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DELAWARE VALLEY
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REGIONAL
PLANNING COMMISSION

LOWER PROVIDENCE TOWNSHIP, MONTGOMERY COUNTY

CONGESTION & CRASH

Analysis Program

site





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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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Table of Contents

Executive Summary.....	1
C H A P T E R 1	
Introduction.....	3
■ Study Process.....	3
C H A P T E R 2	
Study Locations.....	5
■ Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road.....	7
■ Intersection 2: Park Avenue at Eagleville Road and Crawford Road.....	10
C H A P T E R 3	
Existing Traffic Conditions.....	13
■ Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road.....	13
■ Intersection 2: Park Avenue at Eagleville Road and Crawford Road.....	17
C H A P T E R 4	
Crash History Analysis.....	21
■ Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road.....	21
■ Intersection 2: Park Avenue at Eagleville Road and Crawford Road.....	24
C H A P T E R 5	
Issues and Potential Improvements.....	27
■ Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road.....	27
■ Intersection 2: Park Avenue at Eagleville Road and Crawford Road.....	32
C H A P T E R 6	
Recommendations.....	35
■ Intersection 1: Eagleville Road at Sunnyside Avenue and Pinetown Road.....	35
■ Intersection 2: Park Avenue at Eagleville Road and Crawford Road.....	37

Figures and Tables

Figure 1: Regional Setting.....	6
Figure 2: Analysis Area – Intersection 1.....	8
Figure 3: Analysis Area – Intersection 2.....	11
Figure 4: Peak Hour Turning Movement Diagram – Intersection 1.....	14
Figure 5: Peak Hour Turning Movement Diagram – Intersection 2.....	18
Figure 6: Collision Diagram – Intersection 1.....	23
Figure 7: Collision Diagram – Intersection 2.....	26
Figure 8: Intersection 1 – Issues and Potential Improvements.....	31
Figure 9: Intersection 2 – Issue and Potential Improvements.....	34
Figure 10: PennDOT Pavement Plan for Intersection 1.....	36

Table 1: LOS Designations and Associated Delays for Unsignalized Intersections	4
Table 2: Description – Intersection 1	7
Table 3: Intersection 2 Description	10
Table 4: Existing LOS for Intersection 1.....	15
Table 5: Existing LOS for Intersection 2.....	19
Table 6: Crash Summary for Intersection 1	22
Table 7: Crash Summary for Intersection 2	24
Table 8: Issues and Potential Improvements – Intersection 1.....	27
Table 9: LOS Analysis – Scenario 1	30
Table 10: Issue and Potential Strategies – Intersection 2.....	32
Table 11: Recommendations for Intersection 1	35
Table 12: Recommendation for Intersection 2	37

Appendix

Study Advisory Committee Members	A-1
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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 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.

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. Through this data-driven process, four intersections were generated for the Montgomery County Planning Commission (MCPC) to consider. Since these intersections are on state roads, officials from PennDOT also provided input. The four intersections turned out not to be viable options because PennDOT had studied them previously. MCPC and PennDOT later suggested the following two intersections for Lower Providence Township: 1.) Eagleville Road at Sunnyside Avenue/Pinetown Road and 2.) Park Avenue at Eagleville Road and Crawford Road. Both intersections pose various safety issues and have been a safety concern of the Township. Also, both locations are listed on PennDOT's Intersection Safety Implementation Plan (ISIP) for stop-controlled intersection improvements. The MCPC, PennDOT, and Township officials saw this project as an ideal opportunity to evaluate both of these unsignalized intersections.

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 the list of advisory committee participants). The range of strategies included the following: adding signage, restriping, changing traffic control devices, and intersection realignment. With guidance from the advisory committee, the range was refined into a set of recommendations. Both study intersections qualify for PennDOT's fiscal year 2014 Highway Safety Improvement Program (HSIP) "Set-aside" funds and current available PennDOT District 6 HSIP funds. PennDOT currently has a contract underway to begin implementing many of the recommended improvements at the Eagleville Road and Sunnyside Avenue/Pinetown Road intersection. The Park Avenue at Eagleville Road and Crawford Road intersection meet the state's guidelines for Automated Red Light Enforcement (ARLE) grant funding. Findings from this report may be used to help support the ARLE application process.

Introduction

This technical report provides analysis and recommendations for two unsignalized intersections in Lower Providence Township, Montgomery County: 1.) Eagleville Road (SR 4006) at Sunnyside Avenue (T369)/Pinetown Road (T396) and 2.) Eagleville Road at Park Avenue (SR 4004) and Crawford Road (T324). The recommended strategies cover both safety and operational improvements. One of several operational improvements was 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. Many of the recommendations will be implemented by PennDOT and 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 9, 2013, a kick-off meeting was held with the study advisory committee, which included representatives from the following agencies: Montgomery County Planning Commission (MCPC), Lower Providence Township, PennDOT District 6, and DVRPC. This meeting assisted in the identification of problems, with discussion of the advisory committee's observations and feedback.

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) 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 Lower Providence Township Municipal Building on June 27, 2013. 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 includes 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.

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 there is 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.

Crash History Analysis

This analysis includes crashes that occurred at the two study intersections from 2008 through 2012. The main goals of this review are to highlight crash trends and determine causal factors. The crash summaries and collision diagrams used in this analysis were derived from non-reportable and reportable crash records. These records were provided by the Lower Providence Township Police Department. In Pennsylvania, a crash is considered reportable when a person is injured or killed, or if a vehicle must be towed from the scene.

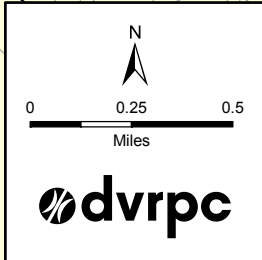
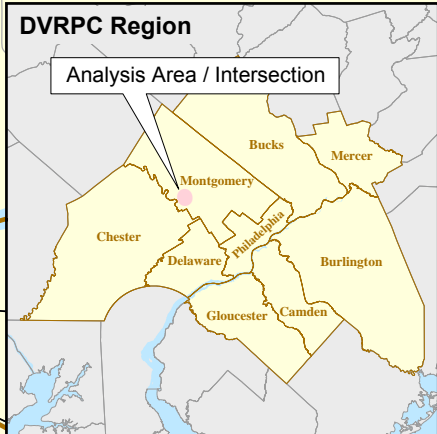
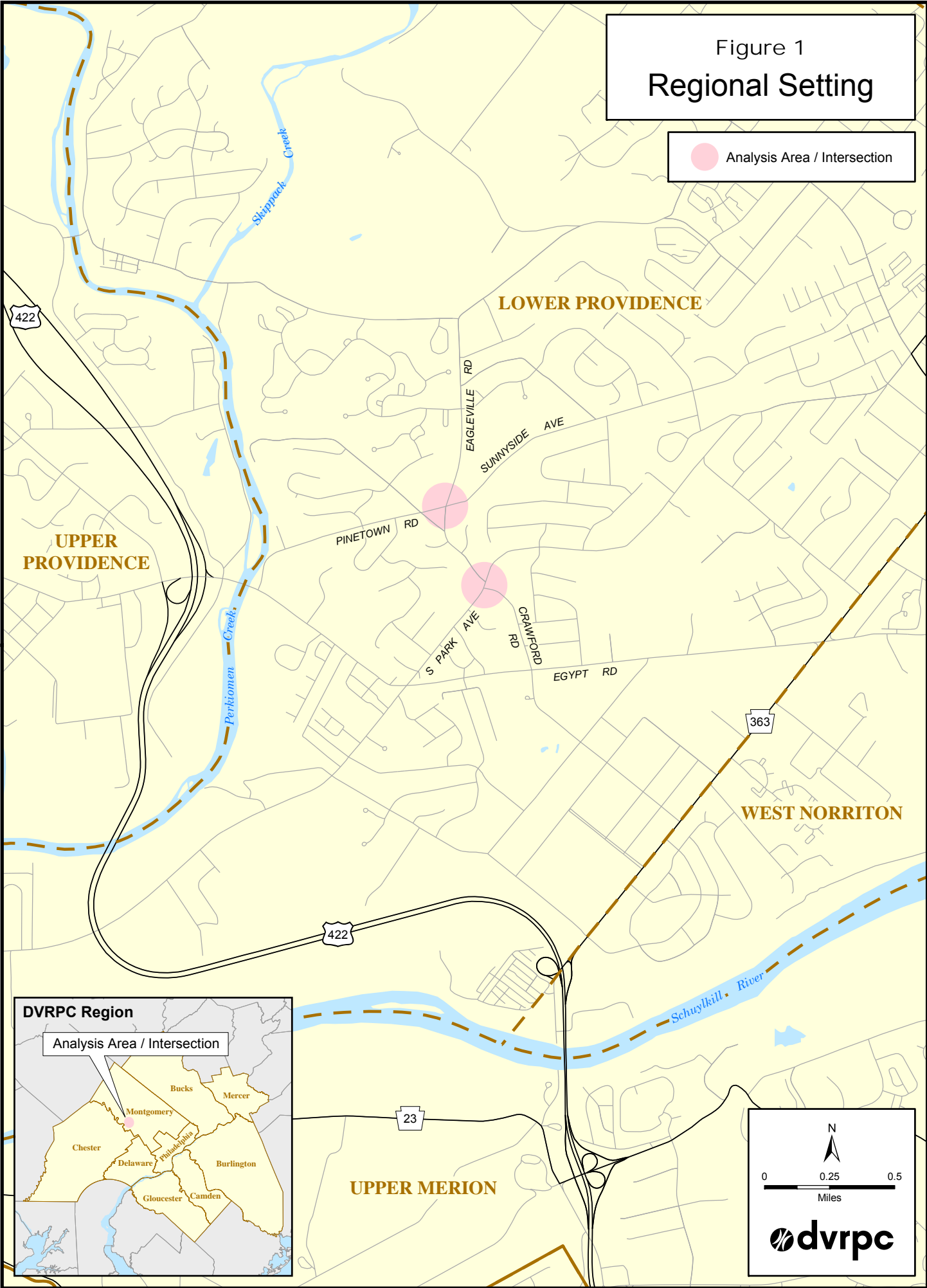
Study Locations

The focus of the study, as shown in [Figure 1](#) on page 6, are the following two unsignalized intersections: 1.) Eagleville Road at Sunnyside Avenue/Pinetown Road and 2.) Park Avenue at Eagleville Road and Crawford Road. These intersections are approximately one-third of a mile apart. Eagleville Road provides access to Arcola Intermediate School and Lower Providence Township offices. It also connects with several key roads, including Park Avenue and Ridge Pike. Park Avenue also links to Ridge Pike and Egypt Road, which provides direct access to US 422. Sunnyside Avenue, Pinetown Road, and Crawford Road provide access to residential areas in Lower Providence Township.

The orientation of Eagleville Road varies at both intersections. For Intersection 1, Eagleville Road will be referenced as northbound and southbound. Sunnyside Avenue and Pinetown Road will be referenced as westbound and eastbound, respectively. At Intersection 2, Park Avenue will be shown as northbound and southbound. Eagleville Road and Crawford Road will be denoted as eastbound and westbound, respectively.

Figure 1
Regional Setting

Analysis Area / Intersection



Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road

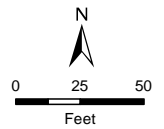
Table 2 below describes Intersection 1. Figure 2 on page 8 and the six photos on page 9 shows a bird's eye view and ground view of the intersection.

Table 2: Description – Intersection 1

Direction/Roadway Approach	Approach Characteristics
NB and SB Eagleville Road	<ul style="list-style-type: none"> ■ Functional classification – Urban collector. ■ NB and SB approaches are one lane in each direction. ■ Posted speed limit – 40 MPH north of intersection and 35 MPH south of intersection. ■ In the SB direction, approach enters the intersection from a curve and on a downhill grade.
EB Pinetown Road	<ul style="list-style-type: none"> ■ Functional classifications – Urban collector and local road. ■ Approach is one lane in the eastbound direction. ■ Posted speed limit – 25 MPH. ■ Stop-controlled.
WB Sunnyside Avenue	<ul style="list-style-type: none"> ■ Functional classification – Local road. ■ Approach is one lane in the westbound direction. ■ Posted speed limit – 35 MPH. ■ Enters the intersection from a steep upgrade slope. ■ Stop-controlled.

Source: DVRPC, 2014.

Figure 2
Intersection 1
Analysis Area



Aerial Imagery: DVRPC, 2010





Northbound view of Eagleville Road approach. Source: DVRPC, 2014.



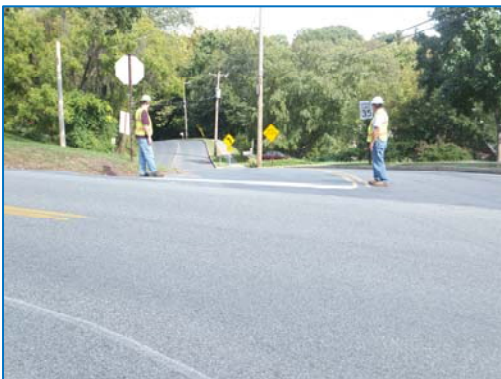
Southbound view of Eagleville Road approach. Source: DVRPC, 2014.



Eastbound view of Pinetown Road
Source: DVRPC, 2014.



Westbound view of Sunnyside Avenue. Source: DVRPC, 2014.



Eastbound view of Sunnyside Avenue to look at the steep approach. Source: DVRPC, 2014.



Southbound view of Eagleville Road. Source: DVRPC, 2014.

Intersection 2: Park Avenue at Eagleville Road and Crawford Road

The intersections of Park Avenue at Eagleville Road and Park Avenue at Crawford Road operate as one intersection. They are located approximately 100 feet apart. [Table 3](#) below describes Intersection 2. [Figure 3](#) on page 11 and the six photos on page 12 show a bird’s eye view and ground view of this intersection.

Table 3: Intersection 2 Description

Direction / Roadway Approach	Approach Characteristics
NB and SB Park Avenue	<ul style="list-style-type: none"> ■ Functional classification – Minor arterial. ■ NB and SB approaches are one lane in each direction. ■ A bridge on Park Avenue crosses Mine Run stream and forms a “T” intersection with Eagleville Road and Crawford Road. ■ Posted speed limit – 40 MPH north of Eagleville Road intersection and 35 MPH south of Crawford Road intersection. ■ SB direction enters the intersection from a curve and on a downhill slope.
EB Eagleville Road	<ul style="list-style-type: none"> ■ Functional classification – Urban collector. ■ Approach is one lane in the eastbound direction and intersects with Park Avenue at a skewed angle. ■ Posted speed limit – 35 MPH. ■ Stop-controlled. ■ Approach is shared with a residential driveway.
WB Crawford Road	<ul style="list-style-type: none"> ■ Functional classifications – Urban collector and local road. ■ Approach is one lane in the westbound direction. ■ Posted speed limit – 25 MPH. ■ Stop-controlled.

Source: DVRPC, 2014.

Figure 3
Intersection 2
Analysis Area



N
0 25 50
Feet
Aerial Imagery: DVRPC, 2010
dvrpc



Northbound views of Park Avenue at Eagleville Road. Source: DVRPC, 2014.



Northbound view of Park Avenue at Crawford Road. Source: DVRPC, 2014.



Southbound view of Park Avenue at Eagleville Road. Source: DVRPC, 2014.



Eastbound view of Eagleville Road at Park Avenue. Source: DVRPC, 2014.



Westbound view of Crawford Road at Park Avenue. Source: DVRPC, 2014.

Existing Traffic Conditions

Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road

AADT Counts

DVRPC counts taken in 2012 on Eagleville Road north and south of Intersection 1 showed an AADT volume of 6,894 and 6,015 vehicles, respectively. Counts recorded on Pinetown Road showed a volume of nearly 4,000 vehicles. Counts taken on Sunnyside Avenue showed a volume of over 3,000 vehicles.

Peak Hour Turning Movement Counts

Manual turning movement counts at the intersection were taken in September 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 14. The morning peak hour is 7:45 AM to 8:45 AM, and the afternoon peak hour is 5:00 PM to 6:00 PM.

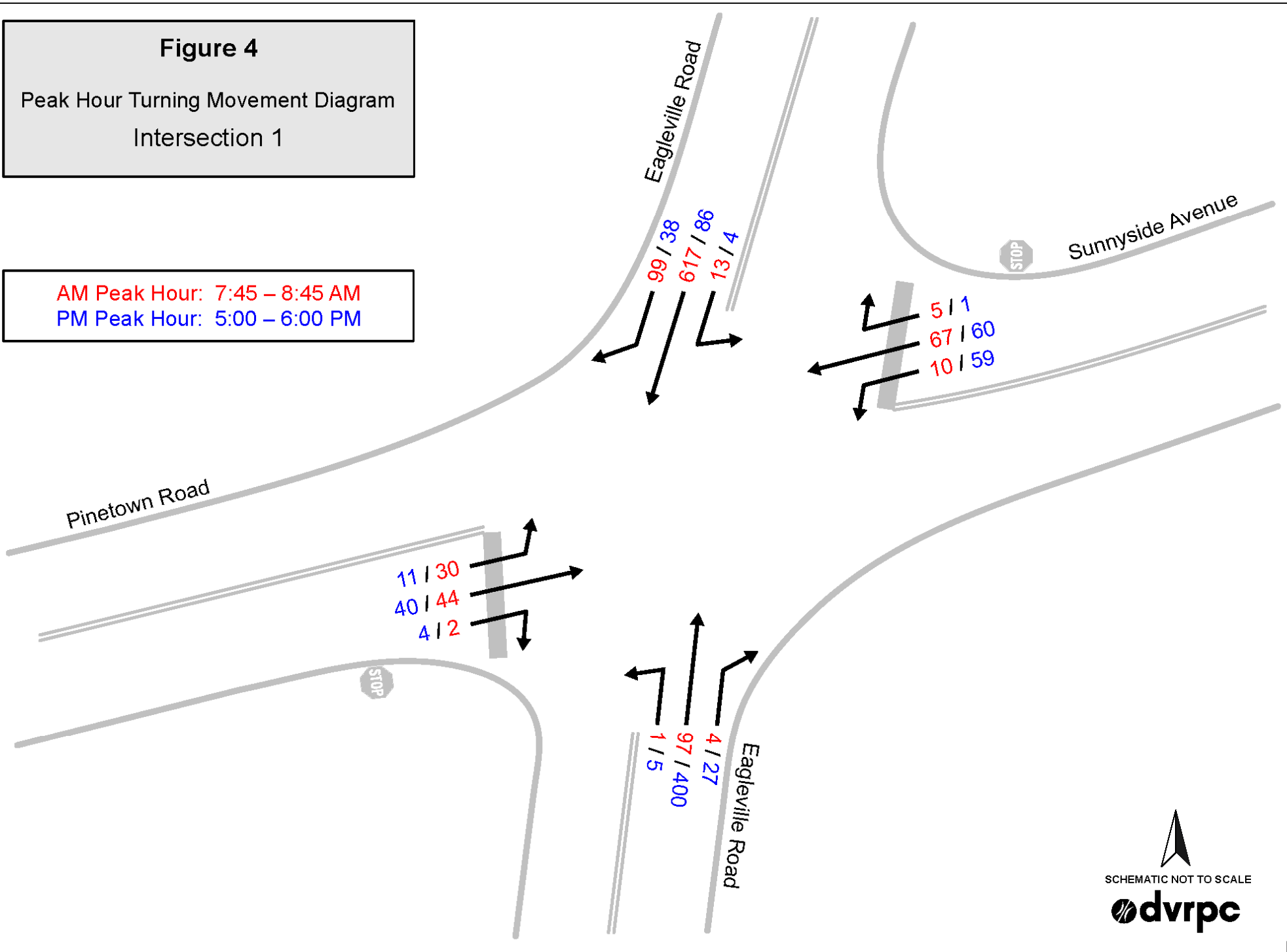
During the morning peak hour, 989 vehicles traveled through this intersection. The dominant movement in the morning and for the entire intersection was the southbound Eagleville Road through movement (617 vehicles). This movement represented 62 percent of the intersection's volume. Morning commuters traveling south on Eagleville Road were likely heading to access US 422. The southbound Eagleville Road right-turn and northbound Eagleville Road through movements were the next highest volume, with approximately 100 vehicles. Right-turning movements from the other approaches were minimal.

During the afternoon peak hour, 735 vehicles traveled through the intersection. The northbound Eagleville Road through movement (400 vehicles) was the dominant traffic pattern. This reversed traffic pattern is likely attributed to motorists returning home in the evening. The southbound Eagleville Road through movement was the next highest volume (86 vehicles). The eastbound Pinetown Road and westbound Sunnyside Avenue through movements were similar to morning volumes, with 40 and 60 vehicles, respectively. The westbound Sunnyside left-turn movement was fairly even (59 vehicles), with the afternoon through movement.

Figure 4

Peak Hour Turning Movement Diagram
Intersection 1

AM Peak Hour: 7:45 – 8:45 AM
PM Peak Hour: 5:00 – 6:00 PM



Existing LOS

LOS analysis was conducted for the study intersection to determine the operational quality in terms of vehicle delay. The existing turning movement data for each intersection was inputted into Synchro and simulated for a one-hour period. Table 4 below summarizes the LOS and corresponding vehicle delay (in seconds) for each approach.

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 four seconds. Northbound and southbound Eagleville Road had no delays due to free-flow conditions. The highest delays in the morning and afternoon were on the eastbound Pinetown Road and westbound Sunnyside Avenue approaches. This was attributed to the stop-and-go conditions associated with stop signs at both approaches.

Table 4: Existing LOS for Intersection 1

Direction/Roadway Approach	Morning		Afternoon	
	Delay (s)	LOS	Delay (s)	LOS
NB Eagleville Road	0	A	0	A
SB Eagleville Road	0	A	0	A
EB Pinetown Road	27	D	15	C
WB Sunnyside Avenue	24	C	19	C
Total Intersection	4	A	4	A

Source: DVRPC, 2014.

Traffic Safety Issues

The following list summarizes traffic safety issues discussed by the study advisory committee at the kick-off meeting. Potential improvements to help improve these traffic safety issues are summarized in Chapter 5.

1. There is a high concentration of angle crashes.
 - o Angle collisions with southbound Eagleville Road through movement vehicles colliding with westbound Sunnyside Avenue through movement vehicles is common. See Chapter 4 for details.
2. The intersection geometry is problematic.
 - o The intersection is skewed and is located on a curve and downhill grade (in the southbound direction). This may be a contributing factor for crashes, particularly angle crashes. See Chapter 4 for details.
3. Sight distance is problematic from the westbound Sunnyside Avenue approach.
 - o This is likely attributed to the steep uphill grade and slight skew at Eagleville Road, which, according to police crash records, often leads to angle crashes. See Chapter 4 for details.

4. A large bush located on the southwestern corner of the intersection obstructs eastbound Pinetown Road motorists' view of northbound Eagleville Road traffic.

Land Use

The land use surrounding the intersection is predominately residential. There are homes located on the northwest, southwest, and southeast quadrants of the intersection. Boruchow Sheldon DDS, a dental office, is located on the northeast corner of the intersection.

Pedestrians

Pedestrian activity is evident at the intersection. During the field views, pedestrians were observed walking near the intersection. There are sidewalks located on the southeastern quadrant of the intersection.

Transit

No transit service is available along Eagleville Road.

Intersection 2: Park Avenue at Eagleville Road and Crawford Road

AADT Counts

DVRPC counts taken in 2012 on Park Avenue north and south of Intersection 2 showed an AADT of 7,636 and 9,757 vehicles, respectively. Counts recorded on Eagleville Road showed a volume of nearly 6,000 vehicles. AADT data was not available for Crawford Road.

Peak Hour Turning Movement Counts

Manual turning movement counts were taken at this offset intersection in September 2012. These counts were taken between the hours of 6:00 AM and 9:00 AM, and between 3:00 PM and 6:00 PM. Since these are two separate intersections, the data shown in [Figure 5](#) on page 18 were adjusted to reflect a continuous traffic movement pattern between both intersections. The morning peak hour is 7:45 AM to 8:45 AM, and the afternoon peak hour is 5:00 PM to 6:00 PM.

During the morning peak hour, 2,104 vehicles traveled through this intersection. The dominant movements in the morning were the eastbound Eagleville Road right-turn movement onto Park Avenue (482 vehicles) and southbound Park Avenue through movement at Crawford Road (471 vehicles). The southbound Park Avenue left-turn movement at Crawford Road (267 vehicles), northbound through movement at Crawford Road (241 vehicles), and southbound Park Avenue through movement at Eagleville Road (256 vehicles) were also dominant. Township officials said that this traffic pattern is likely due to commuters using Park Avenue and Crawford Road to access US 422. Turning movements from westbound Crawford Road and southbound Park Avenue right-turn movement onto Eagleville Road were minimal.

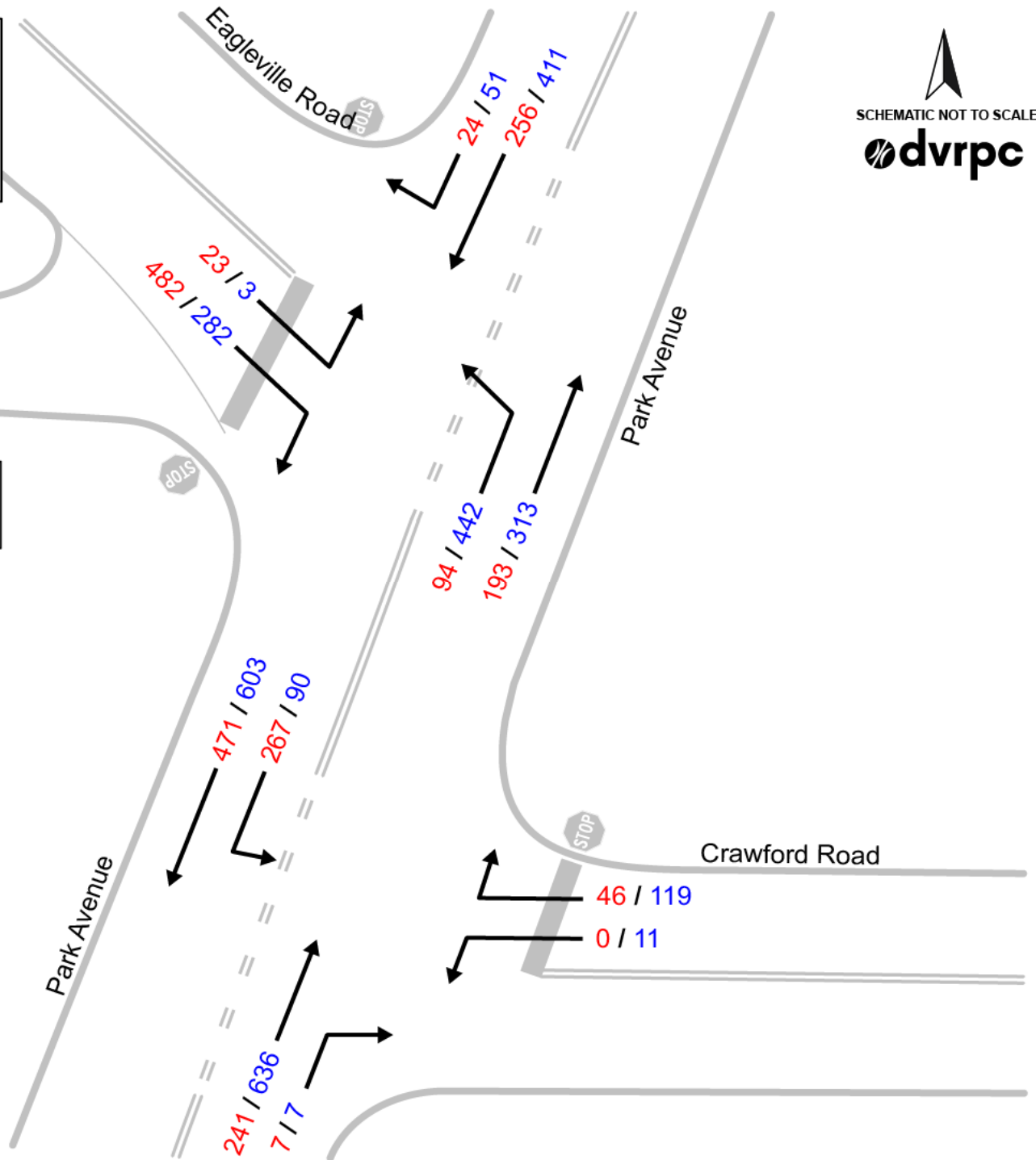
Counts taken during the afternoon peak period showed that 2,968 vehicles traveled through Intersection 2. The highest traffic volumes were the northbound and southbound Park Avenue through movements at Crawford Road (636 and 603 vehicles, respectively). The southbound through movement (411 vehicles) and northbound through and left-turn movements (313 and 442 vehicles, respectively) at Eagleville Road were also dominant. There were nearly 300 vehicles recorded turning right onto southbound Park Avenue from Eagleville Road. Similar to the morning peak hour trend, eastbound Eagleville Road left-turn and southbound Park Avenue right-turn movements at Eagleville Road and northbound Park Avenue right-turn and westbound Crawford Road left-turn movements at Crawford Road were minimal.

Figure 5

Peak Hour Turning Movement Diagram
Intersection 2



AM Peak Hour: 7:45 – 8:45 AM
PM Peak Hour: 5:00 – 6:00 PM



Existing LOS

Due to limitations in the Synchro modeling software, the LOS analysis for Park Avenue at Eagleville Road and Park Avenue at Crawford Road had to be analyzed as separate intersections. The turning movement count data for each intersection was inputted into Synchro and simulated for a one-hour period. The results showing the LOS and corresponding vehicle delay (in seconds) for each approach are summarized below in [Table 5](#).

During the morning peak hour, the Park Avenue at Eagleville Road intersection and the Park Avenue at Crawford Road intersection, operate at LOS B and A, respectively. The 25 second delay on the eastbound Eagleville Road approach is due to the heavy right-turn movement from Eagleville Road interacting with through traffic on Park Avenue. Although westbound Crawford Road is stop-controlled, delays are minimal (10 seconds) due to fewer vehicles turning from the westbound approach. Park Avenue has free-flow conditions.

In the afternoon peak hour, both intersections operate at desirable conditions. Compared to the morning conditions, there was a minor increase in delay on the northbound Park Avenue approach at Eagleville Road due to higher afternoon traffic volumes. Delays on the eastbound Eagleville Road approach remained consistent with existing morning conditions. Delays increased by 12 seconds on the westbound Crawford Road approach. This is the result of more vehicles stopping at this approach in the afternoon (46 vehicles vs. 130 vehicles) and having to wait for the heavy northbound Park Avenue traffic (636 vehicles) traveling through the intersection.

Table 5: Existing LOS for Intersection 2

Park Avenue at Eagleville Road				
Direction/Roadway Approach	Morning		Afternoon	
	Delay (s)	LOS	Delay (s)	LOS
NB Park Avenue	3	A	9	A
SB Park Avenue	0	A	0	A
EB Eagleville Road	25	C	21	C
Total Intersection	13	B	9	A
Park Avenue at Crawford Road				
Direction/Roadway Approach	Morning		Afternoon	
	Delay (s)	LOS	Delay (s)	LOS
NB Park Avenue	0	A	0	A
SB Park Avenue	5	A	3	A
WB Crawford Road	10	B	22	C
Total Intersection	4	A	3	A

Source: DVRPC, 2014.

Traffic Safety Issues

The following statement summarizes the one major traffic safety issue discussed among the study advisory committee at the kick-off meeting.

1. There is a high concentration of rear-end and left-turn angle crashes. The short distance (offset) along Park Avenue between Eagleville Road and Crawford Road may be a contributing factor in these crashes. See Chapter 4 for more information on crash details.

Land Use

The land use surrounding the immediate intersection is wooded and low-density residential development. The east side of the intersection is wooded. There are two homes located on the west side of the intersection. The Mine Run stream runs between Eagleville Road and Crawford Road.

Pedestrians

- ❖ There was no observed pedestrian activity at this intersection. This location is not conducive to pedestrians, due to the tight roadway geometry and no shoulders or sidewalks.

Transit

- ❖ No transit service is available on any of the roadways at this intersection.

Crash History Analysis

This analysis includes all crashes that occurred at the two study intersections from 2008 through 2012. The main goals of this analysis are to highlight crash trends and determine causal factors.

The crash summaries and collision diagrams used in this analysis were derived from non-reportable and reportable crash records provided by the Lower Providence Township Police Department. In Pennsylvania, a crash is considered reportable when a person is injured or killed, or if a vehicle must be towed from the scene.

Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road

Crash History Summary

There were 26 non-reportable and 28 reportable crashes recorded during the study period, within a 250-foot buffer around the intersection. Collision by type for this intersection is summarized in [Table 6](#) on page 22. The angle collision type refers to where one vehicle collides with another, typically in an angular fashion, sometimes referenced as “T”-Bone or broad-side crash. It doesn’t indicate if a crash occurred during a left-turn movement. However in this document, the collision diagram denotes crashes involving left-turns.

Crash Trends

Major findings of **non-reportable** crash report analysis:

- ❖ Angle crashes were the most common collision type, at 77 percent (20 crashes).
- ❖ Seventy-five percent of these crashes involved southbound Eagleville Road vehicles colliding with vehicles traveling through the intersection from westbound Sunnyside Avenue. This may be the result of the intersection’s skewed geometry, which compromises sight distance from westbound Sunnyside Avenue.
- ❖ According to police reports, many drivers who were in crashes complained of not being able to see traffic on southbound Eagleville Road from westbound Sunnyside Avenue, or drivers on southbound Eagleville Road traffic suddenly seeing vehicles enter the intersection from westbound Sunnyside Avenue.
- ❖ Fifty percent of the crashes in the five-year study period occurred in 2009.

Major findings for reportable crash report analysis:

- ❖ Angle crashes were the most common collision type, at 89 percent (25 crashes).
- ❖ Nearly 64 percent of angle crashes involved southbound Eagleville Road vehicles colliding with westbound Sunnyside Avenue vehicles traveling through the intersection (16 incidents).
- ❖ According to police reports, many drivers who were in crashes often complained of not being able to see traffic on southbound Eagleville Road from westbound Sunnyside Avenue, or drivers on southbound Eagleville Road traffic suddenly seeing vehicles enter the intersection from westbound Sunnyside Avenue.
- ❖ Ten of the 11 injury crashes were angle collisions.

Table 6: Crash Summary for Intersection 1

COLLISION TYPE	NON-REPORTABLE CRASHES		REPORTABLE CRASHES	
	Actual Number	Percentage	Actual Number	Percentage
Angle (includes left-turns)	20	77.0%	25	89.3%
Rear-End	1	3.8%	1	3.6%
Hit-Fixed-Object	2	7.7%	0	0.0%
Backing	1	3.8%	0	0.0%
Non-Collision	2	7.7%	2	7.1%
Total	26	100.0%	28	100.0%

Source: DVRPC, 2014.

The following crash analysis refers only to the reportable crashes:

- ❖ Of the 28 reportable crashes recorded during the analysis period, there were zero fatal crashes, 11 injury crashes, and 17 property-damage-only crashes.
- ❖ During the study period years 2008 to 2012, there were four crashes reported in 2008, five crashes reported in 2009, six crashes reported in 2010, six crashes reported in 2011, and seven crashes reported in 2012. Considering crashes by month, December and October were the two highest in crash frequency, with six and four crashes, respectively.

The collision diagram (Figure 6) shows the location, collision type, and frequency of vehicular crashes for Intersection 1. A list of potential safety improvements is provided in Chapter 5.

Crash Analysis Conclusions

- ❖ Angle crashes are a major issue at this intersection, with the majority of them involving southbound Eagleville Road vehicles colliding with vehicles traveling through the intersection from westbound Sunnyside Avenue.
- ❖ The intersection's geometry (skew, location on a curve, downhill slope, and compromised sight distance from the westbound Sunnyside Avenue approach) may be contributing to the trend of angle crashes.
- ❖ The crashes correspond with major traffic flows.

Figure 6

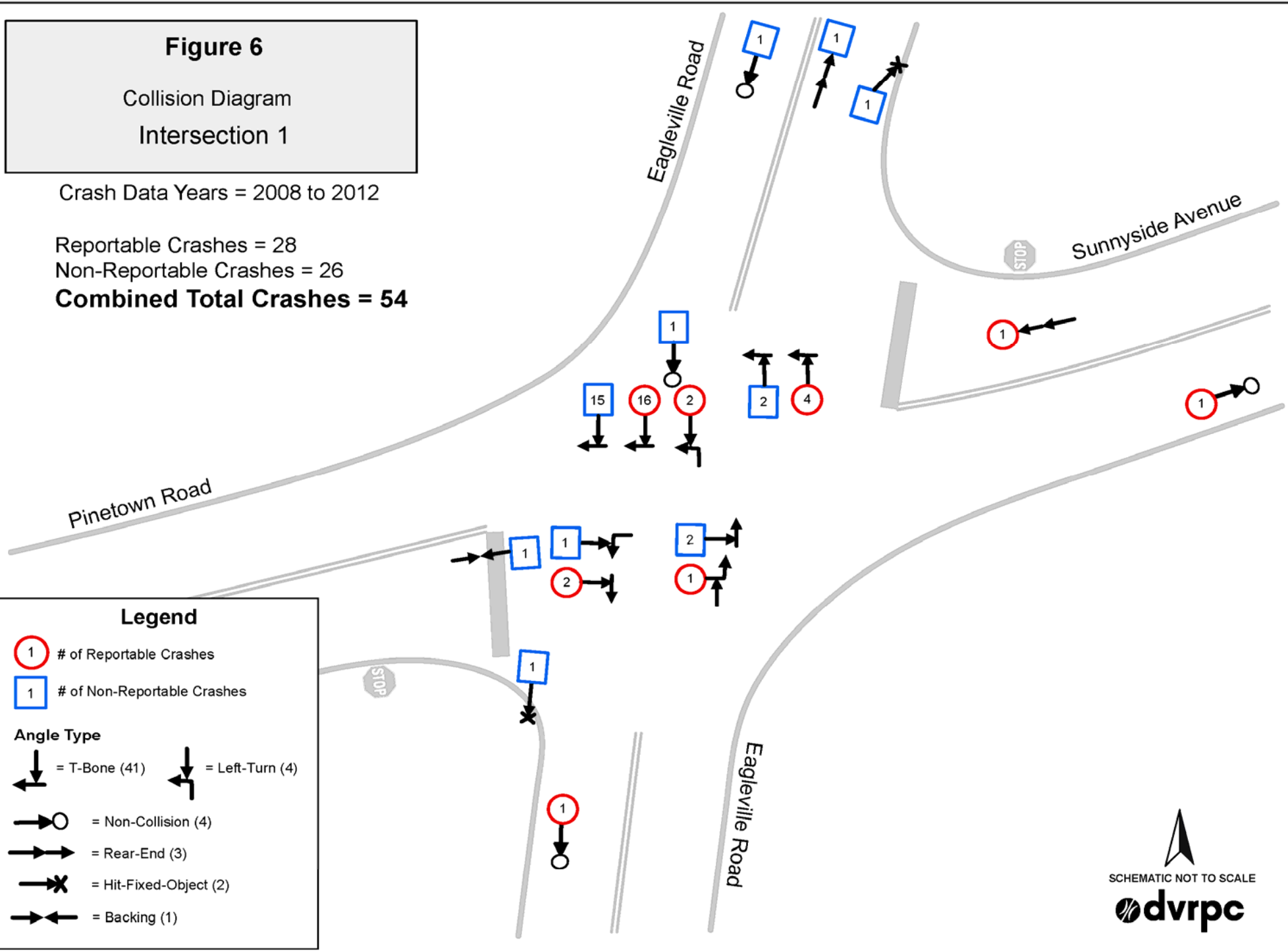
Collision Diagram Intersection 1

Crash Data Years = 2008 to 2012

Reportable Crashes = 28

Non-Reportable Crashes = 26

Combined Total Crashes = 54



Legend

- 1 # of Reportable Crashes
- 1 # of Non-Reportable Crashes

Angle Type

- = T-Bone (41)
- = Left-Turn (4)
- = Non-Collision (4)
- = Rear-End (3)
- = Hit-Fixed-Object (2)
- = Backing (1)

Intersection 2: Park Avenue at Eagleville Road and Crawford Road

Crash History Summary

There were 14 non-reportable and 19 reportable crashes recorded during the study period within a 250-foot buffer around the intersection. Collision by type for this intersection is summarized in Table 7.

Crash Trends

Major findings of non-reportable crash report analysis:

- ❖ Rear-end crashes were the most common collision type, at 57 percent, followed by angle crashes, at 29 percent.
- ❖ Six of the eight rear-end crashes involved southbound Park Avenue vehicles colliding with vehicles turning left onto Crawford Road.

Major finding for reportable crash report analysis:

- ❖ Rear-end crashes were the most common collision type, at 47 percent (nine crashes), followed by angle crashes, at 32 percent (six crashes).
- ❖ The majority of the rear-end crashes occurred on the northbound Park Avenue approach at Eagleville Road.

Table 7: Crash Summary for Intersection 2

COLLISION TYPE	NON-REPORTABLE CRASHES		REPORTABLE CRASHES	
	Actual Number	Percentage	Actual Number	Percentage
Rear-End	8	57.1%	9	47.4%
Angle	4	28.7%	6	31.6%
Hit-Fixed-Object	1	7.1%	4	21.0%
Hit Animal	1	7.1%	0	0.0%
Total	14	100.0%	19	100.0%

Source: DVRPC, 2014.

The following crash analysis refers only to the reportable crashes:

- ❖ Of the 19 reportable crashes recorded during the analysis period, there were zero fatal crashes, 11 injury crashes, and eight property-damage-only crashes.
- ❖ During the study period years 2008 to 2012, there were six crashes recorded in 2008, four crashes recorded in 2009, four crashes recorded in 2010, five crashes recorded in 2011, and

zero crashes recorded in 2012. Considering crashes by month, November and June were the two highest in terms of crash frequency, with three crashes in each.

- ❖ The collision diagram ([Figure 7](#)) shows the location, collision type, and frequency of vehicular crashes for Intersection 2. A list of potential safety improvements is provided in Chapter 5.

Crash Analysis Conclusion

- ❖ There is a high percentage of rear-end and angle crashes along Park Avenue between Eagleville Road and Crawford Road.
- ❖ The short distance between Eagleville Road and Crawford Road and the high turning movements from Eagleville Road onto Park Avenue may contribute to crashes at this location.

Figure 7

Collision Diagram Intersection 2

Crash Data Years = 2008 to 2012

Reportable Crashes = 19

Non-Reportable Crashes = 14

Combined Total Crashes = 33

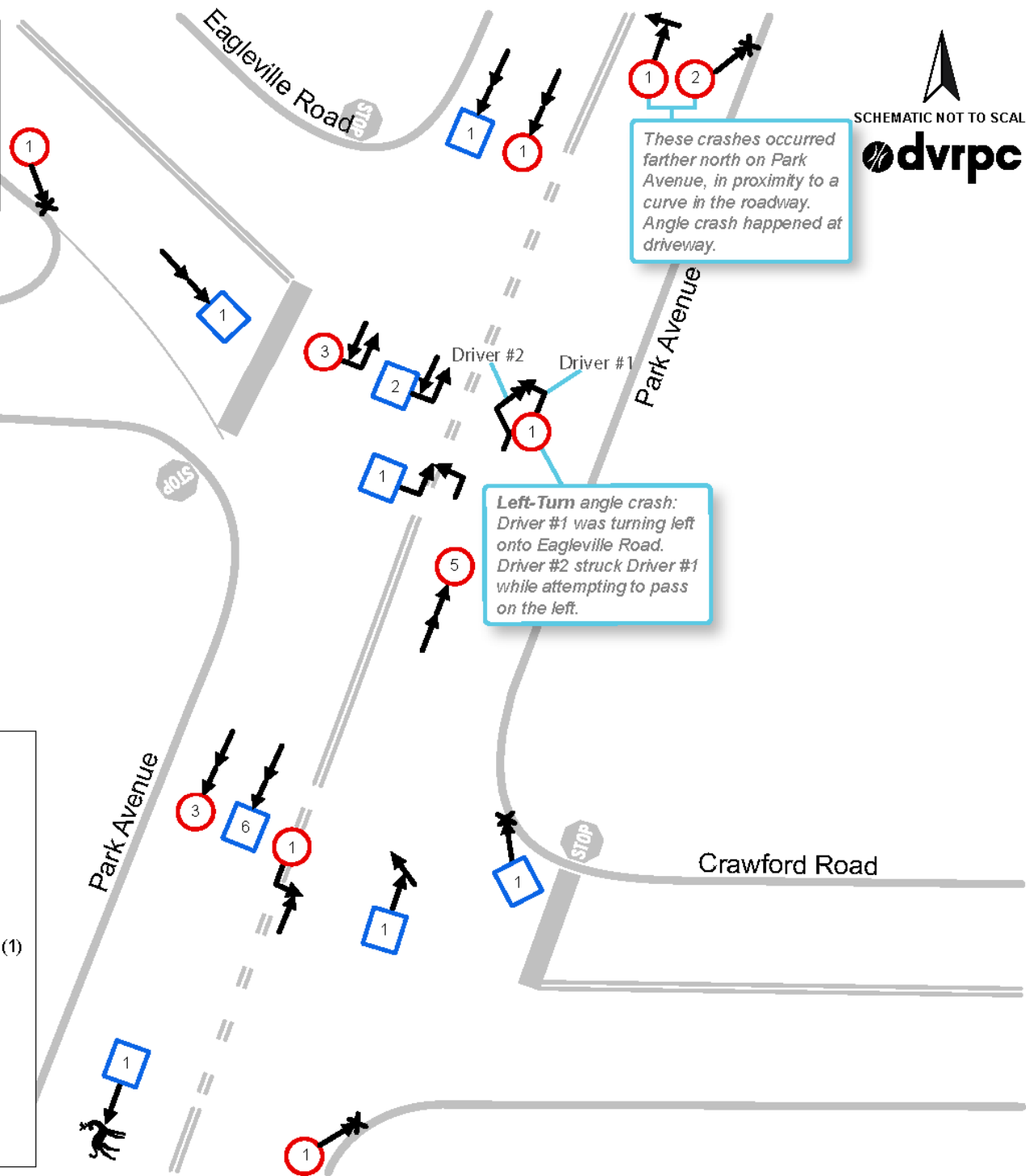


Legend

- 1 # of Reportable Crashes
- 1 # of Non-Reportable Crashes

Angle Type

- = T-Bone (2)
- = Left-Turn (7)
- = Left-Turn (1)
- = Rear-End (17)
- = Hit-Fixed-Object (5)
- = Hit Animal (1)



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 improvements include installing signage and trimming vegetation. Operational improvements can include intersection geometric modifications or changes to traffic control devices.

Intersection 1: Eagleville Road at Sunnyside Avenue/Pinetown Road

This location is identified on PennDOT’s Intersection Safety Implementation Plan (ISIP) for stop-controlled intersection improvements. This intersection ranked 12th in the state on PennDOT’s ISIP for stop-controlled intersection and funding is readily available to make improvements. The issues and the corresponding potential strategies for alleviating these safety and operational concerns are identified below in [Table 8](#). The pros and cons of each strategy are also listed. The [blue highlighted text](#) in the table reflects the operational strategy.

Table 8: Issues and Potential Improvements – Intersection 1

Issues	Potential Improvements
<p>1. There is a high concentration of angle crashes. Angle collisions with southbound Eagleville Road through movement vehicles colliding with westbound Sunnyside Avenue through movement vehicles is common.</p>	<p>1A. Convert intersection to four-way-stop control</p> <p><u>Pros</u> – This option would allow for safer movements from all approaches; however, the greatest benefit is for Sunnyside Avenue and Pinetown Road; the risk of crashes, particularly angle crashes, is minimized; inexpensive; quickly implemented; this location is identified on PennDOT’s ISIP for stop-controlled intersection improvements; the Township is willing to support this effort if other low-cost safety improvements do not work (see strategy 2A).</p> <p><u>Cons</u> – This option will add delay on both Eagleville Road approaches, which minimizes traffic flow on this heavily traveled roadway, and Eagleville Road motorists may likely divert to other residential streets to avoid the intersection.</p> <p>1B. Consider adding a traffic signal</p> <p><u>Pro</u> – This option would allow for safer movements from all approaches, thus minimizing the risk of angle crashes.</p> <p><u>Cons</u> – This option is expensive; delays will be added to the Eagleville Road approaches, which minimizes traffic flow on this heavily traveled roadway; PennDOT and the Township do not support this option; traffic volumes do not meet warrants for a traffic signal; rear-end crashes may likely increase; and motorists may divert to residential streets to avoid the intersection.</p>

Table 8: Issues and Potential Improvements – Intersection 1 (continued)

Issues	Potential Improvements
<p>2. The intersection geometry is problematic.</p> <ul style="list-style-type: none"> ■ Intersection is skewed, located on a curve, and has a downhill grade (in the southbound direction). ■ According to police reports, crash victims complained of not being able to see vehicles entering the intersection (particularly from westbound Sunnyside Avenue) or seeing vehicles pull out from the side streets (particularly from southbound Eagleville Road). 	<p>2A. Modify the intersection geometry. This includes adding dotted white edge lines at the Pinetown Road and Sunnyside Avenue approaches, restriping to realign all four intersection approaches, and restriping the double yellow center line and transverse pavement markings along Eagleville Road. This will help with the intersection’s skewedness.</p> <p><u>Pros</u> – This option increases sight distance at all approaches; low cost; quick implementation; PennDOT has funding available to advance this effort.</p> <p><u>Con</u> – This option will need to be restriped periodically.</p> <p>2B. Add additional signage or replace signage to warn Eagleville Road motorists of the vehicles entering the roadway.</p> <p><u>Pros</u> – This option warns motorists of the intersection ahead and the potential crossing and turning traffic from westbound Sunnyside Avenue and westbound Pinetown Road; low cost; quick implementation; PennDOT has funding available to advance this effort.</p> <p><u>Con</u> – The signage will need to be maintained periodically.</p>
<p>3. Sight distance is problematic from the westbound Sunnyside Avenue approach.</p> <ul style="list-style-type: none"> ■ This approach is on a steep uphill grade and enters Eagleville Road at a skewed angle. 	<p>3. Construct a level pavement platform at the westbound Sunnyside Avenue approach.</p> <p><u>Pros</u> – This option levels the approach to provide for enhanced sight distance to see approaching traffic on Eagleville Road and will help to minimize angle crashes.</p> <p><u>Cons</u> – This is an expensive construction project; PennDOT conducted a field review and determined the grade is too steep and prefers to modify the approach through restriping (See strategy 2A.)</p>
<p>4. Large bush located on the southwestern corner of the intersection obstructs eastbound Pinetown Road motorists’ view of the northbound Eagleville Road traffic.</p>	<p>4. Work with property owner to trim vegetation.</p> <p><u>Pros</u> – This option increases sight lines for eastbound Pinetown Road drivers; low cost; quick implementation.</p> <p><u>Cons</u> – The property owner may object and this effort will need to be repeated periodically.</p>

Source: DVRPC, 2014.

Potential Operational Strategy LOS Analysis

Converting the intersection to a four-way stop was modeled using Synchro software. The results are for comparison to the existing LOS conditions documented in Chapter 3. The potential improvement described in this chapter is graphically shown in [Figure 8](#) on page 31.

Scenario 1 – Convert intersection to four-way stop controlled

Description

- ❖ Convert intersection to four-way stop-control by adding stop signs to the northbound and southbound Eagleville Road approaches.

Advantages

- ❖ This option would allow for safer movements from the westbound Sunnyside Avenue and eastbound Pinetown Road approaches, thus minimizing the opportunity for angle crashes.
- ❖ This option is low cost and can be implemented quickly.
- ❖ This effort is supported by the Township if restriping the intersection does not prove effective.

Disadvantages

- ❖ With the addition of stop signs, delays along Eagleville Road will likely increase, which minimizes traffic flow on this heavily traveled roadway.
- ❖ This option may likely cause motorists to divert to other residential streets, which will increase traffic volumes on low-volume roadways.

LOS Analysis

In the morning, this intersection would function at a LOS E, with 44 seconds of delay. Unlike existing conditions, delays would be experienced along the southbound and northbound Eagleville Road approaches. As indicated in [Table 9](#), the southbound approach experienced the highest delay, of nearly one minute, which is attributed to the heavy southbound traffic and stop-and-go conditions. Delays decreased on the eastbound and westbound approaches by 17 and 14 seconds, respectively. In the afternoon, this intersection operates at a desirable LOS B, with 12 seconds of delay. There are delays on the southbound and northbound Eagleville Road approaches. The northbound Eagleville Road approach has the highest amount of delays, with 15 seconds. The delay is not as high as the morning southbound Eagleville Road delays given that traffic volumes are lower (400 vehicles versus 617 vehicles).

Table 9: 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 Eagleville Road	0	A	0	A	10	B	15	B
SB Eagleville Road	0	A	0	A	56	F	9	A
EB Pinetown Road	27	D	15	C	10	B	9	A
WB Sunnyside Avenue	24	C	19	C	10	B	10	B
Total Intersection	4	A	4	A	44	E	12	B

Source: DVRPC, 2014.

Conclusion

Safety improvements at this intersection are a high priority for the Township. The strategies associated with modifying the intersection’s geometry seem like the most logical initial approach. Strategies such as restriping the intersection should be fully explored. Making this intersection fully stop-controlled would add significant delay, especially for the most heavily traveled legs. Although this strategy is not the first choice of consideration to improve safety at this intersection, it does offer major safety benefits for the eastbound Pinetown Road and westbound Sunnyside Road traffic by reducing the risk of angle crashes. As discussed by the steering committee, if restriping to modify the intersection does not help to minimize crashes at this intersection, then this option should be seriously considered as the next step of action.

Figure 8
Intersection 1
Issues and Potential Improvements

Issue:
1. High concentration of angle crashes

Potential Improvement:
1A. Convert intersection to a four-way stop
1B. Consider adding a traffic signal

Issue:
2. Problematic intersection geometry

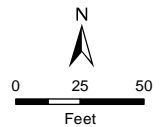
Potential Improvement:
2A. Modify the geometry by restriping
2B. Add additional signage or replace signage to warn Eagleville Road motorists of the vehicles entering the roadway

Issue:
3. Problematic sight distance from the westbound Sunnyside Avenue approach

Potential Improvement:
3. Construct a level pavement platform at the westbound Sunnyside Avenue approach

Issue:
4. Large bush on southwest corner of intersection obstructs eastbound Pinetown Road motorists' view of northbound Eagleville Road traffic

Potential Improvement:
4. Work with property owner to trim vegetation



Aerial Imagery: DVRPC, 2010



Intersection 2: Park Avenue at Eagleville Road and Crawford Road

This intersection is identified on PennDOT’s ISIP for stop-controlled intersection improvements, and it meets the state’s guidelines for Automated Red Light Enforcement (ARLE) grant funding.

There was only one issue identified at this intersection. [Table 10](#) describes the issue and corresponding potential strategies for alleviating safety concerns at Intersection 2. A few years ago, low-cost improvements (dashed lines to help drivers navigate through the intersection and signage) were implemented at this location. These improvements did add some benefit to safety; however, the steering committee felt that more expensive strategies needed to be analyzed to offer more of a longer-term solution at improving safety at the intersection. The pros and cons of each strategy are also listed. The [blue highlighted text](#) in the table reflects the two operational strategies. A more in-depth engineering analysis with multiple alternatives will need to be conducted; therefore, no LOS operational strategies were modeled in this report. The potential improvements described in this chapter are graphically depicted in [Figure 9](#) on page 34.

Table 10: Issue and Potential Strategies – Intersection 2

Issue	Potential Improvements
<p>1. High concentration of rear-end and left-turn angle crashes. The short distance (offset) along Park Avenue between Eagleville Road and Crawford Road may be a contributing factor in these crashes.</p>	<p>1A. Consider realignment of the intersection by combining both intersections (eliminating the offset on Park Avenue between Eagleville Road and Crawford Road), widen Park Avenue to accommodate left-turn lanes (includes the bridge), and add a traffic signal.</p> <p><u>Pros</u> – This option provides dedicated lanes for the heavy left-turn movements; maximizes traffic flow and safety through the intersection; PennDOT and Township are supportive; this intersection is identified on PennDOT’s ISIP for stop-controlled intersection improvements.</p> <p><u>Cons</u> – This option is very expensive and will require Right-Of-Way (ROW) acquisition, bridge widening, and environmental impacts; the ARLE grant funding is not guaranteed.</p> <p>1B. Consider lengthening the offset along Park Avenue between Eagleville Road and Crawford Road.</p> <p><u>Pros</u> – This option increases the room for merges and visibility along Park Avenue between Eagleville Road and Crawford Road, thus minimizing the risk for crashes, and depending on the design, there may be no impact to the bridge; it is less expensive than 1A.</p> <p><u>Cons</u> – This option is expensive and will require ROW acquisition and environmental impacts.</p>

Source: DVRPC, 2014.

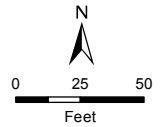
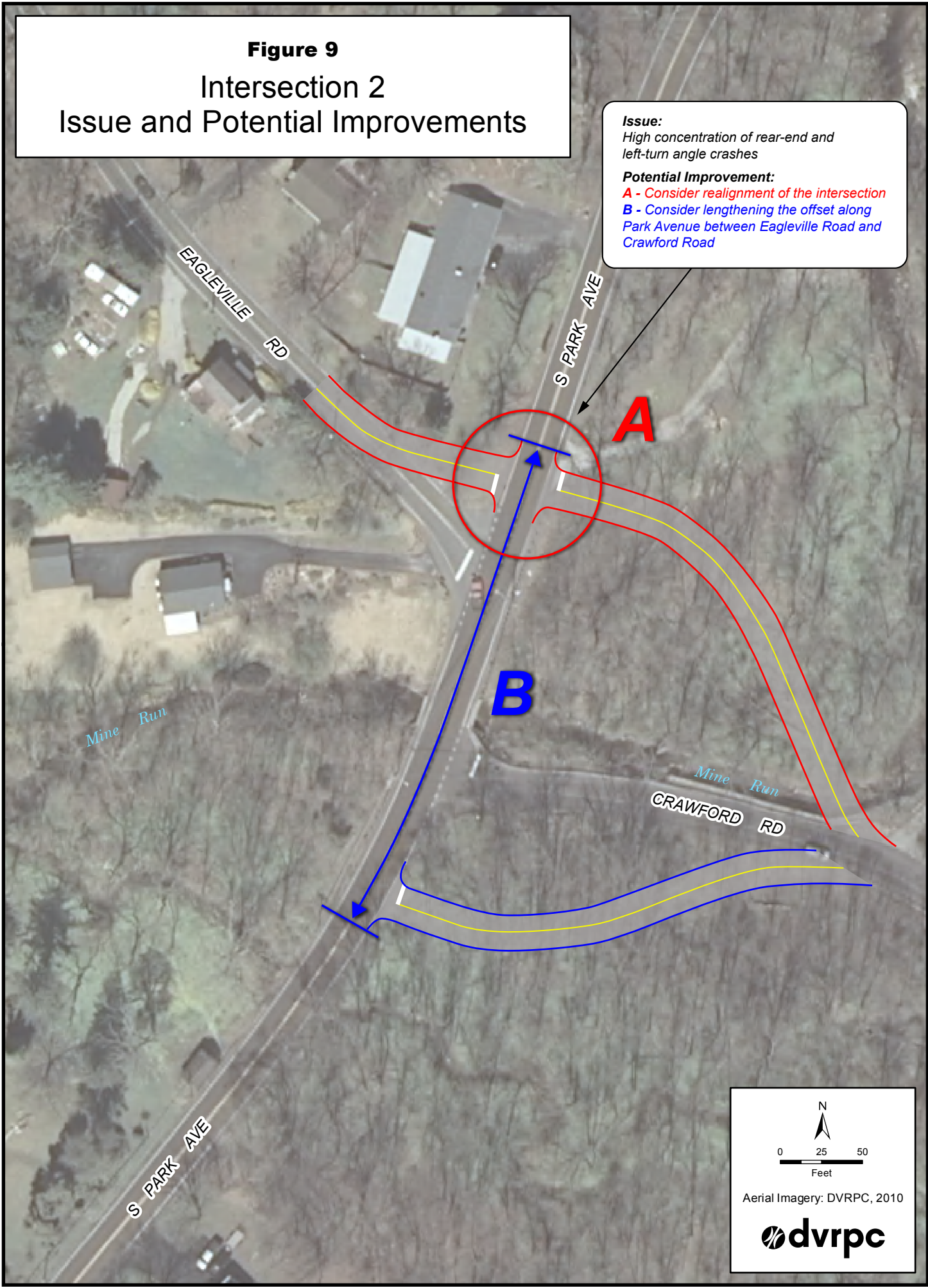
Conclusion

As discussed with the steering committee, no low-cost safety improvements were discussed or taken into consideration. There were two operational strategies, both of which are major capital improvements. Option 1A was the first choice recommended and is supported by the Township and PennDOT. Although this appears to be more expensive, it does meet requirements for ARLE funding, which could help fund improvements in the future.

Figure 9
Intersection 2
Issue and Potential Improvements

Issue:
High concentration of rear-end and left-turn angle crashes

Potential Improvement:
A - Consider realignment of the intersection
B - Consider lengthening the offset along Park Avenue between Eagleville Road and Crawford Road



Aerial Imagery: DVRPC, 2010



Recommendations

At the follow-up meeting held on June 27, 2013, representatives from the Montgomery County Planning Commission, PennDOT District 6, Lower Providence Township, and DVRPC worked together to develop a set of recommendations from the potential strategies. Safety improvements at both intersections remain a high priority for the Township. Both locations qualify for PennDOT’s fiscal year 2014 Highway Safety Improvement Program (HSIP) “Set-aside” funds and current available PennDOT District 6 HSIP funds. The agreed-upon recommendations and PennDOT’s efforts to implement them are described below in [Tables 11 and 12](#).

Intersection 1: Eagleville Road at Sunnyside Avenue and Pinetown Road

The three recommended improvements taken to enhance safety at this intersection are listed below in [Table 11](#). PennDOT District 6 is the lead implementer.

Table 11: Recommendations for Intersection 1

Item	Who Plans to Do It?	Approximately When Would It Be Done?
1. Modify the intersection geometry by restriping. This will help with the intersection’s skewedness. A PennDOT contract was awarded in March 2014 to begin work on restriping the intersection. The contract also included adding intersection-ahead warning signs and oversized stop signs. The pavement marking plan (Figure 10) is on page 36.	PennDOT District 6	Summer 2014 (currently underway)
2. Conduct a follow-up crash analysis in three years to determine if restriping was effective in reducing crashes. Depending on results, the alternative recommendation may involve future consideration of converting the intersection to all-four-way stopped control.	DVRPC	Summer 2017
3. Work with the property owner to trim vegetation and increase sight lines from Pinetown Road approach looking southbound.	PennDOT – Montgomery County Maintenance	Short term

Source: DVRPC, 2014.

Table 10 - PennDOT Pavement Plan for Intersection 1

TABULATION OF QUANTITIES (INFORMATION ONLY)		REMARKS	SEGMENTS/ OFFSETS
PAVEMENT MARKING REMOVAL	UNIT		
0963	0001	0963	0010/1636 TO 0020/0090
0960	SF	24" WHITE HOT THERMOPLASTIC PAVEMENT MARKINGS	42
0964	LF	4" WHITE EPOXY PAVEMENT MARKINGS	670
0964	LF	4" WHITE EPOXY PAVEMENT MARKINGS	530
0964	LF	4" YELLOW EPOXY PAVEMENT MARKINGS	530
0964	SR	SR 4006	0010/1636 TO 0020/0090

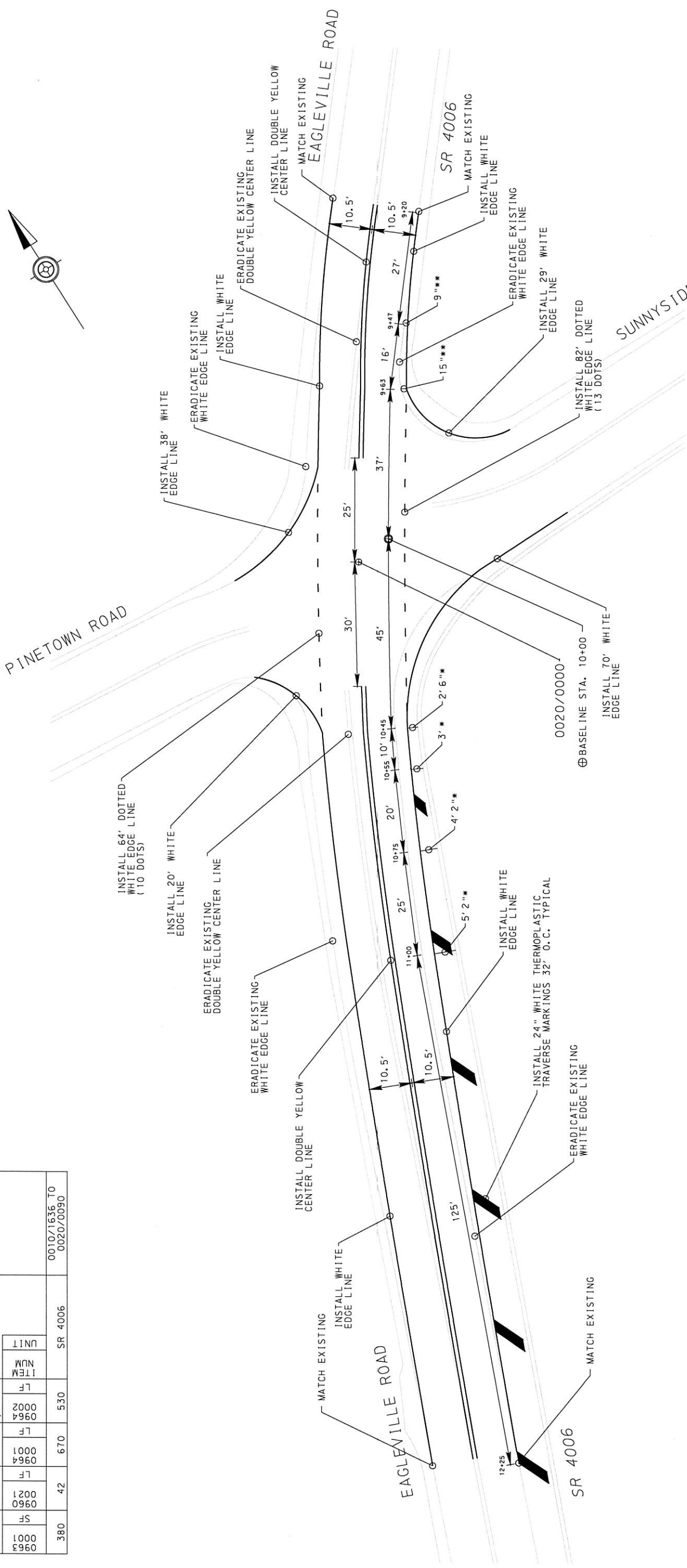
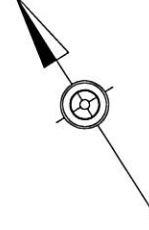
NOTE:

- REFER TO THE PAVEMENT MARKING AND SIGNING STANDARDS. PUB. 111 - TC 8600 SHEETS 3 & 4 OF 13 FOR PAVEMENT MARKING DETAILS.

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
06-0	MONTGOMERY	4006		1 OF 1
REVISION NUMBER	LOWER PROVIDENCE TOWNSHIP	REVISED	DATE	BY

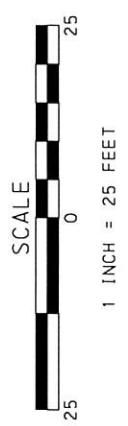
DISTRICT TRAFFIC ENGINEER:
Lawrence A. Bucci

PAVEMENT MARKING PLAN



LEGEND

- * - DISTANCE FROM CURB
- ** - DISTANCE FROM EXISTING EDGE LINE
- ⊕ - BASE LINE CONSISTS OF CURB AND EXISTING LANE LINE



Intersection 2: Park Avenue at Eagleville Road and Crawford Road

Only one viable solution is recommended for this location and it is described below in [Table 12](#).

Table 12: Recommendation for Intersection 2

Item	Who Plans to Do It?	Approximately When Would It Be Done?
1A. Township should coordinate with PennDOT and take steps to apply for the ARLE grant to realign and widen Park Avenue, and add a traffic signal at the intersection. This report may help support the application.	Lower Providence Township and PennDOT District 6	June 2015

Source: DVRPC, 2014.

Next Steps

As documented, both study locations have demonstrated a safety issue and qualify for PennDOT funds to help improve safety. DVRPC will provide assistance as needed to help with the advancement of implementing these recommendations.

APPENDIX



Study Advisory Committee Members

Table A-1: Study Advisory Committee Members

Name	Organization	Title
Jesse Buerk	DVRPC	Sr. Transportation Planner
Regina Moore	DVRPC	Transportation Engineer
Bud Carroll	Lower Providence Township Police Department	Chief of Police
Rich Gestrich	Lower Providence Township Administration	Township Manager
Dan McGuffin	Lower Providence Township Police Department	Police Officer
Wes Ratko	Montgomery County Planning Commission	Transportation Planner
Larry Bucci	PennDOT District 6	Traffic Safety Engineer

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Geographic Area Covered: Lower Providence Township, Montgomery County

Key Words: Eagleville Road, Pinetown Road, Sunnyside Avenue, Park Avenue, Crawford Road, Level of Service, LOS, intersection, safety, crashes, roadway, improvements, turning movements, peak hour, strategies, Lower Providence Township, Montgomery County

Abstract: This document represents the findings and recommendations for the Congestion and Crash Site Analysis Program study conducted in Montgomery County in Fiscal Year 2013. This program represents an effort to improve the mobility and safety on roadways in the DVRPC region.

Working with a data-driven process and the Montgomery County Planning Commission, the intersections of Eagleville Road at Sunnyside Avenue/Pinetown Road and Park Avenue at Eagleville Road and Crawford Road were chosen. In-depth crash 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. The study resulted in recommendations to improve safety at the two intersections. Both intersections qualify for PennDOT's Highway Safety Improvement Program (HSIP) funds. A PennDOT contract was awarded in March 2014 to begin implementing improvements at one of the study locations.

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