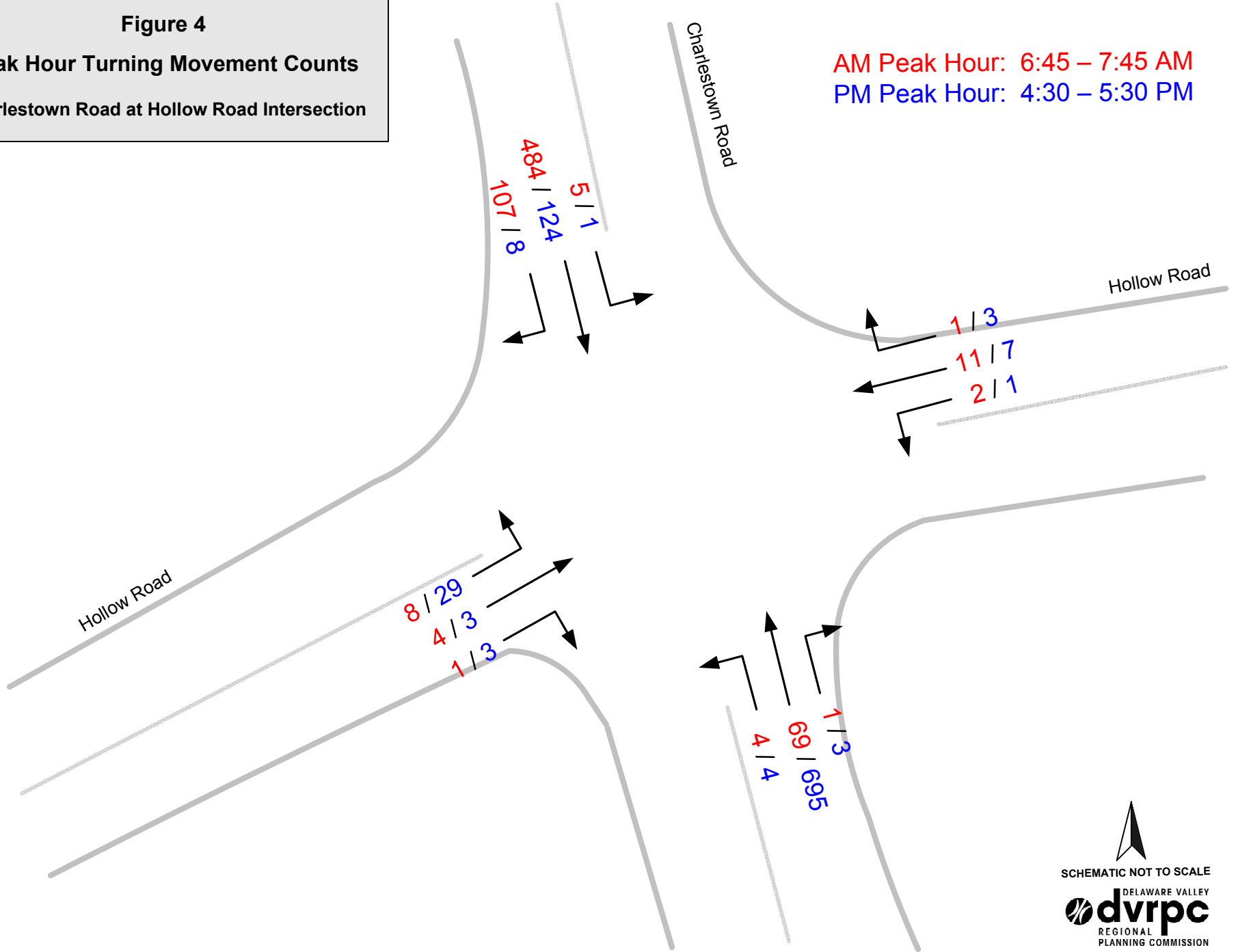
Figure 4

Peak Hour Turning Movement Counts

Charlestown Road at Hollow Road Intersection

AM Peak Hour: 6:45 – 7:45 AM

PM Peak Hour: 4:30 – 5:30 PM



Land Use

The land use surrounding the immediate intersection is wooded and low-density residential development. [Figure 5](#) on page 18 is an aerial view of the intersection. Homes are located on the south side and in the northwest quadrant of the intersection. The northeast quadrant of the intersection is wooded.

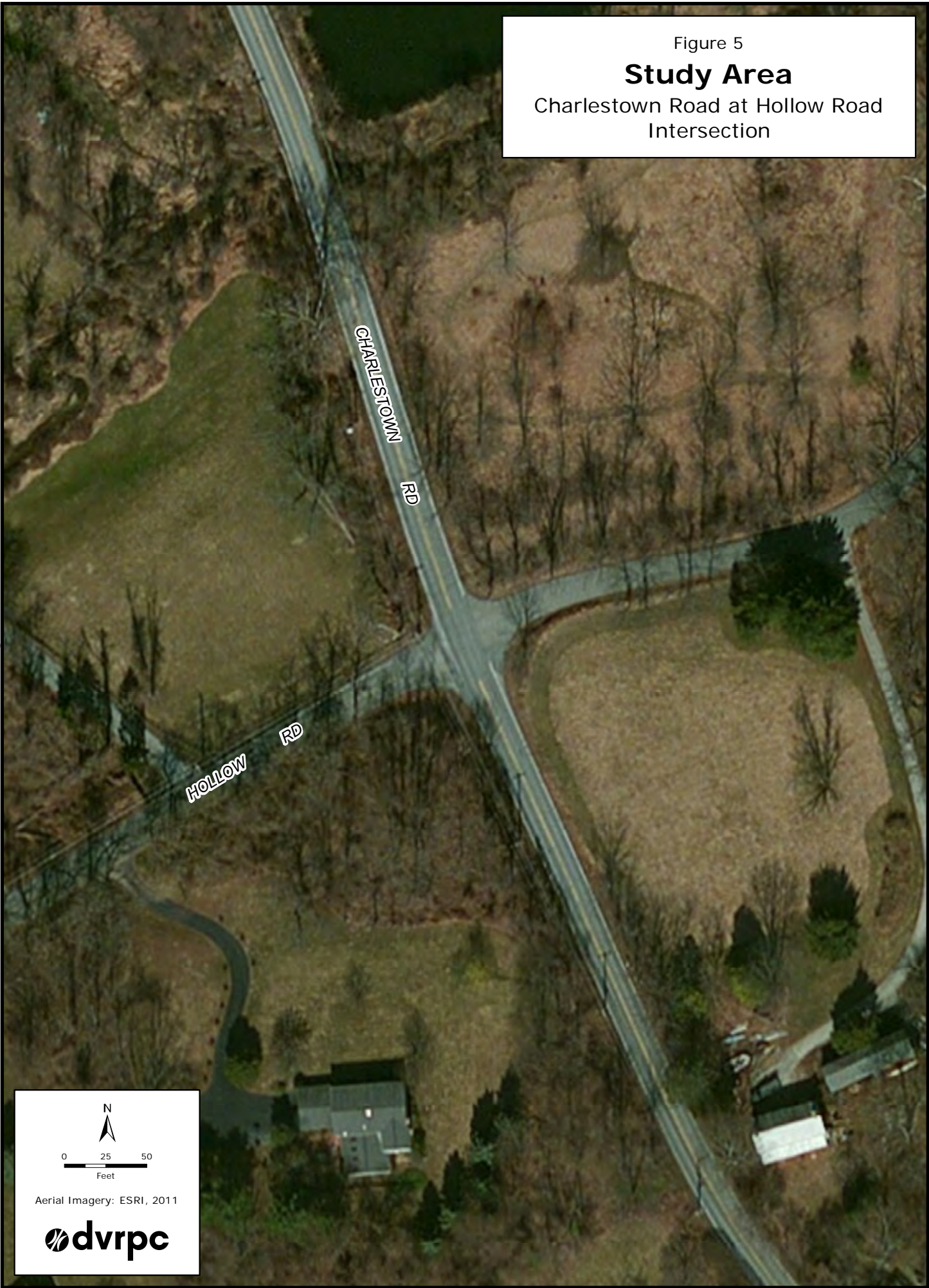
Pedestrians

There was no observed pedestrian activity at this intersection.

Transit

No transit service is available along Charlestown Road.

Figure 5
Study Area
Charlestown Road at Hollow Road
Intersection



N
0 25 50
Feet
Aerial Imagery: ESRI, 2011
dvrpc

Speed Analysis

Speed counting tubes were laid across Charlestown Road between Markley Lane and Country Lane (Section A) and between Country Lane and PA 29 (Section B). The intersection of Charlestown Road at Hollow Road is located in Section A. The intersection of Charlestown Road at Pikeland Road/Trevor Lane is located in Section B. **Figure 6** on page 20 shows the limits of the speed analysis. The results of the analysis are summarized below in **Table 4**. The speed limit is commonly set at or below the “85th percentile speed” (the speed at which 85 percent of the traffic is traveling).

Table 4: Speed Analysis Results

Section	Existing Condition	Analysis Results
A	<ul style="list-style-type: none"> The posted speed limit is 35 MPH. 	<ul style="list-style-type: none"> Northbound speeds ranged between 46 to 50 MPH. Southbound speeds ranged between 46 to 50 MPH.
B	<ul style="list-style-type: none"> The posted speed limit is 35 MPH north of Pikeland Road. The posted speed limit is 40 MPH south of Pikeland Road. 	<ul style="list-style-type: none"> Northbound speeds ranged between 41 to 45 MPH. Southbound speeds ranged between 46 to 50 MPH.

Source: DVRPC, 2012.

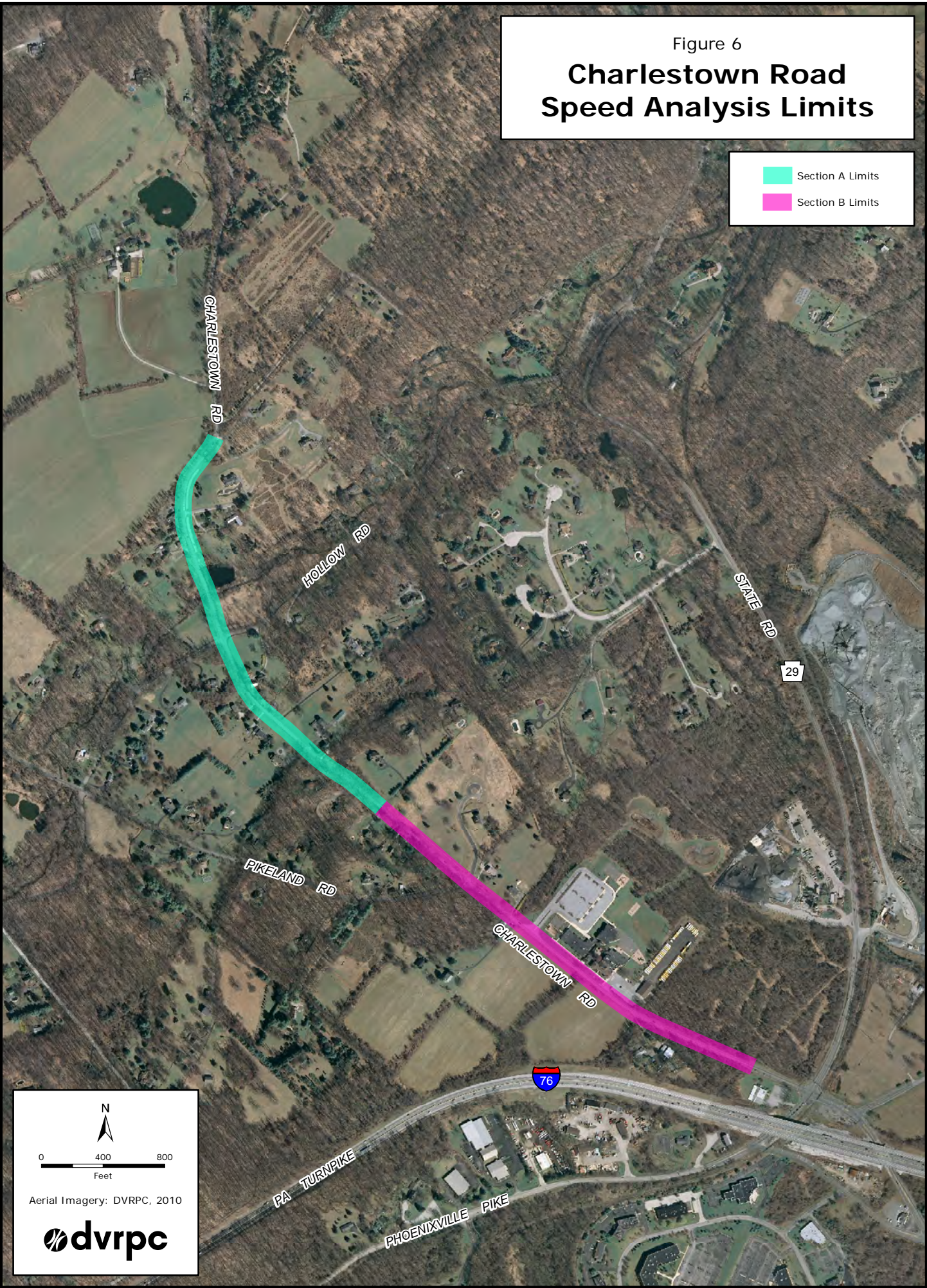
Speed Analysis Conclusions

- ❖ Overall, drivers significantly exceeded the speed limit throughout the corridor. This agrees with the township’s theory of vehicles speeding along Charlestown Road.
- ❖ In Section A, speeds were 10 to 15 MPH higher than the posted speed limit. This could be attributed to the downhill grade, especially as vehicles approach Charlestown Road at the Hollow Road intersection.
- ❖ Speeding may likely be a factor in crashes reported at the Charlestown Road and Hollow Road intersection. Drivers traveling along Charlestown Road may not have time to react to drivers pulling out from Hollow Road.

Figure 6
**Charlestown Road
Speed Analysis Limits**

Legend:

- Section A Limits
- Section B Limits



North Arrow

0 400 800
Feet

Aerial Imagery: DVRPC, 2010

Crash History Review

Although both intersections were generated from a data driven process, the crash analysis revealed they did not have many crashes. These intersections were the CCPC's preferred locations to study. Intersection 2 had nearly twice as many crashes as Intersection 1. Compared to other intersections, the amount of crashes at these locations does not indicate a major safety problem.

Intersection 1: Charlestown Road at Pikeland Road/Trevor Lane

Crash History Summary

There were three reportable crashes recorded during the study period of 2007 through 2011, within a 250-foot buffer around the intersection. The collision diagram (Figure 7 on page 22) summarizes the location, collision type, and detailed information on the three crashes.

- ❖ There were no fatal crashes, one minor injury crash, and two property-damage-only (PDO) crashes.
- ❖ There were no crashes reported in 2007, 2008, and 2011.
- ❖ All crashes occurred on weekdays.

Township officials mentioned that there have been numerous rear-end crashes at the intersection along the southbound approach of Charlestown Road. These incidents are considered non-reportable and were not mapped because information was not available from the Pennsylvania State Police and therefore could not be analyzed.

Crash History Conclusion

- ❖ When considering traffic volume and crash total, this intersection does not have a major crash issue.

Figure 7

Collision Diagram

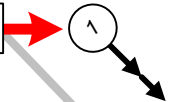
Charlestown Road at
Pikeland Road/Trevor Lane Intersection

Crash Data Years 2007 – 2011
Total Number of Crashes = 3

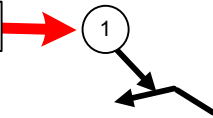
Legend

- ① # of Reportable Crashes
- = Angle
- = Rear-End
- = Non-Collision

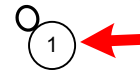
Wednesday, 9/30/09 | 6:55 AM | Clear | PDO



Thursday, 10/14/10 | 11:00 PM | Rain | Minor Injury



Thursday, 7/29/10 | 4:25 PM | Clear | PDO



Intersection 2: Charlestown Road at Hollow Road

Crash History Summary

There were seven reportable crashes recorded during the study period within a 250-foot buffer around the intersection. The collision diagram ([Figure 8 on page 24](#)) summarizes the location, collision type, and detailed information on the seven crashes.

- ❖ There were no fatal crashes, one moderate injury crash, three minor injury crashes, two PDO crashes, and one unknown if injured crash.
- ❖ Five of the seven crashes were angle collisions, including one involving a vehicle making a left-turn. These angle crashes involved vehicles traveling from Hollow Road colliding with vehicles traveling northbound or southbound on Charlestown Road.
- ❖ There was at least one crash reported every year.
- ❖ All crashes occurred during the weekday and under clear weather conditions.

Crash History Conclusions

- ❖ Since there were no fatal crashes and only seven crashes (nearly two times the frequency at Intersection 1) in a five-year period, this intersection does not appear to have a major crash issue.
- ❖ Angle crashes are the most important safety concern to address.
- ❖ Drivers speeding along Charlestown Road may be a contributing factor of the frequency of angle crashes.

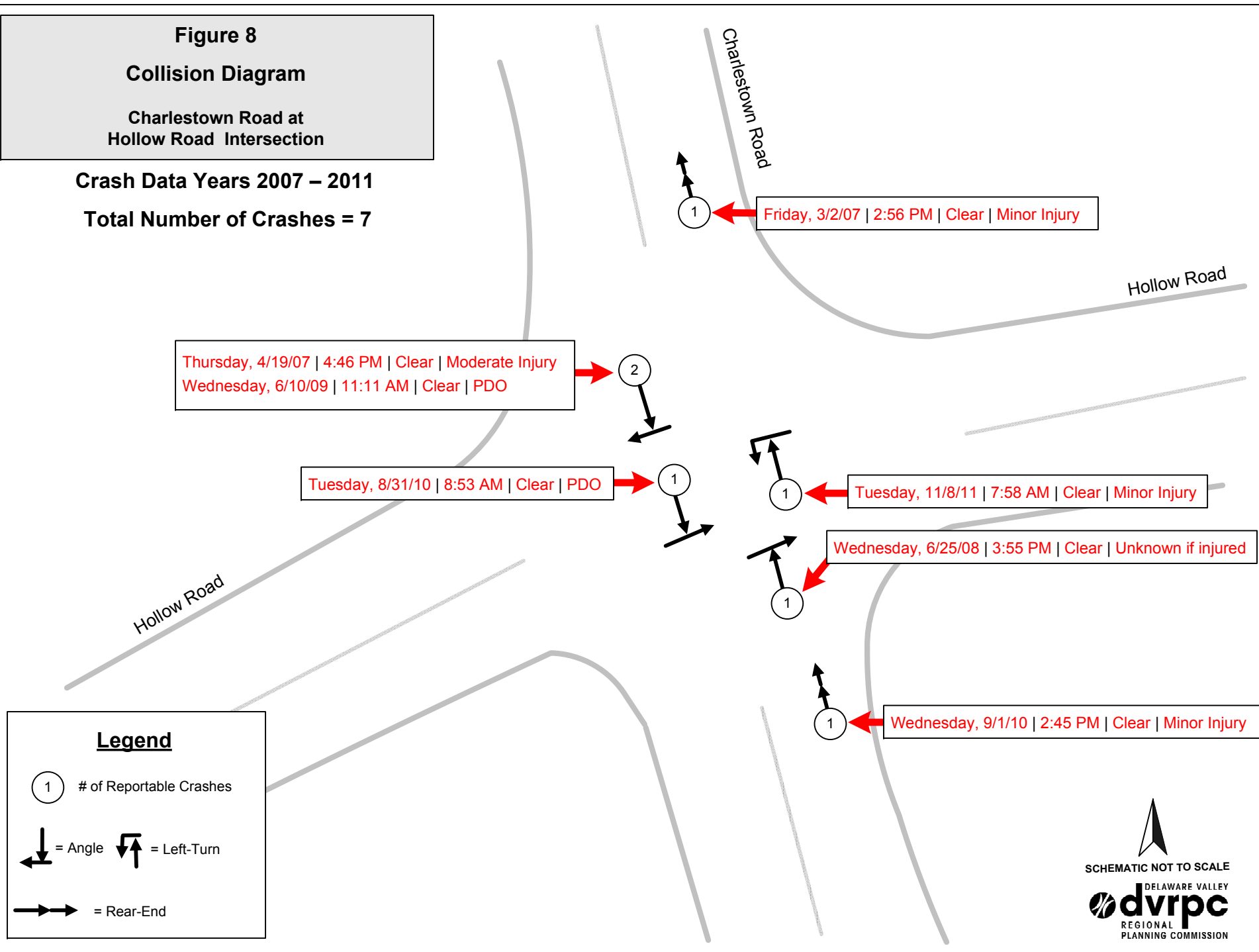
Figure 8

Collision Diagram

Charlestown Road at
Hollow Road Intersection

Crash Data Years 2007 – 2011

Total Number of Crashes = 7



Issues and Potential Improvements

A range of strategies was developed by the study advisory committee for both study intersections. The strategies developed fell within the following two categories: safety and operational. Safety strategies consist of improvements that enhance and promote safer conditions for all roadway users traveling in the area. Examples of safety strategies include increasing enforcement efforts, removing or installing signage and pavement markings to warn and educate motorists of conditions, and trimming vegetation. Operational strategies include intersection geometric modifications or traffic modeling.

Intersection 1: Charlestown Road at Pikeland Road/Trevor Lane

Table 5 and the following sections describe the main issues and the corresponding potential strategies for alleviating these safety and operational concerns. The pros and cons of each strategy are also listed. The red highlighted text in the table reflects operational strategies.

Table 5: Issues and Potential Strategies – Charlestown Road at Pikeland Road/Trevor Lane Intersection

Issues	Potential Strategies
<p>1. Township officials stated that traffic in the morning is impeded by the stop sign on the southbound Charlestown Road approach. Often, motorists ignore the stop sign by either yielding or rolling through the intersection.</p>	<p>1A. Conduct queue analysis or at least multiple field views to validate impression of congestion.</p> <p>Pro – This will validate concerns of congestion, given that the LOS analysis conducted did not indicate congested conditions.</p> <p>Con – There may be limitation on personnel to conduct and analyze the views.</p> <p>1B. Remove stop sign from the southbound Charlestown Road approach, to address potential safety issues resulting from higher speeds. Also add advisory sign of stop control removal.</p> <p>Pro – Maximize traffic flow along southbound approach, especially during the morning peak hour.</p> <p>Con – Potential to increase speeds through the intersection, which could increase the number and severity of crashes. This was a concern voiced by township officials.</p> <p>1C. Add a stop bar and “Stop Ahead” warning sign prior to the southbound Charlestown Road approach.</p> <p><u>Pros</u> – The stop-controlled condition is more prominent and motorists are warned of the stop ahead; low-cost and quick implementation.</p> <p><u>Con</u> – May not be effective in changing driver behavior; the stop bar will need to be maintained.</p>

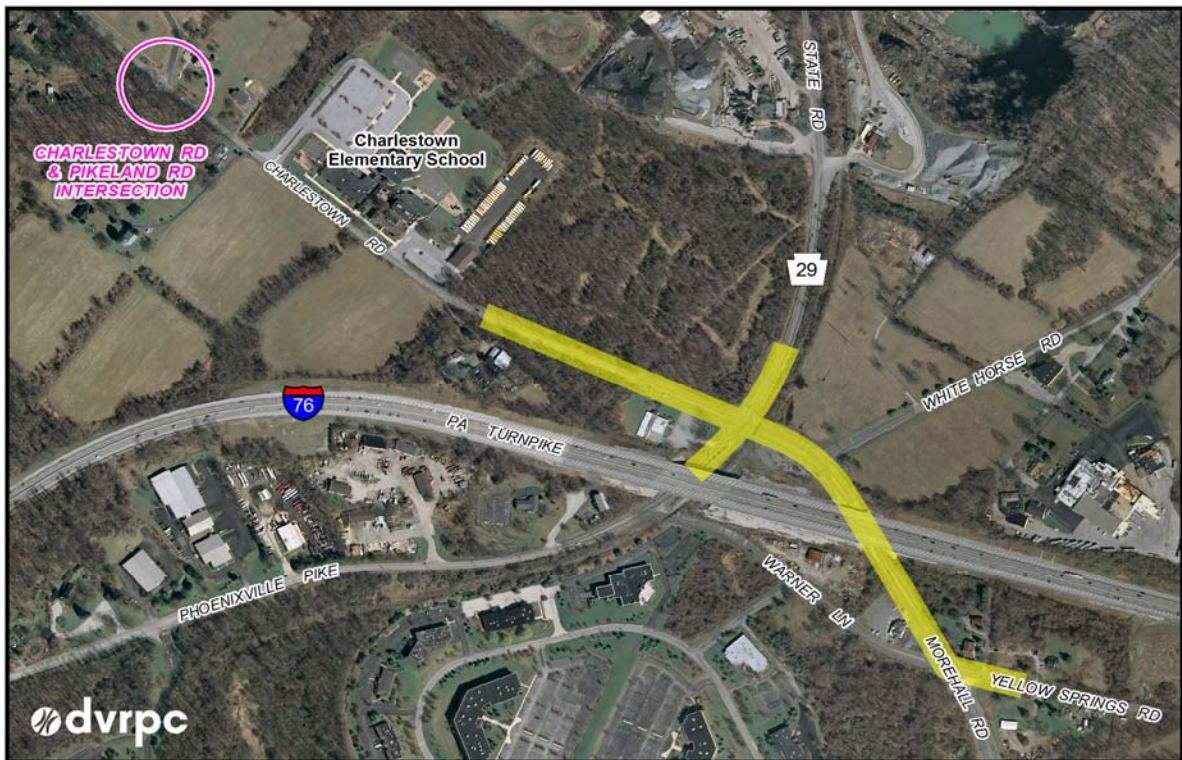
Issues	Potential Strategies
	<p>1D. Increase the shoulder width (on the east side of Charlestown Road, prior to the intersection) to accommodate pull-off area for police enforcement.</p> <p><u>Pro</u> – This option will give police a safe haven to monitor traffic on Charlestown Road, which may influence drivers to obey the stop sign.</p> <p><u>Cons</u> – Right-of-way (ROW) may need to be acquired. There is limited manpower, so enforcement would be infrequent.</p>
<p>2. Sight distance is poor from the Pikeland Road approach. Overgrown vegetation and trees impede drivers' view of southbound Charlestown Road. The intersection's skew could be a contributing factor to the sight distance issue.</p>	<p>2A. Work with property owner to trim vegetation and remove trees.</p> <p><u>Pro</u> – Increases sight distance for Pikeland Road drivers; low-cost; quick implementation.</p> <p><u>Con</u> – The property owner may object; this effort will need to be repeated periodically.</p> <p>2B. Realign the intersection.</p> <p><u>Pros</u> – Increases sight distance at all approaches. This effort could be incorporated within the PA 29 construction project (see details on page 27).</p> <p><u>Cons</u> – Is very lengthy, expensive, and may require ROW acquisition; no guarantee that realignment will be included as part of the PA 29 construction project.</p>
<p>3. Township officials reported that drivers speed along Charlestown Road through the intersection. This was validated with the speed analysis.</p>	<p>3A. Convert intersection to four-way-stop controlled.</p> <p><u>Pros</u> – Reduce speeding through the intersection, particularly along northbound Charlestown Road; inexpensive; quickly implemented; supported by township officials.</p> <p><u>Cons</u> – PennDOT does not favor this option; will increase delay at the intersection.</p> <p>3B. Install transverse rumble strips along Charlestown Road.</p> <p><u>Pros</u> – Alerts drivers to reduce speeds through the intersection.</p> <p><u>Cons</u> – PennDOT was not in favor of this option; nearby residence may complain of noise.</p> <p>3C. Install speed tables along Charlestown Road.</p> <p><u>Pros</u> – Reduce speeding through the intersection.</p> <p><u>Cons</u> – PennDOT was not in favor of this strategy. It is an inappropriate traffic calming measure for a roadway classified as rural major collector, and is more common on residential streets.</p> <p>3D. Increase enforcement throughout the Charlestown Road corridor. Find or create a safe location for police to do enforcement within a few miles of the intersection(s).</p> <p><u>Pro</u> – This option will increase enforcement visibility to encourage safer driving in corridor.</p> <p><u>Cons</u> – The road is curvy and has steep grades so it may be difficult to find a safe location or required ROW.</p>

Source: DVRPC, 2012.

PA 29 Construction Project

PennDOT is undertaking a construction project in the vicinity of PA 29 (Morehall Road) near the Pennsylvania Turnpike. A part of this project includes widening Charlestown Road from Phoenixville Pike to just south of Charlestown Elementary School. See [Figure 9](#). This widening lies southeast of the Charlestown Road and Pikeland Road/Trevor Lane intersection.

Figure 9: PA 29 Project Limits



Source: DVRPC, 2012.

At the follow-up meeting held on June 27, 2012, advisory committee members discussed the option of talking with PennDOT officials to consider extending the PA 29 construction project limits to include traffic safety improvements at the Charlestown Road and Pikeland Road/Trevor Lane intersection. This option would fund and implement many of the strategies referenced above in [Table 5](#).

Potential Operational Strategy

One of the four potential operational strategies from [Table 5](#) was analyzed for the intersection of Charlestown Road at Pikeland Road/Trevor Lane. The result is for comparison to the existing LOS condition documented in Chapter 3.

Scenario 1 – Remove Stop Sign from the Southbound Approach

Description

- ❖ Remove the stop sign from the southbound Charlestown Road approach.

Advantages

- ❖ Southbound traffic will flow freely through the intersection, thus eliminating traffic queues.
- ❖ This option reduces delay on the southbound approach, especially during the morning peak period.

Disadvantage

- ❖ With the removal of the stop sign, speeds may likely increase along Charlestown Road, which could increase the risk of speed-related crashes, particularly angle collisions. This was a concern of township officials.

LOS Analysis

Under this scenario, the overall LOS and vehicle delay in the morning and afternoon peak period is A. Due to the removal of the stop sign, the average driver in the AM peak would experience 13 seconds less delay along the southbound approach. Southbound vehicles would no longer stop, so they would travel at free-flow speeds. As indicated in [Table 6](#), delays have been reduced from 15 to two seconds in the morning and from eight to one second in the afternoon. Delays in the morning on the eastbound approach increased slightly by two seconds, but remained the same in the afternoon. The northbound approach LOS remains at LOS A.



Morning southbound view of traffic back-up.
(Source: DVRPC, 2012.)

Table 6: LOS Analysis – Scenario 1

Direction	Existing Condition				Scenario 1			
	AM		PM		AM		PM	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
NB Charlestown Road	0	A	2	A	1	A	4	A
SB Charlestown Road	15	B	8	A	2	A	1	A
EB Pikeland Road	7	A	2	A	9	A	2	A
WB Trevor Lane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Intersection	10	A	3	A	4	A	4	A

Source: DVRPC, 2012.

Conclusion

The removal of the stop sign on the southbound approach is beneficial in improving traffic flow through the intersection, particularly during the morning peak period. This scenario indicated a slight improvement in the performance of the intersection. The safety implication for removing the stop sign needs to be carefully considered and addressed if the removal goes forward. Congestion that may be experienced during the PA 29 construction should dissipate after the project is done.

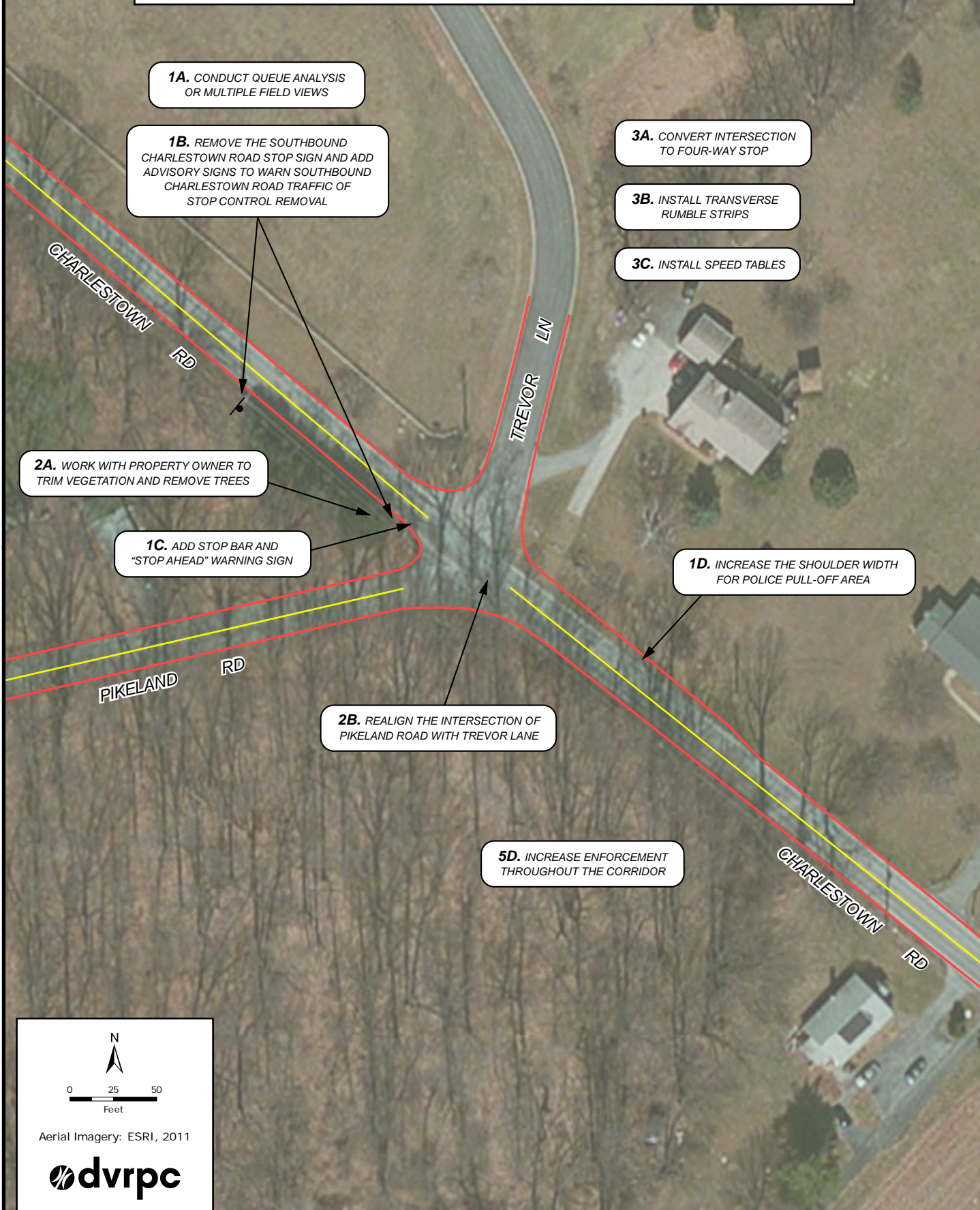
A next step should be to conduct a queue analysis or at least multiple field views to more accurately assess the level of traffic compared to the effort to communicate change and manage safety.

The strategies described at this intersection are depicted in [Figure 10](#) on page 30.

Figure 10

Potential Strategies

Charlestown Road at Pikeland Road/Trevor Lane Intersection



1A. CONDUCT QUEUE ANALYSIS OR MULTIPLE FIELD VIEWS

1B. REMOVE THE SOUTHBOUND CHARLESTOWN ROAD STOP SIGN AND ADD ADVISORY SIGNS TO WARN SOUTHBOUND CHARLESTOWN ROAD TRAFFIC OF STOP CONTROL REMOVAL

3A. CONVERT INTERSECTION TO FOUR-WAY STOP

3B. INSTALL TRANSVERSE RUMBLE STRIPS

3C. INSTALL SPEED TABLES

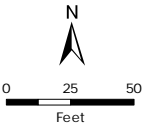
2A. WORK WITH PROPERTY OWNER TO TRIM VEGETATION AND REMOVE TREES

1C. ADD STOP BAR AND "STOP AHEAD" WARNING SIGN

1D. INCREASE THE SHOULDER WIDTH FOR POLICE PULL-OFF AREA

2B. REALIGN THE INTERSECTION OF PIKELAND ROAD WITH TREVOR LANE

5D. INCREASE ENFORCEMENT THROUGHOUT THE CORRIDOR



Aerial Imagery: ESRI, 2011



Intersection 2: Charlestown Road at Hollow Road

Table 7 describes the main issues and corresponding potential strategies for alleviating safety concerns at the intersection of Charlestown Road and Hollow Road. No operational strategies were developed.

The strategies described at this intersection are depicted in Figure 11 on page 33.

Table 7: Issues and Potential Strategies – Charlestown Road at Hollow Road Intersection

Issues	Potential Strategies
<p>1. The majority of crashes reported at the intersection were angle.</p>	<p>1A. Add “Intersection Ahead” warning signs along northbound and southbound Charlestown Road approaches.</p> <p><u>Pros</u> – This warns motorists of the intersection ahead and the potential for crossing and turning traffic from Hollow Road; low-cost and quick implementation.</p> <p>1B. Replace the standard size stop signs with oversized stop signs at both Hollow Road approaches.</p> <p><u>Pros</u> – This heightens the awareness for motorists on Hollow Road to stop at the intersection; low-cost and quick implementation.</p> <p>1C. Continue to monitor speeds on Charlestown Road. If travel speeds remain a contributing factor, engineering, enforcement, and educational steps should be taken to reduce it.</p> <p><u>Pro</u> – If accident reports document speeding as a factor, this will support the need for speed enforcement.</p> <p><u>Cons</u> – If speeds remain consistent with the report’s speed analysis, there is limited police manpower to enforce speed limits, and there is no safe area for police to pull drivers over.</p>
<p>2. Vehicles speed through the intersection. This may be attributed to the grades along Charlestown Road.</p>	<p>2A. In the future, if traffic increases, consider resurface roadway pavement to increase skid resistance through the intersection.</p> <p><u>Pros</u> – Allow vehicles extra traction control for braking, which will minimize the risk of colliding with vehicles from Hollow Road; option could be done in a future PennDOT repaving project.</p> <p><u>Con</u> – It may take time to implement and need periodic maintenance.</p> <p>2B. Increase enforcement near the intersection</p> <p><u>Pro</u> – This will help influence drivers to obey the speed limit.</p> <p><u>Cons</u> – There is no safe area for police to pull drivers over at this time and there is limited manpower.</p>

Issues	Potential Strategies
<p>3. The intersection lacks pavement markings to supplement signage.</p>	<p>3A. Add “dotted” centerline through the intersection.</p> <p><u>Pros</u> – Provides guidance for motorists turning from Hollow Road onto Charlestown Road; low cost; quick implementation.</p> <p><u>Cons</u> – It will require periodic maintenance. Since turning movements are low, this option may not be cost effective.</p> <p>3B. Add appropriate pavement marking legends to supplement signage, such as “Slow Down.”</p> <p><u>Pros</u> – Provides additional warning for motorists to slow down; low cost; quick implementation.</p> <p><u>Con</u> – It will require periodic maintenance.</p>
<p>4. Sight distance is an issue for westbound left-turning Hollow Road vehicles due to a large overgrown hedge.</p>	<p>4. Work with the property owner to trim or remove the hedge.</p> <p><u>Pros</u> – Increases sight distance for motorists approaching westbound Hollow Road approach; low cost; quick implementation.</p> <p><u>Con</u> – Property owner may not be willing to cooperate. Trimming will need periodic upkeep.</p>
<p>5. The drainage grate located on the southeast corner of the intersection is not level with the pavement above. This can present a safety hazard for right-turning vehicles and bicyclists.</p>	<p>5. Level the drainage grate with the pavement on the southeast corner.</p> <p><u>Pros</u> – This will minimize driver hazards for northbound vehicles turning right onto Hollow Road; low cost; quick implementation.</p>

Source: DVRPC, 2012.

Figure 11
Potential Strategies
 Charlestown Road at Hollow Road Intersection



1A. ADD INTERSECTION AHEAD WARNING SIGNS ALONG CHARLESTOWN ROAD

1B. REPLACE THE STANDARD SIZE STOP SIGNS WITH OVERSIZED STOP SIGNS AT BOTH HOLLOW ROAD APPROACHES

1C. CONTINUE TO MONITOR SPEEDS ON CHARLESTOWN ROAD

3B. ADD APPROPRIATE PAVEMENT MARKING TO SUPPLEMENT SIGNAGE, SUCH AS "SLOW DOWN"

2B. INCREASE ENFORCEMENT NEAR THE INTERSECTION

3A. INSTALL "DOTTED" CENTERLINE THROUGH INTERSECTION

5. LEVEL THE DRAINAGE GRATE WITH PAVEMENT ON SOUTHEAST CORNER OF INTERSECTION

HOLLOW RD

2A. RESURFACE ROADWAY PAVEMENT TO INCREASE SKID RESISTANCE THROUGH INTERSECTION



4. TALK WITH PROPERTY OWNER ABOUT CUTTING BACK OR REMOVING HEDGE AND BRUSH

3B. ADD APPROPRIATE PAVEMENT MARKING TO SUPPLEMENT SIGNAGE, SUCH AS "SLOW DOWN"

CHARLESTOWN RD

N
 0 25 50
 Feet
 Aerial Imagery: ESRI, 2011

Recommendations

At the follow-up meeting held on June 27, 2012, representatives from the Chester County Planning Commission, PennDOT District 6, Charlestown Township, and DVRPC worked together to develop a set of recommendations from the potential strategies. Numerous options were discussed. The recommendations for both study intersections are described below in [Tables 8 and 9](#).

Intersection 1: Charlestown Road at Pikeland Road/Trevor Lane

Safety improvements at this intersection remain a high priority for the township. The implementation of many of the safety improvement strategies described in Chapter 5 could have been part of the PA 29 construction project. Unfortunately, no safety improvements from this intersection were incorporated with that project, despite willingness by PennDOT to consider them. The impact from the PA 29 construction project is temporary; thus, traffic will likely dissipate to pre-project levels. Many of the potential improvements mentioned in Chapter 5 were recommended. See [Table 8](#) below. All of the recommendations described below are short term, low in cost, and could be implemented in less than one year. PennDOT District 6 is the implementer of these recommendations.

Table 8: Recommendations for Charlestown Road at Pikeland Road/Trevor Lane Intersection

Item	Who Plans to Do It?	Approximately When Would It Be Done?
1. Conduct queue analysis, and if warranted, remove stop sign from the southbound Charlestown Road approach, while addressing resulting potential safety issues from faster speeds.	PennDOT District 6	Short term
2. Add advisory signs to warn southbound Charlestown Road motorists of the stop sign removal.	PennDOT District 6	Short term
3. Work with the property owner to trim vegetation and remove trees to increase sight lines from Pikeland Road looking northbound.	Township and PennDOT – Chester County Maintenance	Short term

Source: DVRPC, 2012.

Intersection 2: Charlestown Road at Hollow Road

Many of the strategies from Chapter 5 were recommended. These recommendations as shown in [Table 9](#) are low cost and could be implemented in less than one year.

Table 9: Recommendations for Charlestown Road at Hollow Road Intersection

Item	Who Plans to Do It?	Approximately When Would It Be Done?
1. Add appropriate pavement marking legends to supplement signage.	PennDOT District 6	Short term
2. Add "Intersection Ahead" warning signs and replace existing stop signs.	PennDOT – Chester County Maintenance	Short term
3. Work with the property owner to trim or remove hedge. (Township and/or PennDOT plan on talking with the property owner).	Township and/or PennDOT – Chester County Maintenance	Short term
4. Level the drainage grate on the southeast corner with pavement.	PennDOT District 6	Short term

Source: DVRPC, 2012.

Corridor-wide Recommendation

Between both intersections, speeding has been documented as an issue on Charlestown Road. Periodic speed enforcement by the Pennsylvania State Police should be conducted to monitor speeds and minimize the risk of crashes. This may, however, prove challenging given the lack of manpower and safe areas on the corridor to safely pull drivers over.

Next Steps

Due to the recent passage of a Pennsylvania transportation funding bill, there may be an opportunity to help fund some of the above-mentioned recommendations. DVRPC will follow-up periodically with PennDOT and Charlestown Township officials on any progress made towards implementing recommendations.

APPENDIX



Study Advisory Committee Members

Table A-1: Study Advisory Committee Members

Name	Organization	Title
Daniel Wright	Advance GeoServices	Township Engineer
Linda Csete	Charlestown Township	Township Manager
Kevin Kuhn	Charlestown Township	Township Board of Supervisors Member
Charles Philips	Charlestown Township	Township Board of Supervisors Member
Bill Deguffroy	Chester County Planning Commission	Transportation Planner
Tim Townes	J. Loew & Associates	Project Manager
Larry Bucci	PennDOT District 6	Traffic Safety Engineer

Source: DVRPC, 2012.

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Key Words: Charlestown Road, Pikeland Road, Hollow Road, Trevor Lane, Level of Service, LOS, intersection, safety, crashes, roadway, improvements, turning movements, peak hour, strategies, Charlestown Township

Abstract: This document represents the findings and recommendations for the Congestion and Crash Site Analysis Program study conducted in Chester County in Fiscal Year 2012. This program represents an effort to improve the mobility and safety on roadways in the DVRPC region. The goal of the program is to identify cost-effective improvement strategies that will reduce congestion and crashes and improve mobility and safety for all road users.

Working with a data-driven process and the Chester County Planning Commission, the intersections of Charlestown Road at Pikeland Road/Trevor Lane and Charlestown Road at Hollow Road were chosen. In-depth crash, speed, and level of service analyses were performed to gain an understanding of the issues. With input from the advisory committee, improvement strategies were identified to address the issues. As appropriate, proposed improvement strategies were tested for effectiveness. The study resulted in recommendations to improve safety and reduce congestion at the two intersections. A majority of the recommendations will be implemented by PennDOT in the future.

Staff Contact:

Regina Moore
Transportation Engineer II
☎ (215) 238-2862
✉ rmoore@dvrpc.org

Delaware Valley Regional Planning Commission
190 N. Independence Mall West, 8th Floor
Philadelphia PA 19106
Phone: (215) 592-1800
Fax: (215) 592-9125
Internet: www.dvrpc.org



190 N INDEPENDENCE MALL WEST
8TH FLOOR
PHILADELPHIA, PA 19106
215-592-1800
www.dvrpc.org